# SCIENCE AND PRACTICES OF CAKE, PIE, COOKIE, PASTRY AND VARIETY BREADS AND ROLLS PRODUCTION

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THIS BOOK IS DEDICATED TO THE BAKING INDUSTRY

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# CHAPTER 1

## WHEATS

### 1. Wheat and Other Cereals

The Chinese cultivated wheat as about 3000 B. C.

From the beginning of man's civilization he has shown a decided preference for wheat as a bread and cake making cereal. This preference can be definitely attributed to the peculiar property of wheat proteins as compared with proteins of other cereals. (Proteins are complex nitrogenous compounds, containing carbon, hydrogen, oxygen, nitrogen, and sulphur, formed in living organisms). Flour made from any cereal, such as corn, oats, rice, rye, or barley contain proteins in similar amounts to wheat--some even a greater percentage. However, only the proteins of wheat flour possess the peculiar characteristic of combining with water to form gluten (a rubber - like, elastic substance).

From prehistoric times to the present day the foremost agricultural pursuit of civilized people has been the growth and cultivation of wheat. Two of our most important industries are wheat flour milling and bread and cake manufacture.

### 2. Varieties of Wheat

The character of wheat produced in a specific locality is determined by the type of soil, climate, selection of seed wheat, and time of year planted. The tropical climates are unfavorable to wheat growth and production, but this cereal thrives in temperate climates. One-fifth of the total world production of wheat is produced in the United States.

Wheat varieties comprise two general classes - Winter Wheat and Spring Wheat. Wheat sown in the fall of the year in mild climates which allow wheat plants to survive during the winter months is known as Winter Wheat.

In severe climates, where wheat plants cannot survive during winter months, wheat is sown in the spring of the year. Such wheat is classed as Spring Wheat.

Winter Wheat grows rapidly during the spring and early summer months, ripens, and is harvested during midsummer months. Spring Wheat matures later in the season and is harvested during the late summer, or early fall months.

Wheats are also divided into two other classes, viz. Hard Wheats and Soft Wheats. Hard spring wheats, from which our strongest bread flours are produced (those containing larger percentages of protein, or gluten), are grown in such states as North Dakota, South Dakota, Montana, and Minnesota. Because of the location of these states, hard spring wheat is frequently referred to as

Northwestern Hard, Northwestern Spring, or Northwestern.

The best Hard Winter Wheat states are Nebraska, Kansas, Oklahoma and Texas. Since these states are located in the southwestern section of the United States, wheats produced in them are frequently referred to as Southwestern, Southwestern Hard, or Southwestern Winter. Occasionally Hard Winter Wheat is classed as Kansas, doubtless because the state of Kansas was one, if not the first, southwestern state in which Hard Winter Wheat was grown.

Soft Winter Wheats are grown in such midwestern states as Ohio, Indiana and Illinois. These wheats contain much less protein than Hard Spring and Hard Winter. They are employed in the manufacture of pastry and cake flours.

3. Composition of Wheat Grains

Wheat grains are composed of three entirely different portions, viz: Bran, Endosperm, and Germ.

(a) Bran. This portion of the grains consists of six tough, woody outside layers: epidermis, epicarp, endocarp, testa, episperm, and aleurone cells.

The first five layers furnish a protective coating for the dormant plant (germ) and the endosperm, which supplies the first food for the young plant. These layers of bran protect the germ and its food supply from excessive changes of heat and moisture.

The sixth, or aleurone, layer is composed of some mineral matter, fat, and soluble protein-possibly also an available supply of food for the young plants.

(b) Endosperm. The bulk of wheat grains consists of the endosperm, starch and protein cells, which nature has produced and stored as a readily convertible and available supply of food for the wheat plant during its primary stage of growth, and until the plants are able to consume components of the soil as food sustenance.

(c) Germ, or Embryo. This is the dormant plant which sprouts and commences to grow and reproduce other wheat grains when conditions are favorable, such as sufficient heat and an abundant supply of moisture. The germ of wheat grains contain up to 20% fat, as much as 30% protein, and also some starch, mineral matter, and fiber.

Wheat grains composed of dormant plants and plant food well protected by tough, fibrous layers of bran are nature's creation for the purpose of reproducing other wheat grains. But man has learned to skillfully convert the large excess of wheat not needed for reproduction into flour (food for man) and feed (food for animals).

## CHAPTER 2

## WHEAT MILLING AND FLOURS

### 1. Development of Wheat Milling.

Primitive man's first attempts to convert wheat into flour for breadmaking were very crude. The grains were placed on hollowed stones and crushed, by hand, by rubbing with other stones. As civilization progressed, simple flour mills were constructed. These primitive mills consisted of a stationary grooved stone, about five feet in diameter, over which was installed a revolving stone, of the same diameter. Wheat was introduced between these stones and the revolving stone was turned. At first slaves were employed for this purpose. Improvements were soon made upon these crudely constructed mills, but for a great many years stone mills were used for the conversion of wheat into flour.

Hand power was first replaced with that of animals for turning the revolving stones. Then came the harnessing of wind and water for power. In some sections of the United States old "stone burr" mills are still standing; some few still used in the southern states for grinding corn into meal.

At first the entire grains were ground into 100% flour, but with further improvement, into flour, and made flat, heavy breads. However, as the industry grew, and the demand for bread increased, the millers migrated to the rural sections where wind and water power was used for the mill operations. Then two crafts were formed-millers, and the bakers, who remained in the villages and cities.

Today, modern millers, by careful wheat selection, judicious blending of wheats, and efficient milling methods in highly mechanized factories, are placing at the disposal of bakers uniform grades of flours of the best qualities, which fully meet their requirements.

### 2. Pretreatment of Wheat

Prior to the actual milling of wheat, the grain is subjected to many preparatory processes. It is first passed through coarse screens where foreign material, such as particles of straw, are removed. The grain is then scoured. During this process adhering dirt is removed. The final cleaning process is that of washing, to further remove any adhering dirt or foreign matter. Wheat is then tempered by being subjected to carefully controlled heat and moisture conditions. The purpose of this treatment is to toughen the hard, brittle branny coatings to enable better separation of this portion of the grains from the endosperm, which is converted into flours.

Prior to this pretreatment wheats are carefully blended. With previous knowledge of the type, grade, protein content, and baking quality of flour from each wheat in storage, the miller intelligently blends various wheats in proper proportions to insure the production of good grades of uniform bakers' flours.

3. Milling Processes

Cleaned, tempered, blended wheat is first passed through about five sets of corrugated (grooved) steel rolls, each succeeding set having been set a little closer than the preceding one. The purpose of this process is to gradually crack, or crush the grains so as to enable the separation of the endosperm (flour making portion) from the bran and germ.

The coarse meal, finally converted into flour, is known as Middling Stock--first, second, third, fourth, and fifth. These middling stocks are composed of portions of the endosperm (protein and starch granules) of different-sized particles, similar in appearance to "Cream of Wheat". Some branny particles are also combined with those of the endosperm.

These middling stocks are then passed through about five sets of smooth steel rolls, each being set slightly closer than the preceding one. The purpose of this process is to gradually crush the coarse middling stocks into the desired granulation for flour, avoiding the pulverizing of the flour particles. Bread flours are of coarser granulation than cake flours.

During the grinding processes of middling stocks they are each passed over sieves to separate the granules of different sizes. These stocks are at the same time subjected to currents of air passed through purifying machines. These air currents remove light fibrous particles and, in conjunction with the sieving processes, complete the separation of flour and branny particles and germ.

During the milling processes the germ portions of grains are flattened and separated by sieving from the flours. While highly nutritious, these particles contain fat and enzymes which seriously reduce the keeping quality of bread flours, causing rancidity and possibly other undesirable conditions during flour storage and ageing. Therefore, these portions of the wheat grains are combined with the bran to form feed.

4. Wheat Yields

One hundred pounds of clean, sound wheat, when milled will yield approximately 72 pounds of straight flour and 28 pounds of feed. This yield is frequently referred to as 72% flour extraction. However, during the milling processes, the miller does not produce straight (100%) flour, but separates the various streams into two general classes of flours, viz: patent flours and clear flours.

5. Wheat Flours

Millers of either hard spring wheat or hard winter wheat produce the following standard grades of flours, from which bakers may choose the types desired.

(a) Short, or Fancy Patent Flours

These represent the best grades of bread flours produced, and are obtained from the best portions of the wheat grain endosperm. They contain less ash (mineral matter) and somewhat less protein than other grades of flours, but protein of the best quality.

(b) Bakers, or Long Patent Flours

These flours are being used by many bakers for the production of pan bread of good quality. However, they are of somewhat inferior grades when compared with short patent flours. They contain a little greater percentage of ash (mineral matter) and also somewhat more protein of slightly poorer quality than do the fancy patent flours.

(c) First Clear Flours

These are bread flours of the poorer grades. While they contain considerably more protein than do patent flours, its quality is poorer. They also contain much more ash than patent flours, this due to a lower purity. They are not employed in the manufacture of white breads, but are used in large percentages in the production of rye bread, pumper-nickel bread, and wheat bread.

(d) Second Clear Flours

These are the poorest grades of flours produced and possess very little bread-making value. They may be used in pumper-nickel flour blends.

(e) Bromated Flours

High gluten (high protein) flours used in making hard rolls and hearth breads, such as Jewish breads, are generally bromated. This treatment retards enzymatic action of doughs, increasing bench tolerance. Doughs made with such flours have less tendency to become sticky during make-up.

(f) Whole Wheat Flours

When entire wheat grains are ground the resultant product is whole wheat, Graham, or entire wheat flour. Whole wheat flour may be produced from either hard spring or hard winter wheat. The methods generally employed to produce whole wheat flour are: (1) milling flour in usual manner combining the white

flours to form a straight (100%) grade; (2) grinding the bran and germ into a fine, powdery state; (3) combining flour, germ, and bran, blending these thoroughly.

(g) Cake Flours

Cake flours are milled from soft winter wheats. The milling processes are quite similar to those employed during the milling of bread flours, except that cake flours are ground somewhat finer.

(h) Pastry Flours

Flours of this type are produced from soft wheats containing a greater percentage of protein, or from low protein hard winter or bluestem wheats.

6. Definitions and Standards of Identity for Wheat Products

The Federal Security Agency of the Food and Drug Administration, Washington, D. C., promulgated an order (March 28, 1949--effective January 1, 1942) for the definition and standard of identity of the following products:

(a) Flour, white flour, wheat flour, plain flour

(b) Enriched flour

(c) Bromated flour

(d) Enriched bromated flour

(e) Durum flour

(f) Self-rising flour, self-rising white flour, self-rising wheat flour

(g) Enriched self-rising wheat flour

(h) Phosphated flour, phosphated white flour, phosphated wheat flour

(i) Whole wheat flour, Graham flour, entire wheat flour

(j) Bromated whole wheat flour

(k) Whole durum wheat flour

(l) Crushed wheat, coarse ground wheat

(m) Cracked wheat

(n) Farina

(o) Enriched farina

(p) Semolina

NOTE: To secure a copy of Docket No. F. D. C. 21, Definitions and Standards of Identity of above products, write:

Food and Drug Administration
Federal Security Agency
Washington 25, D. C.

## CHAPTER 3

## COMPOSITION OF FLOURS

The important components of flours are moisture, ash, protein, and carbohydrates.

### 1. Moisture

The maximum amount of moisture allowable at the mill when bread flour is packaged is 15%. This is fixed by the United States Government. However, millers have found this amount of moisture in freshly packed flour impractical and have universally adopted 14%. This is not free water but is moisture in combination with other substances. During transit and storage of flour a considerable amount of moisture is lost. This moisture loss, due to the drying of flour, will vary depending upon the climatic conditions, length of storage, etc. The moisture content of flours when used in bakeries ranges from 12% to 14%. The moisture in freshly packed cake flour averages about 12%.

The method employed in moisture determinations is the "vacuum oven method" described in "Official and Tentative Methods of Analyses of the Association of Official Agricultural Chemists," 5th edition, 1940, page 211.

To calculate the protein per cent of a flour with less than 14% moisture to a 14% moisture basis the method can best be described by an example such as:

Moisture 13%, protein 12.5%
100 - 13 = 87 and 100 - 14 = 86
87 : 86: : 12.5 : x = 12.36% protein

### 2. Absorption

Absorption of a flour is the amount (per cent) of water that a particular flour will require to produce a sponge or dough of correct consistency (stiffness). Absorption will be somewhat greater, or less, depending upon the moisture lost after packing at the mill. Absorption is also greater in strong than in weak flours.

### 3. Ash (Mineral Matter)

When any organic substance, such as flour, is completely burned (oxidized) in a muffle furnace within a chemical laboratory, the grayish residue is ash, or mineral matter. During the growth of wheat, minerals such as lime, magnesium, and potassium phosphates are obtained from the soil and are stored mainly in the germ and branny portions of wheat grains. The lower grades of wheat flours contain more mineral matter than do the better grades, or short extraction flours.

Short patent flours contain approximately .40% (.38% to .42%) ash while the bakers patent grades will contain about .45% (.44% to 46%). and first clear flours an average of .70%. Branny particles are more completely removed from patent flours during the milling processes which accounts for the lower percentages of ash than in straight or first clear flours. Cake flours contain only about .37% ash. Chemists consider .02% ash as within experimental error.

The ash content of a flour is a definite indication of its grade. Other things remaining constant, the lower the ash per cent of a flour the better its grade, and conversely, the higher the ash content the poorer the grade of a flour.

To calculate the ash per cent of a flour with less than 14% moisture basis, the method can best be described by an example such as:

Moisture 13%, ash .42%
100 - 13 = 87 and 100 - 14 = 86
87 : 86: : 0.42 : X = 0.415% ash

4. Protein

Protein is the total nitrogenous material in animal or vegetable products. Its composition is that of the elements of carbon, hydrogen, nitrogen, oxygen, and sulphur. Different proteins are composed of several of 22 known Amino Acids--six of these are considered essential.

Wheat proteins are considered especially important since they possess a property unequaled by any other cereal proteins--that of combining with water to form gluten. The formation of dough and the cell structure of bread would not be possible but for the peculiarly characteristic qualities of the proteins of wheat flour. They attribute the rubber-like elasticity to doughs and retention of gas resulting from the feeding of yeast on simple sugars during fermentation.

Wheat proteins comprise two classes, viz: soluble and insoluble--those that readily dissolve in water and those that do not dissolve when in contact with water. The greater percentage of the proteins of wheat flours is insoluble. This makes possible the separation of most of the proteins from starch and other substances occurring in dough by washing under a stream of water. Gluten, while containing mostly wheat flour proteins is not wholly comprised of proteins. During the removal of starch from a piece of dough by washing under a small stream of water, soluble proteins are lost. At the same time non-protein substances, such as fibrous particles, adhere to the insoluble proteins. Gluten per cent obtained by this method, when thoroughly dried, will closely approach the total protein per cent of a flour determined by chemical methods. Protein per cents will average about .5% more than those of dry gluten.

5. Average Composition of Cake and Pastry Flours

| | Moisture | Ash | Protein |
|---|---|---|---|
| (a) Cake Flour | 12% | .33% | 8.5% |
| (b) Pastry Flour | 14% | .44% | 10.4% |

6. Starch and Sugars

Starch and sugars belong to a class of organic compounds known as carbohydrates. They are composed of a combination of the elements carbon (C), hydrogen (H), and oxygen (O), the hydrogen and oxygen always in the proportion found in water ($H_2O_1$). Flours contain two carbohydrates, viz: sugar and starch. Natural sugars, sucrose (cane sugar), and maltose (malt sugar) are present in very small amounts in bread flours. However, they are important aids in fermentation of sponges and doughs, being easily converted into simple sugars (dextrose and levulose) by enzymes present. Sugars of these forms are consumed by yeast as one of its essential foods.

Starch is present in flours in much larger amounts. Representative white pan bread flours of the better grades contain about 70% starch. During sponge or dough fermentation an appreciable amount of this starch is converted into sugar by the action of the enzymes, diastase, and maltase, which are present.

7. Fat

Bread and cake flours may contain as much as 1.5% fat. However, this ingredient is given very little consideration insofar as its presence affects the bread-making value of a flour.

## CHAPTER 4

## BLEACHING AND MATURING AGENTS*

The agents used for maturing flours are chlorine dioxide (called by the trade name of Dyox), chlorine (commonly used in soft wheat flours), and potassium bromate. In addition, most millers use a benzoyl peroxide bleach (Novadel or Oxylite). The benzoyl peroxide bleaches are used merely for removing some of the color from flour and do not act in any degree as maturing agents although benzoyl peroxide is an oxidizing agent.

While all maturing agents are oxidizing agents, not all oxidizing reactions are capable of maturing flour. The commonest maturing agents in use by the millers at the present time are chlorine dioxide and bromate for bread flours and chlorine for cake flours. The benzoyl peroxide bleaches, such as Novadel, are used merely for color removal. If all mills decided to eliminate the use of benzoyl peroxide, there would be no harm done except that the flour would be a little creamier in color. However, if the mills were forced to eliminate the use of maturing agents, such as bromate, chlorine, and chlorine dioxide, there would be serious hazards involved as far as the baking industry is concerned. In many crop years, the flours milled from recently harvested wheat are "green--" the dough tends to be soft and sticky and, when made into bread, the loaves possess inferior volume, grain, and texture. By the use of such materials as bromate, chlorine dioxide, and chlorine, the same effect is obtained as would be achieved if the flour were aged for a long period. The effect of these maturing agents is on some reducing material present in the gluten. The exact chemical changes produced by maturing agents are still not known, but the effects are known. In the case of chlorine, which is used largely on cake flours, it acts as both a bleaching and maturing agent, increasing the acidity of cake flour and allowing the production of very light cakes of good volume; without it, cakes would be gummy, with poor grain and texture and inferior volume. Chlorine dioxide, in addition to its maturing effect, also has a bleaching effect, but potassium bromate is used only for maturing and has no effect on the pigments of flour.

* (Courtesy of Dr. B. Sullivan Russell, Miller Milling Company, Minneapolis, Minnesota).

## CHAPTER 5

## SHORT WEIGHT FLOUR*

Bakers are frequently puzzled when shipments of flour arrive at their plants and the net weight of the flour is found to be less than the invoice calls for. For instance, with flour today being shipped, packed 100 pounds net to the bag, if the shipment consisted of 600 bags there should, of course, have been 60,000 pounds of flour present. Under certain circumstances, this weight may be found to be less than 60,000 pounds on arrival at the bakery. The question immediately arises in the baker's mind as to whether or not the shipment is short weight.

If there are any torn bags, or if flour has been lost by sifting through the meshes of a cloth bag, there has been an obvious mechanical loss and this should be taken into account.

Short weight has reference to an apparent loss not due to any sifting or other mechanical reasons. A bag is apparently in perfect condition; still the flour does not weigh the full 100 pounds.

In searching for the reason for this situation we must remember that flour is a hygroscopic substance. This means that its moisture content is affected by the percentage of relative humidity of the air, in the railroad car, room, or other place in which it is stored or handled. In a very moist atmosphere flour will pick up moisture and will gain weight. Under average conditions flour loses weight and this loss in weight is due to loss in moisture.

It is necessary, therefore, to remember that this loss in weight is a natural process.

Because flour will change in one direction or the other in moisture content, depending on the humidity of the atmosphere which has access to it, it has been desirable and necessary to set a moisture standard for purposes of supervisory and legal control. This moisture standard is 15 per cent, and all flour weights are legally calculated to what they would be if the moisture percentage of the sample were 15 per cent. The chemist has standardized his method of determining moisture content and this method has been accepted by regulatory authorities; therefore, the entire process is on a legal basis.

The first thing that any baker should do if there is evidence that a shipment of flour weighs less than labelled, or invoiced, is to take a proper sample and have the moisture content determined, using the official method. In taking this sample, it is of course important that it be drawn from the entire lot in such a way as to be representative. The laboratory which runs the moisture test for the baker, or the chemist in the bakery, have full directions on taking such

samples. Briefly, they consist in sampling a number of bags, which should never be less than 10, and should be from 15 in a 225-bag lot to 20 in a 400-bag lot, etc.

The samples of flour are taken from each bag with one-half inch steel trier, stored in moisture-proof containers which are filled by the sample, and moisture is determined on the composite sample. (Anyone interested in complete details as to methods of sampling and analysis should consult the official publications of either the Association of Official Agricultural Chemists, or the American Associations of Cereal Chemists).

Once the moisture content of the shipment of flour is known, at the time it was weighed on receipt at the bakery, and we have a correct net weight figure for the flour on receipt at the bakery, the remainder is very simple.

There is a basic formula which can be used to check up on any shipment of any weight or any moisture content. This formula is reproduced in connection with the example of a typical calculation which accompanies this article.

To facilitate checkups in the bakery we have calculated this for flour in 100-pound bags and have built up a table covering all net weights per bag on receipt from 100 down to 96 pounds and all moisture contents on receipt from 15 down to 11.5. To determine the true weight of flour at 15 per cent moisture content from this table, we merely run our finger down the first column until we find the net weight on receipt and then we run across the table until we reach the column showing the moisture content on receipt. The figure found will be the true net weight of the flour per bag at 15 per cent moisture. There is a stepped heavy line running down through the table. Any shipment which falls above this line is overweight, and any shipment which falls below it is underweight by the amount indicated.

In this matter of discrepancy between receiving weights and invoice weights of flour shipments, we believe that the baker will find it difficult to locate shipments which are really short weight. The baker may take it for granted that the bags of flour, when packed at the mill, contain their full weight of flour, or slightly more. Any loss between the mill and bakery will normally be due either to mechanical losses such as sifting or leakage through defective or torn bags, or to loss of weight due to loss of moisture.

When a shipment of flour has been properly checked up, properly sampled, and appears to be short weight, when calculated back to 15 per cent moisture, the matter of a claim for this shortage on the mill comes up for consideration. The amount of the discrepancy should determine whether an actual claim will be made. When complete data from authoritative sources exists and supports the claim for shortage, the baker will find no hesitation about an adjustment. The record shows that when moisture content is accounted for, practically no flour is short weight.

## TRUE WEIGHT OF FLOUR 100-LB. BAGS

Directions: Find the net weight on receipt in the lefthand column, f. i. 99 lbs., then look straight across to the right until the column is reached headed by the moisture content on receipt, f. i. 14. 0, and the figure in the square where the row and column meet, f. i. 100. 16 pounds, is the true weight.

| Net Wt. on Receipt | Moisture Content on Receipt | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 15. 0 | 14. 5 | 14. 0 | 13. 5 | 13. 0 | 12. 5 | 12. 0 | 11. 5 |
| 100 | 100. 00 | 100. 59 | 101. 18 | 101. 76 | 102. 35 | 102. 94 | 103. 53 | 104. 12 |
| 99 | 99. 00 | 99. 58 | 100. 16 | 100. 75 | 101. 33 | 101. 91 | 102. 49 | 103. 08 |
| 98 | 98. 00 | 98. 58 | 99. 15 | 99. 73 | 100. 31 | 100. 88 | 101. 46 | 102. 04 |
| 97 | 97. 00 | 97. 57 | 98. 14 | 98. 71 | 99. 28 | 99. 85 | 100. 42 | 100. 99 |
| 96 | 96. 00 | 96. 57 | 97. 13 | 97. 69 | 98. 26 | 98. 82 | 99. 39 | 99. 95 |
| All shipments falling below the stepped line are short weight | | | | | | | | |

The formula used in computing the above table is:

Net weight of the package of flour at 15% moisture is equal to the net weight of the package on receipt times a fraction, the numerator of which is the difference between 100 and the moisture percentage as received, and the denominator of which is 85.

EXAMPLE: New weight of a particular shipment: 99 pounds.
Moisture percentage AT THE TIME THIS SHIPMENT was weighed: 14%
Net weight of the package of flour at 15%.
Moisture . . . . . 99x86/85, or 100. 16 pounds.
Therefore, the shipment is not short weight. As a matter of fact, it is one-sixth of a pound overweight.

* (Courtesy of Bakers' Weekly)

# CHAPTER 6

## SALT

A chemist possesses knowledge of dozens of salts, such as sulphates, bromates, nitrates, phosphates, chlorides, etc. But manufacturers of baked foods are primarily interested in only one salt, sodium chloride, commonly known as table salt.

Many of our foods contain salt in its natural state. This important ingredient is added to all doughs and batters by bakers for the purpose of improving the tastes of products made therefrom. Baked foods containing the correct amounts of salt are more palatable. If an insufficient quantity is used such products taste flat. In addition to improving the taste of products in which used, salt also makes more pronounced the tastes of other ingredients with which combined.

To sustain health and life salt is an indispensable article of one's diet.

## A. SOURCES OF SALT

A great abundance of salt is found in nature. The two main sources of salt are (a) lake, ocean, and sea water, and (b) salt beds deposited in the earth.

### 1. Recovery from natural salt waters

In the states of California and Utah and in foreign countries with hot dry climates, lake, sea, or ocean water is first drawn into large vats, or shallow ponds. Under such conditions the water containing salt in solution is allowed to evaporate slowly by the sun's heat. When the solutions become sufficiently concentrated, salt crystals commence to form. At intervals during the evaporation process, impurities associated with the salt are removed from the brine by transferring the concentrated solution from one vat or pond to another. Finally, pure salt (NaCl) crystals commence to separate more rapidly from the brine, and this is allowed to continue until practically all of the water evaporates. The remaining salt is then collected and subjected to further purification. All remaining water is then driven off by complete evaporation, the cakes, or large crystals, are then crushed and separated into desired grades by sifting.

### 2. Mining of rock salt

Salt beds deposited far below the surface of the earth in this and foreign countries are known as salt beds. These deposits are often found several hundred feet below the crust of the earth. However, some salt beds are located sufficiently near the surface of the earth to allow "strip mining". Salt secured by

this method is known as rock salt and is recovered in rather large pieces, irregular in shape. This type of salt, after being crushed and graded, is made use of largely as a cattle food, for the curing of hides, and for other industrial purposes.

Although rock salt is usually mixed with impurities, such as clay, it occasionally occurs in a very pure state. Subjecting impure forms of this salt to thorough processes of purification is necessary before it becomes suitable as an edible substance. During these purification methods objectionable substances which would impart undesirable tastes or colors are removed. Because of the expenses involved during purifying processes it is not economical to convert impure rock salt into edible form.

3. Salt wells

Salt wells are found in some localities. Natural Brine is obtained from these wells by boring down into them and pumping the brine to the earth's surface.

Natural salt beds are found in this country far below the surface of the earth. To recover this salt, six-to eight-inch pipes are sunk into these deposits with other pipes about half their diameter driven into these larger pipes and to greater distance into the salt beds. Then fresh water is forced down through the outer, larger pipe and onto the salt beds, soaking into the salt beds and dissolving the impure salt. This artificial brine is then pumped to the earth's surface.

Small quantities of mineral substances, other than salt, are contained in the natural and artificial brines. These impurities possess objectionable bitter tastes and are removed during the evaporating processes, which is continued until practically all water is evaporated. The remaining crystals are in a pure state. By carefully controlled evaporation methods, the size of crystals are more or less controlled. Finally the crystal deposits are thoroughly dried and graded by sifting.

Highly refined edible bakers' salt is today supplied by several manufacturers, all of which are, in most respects, quite similiar.

4. Effect on dough fermentation

Salt has no direct bleaching effect on dough, or bread or rolls, although this claim is sometimes made. This ingredient has a strengthening effect on the gluten of a dough.

The average percentage of salt used in sweet roll and doughnut doughs is 1.25 to 1.50%; in cakes 3% to 4%; and in cookies .005% to .01%--this based on flour as 100%.

5. Primary purpose of using salt

The primary purpose of using salt in baked foods is to improve the taste of such products. However, the presence of salt in a baked product makes more pronounced the taste of other ingredients, such as sugar.

6. Salt storage

Due to its stability, salt does not spoil under ordinary storage conditions. There are, however, two conditions that cause salt to cake:

The first is alternate exposure to damp and to dry conditions. When salt is stored in a damp place, it will not cake until it subsequently dries out. It takes both the damp and the dry condition to produce caking. The critical humidity is 70-75% relative humidity. When salt is exposed to a condition that is higher in relative humidity, it picks up moisture which dissolves some of the salt, thus coating the crystals with brine. A subsequent dry period (below 70%-75% relative humidity) causes this thin coating of brine to evaporate, uniting the crystals by means of salt itself.

The second way that salt can be made to cake is by storing it in contact with artificial heat. Some bakers store salt by piling the bags against the side of the oven, while others store this ingredient in contact with a steam pipe, or radiator. This should be avoided. Salt should be stored in a cool, dry place and not in an excessively hot atmosphere. Multi-wall paper bags protect the salt from dampness and also from odors. Salt will absorb odors and for that reason storage rooms for salt should be free from any undesirable aromas.

7. U. S. Government standards and definitions

Table salt or dairy salt is a fine-grained crystalline salt containing, on a water-free basis, not more than 1.4 per cent of calcium sulphate ($CaSO_4$), not more than .5 per cent of calcium and magnesium chlorides ($CaCl_2$ and $MgCl_2$), nor more than 1 per cent of matter insoluble in water.

# CHAPTER 7

# YEAST

## 1. Compressed Yeast

Yeast is a microscopic one-cell plant. A single yeast plant is round or oval in shape and measures about 1/3600 of an inch in diameter. It multiplies by budding-each new cell growing out of the mature one. This is why yeast is usually found in chains of cells. A pound of yeast is composed of billions of single-cell plants.

There are hundreds of species of yeast, and scores of different strains in each species. So the problem in providing bakers' yeast is to select and produce, uncontaminated, the strain which will do the best job of breadmaking.

The finest bakers' yeast is a special variety chosen and cultivated because of its hardness, uniformity, and strength. It is yeast which will produce the best character of fermentation in the dough and make the highest quality bread.

## 2. Active Dry Yeast

During the war period, active dry yeast was developed for breadmaking overseas and elsewhere where fresh compressed yeast was unavailable. This product requires much less shipping space, and is considerably less perishable than fresh compressed yeast. If properly packed it will remain in good working condition for several months, if kept in a cool atmosphere.

Because of its advantageous characteristics, commercial bakers, at first, showed considerable interest in this form of yeast, but, when all factors were considered, it was found to possess no advantages over fresh compressed yeast.

Three pounds of fresh yeast is required to make one pound of active dry and about half as much dry as compressed is required to produce somewhat similar results.

## 3. Early History of Yeast

Thousands of years ago the Egyptians used a leaven for making crude cakes, the first breads made by man. Some of these simple loaves are to be found in our museums today. The Egyptians possessed no knowledge of yeast, such as we have today. However, their leaven contained wild strains of yeast. This was preserved from day to day and was used as a starter in fermenting another dough. South American bakers and bakers in some other countries still use these ferments (starters) in making bread. These bakers, boast about the number of years the same ferment has been used in their bakery, displaying these claims in signs attached to their bake shops. In recent years this method of fermenting doughs was

practiced by some old-country French bakers, making French loaves.

The first students of fermentation concluded that this process was the result of decomposition of organic matter.

A Dutch scientist, Leeuwenhoeck, in 1680, constructed a microscope which enabled him to recognize individual yeast cells (plants). He described yeast cells but did not recognize them as living substances producing dough fermentation.

A century afterwards, another scientist, Thenard, made the claim of yeast causing fermentation. His claim received the support of many, but for years this was a controversial subject. Not until 1859, and not until considerable research investigation, was any definite information on this subject established. At that time Pasteur, "The Father of Fermentology", positively demonstrated the fact that yeast was a living organism capable of growth and reproduction. Also that yeast produces sponge and dough fermentation when conditions are favorable.

4. Yeast Manufacture

The commercial manufacture of yeast in the United States began in 1868. An outstanding brewer in Cincinnati, who learned his trade as a young man in Austria observed with interest in results obtained by local bakers who obtained supplies of brewers' yeast from his factory. By replacing their starters (old dough) with this form of yeast, marked improvements were made in fermentation. Doughs containing this liquid yeast fermented more rapidly and at a more uniform rate. Stirred by the results bakers obtained with brewers' yeast, this brewmaster then resolved to produce a purer, better type of yeast for bakers. Thus the commerical manufacture of yeast was commenced.

a. Seed Yeast

The first step in yeast manufacture is that of selecting and cultivating a choice strain of seed yeast from which to grow and reproduce a hardy, uniform type of bakers' yeast.

b. Yeast Growth and Reproduction

The second step in the process of yeast production is that of preparing the most suitable food for yeast and providing favorable conditions for growth and reproduction.

The first food used was a water extract of malted barley, or other grains. During the malting (sprouting) of the grain, enzymes secreted and functioned rapidly, converting the starch of the inner portion of the cereal into maltose (malt sugar) and the complex proteins into simpler, more soluble

forms. An extract of these substances, containing a small quantity of minerals found associated with the starch and proteins, constituted a good medium for yeast growth. The sugar thus formed was acted upon by another enzyme, converting this into a simpler, available form which was assimilated by the yeast cells. Seed yeast was then introduced into this extract and the extract was maintained at a most desirable temperature for plant growth. Purified air was forced through the food medium, supplying the yeast plants with much-needed oxygen for optimum growth and removing toxic carbon dioxide gas resulting from the feeding of yeast on sugar present.

In later years, during a grain shortage, research workers discovered that molasses, nitrogen salt, and mineral matter dissolved in water could be successfully substituted for the grain mash extract.

To prevent contamination the vats and food medium are carefully sterilized.

c. Yeast Growth and Reproduction

When supplied with suitable food in solution and favorable conditions, seed yeast commences to grow and reproduce other yeast plants by a process of budding. Each plant commences to assimilate nutrients from the food medium. These food substances are absorbed through the membranous outer coating of the yeast cells. This process is known as osmosis. Within a short time a bulge will appear on the side of the yeast plant. This bud will continue to enlarge until it reaches the size of the parent cell. This requires about two hours. These newly formed plants immediately commence to bud, finally breaking away from the parent cells. This process of multiplication continues.

When the most desirable number of generations has been produced, the yeast plants are then separated from the spent food extract by means of centrifugal machines. It is then cooled, pressed, cut, wrapped, refrigerated, and distributed to bakers.

As many as twenty-five to fifty generations may be produced from the start of the process to completion. In the final yeast generations, only about three to six generations develop before the yeast is sent to the centrifuges.

Each of the many series of stages of yeast manufacture requires eight to twelve hours. Three to five days are usually required from the start of the seed yeast fermenter before commercial yeast is produced.

5. Functions of Yeast in Doughs

Yeast performs two important functions in bread making. It raises and conditions the dough. During fermentation the yeast matures the gluten and produces gas to raise the dough. These two functions, maturing gluten and gas production, must be in harmony with one another. If they are not balanced it will

be evidenced in the baked products. Yeast gives one this harmony which changes the inert, heavy mass of dough into a light, porous, elastic product which, when baked, becomes appetizing, easily digested, nutritious bread.

6. Yeast Enzymes and Their Functions

An enzyme is an organic substance (organic catalyst) found in food products, which produces chemical changes without entering into the changes. Several enzymes are found in yeast. These are:

a. Sucrase, which converts cane, or beet sugar (sucrose) into dextrose and levulose, forms assimilable by yeast as food.

b. Maltase, which converts malt sugar (maltose) into available dextrose.

c. Zymase, which changes dextrose and levulose into carbon dioxide gas and alcohol, producing fermentation.

d. Proteolitic enzymes, which act upon complex proteins converting them into simpler, more soluble forms, thereby aiding in gluten conditioning (dough maturing).

7. Care and Use of Yeast

Yeast is a living plant in which respiration goes on all the time. This consists of the osmotic and chemical prosesses by which yeast absorbs oxygen and gives off carbon dioxide. The respiration is a continuous process, rapid when the temperature is high, slow when it is low. For this reason, yeast must be refrigerated until used.

Extreme care in handling yeast should be observed during manufacture and shipping, in fact through every step, until delivered to the bakery. The baker should take every precaution to insure the greatest activity of his yeast when it is incorporated into the dough batch. Ideal yeast storage is 35° to 45° F., in a clean, dry, sanitary refrigerator. Yeast should not be removed from the refrigerator, or unwrapped until it is to be used.

Yeast should be suspended insome of the ingredient water that is to be used in the dough. This can be done with less difficulty by crumbling the yeast, adding water, and allowing this mixture to stand a few minutes before agitation. Salt, fats, and dough improvers should never be mixed with the part of the water containing the yeast.

8. Qualities of Good Bakers' Yeast

a. Purity of Yeast

Bakers' yeast must be kept pure and uncontaminated from foreign wild strains and undesirable bacteria because they seriously interfere with the normal healthy fermentation.

b. Hardiness or Keeping Quality

Like other living plants, yeast is perishable. Yeast should be cultivated to extreme hardiness so that it retains its baking strength throughout shipping and handling.

c. Strength of Yeast

This is the power of the yeast to raise and condition the dough. Strong yeast acts faster and longer. It will continue to act until the temperature reaches 140° F. within the oven. This is the thermal death point of yeast.

By improved methods manufacturers are producing uniformly strong yeast which acts vigorously in the sponge or dough from start to finish.

d. Appearance

Good yeast ranges from a creamy white to a light cream. Rarely, the outside may be whitish, while the inside is normal cream colored. When dark, or grayish in color, this is an indication that the yeast is old, or has been damaged.

e. Consistency, Feel, and Break

Bakers' compressed yeast should be firm and springy to the touch, and slightly moist. A clean, sharp break should be apparent when the yeast is broken. If soft or putty-like, such yeast is of inferior quality, or old, or damaged.

f. Uniformity

A baker expects that the yeast he receives will be the same-yesterday, to-day, and tomorrow- and that he will always obtain the same results under the same conditions. Uniformity in the yeast not only governs the uniformity of the baked products, but also affects the schedule of shop operation.

# CHAPTER 8

## STARCH, SYRUPS, AND CORN SUGAR

Compounds containing carbon, hydrogen, and oxygen, with hydrogen and oxygen in the proportion found in water ($H_2O_1$), are known as carbohydrates. All sugars belong to this class of compounds.

The three sugars of greatest interest to bread makers are cane sugar, beet sugar, and corn sugar (dextrose). Cane sugar and beet sugar are known by chemists as sucrose. Sugar manufactured from the starches of cereals is known as malt sugar, or maltose, while milk sugar is known as lactose. These sugars are classified as disaccharides. While differing in properties such as sweetness, they all have the same formula; $C_{12}H_{22}O_{11}$. Upon hydrolysis sucrose and maltose yield two molecules of simple sugars ($2C_6H_{12}O_6$).

Cane and beet sugar are sweeter than corn sugar (dextrose), and lactose is less sweet than corn sugar.

### 1. Corn Starch Manufacture

Corn is used in the manufacture of starch. The approximate composition of this cereal is:

| | |
|---|---|
| Moisture | 11% |
| Starch | 70-1/2% |
| Protein | 10% |
| Fat | 4-1/2% |
| Fibre | 2-1/2% |
| Ash | 1-1/2% |

"Thus a bushel of corn weighing 56 pounds, when wet milled, will yield approximately 33 pounds of starch, 15 pounds of "gluten feed" and 1-1/2 pounds of oil. All kernels are by no means the same. The variety, weather, fertility of the soil, and method of cultivation all combine to give the processor an ever-changing raw material.

"Shelled corn is elevated to the storage bins from carloads of around 1300 bushels. From the storage bins the corn passes through cleaners which take out any foreign materials. It is then ready for the initial step in processing which is to separate the grain of corn into its following constituents: solubles, germ, hull or fibre, starch, and "gluten". The hull is loosened and the "gluten" softened by steeping in warm water containing a small amount of sulphur dioxide which prevents fermentation during the soaking process. The steepwater dissolves soluble mineral matter and other solids. When it reaches sufficient concentration, it is drawn off and concentrated to a heavy, syrupy liquid which is used as a food for yeast, for penicillin manufacture, or to enrich the cattle feed made from the fibre and gluten.

"The corn, which has been softened in the steeps, is then ground in attrition mills. These mills have two close plates of teeth revolving in opposite directions. Thus the grains are torn to pieces without injuring the germ.

"The cracked corn then passes on to deep rectangular tanks, called germ separators, filled with starch milk. The germ containing the oil is lighter than the rest of the cracked grain and floats on the surface of the starch milk while the remainder of the grain settles to the bottom.

"The material left from the germ separation is then ground in a stone, or Buhr, mill and run over reels and shakers to separate the particles of hull from the starch and "gluten". The starch and "gluten" are then separated in centrifugals, or on "tables". The "table" is a long, slightly tilted trough. The starch granules are heavier than the "gluten" and drop to the bottom while the lighter "gluten" flows over the end. The deposited starch is then ready for either drying and milling or for further processing into syrups, dextrose, or dextrins.

"The dried starch is milled in a manner equivalent to that used in flour mills, The finely powdered starch is passed over several sets of silk reels to remove all grit and hard particles.

2. Manufacture of Dextrose and Syrups

"In the manufacture of syrups and dextrose the wet starch is treated with a small amount of hydrochloric acid under pressure and heat in convertors. The pressure at which the starch is converted, the time required for conversion, and the amount of acid used depends upon the desired dextrose content of the finished product. The action of the acid on the starch is identical with the process which takes place when starch is acted upon by the enzyme diastase.

"After the starch has been converted the excess acid is neutralized to common salt by the use of sodium carbonate. The neutralized liquor is then passed through centrifugals, filters, and bone char filters to remove all impurities.

a. Dextrose

"Refined dextrose is the product of complete conversion of the starch. The highly converted and concentrated sugar liquor is slowly agitated in large cylindrical crystallizers. Crystallization takes place in 3 or 4 days. The very heavy liquor containing the crystal pure dextrose is then processed in centrifugals to remove the mother liquor. The crystals are washed with pure water until nothing remains but the dextrose. It is then dried, screened, and packed in bags. The solids are 99.8% pure dextrose. Commercial dextrose (corn sugar) contains about 9% moisture.

"Dextrose is especially able to support the growth of yeast, but before yeast can use either cane or beet sugar, it must first change them into a dextrose and levulose.

b. Corn Syrups (Commercial Glucose)

"If the conversion is run to completion only dextrose is produced. Hence the process is stopped at the desired point for the manufacture of syrups. Corn syrups are available in the low, normal, and high conversion types, with dextrose equivalents of approximately 30, 43, and 62, respectively. The dextrose equivalent bears a direct relationship to the dextrose and maltose content of the syrups. "High conversion" syrups are made either by straight acid conversion or by a combination of acid and enzyme conversion. The baker is especially interested in the normal and high conversion types. Forty-three degree Baume syrups are generally preferred, although some users prefer 42° Baume syrups in winter weather because the higher water content makes it flow more readily."*

*(Courtesy of A. P. Gleason, Corn Products Sales Company, New York)

3. Malt Syrups and Malt Flours

To a baker, "malt" is known as malt syrup. However, a strict definition of "malt" is grain that has sprouted. The dictionary definition of malt is "grain, generally barley, softened by steeping in water, and allowed to germinate."

There are two forms of malt available for bakers' use, viz: liquid malt syrup and dry malt syrup.

Malt syrup is a cookie, breads and rolls ingredient usually found in small amounts in bakers' formulas. It possesses a pleasant sweet taste.

a. Malt Syrups

This baking ingredient is composed of about 75% solid matter and 25% water. The composition of average liquid malt syrup is 67.5% maltose (malt sugar), 75% acid, 5.5% soluble protein, 1.25% mineral matter, and 25% water. All of these substances, with the exception of the small quantity of acid, supply food for yeast growth and reproduction.

There is available for bakers' use non-diastatic - 10° L. or less, 20° L., 40° L., and 60° L. liquid malt-syrups. The principal differences between these syrups are their diastatic and protease strengths, or contents. Lintner value is the diastatic measure of the hydrolysis of starch to maltose. In other words, the degree Lintner (°L.) is the chemist's yardstick for measuring the diastase present in a malt syrup. A malt syrup of 10° L., or less is known as a non-diastatic malt. Obviously a 40° L. malt syrup has twice the diastatic value of a 20° L. and a 60° L. three times the starch conversion power as a 20° L.

Protease is a protealitic enzyme associated with diastase in malt syrup. This enzyme possesses the power of converting complex proteins into simpler, more soluble forms. As the diastase is increased or decreased in malt syrups, the protease also increases, or decreases.

hello you - Smock!

b. Commercial Manufacture

(a) Liquid Malt Syrups

Any grain may be used in the manufacture of malt syrups. However, barley is usually preferred for this purpose.

The first step in the process of malt syrup production is that of cleaning the barley, or other grains, removing seeds, dirt, and other foreign matter.

The cleaned grain is then moistened with water, and is kept at a definite temperature and humidity that will favor sprouting. During the sprouting period, the grain is turned frequently by hand, during floor sprouting, or by slowly revolving machines in the case of drum sprouting. By this stirring of the grain it is aerated and excessive heating is prevented - both favoring ideal sprouting conditions. Under these conditions sprouting commences. This is allowed to continue for a few days, until the sprouts become about half the length of the grains. The malting (sprouting) is then checked by gradually increasing and controlling the temperature so as not to damage or destroy the diastase and protease present. The malted grain is then ready for use in the manufacture of malt syrup.

During grain sprouting, the enzymes alpha-amylase, beta-amylase, (diastase) and proteinase increase in quantity and become quite active. Alpha-amylase is the starch-liquefying enzyme and beta-amylase the starch-saccharifying, or sugar-producing, enzyme. At the same time the proteinases convert the complex proteins into simpler, more soluble forms.

The sprouts are removed from the grain, which is then ground and mixed with water at an established temperature, forming a "grain mash". For several hours this mixture is agitated, during which the enzymes above referred to are greatly activated. During this period the grain starch is changed mostly into maltose, with a small quantity converted into malto-dextrin. Simultaneously the natural, complex grain proteins are converted into simpler, more soluble forms. During this process, the maltose and simpler proteins produced, along with mineral matter within the grain, are dissolved within the water present, forming a dilute malt syrup extract, from which the spent grain is removed by filtering. This dilute extract is then transferred to large vacuum pans where evaporation is commenced. This process is allowed to continue until a heavy malt syrup is produced. During this final process the temperature is so regulated as to control the amount of malto-dextrins produced as well as the protealytic and diastatic enzymatic strength of the malt syrup produced.

(b) Dry Malt Syrups

If the process of evaporating the extract is carried to completion, dry malt syrup results. This is a sweet, light yellow colored powder. It is composed of

about 97% malt solids and 3% water. Approximately 75% of the carbohydrate solids is fermentable by yeast. This product is naturally quite hygroscopic (readily absorbs atmospheric moisture) and requires special moisture-free packaging.

4. Use of Malt Syrups

There are two principal purposes for using malt syrup as a dough ingredient:

a. The primary purpose of using malt syrup in a yeast dough is as a partial yeast food, stimulating growth and reproduction.

b. The second is because of its enzymatic content.

c. Malt syrup is used in larger amounts in dark breads, such as Rye and Whole Wheat. This ingredient is also used in the preparation of a glaze for sweet rolls and coffee cakes and in the production of sometype of cookies.

d. The weights of liquid malt syrup are:

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|---|---|
| 1 pint of malt syrup | 1 lb. 7 oz. |
| 1 quart of malt syrup | 2 lb. 14 oz. |
| 1 gallon of malt syrup | 11 lb. 8 oz. |

Because of the greater density and much greater weight of malt syrup than that of an equal measured quantity of water, it becomes obvious that this ingredient should be accurately weighed, or measured in special measures when used. This is important to insure the usage of the exact amounts required.

e. Malt syrups should be stored in cold storage and only small inventory stocks should be carried during summer months to prevent deterioration prior to using.

# CHAPTER 9

## A. CANE AND BEET SUGAR PRODUCTION*

### 1. Planting and Harvesting Sugar Cane

"Commercial production of sugar cane is begun by planting cuttings about a foot long, each containing two or three seed buds. A plant soon grows with several shoots forming a clump of cane. One such planting on virgin soil in Cuba is sufficient to produce crops annually for ten to fifteen years. New plants, termed "ratoons" spring up from the stubble after each harvesting. The first crop, known as "plant cane", ordinarily harvested about 18 months after planting. After the first crop, sugar cane is normally harvested every 12 months, although in some areas, notably Hawaii, at longer intervals.

"The sugar cane stalks are quite similar in appearance to growing corn, but often attain heights of from fifteen to eighteen feet. They are thick and unbranched with broad, flat leaves, about three feet in length.

"When the cane is ready for harvest, the stalks are cut near the surface of the ground. In most areas these operations are performed by hand; in others mechanical harvesters are used. An expert workman, using a heavy machete, can cut and load about six tons of cane a day. After cutting, the leaves are stripped from the stalks which are then loaded into ox carts. While the ox cart is still common in Cuba and much of Asia, the harvested cane is carried to the mills in every type of conveyance ranging from the most primitive to the most modern. The trend in harvesting and transportation of the sugar cane is steadily toward mechanized handling, for greater efficiency and economy.

"Locomotives haul loaded cars to the raw sugar mill or "central" and are switched onto tilting tables. The cars have hinged sides so that, when these tables are tilted to a sufficient angle, the sugar cane slides from the car to conveyors which carry the cane stalks to the crushing rolls. These consist of pairs of corrugated cylinders placed one above the other, which shred the cane by twisting as it passes through. This operation separates the fibers and prepares them for the grinding mills but does not press out the juice.

"The shredded cane now passes through a series of heavy horizontal steel rollers, revolving with tremendous pressure against each other, bursting the sugar cane cells and pressing out the juice. Toward the end of this operation sprays of water facilitate the extraction of any remaining juice. The fibrous residue, known as "bagasse", generally provides the fuel for generating the power to operate the mill and the steam for evaporation and crystallization of the juice. Bagasse also forms the basic material for the manufacture of fiber insulation board used in building construction. The sugar cane juice, which constitutes about 30% of the

entire weight of the cane, is now ready for further processing to produce raw sugar.

2. Raw Sugar Manufacture

"The juice is first heated, after which lime is added to neutralize acidity and precipitate certain impurities which are then removed by settling and filtration.

"Concentration of the juice into syrup starts in huge evaporators. The syrup is then boiled in vacuum pans which are large dome-shaped tanks, where crystallization takes place. It is essential to avoid caramelization or burning of the syrup that would result from boiling at elevated temperatures. Since liquids boil at lower temperature under a partial vacuum than in open air, a vacuum pump in connection with a condenser is employed to create a partial vacuum within the pan. The resulting mixture of sugar crystals and molasses then goes to centrifugal machines,

"A centrifugal machine consists of a round basket-like container with screen sides, suspended on a vertical shaft within a circular metal shell. The shaft spins the basket at a speed of 1000 to 1200 revolutions per minute. The centrifugal force thus developed throws the molasses off through the screen sides, and the sugar crystals are retained inside the basket. The resulting product is rather sticky, ranging from grayish to reddish brown in color, and is known as centrifugal raw sugar. Raw sugar is not suitable for food or as a component of foods unless further processed.

3. Processing and Refining Raw-Sugar

a. "Raw cane sugar is first produced from the sugar cane. The mature sugar cane is shredded and pressed to extract the cane juice. The juice is treated with lime to neutralize the acids present and coagulate colloidal and organic matter, clarified by filtration and concentrated by evaporation into a thick syrup. The sugar is then crystallized from this syrup in vacuum pans and separated from the liquid by means of centrifugal machines. The resulting products are known as raw sugar and blackstrap molasses. The raw cane sugar from which our sugar of commerce is refined is a moist, sticky, brown-colored mass of sugar crystals covered with a coating of syrup and may contain extraneous materials which render it unsuitable for food or a component of food unless further processed.

"The raw sugar is transported to refineries where it is then processed into refined sugar. First the raw sugar is washed in centrifugal machines with a sugar syrup from previously refined sugar to remove the syrup surrounding the crystals. The washed sugar is dissolved in water, clarifying agents added and the mixture filtered through pressure filters resulting in a clear amber-colored solution. The amber-colored solution is then passed slowly through deep beds of special decolorizing materials which produces a clear, water-white solution. This solution is subsequently concentrated by evaporation in vacuum pans (to prevent losses due to caramelization by the effect of heat) until sugar crystals

are formed and developed to the desired size. Only through long, painstaking experience is the sugar boiler able to produce the maximum amount of crystals of the desired size although modern instrumentation today is making this a much easier job with more accurate control available.

"The sugar crystals are then separated from the semi-liquid mass in-high speed centrifuges. After discharge from the centrifuges the crystals are dried by means of heated air blown through the sugar passing through large revolving cylinders. The next process is to screen and classify the various grain sizes and eliminate over-sized crystals and clumps before being packed into bags or cartons as desired. The resulting product, the refined sugar of commerce, is a white crystalline solid containing almost no moisture and is at least 99.9% pure sucrose. This exceptional degree of purity has been obtained by the refiner through the highly efficient and effective processes of crystallization and recrystallization, abetted by the special purification procedures utilized while the sugar is in solution.

b. "Brown sugars or "soft" sugars are prepared by crystallizing and centrifuging the remaining sugar from the final syrup thrown off by the centrifugal machines during the refining of white sugar. Soft sugars, however, are not dried but are packed as they come from the centrifugal machines and therefore, contain more moisture than refined white sugar (about 3 to 4%). They also contain a considerably larger amount of mineral salts than refined granulated sugar.

c. "The sugar refiners also manufacture today another sugar product which is fast becoming of great importance in its use in many industries. This product is "sugar-syrup" - commonly called "liquid" sugar. It is usually made from a sugar liquor in the refinery that has not undergone the final crystallization process but has been decolorized and otherwise purified. This product has been developed on the idea and logic that where ever sugar is used in solution in a manufacturer's operation it should be feasible to deliver sugar in solution from the refinery to the plants storage tanks and then pump it throughout the plant with concomitant savings over the usual bag handling procedures.

d. "Grades of sugars that are most commonly used in bakery products are: Medium Granulated, Sanding Sugar, Fine and Extra Fine Granulated, Bakers Special or Fruit Granulated and the several grades of Powdered and Brown Sugars.

"Medium Granulated sugar (a large grain sugar) is used primarily for the production of fondant (boiled) icings where a very white and glossy icing is a requisite. Sanding Sugar, a brilliant crystal sugar of uniform granulation is used for sprinkling on cookies and other sweet goods. Fine and Extra Fine Granulated sugars are the two important granulated sugar grades for all-purpose use in the bakery. Bakers Special is a very fine grain granulated sugar which is especially suited for fine textured cake baking because this grade of sugar consists of whole crystals and is not a powdered sugar. Fruit Granulated is similar and used for same purpose. The powdered sugars, of course, are used generally in the preparation of icings, fillings, frostings, toppings and dusting powders. Confectioners

XXXX and XXXXXX are especially recommended for velvety smooth cream fillings in biscuit work and perfectly blended uncooked icings and frostings and extra smooth fruit and nut pastes. These grades of sugars are packed either with 3% corn starch to prevent caking or if the buyer so specifies, without cornstarch. Another grade of powdered sugar called Standard Powdered is not as fine as the Confectioners types of powdered sugar and is generally applicable in dusting mixtures where the Confectioners sugar is too fine and the goods are prone to sweat easily.

e. "Brown or soft sugars are usually offered to the baker in four grades; No. 6 which is light yellow in color; No. 8, Medium yellow in color; No. 10, a golden brown color and No. 13, a dark brown color. They are used primarily because of their color and distinctive and delectable cane and cane-molasses flavor. Generally the lighter grades, No. 6 and No. 8, are used in bakery products and icings where a mild flavor is desired. The darker grades, No. 10 and 13, posses a rich cane-molasses flavor, are used in such items as gingerbread, spice cakes, devil food cakes, plum puddings and other dark colored, highly flavored foods.

"An important phase of baking "know-how" is an understanding of the functions of sugar in bakery products. As is well known, sugar not only contributes to the nutritive value of bakery products, but it also affects physical characteristics such as volume, texture, color, flavor, and palatability. Thus, sugar has more than the simple purpose of imparting a sweet taste to baked goods.

f. "The functions of sugar in cakes and other sweet baked goods may be described as follows: a tenderizer - by its effect on the protein in the mix, adds sweetness, aids in the creaming process, creates a softening or spreading action of batter, imparts a good crust color, retains moisture and prolongs freshness. Thus, it can be seen that sugar is a very important ingredient in cakes and should be employed in the correct proportions and carefully incorporated into the mix. A thorough knowledge of the different types of sugar, their properties and functions in cake making is highly essential to any baker producing really fine quality products. Thus, indiscriminate substitution of fine granulated, coarse granulated, powdered or liquid sugar may result in appreciable differences in the final product.

"As an example, very small grain sized sugar such as the Bakers Special grade is widely used for cake batters since the small crystals assist in dispersing the other ingredients and promote early aeration while at the same time fully dissolving by the time the batter is completed. It is reasoned that the sugar must be in the form of fine crystals and not in a finely powdered form otherwise the proper mixing and aeration will be obtained. Another well known example is in the production of cookies wherein the size of the granulation and physical character of the sugar determines the characteristics of the cookies.

g. "Invert sugar may be defined simply as a mixture of the carbohydrates, dextrose and levulose, present in approximately equal proportions. It is produced

commercially by a process called inversion which simply consists of treating a solution of sugar (sucrose) in water with an appropriate acid or enzyme under controlled conditions. Invert sugar possess the very desirable physical property of being hygroscopic (water attracting and holding), therefore, it is particularly useful wherever a moisture retaining ingredient is necessary to maintain freshness, increase shelf life and aid in the standardization of processes to produce a uniform quality product. Invert sugar used in cakes and cake icings improves their keeping quality to retain moisture. The percentage of invert sugar that can be successfully used in cakes depends upon the type of cake and care must be taken not to use too much or the volume, cell structure and crust color will be affected adversely. The use of the proper amount of invert sugar also assists in imparting a rich brown color to the cake surface and enables bakers to remove cakes from the oven before they are over-baked.

h. "A brief word on the nutritional value of baked goods may be in order. Because of the increasing attention being given to the facts about nutrition and health people today are becoming more aware of the value of vitamins and the role of proteins in the diet. However, few have stepped forward to say a good word for the foodstuffs that are a source of 50 to 60% of our caloric intake, the carbohydrates, of which sugar is a very important component. It may be true that probably, as a whole, a large enough proportion of carbohydrates are consumed but, through failure to understand the important functions they perform, extremists and faddists think they can almost eliminate starches and sugars with impunity. This is not so - because in addition to providing fuel for energy carbohydrates are vital to our good health in other ways for example, to aid in the utilization of fat and to spare protein for body building and tissue repair. Recent researches indicate that the body assimilates more than one half of the material it needs for efficient maintenance in the form of sugars, and that common sugar is assimilated more quickly than any other food. In carefully controlled studies of groups of children it has been shown that when abundant calories are supplied to an adequate diet, the subjects grow more rapidly, show more resistance to fatigue and have sounder teeth than did a control group which received the same balanced diet without wholly adequate calories.

"Scientists are continually disproving many of the superstitions that have long surrounded sugar. A generation ago all sweets were "taboo" on training tables. Today, athletes are given a diet rich in sugar for such feeding has been shown to be entirely compatible and even helpful to vigorous exercise. The importance of sugar and sugar containing foodstuffs in the diets of our fighting men also shows that they are essential to good health. Fallacies which hold that sugar and other sugar containing foodstuffs are primarily responsible for diabetes and tooth decay have been upset by findings which show that these diseases are very complex in origin and careful research is gradually investigating all of the factors concerned in their cause and control.

"The large variety of products produced by the baking industry vary quite widely in their composition and concomitantly, in their nutritive properties. However, in general, relatively large quantities of carbohydrates and significant quantities of fat are present in most bakery products and therefore they are good energy foods. Also, bakery products made with milk, eggs, etc. posses additional nutritional value over and above their caloric content."

* Courtesy of American Sugar Refining Company

## B. MANUFACTURE OF BEET SUGAR

Beet sugar is produced from large white sugar beets weighing 8 to 12 pounds. These beets are grown in Michigan, Colorado, and California. They are purchased from farmers on a sliding sugar content scale. When received at the sugar factories, they are dumped into large v-shaped bins constructed over artificial flumes. When required in the factory, the beets are fed into these artificial water streams and transported by the swift current to slicers. During this movement all dirt and foreign matter is removed. Large slicers are constructed with corrugated blades which are power driven. The clean beets are pressed against the slice and are cut into thin corrugated slices. These are transferred to "fusion tanks" where warm water is slowly diffused through the tanks containing beet slices, during which the sugar within the beet cells is dissolved.

The diluted sugar solution is then purified and concentrated in evaporators to a heavy syrup. When of desired density, this concentrated sugar solution is allowed to cool slowly in vats, during which time pure sugar crystals form. When this crystallizing process is completed, the grainy mixture is transferred to centrifugal machines which separate the crystals from the liquor. The molasses adhering to the crystals is removed by washing; the sugar remaining is dried, graded, packaged, and marketed.

Contrary to erroneous statements there is no difference whatsoever in the chemical composition or baking values of the best grades of cane and beet sugar, both containing about 99.5% pure sucrose.

### 1. Other Forms of Sugar

Maple sugar, from the sap of maple trees, is produced in New Hampshire, Vermont, and West Virginia. Most of this sugar is used by confectioners and for domestic consumption in the form of table syrup. Very little is found in products of the baker.

Honey, one of the products of nature, is a pleasant liquid sugar.

2. Synonymous Terms

Cerelose and corn sugar are synonymous. An average analysis of cerelose is:

| | |
|---|---|
| Water | 8.5% |
| Dextrose | 91.0% |
| Dextremash | .5% |
| Total | 100.0% |

Commercial glucose and corn syrup are synonymous.

Average commercial glucose, or corn syrup, contains about 40% dextrose.

3. Comparative Sweetness of Sugars and Syrups

Sucrose given 100 is used with which to compare the sweetness of other products. The comparative sweetness of some sugars and syrups are:

| | |
|---|---|
| Sucrose | 100 |
| Saccharin | 300 to 500 |
| Levulose | 103 to 173 |
| Dextrose | 50 to 70 |
| Invert Sugar | 78 to 130 |
| Invert Syrup | 93 |
| Corn Syrup (best quality) | 40 to 45 |
| Honey | 60 to 90 |
| Lactose | 16 to 28 |
| Maltose | 32 to 60 |

4. Advantages of Sugars in Cakes, Cookies, and Rolls

The primary purpose of using sugar in bread-stuffs is that of imparting sweetness to the product. At the same time sugar is largely responsible for the crust formation on baked foods; that rich, golden brown appetizing appeal. When hydrolized to simple forms, sugar supplies a valuable, necessary food for yeast. Excessive amounts retard fermentation. Sugar has a tenderizing effect on the crumb of baked foods, and finally sugar is a good preservative. This makes possible the processing of condensed milk.

# CHAPTER 10

# SHORTENINGS

Chemical and Technical Dictionary, by Bennett defines shortening as "fat used in baking to produce a tender and flaky product." Doubtless the name shortening is derived from the physical effect this ingredient has on baked foods.

There are two distinct types of shortening used in baking, viz: animal and vegetable shortening. Either of these may be in a liquid, semi-solid or plastic state at average room temperatures, this depending on variations in melting points. Semi-solid, or plastic, types are mostly used in baking.

An analysis of ordinary shortenings shows them to consist of mixtures of the following glycerides: linolien, linolin, olein, palmitin, and stearin.

(a) Linolein is an oil present in vegetables.
(b) Linolin is an oil found in cottonseed, corn, and soya beans.
(c) Olein is an oil obtained from animals and vegetables.
(d) Palmitin is a hard fat found in both vegetables and animals.
(e) Stearin is a hard fat secured from both animal and vegetable sources.

The above glycerides are similar in composition but not identical.

## A. ANIMAL SHORTENING MANUFACTURE

Hog fats are mostly used in processing animal shortening. Fats nearer the surface of animals have higher melting points than those found near the center. This variation in melting points is doubtless due to the colder body temperature near the animal's surface and the warmer nearer the center of the body. For a living body to utilize fats they must be in the liquid state.

When fatty tissue of hogs is heated, the fat is expelled. This process is known as "rendering".

The melted fat is then allowed to cool slowly under carefully controlled conditions. The solidified product known as <u>lard</u> possesses a pleasant flavor and is white in color. During the cooling process, some of the melted fat remains in a liquid state at ordinary atmospheric temperature. This product is known as Lard oil.

### 1. <u>Prime Steam Lard</u>

Prime steam lard is produced from all fatty tissue obtained from hogs. By means of steam pressure the fat is removed from the tissues and melted. If allowed to cool slowly without agitating, the resulting lard will be in a coarse, granular state.

If, however, the melted fat is quickly chilled and, when assuming a solid state, is agitated and then allowed to set, the resultant product will possess a smooth, non-granular state.

2. Kettle-rendered Lard

Kettle-rendered lard is produced from back and leaf fats, containing more stearin. The fatty tissues are rendered in heated kettles, where the fat separates from the tissues. The temperature at which rendered is somewhat lower than that of steam-rendered. The melted fat is cooled slowly without being agitated. Lard produced by these methods is somewhat firmer, somewhat granular, and has a pronounced cooked flavor.

3. Hydrogenated Lard

Some of the best grades of lards are hydrogenated in a manner similar to the hydrogenating of vegetable fats.

4. Mono and Diglyceride Lards

Lards containing about 20% to 25% of mono and diglycerides are now available for bakers' use. These products possess emulsifying properties and, when used in sweet roll and coffee cake doughs, the keeping property of products made therefrom is appreciabley enhanced.

5. Beef Fats

By processes similar to those above described, beef fats may be obtained from the fatty tissues of this animal. Oleo oils thus produced are used by cracker and cookie manufacturers.

6. Butter

When milk or cream is churned, milk fat, containing a small percentage of salt, other milk solids, and moisture, is separated into a product known as butter. An average composition of butter is:

| | |
|---|---|
| Moisture | 16% |
| Milk Fat | 80% |
| Non-fat Milk Solids | 1% |
| Salt | 3% |

Butter possesses a delightfully characteristic flavor. In past years this product was used quite extensively in the manufacture of cakes and sweet dough products. However, because of its excessive cost and the greatly improved manufacturing processes of animal and vegetable shortenings, its use in such products today is quite limited.

## B. MANUFACTURE OF VEGETABLE OIL SHORTENINGS

Vegetable and animal fats and oils are known as triglycerides. They are called triglycerides because they are made up of three fatty acids combined with one glycerin molecule. Stearic acid, palmitic acid, oleic acid, and linolinic acid are typical of the fatty acids which are combined with glycerin to form a triglyceride, or fat. There are over twenty different fatty acids that occur in natural fats, so the possible combinations of three fatty acids to each glycerin molecule runs into the thousands. This is why fats from different sources vary so much in flavor, hardness, keeping quality, etc.

### 1. Fatty Acids and Glycerides

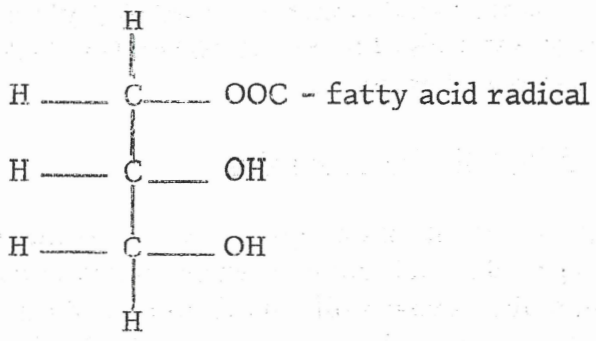
The formulas for all fatty acids end in COOH. The other portions of the formulas are known as radicals. These will vary in the combinations of carbon and hydrogen with the different fatty acids, although the general combination is $C_nH_{2n}$. Examples are: linolinic acid, $C_{17}H_{29}$: linoleic acid, $C_{17}H_{31}$: oleic acid, $C_{17}H_{33}$: and palmitic acid, $C_{15}H_{31}$.

Monoglycerides, diglycerides and triglycerides are nutritious fats, and contribute calorically to the bread in approximately equal amounts.

All fats, whether it is triglyceride or not, must go through the monoglyceride stage in the body during digestion. This means that the human animal cannot avoid monoglyceride, even should he want to, unless he should go on a completely fat free diet.

These facts have been established and have been recognized by the Food and Drug Administration not only in bread, but in other standardized foods. This subject has also been investigated at great length by the Food Protection Committee of the National Research Council. This committee was pressured quite highly by manufacturers and supporters of the "Polys", and was forced to be very sure of its ground before issuing a report concerning the wholesomeness of mono and diglycerides. They could not afford to be placed in the position of having favored one type of product over another. As a result of over a year's intense investigation, the Food Protection Committee issued two reports, one of which condemned the Polys as having "not been tested sufficiently for recommendation in food use", and a second report, releasing the mono and diglycerides as "wholesome and nutritious fats, safe for inclusion in bread and other foods".

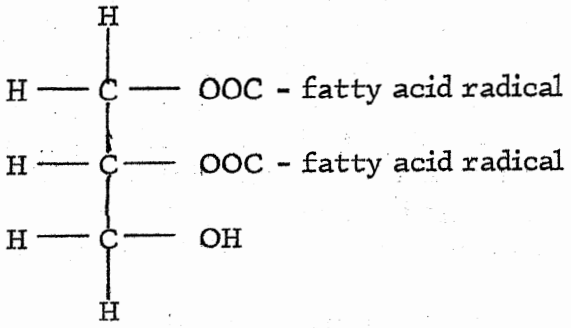
(a) Monoglyceride



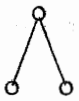

oSimple Illustration:

One molecule of glycerol combined with one molecule of fatty acid.

(b)

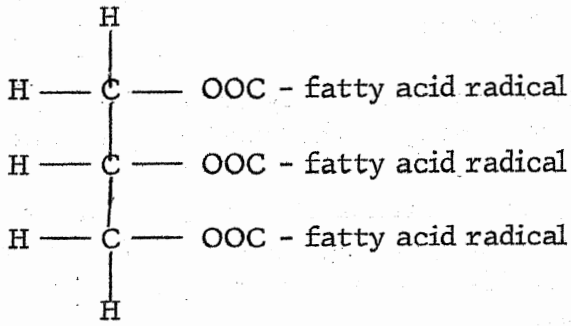



Diglyceride (b)



Simple Illustration:
One molecule of glycerol
combined with two molecules of fatty acids.

(c)




Triglyceride (c)

Simple Illustration:
One molecule of glycerol combined with
three molecules of fatty acids.

For commercial purposes, monoglycerides and diglycerides are manufactured. These two glycerides absorb or dissolve in water. When comprising a portion of shortening used in cake batters, they produce an emulsified mixture enabling the incorporation of more liquid and sugar.

Triglycerides have very little emulsifying power, are practically insoluble in water, and therefore do not mix easily with water or doughs containing large amounts of liquid.

Shortenings containing mono and diglycerides are used in cakes, icing, bread, and other yeast-raised products where the extra emulsifying properties help produce better baked products.

2. Kinds of Vegetable Oils

Fats of vegetable origin are used extensively in food processing, in baking, as table spreads, and most anywhere a fat is needed. Such oils as cottonseed oil, peanut oil, soybean oil, sunflower seed oil, sesame seed oil, and palm oil are used for making shortenings, salad oils, cooking oils and margarine.

Corn oil is seldom, if ever, used in making hydrogenated shortenings, because it is difficult to hydrogenate. Corn oil is used mostly as a salad oil and for frying.

Olive oil is used mostly as a salad oil and for seasoning foods. It has a characteristic flavor which is very desirable in some foods and not at all desirable in others.

The most commonly used oils for making shortenings are known as domestic oils and are grown in the United States. They are cottonseed oil, peanut oil, and soybean oil. Most of the other oils are not produced in sufficient quantity in this country to be used extensively in shortenings.

3. Processing of Vegetable Oils

"The seeds, cottonseed, soybean, peanut, after being harvested, are cleaned, then crushed and cooked to break down the cell structure and free the oil. The oil is then either pressed from the seeds by hydraulic pressure, or in expellers, or it may be extracted with a solvent such as hexane, which is similar to gasoline.

"The oil obtained is known as crude oil and usually contains some meal, dirt, and free fatty acids - fatty acids which are not combined with glycerine, but are formed because the fat has started to deteriorate or break down.

"The crude oil is sent to processing plants in tank cars by the oil millers. This crude oil is refined, usually by adding a lye or similar material. The lye combines with the free fatty acid to form soap. This soap stock, meal, and dirt are separated from the oil in huge centrifuges. The separating is much like the separating of cream from milk.

"The resulting refined oil is usually clear and clean-looking, but often has too much color, due to oil-soluble pigments which have come along from the seed. The refined oil is bleached to remove some or all of this color and to impart a more desirable appearance. A diatomaceous earth, very much like Fuller's earth, is mixed with the oil. The color is absorbed on the earth and when the earth is filtered out of the oil, the color is removed with it.

"All edible vegetable oils are normally refined and bleached. From here on, the processing will depend on what the end product is to be, i.e., salad oil, cooking oil, or shortening.

"Deodorizing is the process of removing undesirable odors and flavors. It is done by washing the oil under vacuum with superheated steam at a high temperature for several hours. Most of the materials which give the fat an odor or flavor distill off during this processing. The high temperature and steam also sterilizes the fats.

"Oils which are to be changed from liquids at room temperature to solids at room temperature are usually hydrogenated. The fatty acids such as oleic, linoleic, and linolinic are usually in high concentration in triglycerider which are liquid at room temperature. Triglycerides with high concentrations of palmitic and stearic acids are solid at room temperature. The only difference in most of these fatty acids is the amount of hydrogen in the molecule. The liquid fatty acids contain less hydrogen. By combining hydrogen with the liquid fatty acids in the triglycerides, they are changed from liquid fats to solid fats at room temperature. The melting point of the fat is increased.

"The degree of hardness is usually controlled by the amount of hydrogen combined with the fatty acids. If the product is saturated with hydrogen, it becomes very hard, and the melting point goes up to about 150°F.

"The process of hydrogenation is simply the mixing of the hydrogen gas at an elevated temperature in the presence of a catalyst such as finely divided nickel. After the hydrogen gas has combined with the oil, the catalyst is filtered out and the fat is deodorized.

"After the vegetable oils are refined, bleached, hydrogenated and deodorized, it is very necessary to plasticize them properly. This means to chill the melted fat so that, in its semi-solid form, it will have a smooth, plastic consistency at room temperatures, which makes it easy to work into cake batters and doughs of various kinds. The melted fat must be chilled very quickly so that the fat crystals are very small. If the crystals are large, the shortening will be grainy, lumpy, and have a ribby or brittle feel.

"In most plants, the shortening is plasticized or chilled in machines very similar to ice cream freezers. The shortening goes in one end of the machine liquid and comes out the other end as a creamed semi-solid shortening. Then it is run directly into packages. Air is creamed into the shortening to give it a white appearance and help with the working properties of the shortening. If these shortenings did not contain air (10% to 15%), they would look very much like vaseline.

## C. TYPES OF VEGETABLE OIL SHORTENINGS

"Shortenings in which vegetable oils are used can be classified in types:

(a) Standard Shortening
(b) All-hydrogenated Shortening
(c) Emulsifier-type Shortening
(d) High Stability Shortening
(e) Compounds

1. "Standard shortenings are made of all vegetable oils. Part of the vegetable oil is hydrogenated completely to make a very hard fat. This hard fat is then blended with unhydrogenated vegetable oil in sufficient quantities to make a shortening semi-solid at room temperature. For many purposes, these fats do a fine job, but not quite as good as where all the fat has been hydrogenated. The label on these standard shortenings must read, 'Made from hardened vegetable oils'. This label is the means of identifying a standard shortening and differentiating between a standard and an all-hydrogenated shortening.

2. "All-hydrogenated shortenings are made by putting every drop of the oil through the hydrogenation process and hydrogenating it all just to the desired hardness of firmness. When every drop of the oil is hydrogenated, the shortening has greater stability, resists rancidity, and usually has better performance characteristics. It is an all-purpose shortening with the proper plasticity and consistency for general use in the bakery. The label on this product usually reads, 'Made from hydrogenated vegetable oils'. In a few cases it might read 'Made from Hydrogenated vegetable oils and animal fats', if the animal fats have been hydrogenated. Please note that these products say 'hydrogenated', while on standard shortenings, it says 'hardened'.

3. "Emulsifier type shortenings are usually made from hydrogenated vegetable oil shortenings with emulsifiers such as mono and diglycerides added. This is a specialty shortening made especially for cakes, icings, and yeast-raised doughs, where high emulsifying properties are necessary for good quality products. Other than having high emulsifying properties, this shortening is very similar to the all-hydrogenated type.

4. "High stability shortening is similar to the all-hydrogenated type, except that it is usually hydrogenated to a firmer consistency in order to obtain greater stability. These high stability shortenings are used in stiff biscuit and cracker doughs where firmness and lack of plasticity are not nearly as important as the keeping quality - ability to resist rancidity. Biscuits and crackers often on the grocer's shelf for months, and the shortening must stay sweet and fresh all this time.

"Also these high stability shortenings are used extensively for deep fat frying such as for doughnuts, potato chips, and other fried foods. Here they stand up better at the high frying temperatures than do standard shortenings and oils.

5. "Compounds are usually made by adding a hard animal fat to an unhydrogenated vegetable oil. The blending of the hard fat with the oil raises the melting point of the mix high enough to make the product a semi-solid fat at room temperature. The manufacturer of these fats must always state on their label that they contain animal and vegetable fat. If there is more animal fat than vegetable fat in the mix, the word 'animal' must come first in the statement on the label, and vice versa."*

*Courtesy of Mr. Mike Deck, Mrs. Tucker's Foods, Inc.

## D. USES OF ANIMAL SHORTENINGS IN BAKERIES

1. Lard oil may be used for pan greasing, and for trough greasing.

2. There are a number of uses of lard by bakers. This type of shortening is used very extensively as a shortening in all pan bread doughs, hearth bread doughs, hard rool doughs, soft roll doughs, and in some sweet roll doughs. Lard is used, when melted, in pan greasing machines, for pan greasing by hand, and for trough greasing. This shortening is also used extensively in pie doughs.

Hydrogenated and emulsifying lards are now being used to some extent in breads, rolls, and sweet dough products.

## E. USES OF VEGETABLE SHORTENINGS IN BAKERIES*

1. "Compound shortening is defined as 'high melting fats such as animal or vegetable stearins, or completely hydrogenated oils mixed with edible oils and fats'.

"Compounds and standard type shortenings are usually used in bakeries because of their lower cost. Compounds are often cheaper than standard shortenings.

2. "Standard Shortenings can be used in cookies, pies, sweet yeast doughs, and for frying, with fairly satisfactory results. In cream icings, standard shortenings usually do not cream in as much air and have a greater tendency to lose their air if over-creamed than when all-hydrogenated and emulsifier type shortenings are used.

"In the frying kettle, compounds and standard shortenings usually break down faster than all-hydrogenated. In this respect, standard shortenings usually stand up a little better than compounds.

"Only low, sugar, low liquid cakes can be made with standard and compound types of shortening. The emulsifier type shortening is the only kind that will make the high sugar, high liquid cakes which are not only the lowest cost cakes but also the best quality cakes.

3. "The all-hydrogenated vegetable shortenings are best for cookies, pies, doughs, doughnuts, frying, and most all other bakery products, excepting cakes, icings, and sweet yeast raised doughs. These all-hydrogenated shortenings have good stability, good creaming qualities, good working consistency, and good body, which makes them worth more than the extra cost over standard and compound types of shortening. All-hydrogenated shortenings can be used in low-liquid, low-sugar cakes with good results.

"Shortenings should be melted carefully when for deep fat frying so there is no danger of scorching or burning the fat. At no time should the shortening be heated to a higher temperature than that normally used for frying. As soon as the frying is completed the heat should be turned off so the fat can cool. Fats held at frying temperatures when nothing is being fried break down faster than when food is being fried, and the surface of the hot fat is protected by the steam coming out of the food.

"Burnt food particles, dirty frying kettles, alkali, or other cleaning agents in contact with the hot fat hasten its break down. Copper and copper-bearing kettles should not be used in frying equipment where it can come in contact with the fat. It acts as a catalyst and hastens the break down of the fat.

4. "The emulsifier-type shortening is a specialty product for use in cakes, icings, and sweet yeast-raised doughs. In these products, it produces much better results from the point of view of volume, tenderness, keeping quality, and eating quality. In other bakery products, there is no advantage of the use of emulsifier-type shortenings. Emulsifier-type shortenings are a real necessity in cakes, icings, and sweet doughs, if the baker expects to build and hold his business.

5. "The high-stability type shortening is also a specialty type shortening for use in biscuits (especially sweet biscuits), crackers, and other bakery items which might have a long shelf life. It is also made for potato chip friers and other deep fat frying purposes where a high-stability fat is needed. There will be less smoking, less gumming, and less breakdown in the frying kettles with this fat than with any of the other four types. Also, the fried foods will keep longer and not develop rancidity so quickly.

## F. STORAGE AND CARE OF SHORTENINGS IN BAKERIES

"All shortenings and edible fats or oils deteriorate as they age. The baker should be sure to use his oldest stock first, so that none of it will become any older than necessary in his storeroom.

"Shortening should be stored at temperatures as near 70° F. as possible, so that it will be at a good workable consistency when it is used. At lower temperature, it will probably be too hard or firm; at higher temperatures it may be too soft to work properly.

"Never store the shortening near a hot radiator or stove, or in direct sunlight, as the heat will cause it to start melting. Once a shortening is melted or partly melted, it loses its plasticity and will not cream or work properly in most bakery products. Even though it is cooled later, it sets up in large crystals which lower its creaming properties and ruin it for many uses.

"Shortenings exposed to high temperatures and to light, especially direct sunlight, deteriorate rapidly in flavor and odor. All edible fats should be protected from strong light and elevated temperatures.

"The place where shortenings are stored should be clean, well aired, and free from strong odors. Shortenings and oils are among high priced materials, and they should be given the proper care and storage at all times."*

*Courtesy of Mr. Mike Deck, Mrs. Tucker's Foods, Inc.

## G. MARGARINES*

"There are two types of Margarine - one Roll-In for sweet doughs, and the other Puff Paste. Four or five percent air is incorporated in the roll-in product for sweet doughs. This makes the product a trifle softer. Air is not incorporated in the product to be used for Puff Paste. This gives a little firmer product which handles better in warm weather.

### 1. Puff Paste Margarine

"Margarine of the Puff Paste type must be dry and waxy to the feel. If oily, greasy, sticky, or spongy to the feel, it will not possess the puffing characteristic. Because of the peculiarly dry waxy texture involved, special formulations and special procedures for making this product are employed.

"Puff Paste is made from liquid cottonseed oil and or soybean oil, plus a high melting point fat known as Oleostearine, the hard faction of Beef Suet. This product is first rendered and then permitted to stand at temperature of approximately 55° F. Until there is separation of liquid from solid components. The rendered Beef Suet will be a rather granular and mushy appearing fat at this stage. It then is placed in hydraulic presses and the remaining liquid oil is squeezed from it. Approximately 40% yield of Oleostearine can be obtained from good grade Beef Suet. This stearine will have a melting point of approximately 135° F. It is usually mixed with cottonseed oil, or soybean oil in approximately 50-50 or 60-40 proportions. The resulting mix is then placed in a churn and is cultured with milk and salt. An emulsion is made by churning. The fat is then permitted to age for approximately 48 hours so that a suitable crystallization is achieved and the milk is allowed to develop a desired flavor.

"The product is then put through various kneading machines or "workers" where the margarine is plasticized and surplus moisture worked therefrom. At this stage is produced the desired waxy and dry texture which is necessary to cause the puffing.

### 2. Roll-in Margarine

"Roll-In Margarine of much softer consistency is made for sweet dough. Many bakers mistakenly believe that the roll-in accounts for volume, or puffing characteristics in Danish pastry. This is erroneous. Danish pastry and sweet doughs are not rolled more than two or three times maximum and the fat merely serves to stratify, or to make certain dough layers. The volume is regulated

by fermentation and pan proof. The roll-in fat merely serves to produce a flaky effect, or a separation of the dough into various stratas.

"Various Roll-in Margarines are produced for sweet doughs, ranging in consistency from that of a relatively soft grade of table margarine, up to the other extreme of the range. Most bakers, however, prefer a roll-in for sweet doughs, or Danish pastries somewhere between these two extremes. The margarine industry therefore produced products designed to match the consistency of the dough used in the sweet dough work. This is particularly important, if mechanical rolling devices are used for working the dough. Obviously the baker using sheeting devices cannot be bothered with stiff margarine or with soft margarine. The bakers insist that the texture of the Roll-in fat match that of the dough being processed.

"Most Roll-In margarine contains about 80% fat, 3% salt, 1% non-fat dry milk solids, 15% water, 0.5% monoglyceride, 0.1% lecithin, coloring material, and possibly flavoring material. A preservative, usually Sodium Benzoate, may also be added.

"In the manufacture of Roll-In Margarine, the fat portion made up of properly selected vegetable oils which have been refined, bleached, hydrogenated and deodorized is combined with the other ingredients in emulsion form, and solidified by passing through an enclosed freezer system.

"When the product is churned with milk, it is called margarine. If it is churned with water and salt, it is called water-churned shortening."

*Courtesy of Wilson Co.

# CHAPTER 11

## MILKS

To a bread consumer, the word "milk" has reference to fresh milk obtained from cows. But to manufacturers of breadstuffs, the term "milk" may refer to any one of three types of processed milk used in bakeries. These are: evaporated, sweetened condensed, and dry. They may be purchased without the removal of the milk fat, and are classed as whole milks. However, because of the much greater cost of milk fat as compared with good grades of animal and vegetable fat suitable for bread and cake manufacture, and the demand for milk fats in butter manufacture, bakers almost always use non-fat milks.

Fresh liquid milk, whole, or non-fat, is seldom used in the manufacture of cakes, breads and rolls. This type of milk is bulky, containing 88 to 91% water. It is quite difficult to obtain this milk with a minimum and constant per cent of lactic acid, or lactic bacteria. Due to the large water content, this form of milk also offers a serious refrigeration problem within bakeries. For these reasons, its use by bakers has been almost discontinued.

In the order of preference, the processed milks in general use for cake, bread and roll manufacture are: first, non-fat dry; second, sweetened condensed; and third, evaporated milk.

### A. MANUFACTURE OF MILKS

#### 1. Non-fat Dry Milk

The first step in the processing of non-fat dry milk is that of subjecting fresh milk to a temperature of 160° to 180° F. in "hot wells". This preliminary treatment effectively pasteurizes the milk.

The next step is that of transferring the heated milk into vacuum pans. By maintaining a vacuum of 24 to 28 inches within these pans, the milk will boil at 120° to 140° F., during which time a large percentage of water is removed from the milk.

There are two processes by which practically all of the remaining water in pre-condensed milk is removed. These are known as the roller, or drum process and the spray process.

(a) Roller or Drum Process

Open drum, or roller, driers are installed within a suitable room. These rolls are then steam heated, and uniformly thin layer of milk is applied while they are revolving. The dried milk is then removed by means of stationary

scraper attached to the rolls. It is not necessary to precondense milk dried by this process.

Dry milk thus obtained is then crushed to a uniform fineness.

(b) Spray Process

Pre-condensed milk is sprayed into a moving current of heated air within an enclosed chamber. By this process, all remaining water is removed, and dry powdered milk falls to the floor. There are several spray processes, but the general principles are the same in all cases.

While, by carefully controlled operation, good grades of non-fat dry milk may be produced, there remains a danger of damaging the milk solids, reducing solubility. Most bread manufacturers express a preference for spray processed milk, although usually slightly more expensive than the roller processed.

2. Non-fat Sweetened Condensed Milk

Pre-heated milk is evaporated to the desired density within vacuum pans. During this process, about 16 pounds of cane or beet sugar is added to each 100 pounds of fresh fluid hot milk.

The condensed milk is then slowly cooled to avoid separation of the sugar during the process. The final product will contain about 42% sugar, which is added as a preservative.

3. Non-fat Evaporated Milk

Non-fat evaporated milk is processed in a similar manner to that of non-fat sweetened condensed milk, except that no sugar is added during the condensing. When the pre-heated milk has been sufficiently condensed in vacuum pans, it is immediately cooled to 40° F. and stored.

## B. ADVANTAGES OF USING MILK

Liberal quantities of milk solids are used in the manufacture of all pan breads soft rolls, sweet rolls, cakes, cookies and coffee cakes. The primary purpose of using milk in baked foods is to increase their nutritional value. However, there are some other advantages. These are: (a) improved crust color due to the fact about 50% of milk solids is lactose (milk sugar). This sugar possesses approximately the same caramelizing effect upon the crust of baked articles as other sugars, (b) improved grain and texture, (c) improved flavor, (d) increased keeping qualities, (e) increase yield, and (f) increased fermentation tolerance.

## C. USES OF MILK

### 1. How incorporated

Milks are usually introduced into the mixer bowl with other ingredients. Unless difficulty soluble, dry milks readily enter solution along with the other ingredients.

### 2. Substitution of Different Types

In order to be able to correctly and intelligently substitute one type of milk for another, and to insure usage of the same percentages of milk solids, sugar, and water, one must know the composition of the various milks.

Average analysis of different non-fat milks usually used by bakers:

| | Percentages of non-fat Solids | Percentages of Water | Percentages of Sugar |
|---|---|---|---|
| Fresh Non-fat | 9% | 91% | None |
| Evaporated Non-fat | 25% | 75% | None |
| Sweetened Condensed Non-fat | 28% | 30% | 42% |
| Dry Non-fat | 96% | 4% | None |

Average analysis of Whole Milks

| | Fat | Non-fat Solids | Water | Sugar |
|---|---|---|---|---|
| Fresh Whole Milk | 3-1/2% | 8-1/2% | 88% | None |
| Dry Whole Milk | 27 % | 70 % | 3% | None |
| Sweetened Condensed Whole Milk | 8 % | 20 % | 30% | 42% |
| Evaporated Whole Milk | 8 % | 18 % | 74% | None |

### 3. Reconstitution of Non-fat Dry Milk

Non-fat dry milk can be reconstituted to fluid non-fat milk by dissolving 13 ounces of non-fat dry milk in 7 pounds 13 ounces of water, adding the milk to the water and stirring vigorously. For practical purposes, dissolve 1 pound of non-fat dry milk in 1 gallon (8 pounds 5 ounces) of water. For best results, place the reconstituted milk in refrigerator overnight.

## REPLACEMENT OF LIQUID NON-FAT MILK WITH WATER AND DRY NON-FAT MILK

| LIQUID NON-FAT MILK | | WATER | | | | NON-FAT DRY MILK |
|---|---|---|---|---|---|---|
| POUNDS | | LBS. | | OZS. | | OZS. |
| 1 | equals | | | 14-1/4 | and | 1-3/4 |
| 2 | equals | 1 | plus | 12-1/2 | and | 3-1/2 |
| 3 | equals | 2 | plus | 10-3/4 | and | 5-1/4 |
| 4 | equals | 3 | plus | 9 | and | 7 |
| 5 | equals | 4 | plus | 7-1/4 | and | 8-3/4 |
| 6 | equals | 5 | plus | 5-1/2 | and | 10-1/2 |
| 7 | equals | 6 | plus | 3-3/4 | and | 12-1/4 |
| 8 | equals | 7 | plus | 2 | and | 14 |
| 9 | equals | 8 | plus | 1/4 | and | 15-3/4 |
| 10 | equals | 8 | plus | 14-1/2 | and | 17-1/2 |

| LIQUID NON-FAT MILK | | WATER | | NON-FAT DRY MILK |
|---|---|---|---|---|
| OUNCES | | OUNCES | | OUNCES |
| 4 | equals | 3-1/2 | and | 1/2 |
| 6 | equals | 5-1/4 | and | 3/4 |
| 8 | equals | 7 | and | 1 |
| 10 | equals | 8-3/4 | and | 1-1/4 |
| 12 | equals | 10-1/2 | and | 1-1/2 |
| 14 | equals | 12-1/4 | and | 1-3/4 |
| 16 | equals | 14 | and | 2 |

# CHAPTER 12

## FROZEN EGGS*

### 1. Frozen Egg Quality

"The frozen egg business was started in Kansas, around 1908, when shell egg distributors discovered that they could freeze the contents of eggs which were of satisfactory quality but, because of imperfections in the shells, could not be shipped as shell eggs.

"From 1908 until after the first World War, there was little change or improvement in processing such eggs. They were still a by-product of the shell egg industry still the edible but imperfect eggs that could not be shipped in shells. However, after the enormous expansion in wholesale baking following the first World War, the great demand for better quality eggs that could be depended upon day in and day out, all through the year, resulted in vast improvements in frozen egg processing.

"Today, it is a very far cry from the haphazard freezing of imperfect shell eggs which was started in 1908 to the modern, sanitary, breaking and freezing plants, where the finest quality eggs are carefully processed at the rate of close to 400 million pounds a year.

"Frozen eggs are strictly fresh eggs, collected virtually as soon as laid and rushed from the farm to a near by freezing plant. Upon arrival at this plant, they are inspected, chilled, broken, and inspected again; then quickly frozen. In the frozen state, all the inherent fine qualities of the fresh egg are preserved by storing at 0° F. or below until withdrawn for delivery.

### 2. Spring-laid Quality

"The better packing plants confine their packing season to the cool spring months. This is because eggs laid during this time of year have the best quality for baking. The molting season starts usually in July. During molting and for some months thereafter, the egg quality is adversely affected - the whites being especially weak and watery. It is not until the following cool spring months that eggs once again achieve their firm-bodied fullness and quality.

"Frozen eggs, which maintain their high baking quality throughout the year, assure greater economy the year round.

"For example, full-bodied frozen eggs in sponge cake batters will whip up much lighter and to a greater volume. And this volume holds up during baking. It actually permits lighter scaling perlayer and the production of more layers from a given weight of batter.

"The breed of the hen or the color of the shell does not affect the color of the yolk. However, the intensity of the yolk color is affected by the quantity and type of green feed consumed by the hen. And since green feed is more abundant in the spring, eggs packed at this time of year are more apt to have the rich golden color so desirable for bakery products.

3. Importance of Rapid Handling and Freezing

"In the modern breaking plants, the most recent discoveries of science are put to work. Research has shown, for instance, that the pH of egg white has a definite influence on its tendency to become watery. It has also been established that the pH is changed by the escape of $CO_2$ from the egg. This escape of $CO_2$ is principally dependent upon the conditions under which the shell eggs are held. Therefore, reducing the time and temperature from laying to freezing produces a much higher quality white with a more desirable jelly-like consistency.

"Changes in pH are of special interest in connection with egg white. The albumen contains a bicarbonate buffer which, at room temperature, is in equilibrium with an atmosphere containing about 10% $CO_2$ and take on oxygen, so that after a few days, the pH may increase to as much as 9.6.

"An investigation of this change in pH of egg white showed that a pH of 9.25 was reached in 2 days at a temperature of 98°F. The same pH was reached in 5 days at a temperature of 60°, but required 10 days at a temperature of 35° F. These figures demonstrate very clearly the necessity of proper care and rapid handling of eggs that are to be broken and separated for frozen eggs. Incidentally, a watery egg white in shell eggs tends to be absorbed by the yolk at a more rapid rate and will reduce the solid content of the yolk due to such water absorption.

"The change in the pH of egg white does not stop when it reaches the maximum; but the change from the point on reverses itself, due to the decomposition which sets in. If the egg white is held for a sufficiently long period, the pH will ultimately get down on the acid side. This decomposition is sometimes indicated by a pink coloration in the egg white.

4. Types of Frozen Eggs

"Frozen eggs are generally available in convenient 10 and 30-pound containers.

(a) Frozen Whole Egg

"Frozen whole egg is a product which is separated from the shell in its natural proportion; packed and frozen. Approximate specifications for solids in this type should be a minimum of 24% and a maximum of 28%.

"The approximate composition of frozen whole egg is:

| | |
|---|---|
| Protein | 13.3% |
| Fat | 12.2% |
| Mineral Matter | 1.0% |
| Total Solids | 26.5% |

"The proportion of yolk and white in the frozen whole egg is as follows:

| | |
|---|---|
| Yolk | 35% to 40% |
| White | 60% to 65% |

5. Frozen Egg White

"Frozen egg white is that part of the egg which encloses and protects the yolk in the shell. The solid content is mainly albumen, or protein and specifications (again approximate) should run from 11% to 14% - the balance being moisture.

"Shell eggs, when unprotected, lose moisture, through the shell. This moisture is mainly lost from the egg white. Therefore, the older the egg is before freezing, the lower the moisture content, or the higher the total solids. Thus, frozen egg white with very high solids content may mean that the egg whites were not packed from strictly fresh eggs.

"The following approximate analysis of egg white is suitable for calculation in the bakery:

| | |
|---|---|
| Protein | 11.9% |
| Mineral Matter | .6% |
| Total Solids | 12.5% |

6. Frozen Sugar-yolk

"Sugar-yolk is an egg product containing 90 parts by weight of egg yolk, as commercially separated, and 10 parts by weight of sugar.

"Sugar in sugar-yolk isn't added to cheapen the product, or to give it bulk; but is added for certain protective reasons in the freezing process.

"The egg liquid alone will freeze, and the fat content of the yolk will begin to solidify at 28° F. Since this temperature is approximately 4° below the freezing point of water, when plain yolk is frozen in a Sharp Freezer, a very mealy and plastic product with poor solubility and very poor emulsifying properties is produced. This condition results because the colloidal structure of the egg has been damaged, and the complex protein has been partially denatured (or dehydrated) due to the freezing out of water.

"When this happens to egg yolk, the result is a poor product for use in any type of cake baking. If used in pound cake, there appears yellow specks. If used in sponge cake, the volume will be comparatively poor. Therefore, the use of sugar for the use of salt, glycerin, or any similar ingredient is primarily for the protective action it has on the protein and on the colloidal structure of the egg yolk. By reducing the freezing point of the moisture content of the product to the approximate solidifying point of the yolk solids, these added ingredients permit freezing to occur with breakdown of the colloidal structure.

"It would be desirable to reduce the sugar content; but when reduced, there is a resultant loss of emulsifying properties. Possibly even 10% sugar is not the extreme which could be used for the best results. A sugar-yolk product, however, containing 10% sugar, is satisfactory for general use, and most sugar-yolk today is made upon that basis.

"Commercially frozen egg yolk or sugar-yolk contains a small amount of egg white, since it is impossible to remove all the white from the yolk in the commercial separation of eggs. However, reputable packers of frozen eggs take steps to assure a minimum of egg white in frozen yolk products. Since whites contain considerably more moisture than yolk, it is obvious that the less white adhering to the yolk, the higher will be the percentage of total solids.

"The following approximate analysis of sugar-yolk is suitable for calculation in the bakery:

| | |
|---|---|
| Protein | 14.3% |
| Fat | 24.0% |
| Mineral matter | 1.1% |
| Sugar | 10.0% |
| Total Solids | 49.4% |

7. Nutritive Value of Frozen Eggs

"The nutritive qualities of frozen eggs are well known, but their nutritive value has never been sufficiently emphasized in relation to products in which they are used.

"As a rich source of fat, protein, vitamins, and essential mineral substances necessary to growth and health, eggs, are rightly considered one of mankind's protective foods.

"Egg yolk is an especially rich source of vitamins. It supplies a goodly portion of Vitamin A, riboflavin, and thiamin, Phosphorus, calcium, and iron are also found in appreciable amounts.

"The protein in egg yolk is a source of tissue-building material of the highest quality.

"Egg yolks are also high in energy value, since one pound of egg yolk represents about 1600 calories.

"In promoting the sale of baked products containing egg, a great deal more emphasis should be made upon their nutritional value.

"Incidentally, approximately 30% of commercially separated egg yolk is fat. Sugar-yolk contains about 24%. Considerable shortening value is, therefore, added to bakery products by either whole egg, sugar-yolk, or egg products containing high quantities of egg yolk. This should be taken into consideration when balancing the shortening in a formula containing a high percentage of yolk.

8. Color and Flavor

"The color and flavor of eggs is of primary importance. Frozen eggs produce in baked goods the golden color and egg flavor which the housewife associates with richness and quality. The color and flavor imparted by egg is directly proportional to the quantity and quality of eggs used.

9. Development of Cell Structure and Leavening Action

"One of the most essential factors in cake making is the formation and development of cell structure when mixing a batter, and the maintenance or retention of the cell structure while the cake is being baked. The way in which eggs - whole, whites, or yolks - hold together the other ingredients of a cake is mainly responsible for the formation of the elastic cell structure which permits even expansion of the batter in the oven. And the higher the quality of the eggs, the better they perform this function.

"The leavening action of eggs goes hand in hand with the development of cell structure. When eggs are beaten they form a fluffy, foam-like mass which is much lighter and occupies a much larger volume than the unbeaten eggs. When included with the other ingredients to make a cake batter, this foam-like mass constitutes (to a certain extent) the cell structure of the cake. In the oven, water vapor forms in the cells and expands, and this action raises, or "leavens", the cake. Somewhat the same results are achieved from eggs which are simply creamed into a sugar-shortening batter. This action of the eggs is also of primary importance in the production of a smooth flowing batter which is so necessary for proper handling of cake mixes in scalling or depositing machines.

10. Shipping, Storage, and Delivery of Eggs

"All of the care which goes into the production of high-quality frozen eggs will be nullified if certain precautions are not taken during shipment, storage, and delivery. Careless handling may cause partial defrosting, which in turn may cause spoilage or loss of fresh egg flavor. Frozen eggs should be stored in master warehouses at temperatures of 10° to 15° below zero. Temporary storage for one or two months can be handled satisfactorily at zero. No attempt should be made at any time to hold frozen egg products in freezer storage at temperatures above zero.

"Egg shipments from breaking plants or master warehouses to local warehouses should be made in refrigerated cars in which salt is used with ice to insure low temperature during transit.

"If frozen eggs are to be used successfully in the bakery, it is very important that they be delivered promptly when needed. When deliveries are made on an established schedule, the baker can regulate his supply to meet his shop conditions. When they are not, serious trouble may result.

11. Handling Frozen Eggs in the Bakery

"The first and most important phase of the handling of frozen eggs in the bakery is the question of defrosting.

"Frozen eggs are abused in the bakery, because in large plants it is frequently the lower-paid employee who defrosts them and gets them ready for the cake mixer or for the man who is scaling the mixes. It is difficult to get the men handling the eggs to use the care required.

"When frozen eggs are delivered, they are solidly frozen at a temperature of about 15°. Before they can be used, they must be thawed out and mixed to secure uniform consistency. There are two practical ways to thaw frozen eggs. First, the containers required for the next day's baking may be set out in a temperate part of the shop where they may thaw slowly. Under no circumstances should they be thawed at a high temperature, since egg albumen coagulates at about 126° F. and such coagulation destroys their whipping quality. At a room temperature of 70° to 80° a 30 pound container will ordinarily take 12 to 14 hours to thaw.

"Second, the preferred method of defrosting frozen eggs today is to set them in tanks of running water at 50° to 60°. By this method they will thaw out a great deal more rapidly. A 30 pound container will be completely defrosted in from 5 to 6 hours and a 10 pound container will be defrosted in 2 1/2 to 3 1/2 hours.

"Defrosting eggs as quickly as possible is also one of the best ways to protect their keeping quality. Warm temperatures cause spoilage of eggs near the outside of the can while the eggs in the center may remain frozen and in good condition. Consequently, if the defrosting time is shortened and the eggs at the outside of the container are kept from becoming dangerously warm it will help to protect the keeping quality of the entire can of defrosted eggs.

"Incidentally, one to three ounces of moisture will condense on the lid of the egg can during freezing. Therefore, the lid should be left on the cans when defrosting to avoid loss of weight. Frozen egg cans should also be covered when not is use in order to prevent contamination by foreign material.

"After defrosting, the eggs should be kept in as cold a refrigerator as possible for they are an extremely perishable product. But under no circumstances

should they be refrozen since every refreezing causes greater denaturation and greater damage to their colloidal properties. No definite time limit can be given on the keeping quality of frozen eggs after defrosting, because of the wide variation in the methods and temperatures at which the eggs are defrosted and stored. However, it is a well-established fact that sugar-yolk will keep approximately three times as long as whole eggs.

"After the frozen whole eggs have thawed, it is good practice to stir them thoroughly before incorporating them in batters or doughs. Since egg yolks contain fat, they tend to come to the top of the can. And unless they are stirred, there is a strong possibility that the egg taken from the top of the can will be largely yolks. Also, during freezing and thawing, there is always some separation of water from the egg solids, and stirring hastens the reabsorption of this moisture into the egg body.

"Formulas calling for a given number of eggs or a given number of whites or yolks are essentially inaccurate because eggs vary so much in size.

"However, here is a conversion table which should be useful for general work in a bakery.

12. Frozen Eggs vs. Shell Eggs: Equivalents

"Good quality shell eggs figured over a period of time will yield an average of 36 to 38 pounds of egg meat to the case. If these eggs are separated carefully on a commercial basis, they will yield 45% of yolk and 55% of white. On this basis:

1 lb. of frozen whole egg equals 9 to 11 shell eggs
1 lb. frozen egg white equals 17 to 19 whites
1 lb. frozen plain yolk equals 21 to 23 yolks
1 lb. frozen sugar-yolk equals 19 to 21 yolks plus 1.6 ounces of sugar

For accuracy, eggs should always be weighed. However, if it is desirable to measure eggs, the following table gives the approximate weight of one quart of the various types frozen eggs:

1 quart of whole egg equals 33.75 ounces
1 quart of egg white equals 34.25 ounces
1 quart of plain yolk equals 33.50 ounces
1 quart sugar-yolks equals 33.60 ounces

*(Courtesy of Standard Brands Incorporated).

## CHAPTER 13

## MOULD

### 1. Mould Growth

Bread moulds are produced from mould seeds or spores, so small that they cannot be seen without the aid of a microscope. However, moulds found in bread are small plants which appear as colored, velvety spots, usually on the crumb. They vary in color - blue, black, green, or pink. If allowed to grow undisturbed, they will penetrate the entire surface and crumb of loaves.

The air is permeated with microscopic mould spores. If they are deposited on a food substance, and heat and moisture conditions are favorable, they soon develop into plants (mould). Bakery products supply mould spores with a suitable food and, under favorable circumstances, mould will soon appear on them. High temperature and high humid atmospheres furnish favorable conditions for mould growth.

Scraps of dough, if allowed to accumulate undisturbed on bakery floors, in corners of a room, or around machinery, also furnish favorable food for mould growth.

A slightly acid medium is most desirable as a source of food for mould spores. However, some acids such as acetic acid (found in vinegar - a saturated fatty acid) has a retarding effect on the growth of mould.

Mould spores occurring in bakery ingredients or doughs are destroyed at oven temperature during baking. Baked foods become mould contaminated after baking. Therefore, the importance of cooling and packaging baked articles in sanitary, air-conditioned rooms.

### 2. Mould Inhibitors

Sodium Propionate and Sodium Diacetate, if used in the amounts recommended by manufacturers (about .25% based on flour as 100%) will prevent mould growth during the normal time which elapses between the baking and consumption of breads and cakes.

Bakers find it advisable to use mould inhibitors during summer months, which are favorable to mould growth, discontinuing their use during winter months.

When mould appears on the walls or ceilings of the shop, dough room or proofing cabinets, these should be sprayed with mould-destroying solutions and painted with mould-inhibiting wall paint.

# CHAPTER 14

## SPICES*

"Throughout the years since early history wars have been waged and empires have risen and fallen on man's quest for spices. To the average layman this is not quite understandable, but to those men who have now taken a scientific interest in the industry the basic underlying motive of this necessity can be very readily understood.

"Nature has provided man with sustenance of life but in order to derive the greatest pleasure from that sustenance it has been necessary for him to seek something to add zest to his foods and this is the part spices is playing in the program of mankind in the manufacturing of bakery products. We list below herewith the spices in their alphabetical order.

### 1. Alspice

"Alspice is the only major spice produced exclusively in the Western Hemisphere. Practically all of it comes from the Island of Jamaica. The tree is about 25 to 30 feet tall. It begins to bear the spicy berries about 7 years after taking root. The trees will bear for about 12 years. Berries are harvested while immature. The natives remove the small twigs by hand. After drying in the sun, the berries are sifted, coming on the market in a very clean condition. During the drying process color changes to a dark brown. The name Alspice is due to the flavor which resembles a combination of Cloves, Ginger and Nutmeg. Throughout Central and South America it is known as Jamaica Pepper because the appearance suggests certain varieties of Whole Black Pepper. In the spice trade it is called Pimento - not to be confused with Piminto, a species of Red Pepper, used as a garnish. It is indispensable in Mincemeat, into which product it is accompained by Cinnamon and Cloves. There are many baking products to which Alspice can be added such as blueberry pie, pineapple tarts, spice cakes and fruit cakes.

### 2. Anise

"The fruit of this small annual plant Anise, dries in the form of seed. The seed itself is very small, hidden in the center of the fruit. The Anise cultivated in Spain is generally preferred. In that country the flavor develops unusually well so that it ranks first in making of Anisette, a cordial which is popular wherever the Spanish language is spoken. A good grade is also grown in India and Mexico. From prehistoric times, it had been widely used as a medicine. Most cough remedies carry this flavor. Throughout Latin lands it is much used on bread, rolls, and cookies. A refreshing summer beverage is a tea made with Anise and served cold. Preparation for market consist of grading it as to size, drying and thoroughly cleaning. Anise is very widely used in licorice products.

3. Caraway

"What we know as Caraway is actually fruit; the seed itself being very small and enclosed in the fruit substance. It contains the maximum elements as to flavoring strength in Holland where growing conditions appear to be ideal. It is also cultivated in Russia, Poland and parts of Africa. The growing period is 24 months--2 years, harvest occurring the second August or September. One of the most widely used flavorings because of its popularity in rye bread, in which it appears either in the whole or ground form. For more appetizing quality, the whole seeds are frequently mixed in cottage and other soft, mild cheese. It may be interesting to know that the world's renowned Kummel Cordial is made from Caraway seed. There are many baking products besides rye breads to which Caraway can be added such as onion breads, cakes, cookies, apricot and peach pastries and corn muffins.

4. Cardimon

"This is a fruit in the form of a pod of about 1/2" long by 1/4" thick. It is usually distributed through the retail shops in the form of bleached Cardimon. These are pearly white and are a spice of many purposes. The seeds within the pod are of strong assertive taste. They give Danish Pastry a distinctively good flavor. Cardimon flavored coffee cakes and buns are popular because of the happy affinity between coffee and cardimon flavors. Makes "kaffee Klatches" happy. Principal sources of supply are Ceylon, India, and Central America. The fruit is grown on a bush about 6 to 12 feet tall. Cardimons are marketed in three ways -- whole, decorticated (that is, with the pod removed and the seeds kept whole) and ground. In the two latter methods, only the inner seeds are used. Unbleached Cardimons, a less expensive form, are available for production of Cardimon oils used for medicinal purposes as well as in the flavoring of all types of candies, cakes and cookies for the Scandinavian trade.

5. Cinnamon and Cassia Cinnamon

"This is the most familiar spice to the baking trade and one with a long and romantic history. It was prized from remote antiquity for its delicate aroma. It was widely adapted to medicinal purposes and for scenting perfumes and ointments long before its flavor value was generally utilized in food. True Cinnamon is extremely mild and grown only on the Island of Ceylon. Cassia Cinnamon is a variety used most frequently in cooking. It is more full bodied and imparts more definite, recognizable aroma and flavor. This is grown in the East, notably Indonisia, Indo China and China. The better grades of Cassia Cinnamon comes from Indo China and are all known as Saigon Cassia. This grade is shipped in several forms such as all thin, all medium, all thick. Sometimes they are packed 6 thin, 6 medium and 6 thick to the picul bale and weigh about 133 pounds. The largest exporter of Cassia is China with some of the grades being Honan, Yunan, Kwangsi, Canton Roll, Extra Selected, Selected and Broken China. The Indo China and China Cassias are botanically known as Cassia Lignea and contain very

little starch. Cassias from Indonisia are known as Cassia Vera and contain a very large amount of starch. These grades are known as Java-Padang and Batavia.

"In early days when the Mediterranean countries were considered the only civilized places in Europe, Cinnamon was brought to Rome and Venice by the way of Arabia.

"Cinnamon, or Cassia is a bark of a tree which sends up a cluster of shoots from its roots. Peeling begins when it is about 6 years old. Branches to be peeled are cut close to the ground, then taken to a shelter and scraped and bark removed in long sections. As these dry, they curl and form the familiar Cinnamon Sticks. The stumps send up new shoots which are ready for cutting again within a year. Of all the spices that are used in the baking trade, research shows that Cinnamon will command about 60 to 65%. Some of the items in the baking trade in which Cinnamon is used are apple, peach, custard and coconut pies, coffee cakes, kuckens, buns, mincemeat, fruit and chocolate sauces and icings. And, who would eat a baked apple without Cinnamon?

6. Cloves

"Everyone is familiar with these nail-shaped little brown buds which add so much zest to a great many foods. Cloves are among the major spices and were known before the days of the early Egyptians. Clove trees were originally found growing on the Molucca Islands, which are not a part of Indonisia. These islands are often referred to as the Spice Islands. The Cloves from this area (Pennang and Amboyna) are the world's best in appearance and flavor. Zanzibar, Madagascar and Pemba in Africa supply most of the Cloves used in the United States. The Clove tree grows to a height of about 30 to 40 feet, but despite its size it is a fragile plant, and harvesting the unopened flower buds must be very carefully done. The Cloves are hand picked, the top branches being reached either by long poles or by ladders. The trees usually begin to bear in their 7th year and may continue to produce as long as 100 years. After picking, the Cloves are spread on mats to dry for 6 to 8 days, depending upon the moisture in the air. During this time they turn from green to brown and lose fully half their original weight. Before they reach the grocery shelf, whole and ground, they are thoroughly recleaned by American Spice Grinders. Cloves, of course, are used for many medicinal purposes and is a favorite among the Orientals for perfume. In India it is used extensively in religious ceremonies. A Clove is an antiseptic. They are important in many of the baking items such as fruit cake, sugar cookies, breads, buns, preserves and stewed fruit fillings and mincemeat. This spice contains about 15% of essential oil. This rich brown and formerly expensive spice has been the cause of much world history because many nations vied for ownership of the lush islands where they were first discovered. Wars were fought in Europe between Europeans and native islanders to secure the ultimate rights to the profitable Clove business. The natives prized the trees not only for their spice value but as a record of ages, it being their custom to plant a clove tree for each child that was born. A tribe could number its strength by the number of trees no matter how scattered the members might be.

7. Ginger

"Ginger is one of the few spices which grow below the ground. It is a root and a perennial, flourishing in tropical and semi-tropical countries, including China, Japan, Africa, India and particularly the island of Jamaica in the British West Indies. When the plant is about a year old the roots are dug up, washed and dried. Because the roots are rough in shape, they are often referred to as hands. After drying, the sun bleaches somewhat at the same time, it is ready for export. Ginger in the baking trade is used in cakes, cookies, wafers, pear tarts and pies. And don't forget the old-fashioned gingerbread and gingersnaps.

8. Mace

"Ground Mace is a yellow powder with a fragrance like Nutmeg. It comes honestly by this aroma, for Mace is the fleshy part which grows around the Nutmeg. In comparing these two, which are the only fruit that develops two types of spices, we use a peach. The part of the peach that we eat is the Mace and the seed inside the stone is the Nutmeg. Although they grow together, the flavor is similar but yet very different and there are separate uses for each. Generally in the baking trade the Mace is referred to as the pound cake spice. It can be used in sweet rolls, coffee cakes, cream fillings for eclairs, cream puffs, charlottes and cherry pie. Mace does not contain starch whereas Nutmeg does. The better grades are produced in Indonesia but many Nutmeg trees were transferred by the English from Indonesia to the British West Indies and today a Source of Supply, which is almost ample for this part of the world, is produced in Grenada, British West Indies.

9. Nutmeg

"The hard brownish Nutmeg for home grating is really a seed, for the part of the fruit we use as spice is the pit or seed of the Nutmeg fruit. There are four parts to the fruit, the outer husk, the mace (already described), the inner shell around which the Mace curls, and the seed or Nutmeg itself on the inside of this shell. The whole fruit somewhat resembles a peach in shape and size. As the fruit ripens the outer husk splits open and reveals the scarlet Mace. From this fact has grown a legend about Nutmegs which tries to explain why they are found growing in the widely separate parts of the world. It is said that the original Nutmeg grew on a single island what we now know as Banda in Indonisia. European conquerors of the island were anxious to limit the Nutmeg to this location so the spice would be scarce and bring high prices. They were fooled in this by large birds who were attracted by the red Mace peeling through the Nutmeg husk. The birds carried off the whole fruit, ate the Mace, dropped the seed or Nutmeg which took root and became trees. Not long ago man planted in Grenada, British West Indies and production there is increasing tremendously as mentioned before. Between the 6th and the 60th year the trees are in almost constant bearing; yield depending much upon the care of the trees, fertilizing, etc. Nutmegs are gathered by means of a long pole which is attached to a basket and prongs. These loosen the

fruit letting it fall into the basket which hold three or four Nutmegs. The basket arrangement is called in the east "gai-gai" and is manipulated with amazing dexterity by the natives. When gathered, the outer husk and Mace are separated from the nut and both products are dried. Shelling and grading the Nutmegs complete the operation. Nutmeg is used in doughnuts, custards, spice cakes, cookies, pastry crusts, especially with apple, cherry, peach and pear fillings.

10. Poppy Seed

"Easily distinguishable because it is the only spice which is blue. There are various kinds of Poppy plants, some of which are interesting to the drug trade. The poppy seed for bread and rolls is imported from Holland, Hungary, Eastern Germany and Poland. As served on bakery products, it imparts a rich "roasted nut-meat" flavor which accounts for much of its world wide popularity. Few foods are more delicious than roasted almonds, pecans, peanuts, filberts, etc., and roasted Poppy Seed is in the same flavor class. So small are the Poppy Seeds that about 9,000,000 of them will weigh about 1 pound. Many are the fancy cakes and pastries of which Poppy jam is a part. This jam is made by mixing Poppy Seed with strained honey or heavy syrup. In the baking trade Poppy Seeds (ground or Jam) are used in doughs and fillings of cakes, cookies, doughnuts, strudels, twists and coffee rings.

11. Sesame Seed

"This paragraph properly could carry the title "Return to Sesame". In America it fell somewhat into disuse for other than candy and oil making. Now riding the wave of a new popularity, it is sweeping through the States. You find it improving the taste of rolls, bread, crumpets, scones and biscuits. There is a fruity richness to the flavor of baked Sesame that suddenly was recognized. Resembling toasted almonds many tons are annually required for the Jewish candy Halyah, the Orient's gift of low cost luxury to the Occident. It is cultivated on an enourmous scale in India and China where it is a staple nourishment. The Sesame herb grows from 12 inches to 2 feet high and puts out pretty blossoms of various colors, Seed pods form with the blossoms. They vary from grayish white to black. Marketed in two forms, unhulled and hulled, the latter is greatly preferred. After hulling, the seeds are pearly white.

12. Mincemeat Spice

"Not only is it important that the proportions of Cloves, Allspice and the other ingredients be correct so that no one predominates, but all together produce a pleasing whole; there is another vital feature, selections of the varieties of these different Spices. One result would be obtained by using Zanzibar Cloves, Ceylon Cinnamon, etc. A different result would follow from Amboyna Cloves and Saigon Cinnamon. Each manufacturer thus has the opportunity to experiment, backed by sound research, to improve his blend. Although sold for Mincemeat Spice, remember that the same mixture is good for fruit cake. The advantage

of buying varieties which are correctly chosen for flavor, strength, etc., and ground together to become thoroughly incorporated one with the other as against spices which are merely mixed together, is worth looking into. Try Mincemeat Spice also in the making of spiced cookies and spice sauces for cornstarch and cake-like puddings.

13. Pumpkin Pie Spice

"Here is a real convenience. The brand that you know best is usually a blend of fancy Cinnamon with the right kind of Cloves and Ginger. The percentages are adjusted to bring out the finest effect of each spice. Best results are obtained by milling the spices together, rather than merely mixing after they are ground. This fusing of the spices together by the action of high speed mills results in a flavor-smoothness that cannot otherwise be obtained. Pumpkin Pie Spice is a real achievement.

"All imported spices must pass through the United States Food and Drug Administration and are inspected by them at the port of entry as to their purity. Yet, all modern spice mills have modern equipment for the processing and cleaning. The modern spice mill cleans every pound of spice before it enters the Milling Room. Several types of mills are used in the grinding. Some mills are more efficient on one spice than on others. Many spices are ground on water-cooled mills as they create a cooler grind thereby retaining much of the essential oils that would be lost in grinding through a hot friction mill.

There are many methods of grinding spices. Some prefer a very fine pulverization, but in grinding we must remember that the finer we grind the more flavor we lose. After all, in pulverization you break down the natural cellular structure from their natural covering. Many today are accepting a fine granulation thus insuring more flavor in the final product.

Today there are many substitutes and synthetic spices being offered. Their flavoring consists of spice oils and oleoresins with a sugar base or ethers and esters. Of course, everyone knows that any of these substitutes cannot stand the element of heat that is required in general baking. Natural spices with their globules of flavoring are wrapped by nature; mankind, as yet, has not supplanted this natural carrier of the flavoring properties in natural spices.

We in the United States of America enjoy the cleanest and best natural spices that the entire world produces because of the joint efforts of the United States Department of Agriculture and the American Spice Trade Association, and through the American Spice Trade Association many programs of research have been, and are now being, carried out in several universities.

*Courtesy Chapman and Smith Company

## CHAPTER 15

### EMULSIONS VS: STRAIGHT ESSENTIAL OILS*

Emulsions are superior for flavoring baked goods because straight Essential Oils are too much affected by heat, and are too volatile.

The following serves as a good example: Lemon Oil contains very many compounds, such as limonene, terpinene, pinene, citral, geraniol, linalool, and a number of acids, esters, aldehydes, and alcohols, all of which are very readily affected by heat. When relatively low temperatures are applied to Lemon Oil these compounds oxidize into comphor-like compounds that are entirely different from the original Lemon Oil, and have an objectionable taste and aroma.

The flash point of Lemon Oil has been determined to be as low as 141° F. When cookies, containing Lemon Oil, are baked at temperatures of 500° and higher, the interiors of the cookies reach temperatures of boiling or at least around 200° F. Lemon Oil doesn't maintain the same character after being subjected to such high heat as it had originally, in its natural state.

It requires a large amount of Lemon Oil to do a relatively small amount of flavoring because of the vaporization of the Lemon Oil that takes place during baking. In order to have just a little left in the cookie, after baking, it is necessary to add large amounts that never get a chance to produce any flavoring, either good or bad. The result is an expensive, wasteful process.

If the Lemon Oils are emulsified in a natural gum base that protects them against the oven heat the oxidation is greatly reduced, and the Lemon Oil, instead of changing to the camphory, terpene-like compounds would remain more like it is found in nature, and taste more like a fresh lemon. Furthermore, evaporation is reduced to a minimum, and a much lesser amount of Lemon Oil, when protected by an emulsion base, will do more and better flavoring, - thus making the use of the emulsion more economical.

The cost of using a good Lemon Emulsion often comes to less than the cost of using straight Lemon oil, - the flavor is better, and the shelf life extended indefinitely because the Emulsion feeds the flavor into the products for days and weeks after baking; - and regardless of how long they stand, the cookies will always have a recognizable Lemon Flavor, while with the Lemon Oil, the tendency is to fade from the time the goods leave the oven.

So it is possible to get finer Lemon flavor with an Emulsion at less the cost of Lemon Oil, and if more aroma is wanted along with taste, you can use as much as twice the recommended level of the Lemon Emulsion and get good, high flavor. It will not produce the harsh taste of straight Lemon Oil and will still cost no more to use than the straight Lemon Oil.

Other emulsions used by bakers are: Rum, Orange, Lemon, Banana, Almond etc.

*Courtesy of the Lancaster Inc.

## CHAPTER 16

## POWDERED LEMON JUICE*

### 1. Advantages and Uses of Powdered Lemon Juice

Being dry, Powdered Lemon Juice handles and mixes like sugar. It is also convenient to store and always ready for use.

Experience shows that people like sweet goods, but they like them better if the sweetness is combined with an appetizing tartness. This explains the popularity of tart apple pies, lemon pies, lemon icings and fillers.

The use of Powdered Lemon Juice is not confined to lemon pies, but may be used in lemon cake icings, and lemon layer cake fillings. This flavor improves rolls and yeast raised sweet goods. It also improves such pies as apple and raisin.

### 2. Use in Large Mixes

When using powdered Lemon juice in a large batch it is advisable to add it in the last stage of cooked mix in order to preserve the maximum flavor. The reason for this is that bulk batches hold the heat longer and consequently will volatilize more of the flavor, if added in the early stages.

### 3. Baking Hints

Do not cook the filler too stiff. Over-cooking causes it to crack when cold and also cooks out part of the flavor. The filler will thicken considerably after it is removed from the fire. A good time to stop cooking and remove from the fire is when the filler shows thin strings on top when stirring.

Bakers using shell eggs, who do not want to take the time to separate the yolk from the whites, can use whole eggs in the formulas for lemon filling. The filling will set faster when yolks only are used and may crack on standing if over-cooked.

In making the starch cream, use the exact amount of water recommended. If the cream is made too stiff, the finished filler is apt to taste of raw starch; if too thin, an unnecessary amount of cooking is required.

Always use some butter, or margarine in a lemon pie filling.

Prolonged cooking is to be avoided as it will eventually soften the filler.

Never spread the meringue on a pie before the filling has cooled, otherwise it will sweat and shrink. The meringue should spread without pulling up the filler.

Spread the meringue so that it covers the pie all the way to the edge. This prevents shrinkage and leakage and makes the pie appear larger.

4. Caution

When not in use, the cover of the can should be carefully replaced to avoid moisture being absorbed by the powders.

A Dry Scoop Should Be Used At All Times.

Use no emulsions or artificial flavors so as to get the full benefit of true juice flavors.

5. Conversions Tables

a. Lemon

30 Doz. (360) average lemons are contained in 1 crate (90 lb.)
30 Doz. (360) average lemons yield 3 gal. juice (24 lb.)
30 Average lemons yield 1 quart juice (2 lb.)
1 Average lemon yields approximately 1 oz. juice (by weight)
1 oz. Powdered Lemon Juice is equal in Flavor to 3 average lemons (3 oz.)
4 oz. Powdered Lemon Juice is equal in Flavor to 1 doz. average lemons (12 oz.)
1 lb. Powdered Lemon Juice is equal in Flavor to 4 doz. average lemons (3 lb.)
5 lb. Powdered Lemon Juice is equal in Flavor to 20 doz. average lemons (15 lbs.)
7-1/2 lb. Powdered Lemon Juice is equal in Flavor to 30 doz. average lemons (1 crate)

To make Powdered Lemon Juice into a liquid use 3 ounces of the powder and 4 ounces water. Place powder on top of water and mix until dissolved.

b. Orange

Powdered Orange Juice may also be used for orange flavor.

12 Doz. Average Oranges (144 oranges) are contained in 1 crate (90 lb.)
12 Doz. Average Oranges (144 oranges) yield 3-1/2 gallons juice (27 lb.)
11 Average Oranges yield 1 quart juice (2 lb.)
1 Average Orange yields, 2 oz. juice ( by weight )
1 Ounce Powdered Orange Juice is equal in flavor to 2 oz. juice.
4 Ounces Powdered Orange Juice is equal in flavor to 1/2 pt. juice.
1 Pound Powdered Orange Juice is equal in flavor to 1 qt. juice.
4 Pounds Powdered Orange Juice is equal in flavor to 1 gal. juice.

*Courtesy of Borden Food Products Co.

# CHAPTER 17

## VANILLA BEANS AND EXTRACT

### A. VANILLA BEANS

Technically speaking, the vanilla plant is a member of the orchid family and the vine produces, in addition to the bean itself, a beautiful orchid blossom. In general, vanilla beans are grown in the tropical zones of the earth immediately adjacent to the equator. The growing areas extend to both the Eastern and Western Hemispheres. Due to the geographical dispersement of growing areas, vanilla beans are named for the areas from which they originate. Listed below are the different types of vanilla beans.

1. Mexican Vanilla Beans - For years, Mexico has been famous for its production of the highest quality of vanilla beans grown. The climatic and soil conditions are conducive to quality and the curing process is a long and tedious one lasting for approximately six months. The beans are picked green in the late fall and are ready for shipment to the United States and other parts of the world in early spring. The intervening period is used for the curing process which develops properly the flavor, aroma, and bouquet of the vanilla bean. During this curing process, the beans are individually handled, since during the daytime it is necessary for them to be spread out on large racks and subjected to the sun's rays, and at night they are brought inside, covered with blankets, and allowed to sweat. This process is continued until the curers, who have had the benefit of generations of experience, determine that the vanilla beans have reached their proper state of development.

Mexican vanilla beans may be recognized by the general characteristics of being longer than other types and having a more delicate flavor and aroma. If all else fails, one of the simplest ways to recognize Mexican beans is that the bundle of beans is tied in three places - at each end and in the middle. The products of Mexico are the only ones bound in this manner, others being tied only in the middle.

2. Bourbon Vanilla Beans - Bourbon beans originate on the island of Madagascar, the Comores Islands and other island groups on the east coast of Africa. Years ago, these island were known as the Bourbon Islands and that explains the reason for the name "Bourbon" vanilla beans. You will also hear Bourbon beans referred to as Madagascar beans, Comores beans, etc.; they are still Bourbon vanilla beans.

The flavor and aroma of this type is heavier and more full-bodied than its Mexican counterpart, which is not necessarily a reflection on the quality of the Bourbon bean. One may compare the difference between the Mexican and Bourbon bean to the difference between a heavy and a light wine - merely a matter of preference as to which you use.

3. Puerto Rican Vanilla Beans - This product originates in the West Indies. As a result of long years of research, the Puerto Rican vanilla bean is gradually gaining a high quality standard. Its quality still does not compare with that of its neighbor, the Mexican bean.

4. Java Vanilla Beans - A great deal of money has been spent to build up the quality of the Java bean and, although closely resembling the Bourbon bean in flavor and appearance, the quality is still inferior to the products of Madagascar.

5. Tahiti Vanilla Beans - Tahiti beans originate on the island of Tahiti. They are very inferior in quality and have a rank odor and flavor that is easily distinguished from other types.

6. Tonka Beans - Tonka beans are different in appearance, flavor, and aroma from any other type. Originating in South America where the growing conditions are very different, they never attain the long slender shape of the Mexican or Bourbon beans; instead, they are short and stubby in appearance.

Where other types of beans have natural vanillin which gives the flavor and aroma, Tonka beans have natural coumarin. Vanillin, as it occurs naturally, possessed a delicate flavor that is enhanced by other materials present in the vanilla bean. The coumarin present in the Tonka bean, on the other hand, has a thick, tarry flavor, and a strong pungent aroma.

Vanilla beans are also graded as to quality. Although Mexican vanilla beans are the finest obtainable, there are different grades of Mexican beans which vary widely. The knowledge and understanding of these quality standards is important to the purchaser of vanilla beans because a PURE VANILLA EXTRACT IS ONLY AS GOOD AS THE FLAVOR AND AROMA OF THE VANILLA BEANS WHICH ARE USED. It is important the vanilla beans be grown properly. It is even more important that they be cured properly. Once the beans are shipped to their destination, they must be handled with extreme care in order to preserve their flavor, bouquet, and aroma and to prevent the occurrence of mold.

## B. VANILLA EXTRACT

The actual production of pure vanilla extract is a highly technical procedure and an operation which must be conducted under the most rigid quality controls. The proper handling of raw materials in order to insure the most efficient percolation is extremely important and this knowledge is only gained after long years of experience. In theory, however, the percolation of vanilla extract is similar to the percolation of coffee. The equipment used to produce vanilla is similar in design to the percolator used in the kitchen for making of coffee. Sieves containing chopped vanilla beans are placed in the percolator. Instead of using heat and water to extract the flavor from the vanilla beans, we use alcohol as the extracting agent. The alcohol serves two purposes: extracting the flavor from the vanilla beans and acting as a preservative for the finished extract. Extreme care must be exercised through out the entire process to make sure that the proper formulation of the

raw materials involved is affected and that the flavor and aroma of the finished product measures up to the quality standards which have been established.

After the extract is manufactured, it is subjected to a very thorough laboratory analysis where the quality, flavor, taste, and aroma are all checked, in addition to the technical requirements specified by the Federal Food and Drug Administration. Federal law requires us to use 13.35 oz. of vanilla beans for each gallon of finished extract produced. It is important, however, to note here that no specification is made as to the quality or type of beans used. The use of 13.35 oz. of Tonka beans may be labled "Pure Vanilla Extract" and comply with legal requirements as much as a product made from 13.35 oz. of the finest Mexican vanilla beans obtainable. After all the variables are carefully tested and the finished extract has measured up to each of the requirements, it is approved by the laboratory, filtered, and put in storage tanks for aging. Even then, the job is not complete, for strict requirements are enforced for proper aging and development.

*Courtesy McCormick and Company

## CHAPTER 18

## LEAVENING AGENTS*

The three leavening agents largely responsible for raising cake batters during baking are Carbon Dioxide ($CO_2$), Steam, and Air. During the mixing of cake batters an appreciable quantity of air is incorporated. During baking some moisture in cake batters is converted into steam. While baking the steam and air are expanded by the oven heat assisting in the raising of the cake batters.

Baking Powder, the most important leavening agent is composed of acid salts such as, Sodium Pyro-Phosphate, and Monocalcium Phosphate and an alkaline salt, Bicarbonate of Soda, carefully blended together in perfectly balanced proportions. The powder is kept dry by including a specially dried starch filler.

In the presence of both moisture and heat the acid reacting ingredients act upon the alkaline salt, Bicarbonate of Soda, releasing Carbon Dioxide ($CO_2$). Some of this gas is absorbed by the liquid of the batter. The rest enters into the air cells (formed by mixing) which are expanded by the oven heat increasing the batter volume until it is finally "set" by the oven heat. This is responsible for the light, porous cell-like structure of cakes.

The amount of baking powder used in any mix depends upon the type of baked product desired, the altitude, the character and amount of ingredients and the manner of mixing and handling of the batter.

Some types of cakes such as Angel Food require no baking powder. However, an acid salt should be used in Angel Food Cake to adjust the pH for optimum results. In other types of cakes and in biscuits the amount of baking powder used may range from 1/4% to about 6% - based on the weight of flour.

Guess work in the use of baking powder means a lack of uniformity and therefore it is <u>important to carefully weigh the correct amount</u>.

Carefully sift and blend the baking powder with the flour so that it will be evenly dispersed throughout the batter. This prevents irregular leavening.

Carbon dioxide of most baking powders is released not merely at one or two but at several stages in the baking process. This action is called multiple action and it means that the gas is produced at a regulated speed throughout the entire batter during the baking process and in sufficient amounts to produce an excellent grain and texture in the baked products.

After mixing, batter containing this baking powder can stand for several hours without loss in volume or other desired qualities in the finished product.

The size of the batch to be mixed is not limited to the immediate oven capacity.

The batter can be made up in one mixing to the full capacity of the mixer. Should the required oven facilities not be available, the remaining portion of the batter can be safely set aside.

*Courtesy Standard Brands, Inc.

## BALANCING CAKE FORMULAS

Five important functions of ingredients:

1. Toughners
2. Tenderizers
3. Moisteners
4. Dryers
5. Flavors

Toughening ingredients include Flour, Milk Solids, and Egg White.
Tenderizing agents include Shortening, Chocolate, and Fat in Egg Yolk.
Moisteners include fluid Milk and Egg.
Dryers include Flour, Sugar, Dry Milk, and Cocoa.
Flavors include Sugar, Cocoa, Chocolate, and practically all other ingredients.

## HIGH LIQUID CAKE BALANCE

1. The weight of the sugar should exceed that of the flour.
2. The weight of egg should exceed that of the fat.
3. The weight of the liquid in egg and milk should equal, or slightly exceed the weight of the sugar.

Rule 1 Very seldom should one use less than 100% sugar based on flour. As much as 180% Sugar can be used in chocolate cakes. Sufficient liquids in the form of milk and egg must be present to bring the sugar into solution without depriving the flour starch of adequate moisture for gelatinization. Consequently the sugar cannot exceed 90-95% of the combined liquids.

Rule 2 The weight of egg should exceed that of fat. Because of the high protein content of egg they exert a toughening effect which must be counteracted by the tenderizing action produced by an appropriate amount of shortening. The percent of fat should be kept about 15% lower than that of egg. The preceding rule is for egg yolk and high emulsifying shortening. If egg white is used, with its higher moisture and lower protein content, a downward adjustment will produce best results, or the egg white might be increased. In normal usage in yellow or white cake, the shortening will range from 35-50% based on flour. Egg will, or must equal this. In most cases egg will exceed fat.

Rule 3 The weight of the combined liquids in egg and milk must equal, or slightly exceed the weight of sugar. This refers to the weight of the liquid ingredients, egg, and milk, rather than to their actual moisture contents. In cakes made with high emulsifying shortening, the amount of milk may be double that of egg, and their combined weights may be increased to as much as 165% based on flour.

# CHAPTER 19

## HIGH ALTITUDE CAKE BAKING*

Almost all formulas released for general distribution to the baking industry are developed in cities of low altitude. The various ingredients in the formulas are so balanced with each other that they produce the desired results at, or near sea level. It is recognized, however, that in high altitudes (because of lessened atmosphereic pressure) the same formulas must be adjusted to perform satisfactorily.

Those who have baked at higher altitudes have, in general, followed adjustments that have been worked out through experience on the basis of the older type, lower sugar formulas. In general these changes for batter cakes consist of reducing the baking powder and sugar, and increasing the liquid as the altitude increases. Such an adjustment protected the physical character of the cakes, but necessarily lowered their eating quality and flavor. Cakes are sweet desserts, and anything that markedly lowers their sweetness detracts from their general appeal and acceptability.

The results of extensive work on cake baking at higher altitudes indicate that, with the emulsifier type shortening and softer cake batters, it is not necessary at high altitudes to reduce the sugar percentage from sea-level amounts, provided the sugar percentage ranges from approximately 120% to 130%, based on flour. This is particularly true in batter type cakes made by the two stage method, where by standardized shop manipulation, it is possible to control, to a large degree, the amount of air incorporated in the batter.

It is to be expected that some experimental baking will have to be done to adapt a sea-level formula to the particular elevation of any individual shop and to meet the local conditions that may prevail. The following chart on "The Relationship of Altitude to the Amount of Essential Ingredients Used in Cakes" is offered as a guide towards minimizing unavoidable experimentation.

Because of the lowering of atmospheric pressure as altitude increases and the tremendous effect it has on cake baking, we find that the three ingredients which require adjustment to compensate for this condition are as follows:

1. Leavening Materials. Reduce baking powder, soda, cream of tartar, or other agents having leavening action in the cakes, beginning at 2000 feet elevation, (making a 15% reduction at this elevation) and increase the reduction as the altitude increases until at 8000 feet elevation the reduction amounts to 60% of the quantity used at sea-level. For example, if a cake formula developed at sea-level calls for 5 ozs. of baking powder, only 2 ozs. should be used at 8000 feet elevation.

If a dark cake formula at sea-level calls for soda, buttermilk and/or baking powder, the correction of the leavening agents can best be controlled and adjusted by changing to sweet milk and baking powder only. This elliminates the compensations involved in considering more than one gas-producing leavening ingredient.

It is also suggested that the creaming of the shortening and sugar be standardized both as to machine speed and time so that the volume of air incorporated into the batter will be as uniform as possible. In this manner the volume of the cakes can be controlled and their rapid drying or crumbling can be materially lessened.

2. Egg. Beginning at 2500 feet elevation, add 2 1/2% more whole egg, or egg white. Gradually increase the egg content as the elevation increases untill at 7500 feet 15% more are used. For example, if a formula developed at sea-level specifies 2 lbs. 8 ozs. whole egg (40 ozs.) at 2500 feet elevation use 1 oz. more or 2 lbs. 9 ozs. At 7500 feet elevation, 6 ozs. more or a total of 2 lbs. 14 ozs. should be used. By increasing the egg more liquid is added to the mix and at the same time greater stability is provided, due to the strengthening action of the egg protein.

3. Flour. Beginning at 3500 feet elevation, increase the flour 2 1/2% and gradually add more as the elevation increases until at 8000 feet elevation 10% more flour is used. For example, if a formula developed at sea-level specifies 5 pounds of cake flour (80 ozs.) use 2 ozs. more at 3500 feet elevation, making the total 5 pounds 2 ozs. This amount should be increased as the elevation increases until at 8000 feet elevation 5 pounds 8 ozs. are used.

As mentioned previously, these corrections or adjustments apply particularly to formulas in which the sugar ranges between 120% and 130%, based on flour.

In addition, the following recommendations are made for cake baking at altitudes of 4500 feet or over:

A. Grease and dust the cake tins somewhat more thoroughly and heavily, as the cakes have a tendency to stick to the sides and bottom of the pans.

B. Beginning at 3500 feet elevation increase the oven temperature approximately 25° F. Keep the baking time the same as for sea-level. Precautions should be taken to prevent over-baking because at higher altitudes evaporation takes place at a much more rapid rate and this will contribute to excess dryness in the baked cake.

C. In formulas specifying either whole egg, egg white, or egg yolk make the altitude adjustments as shown on the chart by adding either whole egg, or egg white. This is recommended particularly in order to get the

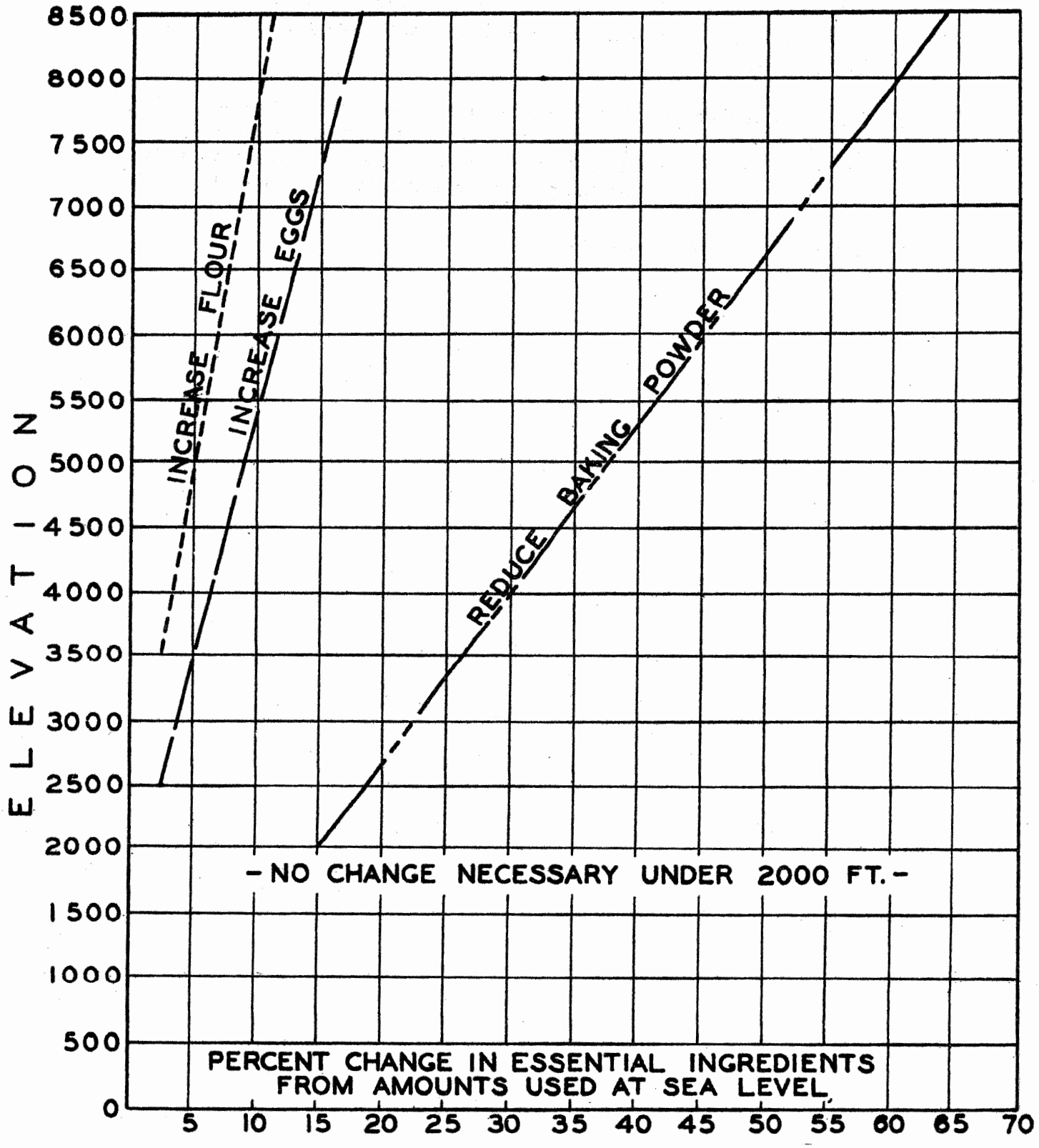
benefit or both the egg substance and the extra liquid, which of course is greater in these two forms of egg than in the yolk.

D. Less beating of the egg is required for Sponges and Angel Food Cakes, and the acid ingredient (cream of tartar) in the formulas should be reduced in the same ratio as for baking powder, as shown in the preceding chart.

E. Maximum moisture and freshness in the baked cakes can be assured if they are removed from the baking tins as soon as they are taken from the oven. Do not cool freshly baked cakes in a strong current of air. Ice them as soon as possible after they are thoroughly cooled.

*Courtesy of General Mills, Inc.

# RELATIONSHIP OF ALTITUDE TO THE AMOUNT OF ESSENTIAL INGREDIENTS USED IN CAKES



# CHAPTER 20

## CAKES

There are many varieties of cakes produced by the three types of bakers of today - Wholesale, House-to-House, and Retail. While the finishing, sizes and shapes vary considerably, and, to some extent, also the consistency of batters, the cake qualities produced by the three types of cake bakers are, in many instances, quite similar. Most producers of cakes use the best qualities of ingredients contained in their rich, well balanced formulas. Methods of incorporating ingredients and baking are standard and quite uniform in the better operated bakeries.

The formulas and methods given herein are representative of some of the most popular types of cakes produced throughout the states.

## A. METHODS FOR CAKE BAKING

### 1. Cake Batter Temperatures

Batter temperatures have little effect on cake volume. However, hot batters will produce cakes of a somewhat greater volume.

The temperatures of cake batters have a more pronounced effect on the grain and texture of cakes. A hot batter will produce a cake with a coarse, open grain and a cold batter will produce the same results. Cake batter temperatures should never be less than 65° F. The ideal temperature is 70° F.

### 2. Mixing Time of Cake Batters

Mixing time of cake batters can be determined by mixing small batches and varying the mixing time of each. As a rule, the longer the mixing time the better the cake texture, up to a point where the shortening will commence to break down this being about ten minutes in each stage. However there is one thing to remember, the longer the mixing time the more the gluten develops the tougher the cake. Most formulas have the mixing time already established. These mixing times are usually correct.

### 3. Cake Baking Temperatures

The baking temperature of cakes will vary with the type of the cake and size of the layers. Most layers will be thoroughly baked at 365° to 385°. Cakes baked at a low temperature will have more volume, a flat top and a coarse grain. A high baking temperature will produce cakes lacking in volume and with a fine grain.

### 4. Preparation of Cake Pans

Most bakers prepare their own pan grease. However, there are many good ones on the market. The type of pan grease to use depends upon the kind of a cake to be made, the per cent of sugar in the formula etc. The more sugar in a batter the more likely will the cakes stick to the pans. A 100% sugar cake will leave the pans easily when they are greased with hydrogenated shortening, but a cake with 120% sugar will often stick to the pan when greased with this shortening. To eliminate sticking some bakers add flour to the pan grease. Other bakers grease the pans and dust them with flour. A pan grease made with hydrogenated shortening, vegetable oil, flour, and lecithin will prove very satisfactory.

The formula for this is:

Cake Pan Grease

| PER CENT | INGREDIENTS | LBS. | OZ. | METHODS |
|---|---|---|---|---|
| .445 | Vegetable Oil | 4 | 7 | Mix well |
| .450 | Hydrogenated shortening | 4 | 8 | |
| .100 | Cottonseed Flour* | 1 | | |
| .005 | Lecithin | | 1 | |
| 1.000 | TOTALS | 10 | | |

Note: If too thin for summer use, increase shortening 10% and reduce oil 10%.

*Cake Flour may be used.

## B. CAKE INGREDIENT INCORPORATION

There are four methods for mixing cake batter viz: 1 Stage, 2 Stage, 3 Stage, and 4 Stage.

### 1. One Stage Method

A one stage method consists of introducing all ingredients into a bowl and mixing about 8 to 10 minutes. This method is undesirable. Batters are lumpy; and cakes made therefrom are lacking in volume, have a harsh texture, and a coarse grain.

### 2. Two Stage Method

This is a good method but has a slight disadvantage. The batter will lump if water is added to quickly. Cakes made therefrom possess good volume and grain and considerable less time of mixing is required. During the first stage all ingredients and a portion of the water are introduced into a bowl and mixed for about 4 to 6 minutes; then during the second stage egg and the remaining water are introduced and mixed for about 6 minutes.

### 3. Three Stage Method

This is also a good method and will probably produce the best results of the four methods. It requires more time of mixing than the one or two stage methods but will always produce a good smooth batter. This method can be used by inexperienced bakers with good results. During the first stage shortening and the flour are mixed together, during the second dry ingredients and a portion of the water are mixed in, and finally the remainder of the water and the egg is added and mixing completed.

4. Four Stage Method

This method will produce a batter that will be smooth. Cakes produced from this will have a good grain and volume. However, a much longer mixing time is required. There is very little difference in the results obtained from this method and the 2 and 3 stage methods except that cakes made by this method might be somewhat firmer. This method requires too great mixing time and possesses no extra advantages over the 2 and 3 stage methods. The method consists of creaming the flour and shortening; next adding the dry ingredients and part of the water; then adding the egg; and finally adding the remainder of water and finishing mixing. Sides of bowl should be scraped after each mixing stage.

5. Determining When a Cake is Thoroughly Baked

This is something that only experience teaches; however, a fully baked cake will pull from the sides of pan. The best method is to press the cake lightly. If cake receeds it is still unbaked, but if it springs back it should then be removed from oven. The longer a cake remains in the oven after being fully baked the drier it becomes.

6. Scaling and Distribution of Cake Batter into Pans

Most batters are thin enough to spread of themselves. However, some batters are somewhat stiff and will require the dropping of filled pans on the bench or the spinning of the pan on the bench. One must be sure that the pans are level while baking. Sometimes burnt particles of baked goods are left on the oven shelves. This tilting of pans will cause cakes to bake uneven.

## C. CALCULATIONS

1. Ingredient Percentages

To calculate the percentages of ingredients in a formula divide the weight of each ingredient (lbs. and decimal fractions of a pound). Total weights of ingredients in a formula is known as 100% batter weight.

| Percentages | Ingredients | Lbs. | Ozs. |
|---|---|---|---|
| .285 | Sugar | 6 | 8 |
| .008 | Salt | | 3 |
| .014 | Baking Powder | | 5 |
| .022 | Milk (dry) | | 8 |
| .110 | Emulsifying shortening | 2 | 8 |
| .220 | Cake Flour | 5 | |
| .165 | Water | 3 | 12 |
| .132 | Egg White | 3 | |
| .044 | Water | 1 | |
| 1.000 | | 22 | 12. or 22.75 lbs. |

Example No. 1

Per cent sugar
6.500 ÷ 22.75 = .2857% Sugar

Example No. 2

Per cent salt
3.000 ÷ 16 = .1875 lb.
.1875 ÷ 22.75 = .008% Salt

Example No. 3

Convert 22 Lbs. into ounces and add 12 oz.

22 lbs.
16 oz.
132
22
352
12
364 oz.

3 ÷ 364 = .008% Salt

2. Amounts of Ingredients in a Formula

The most accurate and simplest way to calculate the amount of batter desired is to multiply the percentages of each ingredient in a formula by the pounds of a batter desired.

Example No. 1

Wanted 51 lbs. of batter -- Calculate amount of sugar desired

.285 - Per cent of sugar
51 - Number of pounds wanted
285
1425
14.535 or, 14 lbs. and .535 - Fraction of a Pound

.535
16
3210
535
8.560

The amount of sugar desired is 14.535 or 14 lbs. 8 1/2 oz.

Example No. 2

Calculate desired quantity of Baking Powder

The result obtained in Example No. 1 shows pounds, and a fraction of a pound. The number on the left side of the decimal point is pounds and that on the right side a fraction of a pound. When the fraction is multiplied by 16 (16 ozs. in a pound) the result will be ounces.

.014 - Per cent of Baking Powder
51 - Number of pounds wanted
14
70
.714
16
42.84
714
11.424 oz., or 11 3/8 oz.

3. Cost Per Pound and Ounce of an Ingredient

Example No. 1

Sugar cost $9.69 for 100 lbs.
Calculate cost per pound

Move the decimal point two places to left or divide $9.69 by 100.

Example:

```
   .0969        cost per lb.
100/9.69
  900
   690
   600
    900
    900
```

Example No. 2

1 Pound - 16 oz.
Calculate cost per ounce

.0969 (cost of 1 lb. or 16 oz.) divided by 16 gives cost per ounce.

```
   .0060        cost per oz.
16/.0969
  96
   9
```

Example No. 3

Using 14 lbs. 8 1/2 oz.
Calculate cost of sugar in batch.

14 x .0969 (cost of per lb.) - $1.357 cost of 14 lbs.
8 1/2 x .006 (cost of per oz.) -.051 cost of 8 1/2 oz.

TOTAL COST $1.408

4. Conversion of Ounces to Pounds and Pounds to Ounces

Rule: (a) To Change ounces to pounds, divide by 16
(b) To Change pounds to ounces, multiply by 16

| OUNCES | FRACTIONS | POUNDS DECIMALS | PERCENTAGES |
|---|---|---|---|
| 1 | 1/16 | 0.0625 | 6.25% |
| 2 | 1/8 | 0.125 | 12.5% |
| 3 | 3/16 | 0.188 | 18.8% |
| 4 | 1/4 | 0.25 | 25.0% |
| 5 | 5/16 | 0.313 | 31.3% |
| 6 | 3/8 | 0.375 | 37.5% |
| 7 | 7/16 | 0.438 | 43.8% |
| 8 | 1/2 | 0.5 | 50.0% |
| 9 | 9/16 | 0.563 | 56.3% |
| 10 | 5/8 | 0.625 | 62.5% |
| 11 | 11/16 | 0.688 | 68.8% |
| 12 | 3/4 | 0.75 | 75.0% |
| 13 | 13/16 | 0.813 | 81.3% |
| 14 | 7/8 | 0.875 | 87.5% |
| 15 | 15/16 | 0.938 | 93.8% |
| 16 | 1 | 1.000 | 100.00% |
| 17 | 1 - 1/16 | 1.063 | 106.3% |
| 18 | 1 - 1/8 | 1.125 | 112.5% |
| 19 | 1 - 3/16 | 1.188 | 118.8% |
| 20 | 1 - 1/4 | 1.25 | 125.0% |

5. Correct Batter Weights for Pans

To determine correct batter for a cake pan, the methods are the following:

1. Straight side round pans

Batter scaling weight for one size pan must be known. To determine batter expansion factor, multiply 1/2 of the diameter by itself, times height of pan, times 3. 1416 (standard factor).

Example: Pan size 8 inches in diameter and 1 1/2 inches deep, scaling weight 16 ozs.

4 x 4 x 1. 5 x 3. 1416 = 75. 40 cu. in. of pan

Divide known scaling weight into cubic inches content. This will give expansion in cu. in. of batter.

Example: 75. 40 ÷ 16 = 4. 70 cu. in. which is expansion of one oz. batter.

To determine scaling weight for any size round straight side pan, divide cubical inches content of pan by the expansion factor obtained (4. 7).

Example: Pan 6 1/2 inches in diameter and 1 inch deep.
3. 25 x 3. 25 x 1 x 3. 1416 = 33. 18

33. 18 ÷ 4. 7 = 7. 06 oz. (scaling wt. for above pan).

2. Flared pan

Pan 9 1/4 inches top and 7 3/4 inches bottom, and 4 inches high. Cone 2 1/4 inches top and 3 1/2 inches bottom, and 4 inches high.

Scaling weight 24 oz.

The same method given above to be used in determining the capacity of pan and also that of cone.

Then deduct cu. inches content of cone from that of pan. This gives capacity pan in cu. inches.

Cubical inches content of pan divided by known scaling weight (24 oz. ) will give expansion factor.

Example: Pan - 9.25 + 7.75 = 17 ÷ 2 = 8.50 ÷ 2 = 4.25

4.25 x 4.25 x 4 x 3.1416 = 226.98

Cone - 2.25 + 3.50 = 5.75 ÷ 2 = 2.875 ÷ 2 = 1.437

1.437 x 1.437 x 4 x 3.1416 = 25.95

226.98 - 25.95 = 201

201 ÷ 24 = 8.37 (Expansion Factor)

To determine correct scaling weight of any size pan of this type, divide cu. in. content of pan by expansion factor.

Example: Dimensions of pan, 8 in. top, 7 1/2 in. bottom, and 3 in. high.

8 + 7.5 = 15.5 ÷ 2 = 7.75 ÷ 2 = 3.875

3.875 x 3.875 x 3 x 3.1416 = 141.519

Cone 1 3/4 top, 2 7/8 bottom and 3 in. high

1.75 + 2.875 = 4.625 ÷ 2 = 2.313 ÷ 2 = 1.16

1.16 x 1.16 x 3 x 3.1416 = 2.566

141.519 - 12.566 = 128.94 cu. inches content of pan

129 ÷ 8.37 (expansion factor) = 15.4 oz. (correct scaling weight).

## 6. Conversion of Chocolate to Cocoa Powder
(Table for cakes)

| Chocolate | | | Cocoa | | | Hydrogenated Shortening | |
|---|---|---|---|---|---|---|---|
| Lbs. | Ozs. | | Lbs. | Ozs. | | Lbs. | Ozs. |
| - | 4 | replace with | - | 2-1/2 | + | - | 1 |
| - | 8 | replace with | - | 5 | + | - | 2 |
| - | 12 | replace with | - | 7-1/2 | + | - | 3 |
| 1 | - | replace with | - | 10 | + | - | 4 |
| 1 | 4 | replace with | - | 12-1/2 | + | - | 5 |
| 1 | 8 | replace with | - | 15 | + | - | 6 |
| 1 | 12 | replace with | 1 | 1-1/2 | + | - | 7 |
| 2 | - | replace with | 1 | 4 | + | - | 8 |
| 2 | 4 | replace with | 1 | 6-1/2 | + | - | 9 |
| 2 | 8 | replace with | 1 | 9 | + | - | 10 |
| 2 | 12 | replace with | 1 | 11-1/2 | + | - | 11 |
| 3 | - | replace with | 1 | 14 | + | - | 12 |
| 3 | 4 | replace with | 2 | -1/2 | + | - | 13 |
| 3 | 8 | replace with | 2 | 3 | + | - | 14 |
| 3 | 12 | replace with | 2 | 5-1/2 | + | - | 15 |
| 4 | - | replace with | 2 | 8 | + | 1 | - |
| 4 | 4 | replace with | 2 | 10-1/2 | + | 1 | 1 |
| 4 | 8 | replace with | 2 | 13 | + | 1 | 2 |
| 4 | 12 | replace with | 2 | 15-1/2 | + | 1 | 3 |
| 5 | - | replace with | 3 | 2 | + | 1 | 4 |

## D. CAKE TYPES

1. Wedding Cakes

Round

| Tiers | Size of Layers | Servings |
|---|---|---|
| 3 | 6" X 10" X 14" | 85 |
| 3 | 8" X 12" X 16" | 100 |
| 4 | 8" X 12" X 16" X 20" | 175 |

Square

| Tiers | Size of Layers | Servings |
|---|---|---|
| 3 | 4" X 10" X 14" | 100 |
| 3 | 8" X 12" X 16" | 110 |
| 4 | 8" X 12" X 16" X 20" | 245 |

Note: The number of servings given above is based on approximately two ounces per person.

2. Cup Cakes

Cup cakes are generally made from regular cake batters. Some bakers alter their batters with added flour. Others bake at higher temperatures. If flour is added 1 oz. to each pound of cake batter is sufficient to produce peaking.

Peaking on cup cakes is desirable, enabling easier icing, resulting in a better appearance. Cup cakes baked at too low a temperature will be difficult to ice. They stick on the top of the pans and are very crumbly. Too high a temperature will cause excessive peaking and burning of the crust before they are baked.

It is more desirable, so far as quality is concerned, to cause peaking by baking at a higher temperature, about 400° F.

## BALANCING CAKE FORMULAS

Five important functions of ingredients:

1. Toughners
2. Tenderizers
3. Moisteners
4. Dryers
5. Flavors

Toughening ingredients include Flour, Milk Solids, and Egg White.
Tenderizing agents include Shortening, Chocolate, and Fat in Egg Yolk.
Moisteners include fluid Milk and Egg.
Dryers include Flour, Sugar, Dry Milk, and Cocoa.
Flavors include Sugar, Cocoa, Chocolate, and practically all other ingredients.

## HIGH LIQUID CAKE BALANCE

1. The weight of the sugar should exceed that of the flour.
2. The weight of egg should exceed that of the fat.
3. The weight of the liquid in egg and milk should equal, or slightly exceed the weight of the sugar.

Rule 1 Very seldom should one use less than 100% sugar based on flour. As much as 180% Sugar can be used in chocolate cakes. Sufficient liquids in the form of milk and egg must be present to bring the sugar into solution without depriving the flour starch of adequate moisture for gelatinization. Consequently the sugar cannot exceed 90-95% of the combined liquids.

Rule 2 The weight of egg should exceed that of fat. Because of the high protein content of egg they exert a toughening effect which must be counteracted by the tenderizing action produced by an appropriate amount of shortening. The percent of fat should be kept about 15% lower than that of egg. The preceding rule is for egg yolk and high emulsifying shortening. If egg white is used, with its higher moisture and lower protein content, a downward adjustment will produce best results, or the egg white might be increased. In normal usage in yellow or white cake, the shortening will range from 35-50% based on flour. Egg will, or must equal this. In most cases egg will exceed fat.

Rule 3 The weight of the combined liquids in egg and milk must equal, or slightly exceed the weight of sugar. This refers to the weight of the liquid ingredients, egg, and milk, rather than to their actual moisture contents. In cakes made with high emulsifying shortening, the amount of milk may be double that of egg, and their combined weights may be increased to as much as 165% based on flour.

# WHITE CAKE

| PER CENT | INGREDIENTS | LBS. | OZS. | METHODS |
|---|---|---|---|---|
| .272 | Sugar | | | Mix one minute on medium speed. Scrape down sides of mixing bowl. |
| .0076 | Salt | | | |
| .0125 | Baking Powder | | | |
| .105 | Emulsifying Shortening | | | |
| .0209 | Dry Milk | | | |
| .209 | Cake Flour | | | |
| .160 | Water | | | |
| .087 | Water | | | Mix 7 minutes on medium speed. Scrape down sides of mixing bowl. |
| .12ß | Egg White | | | Whip whites to wet peak and add slowly to above & mix 1 1/2 minutes on low speed. |
| | Flavor (to taste) | | | |
| 1.0000 | Totals | | | |

Batter Temperature: 65° to 75° F. NEVER GO OVER 75°
Scale Seven pounds for Sheet Cake.
Scale 1 ounce less than regular 9 inch White Cakes.

3. WHITE CAKE (130% Sugar)

| PER CENT | INGREDIENTS | LBS. | OZS. | METHODS |
|---|---|---|---|---|
| .285 | Sugar | 5 | 11 1/4 | Mix 1 minute on med. speed. Scrape down sides of mixing bowl. |
| .008 | Salt | | 2 1/2 | |
| .014 | Baking Powder | | 4 1/2 | |
| .110 | Emulsifying Shortening | 2 | 3 1/4 | |
| .022 | Dry Milk | | 7 | |
| .220 | Cake Flour | 4 | 6 1/2 | |
| .133 | Water | 2 | 10 1/2 | |
| .032 | Water | | 10 1/4 | Mix 6 minutes on med. speed. Scrape down sides of mixing bowl. |
| .132 | Egg White | | 10 1/4 | Add slowly to above and mix 1 minute on low speed. Scrape down sides of mixing bowl. |
| .044 | Water<br>Flavor (to taste) | | 14 | Add and mix 4 min. on low speed. |
| 1.000 | | 20 | 00 | |

Batter Temperature: 65° to 75° F. NEVER GO OVER 75°.

4. White Cake (130% Sugar)

Batter Weights

| | | 2 Lbs. | | 10 Lbs. | | 12 Lbs. | | 14 Lbs. |
|---|---|---|---|---|---|---|---|---|
| | Ingredients | Gms. | Ozs. | Lbs. | Ozs. | Lbs. | Ozs. | Lbs. | Ozs. |
| | Sugar | | 9 | 2 | 13 1/2 | 3 | 6 3/4 | 3 | 15 3/4 |
| | Salt | *7 1/4 | 1/4 | | 1 1/4 | | 1 1/2 | | 1 3/4 |
| | Bak. Powd. | *12 3/4 | 1/2 | | 2 1/4 | | 2 3/4 | | 3 1/4 |
| (1) | Emul. Short. | | 3 1/2 | 1 | 1 1/2 | 1 | 5 | 1 | 8 3/4 |
| | Dry Milk | *20 | 3/4 | | 3 1/2 | | 4 1/4 | | 5 |
| | Cake Flour | | 7 | 2 | 3 1/4 | 2 | 10 1/4 | 3 | 1 1/4 |
| | Water | | 4 | 1 | 5 1/4 | 1 | 7 3/4 | 1 | 11 3/4 |
| (2) | Water | | 1 1/4 | | 6 1/4 | | 8 | | 9 1/4 |
| (3) | Egg White | | 4 1/4 | 1 | 5 1/4 | 1 | 9 1/4 | 1 | 13 1/2 |
| (4) | Water | | 1 1/2 | | 7 | | 8 1/4 | | 9 3/4 |
| | Flavor | To Taste | | To Taste | | To Taste | | To Taste | |

Batter temperature: 65° to 75° F., NEVER GO OVER 75°.
First Stage: Mix one minute on medium speed. Scrape down sides of mixing bowl.
Second Stage: Mix 6 minutes. Scrape down sides of mixing bowl.
Third Stage: Add slowly to above and mix 1 minute. Scrape down sides of mixing bowl.
Fourth Stage: Add and mix 4 minutes.
NOTE: Mix 1st and 2nd stages on medium speed and the 3rd and 4th on low speed.

*Equivalents of fractions of ounces.

White Cake (130% Sugar)

## Batter Weights

| | | 16 Lbs. | | 18 Lbs. | | 20 Lbs. | | 22 Lbs. | |
|---|---|---|---|---|---|---|---|---|---|
| | Ingredients | Lbs. | Ozs. | Lbs. | Ozs. | Lbs. | Ozs. | Lbs. | Ozs. |
| | Sugar | 4 | 9 | 5 | 2 | 5 | 11 1/4 | 6 | 4 1/4 |
| | Salt | | 2 | | 2 1/4 | | 2 1/4 | | 2 3/4 |
| | Bak. Powd. | | 3 1/2 | | 4 | | 4 1/2 | | 5 |
| 1) | Emul. Short. | 1 | 12 1/4 | 1 | 15 3/4 | 2 | 3 1/4 | 2 | 6 3/4 |
| | Dry Milk | | 5 3/4 | | 6 1/4 | | 7 | | 7 3/4 |
| | Cake Flour | 3 | 8 1/4 | 3 | 15 1/4 | 4 | 6 1/2 | 4 | 13 1/2 |
| | Water | 2 | 2 | 2 | 6 1/4 | 2 | 10 1/2 | 2 | 14 3/4 |
| 2) | Water | | 8 1/4 | | 9 1/4 | | 10 1/4 | | 11 1/4 |
| 3) | Egg White | 2 | 1 3/4 | 2 | 6 | 2 | 10 1/4 | 2 | 14 1/2 |
| 4) | Water | | 11 1/4 | | 12 3/4 | | 14 | | 15 1/2 |
| | Flavor | To Taste | | To Taste | | To Taste | | To Taste | |

Batter Temperature 65° to 75° F., NEVER GO OVER 75°.

First Stage: Mix one minute on medium speed. Scrape down sides of mixing bowl.

Second Stage: Mix 6 minutes. Scrape down sides of bowl.

Third Stage: Add slowly to above and mix 1 minute. Scrape down sides of mixing bowl.

Fourth Stage: Add and mix 4 minutes.

NOTE: Mix 1st and 2nd stages on medium speed and the 3rd and 4th on low speed.

White Cake (130% Sugar)

## Batter Weights

| | | 24 Lbs. | | 26 Lbs. | | 28 Lbs. | | 30 Lbs. | |
|---|---|---|---|---|---|---|---|---|---|
| | Ingredients | Lbs. | Ozs. | Lbs. | Ozs. | Lbs. | Ozs. | Lbs. | Ozs. |
| | Sugar | 6 | 13 1/4 | 7 | 6 1/2 | 7 | 15 3/4 | 8 | 8 3/4 |
| | Salt | | 3 | | 3 1/4 | | 3 1/2 | | 3 3/4 |
| | Bak. Powd. | 2 | 5 1/2 | | 6 | | 6 1/4 | | 6 3/4 |
| (1) | Emul. Short. | 2 | 10 1/4 | 2 | 13 3/4 | 3 | 1 1/4 | 3 | 4 3/4 |
| | Dry Milk | | 8 1/2 | | 9 1/4 | | 9 3/4 | | 10 1/2 |
| | Cake Flour | 5 | 4 1/2 | 5 | 11 1/2 | 6 | 2 1/2 | 6 | 9 1/2 |
| | Water | 3 | 3 | 3 | 7 1/4 | 3 | 11 1/2 | 4 | |
| (2) | Water | | 12 1/4 | | 13 1/4 | | 14 1/4 | | 15 1/2 |
| (3) | Egg White | 3 | 2 3/4 | 3 | 7 | 3 | 11 1/4 | 3 | 15 1/4 |
| (4) | Water | 1 | 1 | 1 | 2 1/4 | 1 | 3 3/4 | 1 | 5 |
| | Flavor | To Taste | | To Taste | | To Taste | | To Taste | |

Batter Temperature 65° to 75° F., NEVER GO OVER 75°.

First Stage: Mix one minute on medium speed. Scrape down sides of mixing bowl.

Second Stage: Mix 6 minutes. Scrape down sides of bowl.

Third Stage: Add slowly to above and mix 1 minute. Scrape down sides of mixing bowl.

Fourth Stage: Add and mix 4 minutes.

NOTE: Mix 1st and 2nd stages on medium speed and the 3rd and 4th on low speed.

White Cake (130% Sugar)

## Batter Weights

| | | 32 Lbs. | | 34 Lbs. | | 36 Lbs. | | 38 Lbs. | |
|---|---|---|---|---|---|---|---|---|---|
| | Ingredients | Lbs. | Ozs. | Lbs. | Ozs. | Lbs. | Ozs. | Lbs. | Ozs. |
| | Sugar | 9 | 2 | 9 | 11 | 10 | 4 1/2 | 10 | 13 1/4 |
| | Salt | | 4 | | 4 1/4 | | 4 1/2 | | 4 3/4 |
| | Bak. Powd. | | 7 1/4 | | 7 1/2 | | 8 | | 8 1/2 |
| 1) | Emul. Short. | 3 | 8 1/4 | 3 | 11 3/4 | 3 | 15 1/4 | 4 | 3 |
| | Dry Milk | | 11 1/4 | | 12 | | 12 3/4 | | 13 3/4 |
| | Cake Flour | 7 | 1/2 | 7 | 7 3/4 | 7 | 14 3/4 | 8 | 5 3/4 |
| | Water | 4 | 4 | 4 | 8 1/4 | 4 | 12 1/2 | 5 | 3/4 |
| 2) | Water | 1 | 1/2 | 1 | 1 1/2 | 1 | 2 1/2 | 1 | 3 1/4 |
| 3) | Egg White | 4 | 3 1/2 | 4 | 7 3/4 | 4 | 12 | 5 | 1/4 |
| 4) | Water | 1 | 6 1/2 | 1 | 8 | 1 | 9 1/4 | 1 | 11 |
| | Flavor | To Taste | | To Taste | | To Taste | | To Taste | |

Batter Temperature 65° to 75° F., NEVER GO OVER 75°

First Stage: Mix one minute on medium speed. Scrape down sides of mixing bowl.

Second Stage: Mix 6 minutes. Scrape down sides of bowl.

Third Stage: Add slowly to above and mix 1 minute. Scrape down sides of mixing bowl.

Fourth Stage: Add and mix 4 minutes.

NOTE: Mix 1st and 2nd stages on medium speed and 3rd and 4th on low speed.

White Cake (130% Sugar)

## Batter Weights

| | Ingredients | 40 Lbs. Lbs. | 40 Lbs. Ozs. | 42 Lbs. Lbs. | 42 Lbs. Ozs. | 44 Lbs. Lbs. | 44 Lbs. Ozs. | 47 Lbs. Lbs. | 47 Lbs. Ozs. |
|---|---|---|---|---|---|---|---|---|---|
| | Sugar | 11 | 6 1/2 | 11 | 15 1/2 | 12 | 8 3/4 | 13 | 6 1/4 |
| | Salt | | 5 | | 5 1/2 | | 5 3/4 | | 6 |
| | Bak. Powd. | | 9 | | 9 1/2 | | 9 1/2 | | 10 1/2 |
| (1) | Emul. Short. | 4 | 6 1/2 | 4 | 10 | 4 | 13 1/2 | 5 | 2 3/4 |
| | Dry Milk | | 14 | | 14 3/4 | | 15 1/2 | 1 | 1/2 |
| | Cake Flour | 8 | 13 | 9 | 3 3/4 | 9 | 11 | 10 | 5 1/2 |
| | Water | 5 | 5 | 5 | 9 1/2 | 5 | 13 1/2 | 6 | 4 |
| (2) | Water | 1 | 4 1/2 | 1 | 5 1/2 | 1 | 6 1/2 | 1 | 8 |
| (3) | Egg White | 5 | 4 1/2 | 5 | 8 1/2 | 5 | 13 | 6 | 3 1/4 |
| (4) | Water | 1 | 12 1/4 | 1 | 13 1/2 | 1 | 15 | 2 | 1 |
| | Flavor | To Taste | | To Taste | | To Taste | | To Taste | |

Batter Temperature 65° to 75° F., NEVER GO OVER 75°.

First Stage: Mix one minute on medium speed. Scrape down sides of mixing bowl.

Second Stage: Mix 6 minutes. Scrape down sides of bowl.

Third Stage: Add slowly to above and mix 1 minute. Scrape down sides of mixing bowl.

Fourth Stage: Add and mix 4 minutes.

NOTE: Mix 1st and 2nd stages on medium speed and 3rd and 4th on low speed.

White Cake (130% Sugar)

## Batter Weights

| Ingredients | 50 Lbs. Lbs. | 50 Lbs. Ozs. | 54 Lbs. Lbs. | 54 Lbs. Ozs. | 58 Lbs. Lbs. | 58 Lbs. Ozs. | 62 Lbs. Lbs. | 62 Lbs. Ozs. |
|---|---|---|---|---|---|---|---|---|
| Sugar | 14 | 4 | 15 | 6 1/4 | 16 | 8 1/2 | 17 | 10 3/4 |
| Salt | | 6 1/2 | | 7 | | 7 1/2 | | 8 |
| Bak. Powd. | | 11 1/4 | | 12 | | 13 | | 14 |
| Emul. Short. | 5 | 8 | 5 | 15 | 6 | 6 | 6 | 13 |
| Dry Milk | 1 | 1 1/2 | 1 | 3 | 1 | 4 1/2 | 1 | 5 3/4 |
| Cake Flour | 11 | | 11 | 14 | 12 | 12 1/2 | 13 | 10 1/4 |
| Water NONE | 6 | 10 1/2 | 7 | 3 | 7 | 11 1/2 | 8 | 4 |
| Water NONE | ~~1 Lb.~~ | 9 1/2 | 1 | 11 1/2 | 1 | 13 3/4 | 1 | 15 3/4 |
| Egg White | 6 | 9 1/2 | 7 | 2 | 7 | 10 1/2 | 8 | 3 |
| Water NONE | 2 | 3 1/4 | 2 | 6 | 2 | 8 3/4 | 2 | 11 1/2 |
| Flavor | To Taste | | To Taste | | To Taste | | To Taste | |

Batter Temperature 65° to 75° F., NEVER GO OVER 75°.

First Stage: Mix one minute on medium speed. Scrape down sides of mixing bowl.

Second Stage: Mix 6 minutes. Scrape down sides of bowl.

Third Stage: Add slowly to above and mix 1 minute. Scrape down sides of mixing bowl.

Fourth Stage: Add and mix 4 minutes.

NOTE: Mix 1st and 2nd stages on medium speed and 3rd and 4th on low speed.

5. Yellow Upside Down Cake

| PER CENT | INGREDIENTS | LBS. | OZS. | METHODS |
|---|---|---|---|---|
| .225 | Cake Flour | 5 | 1 | Mix 3 1/2 minutes. |
| .107 | Emulsifying Shortening | 2 | 6 | |
| .270 | Sugar | 6 | | Mix 4 to 5 minutes. |
| .013 | Baking Powder | | 4 1/2 | |
| .007 | Salt | | 2 1/2 | |
| .101 | Liquid non-fat Milk | 2 | 4 | |
| | Flavor to taste | | | |
| .090 | Whole Egg | 2 | | Add 1/2 of each, mix |
| .113 | Liquid non-fat Milk | 2 | 8 | 1/2 minute, add re- |
| .023 | Egg White | | 8 | mainder and mix till smooth. |
| .051 | Bread Flour | 1 | 2 | Add and complete mixing. |
| 1.000 | Totals | 22 | 3 | |

Add liquid slowly during 2nd and 3rd stages.

Batter temperature 70° to 80° F., NEVER OVER 80°.

NOTE: Mix 1st and 2nd stages on medium speed and the 3rd and 4th stages on low speed.

6. Pan Dressing for Upside Down Cake and Caramel Rolls

| PER CENT | INGREDIENTS | LBS. | OZS. | METHODS |
|---|---|---|---|---|
| .714 | Brown Sugar | 5 | | Place in mixing bowl. Cream till light. Transfer to vessel; use as needed. |
| .143 | Margarine | 1 | | |
| .143 | Honey or Corn Syrup | 1 | | |
| 1.000 | Totals | 7 | | |

Coat pans with pan dressing. Place sliced fruit (pineapple, peaches, cherries, nuts, etc.) in bottom of pan. Deposit batter on top. Drain fruits thoroughly before using.
Use regular yellow cake batter, adding 2 oz. of bread flour per pound of batter.

For an 8 x 8 x 2 inch square pan: scaling wt. of Batter, 18 oz., baking time, 48-50 min. at 350° F.

For an 8 x 2 inch layer (round) cake pan: scaling wt. of Batter, 14 oz., baking time, 38-40 min. at 350° F.

For an 8 x 1 1/2 inch round layer cake pan: scaling wt. of Batter, 11 oz., baking time 32-40 min. at 350° F.

It is, however, not recommended to have the cake batter too shallow in proportion to the fruit. For this reason we do not advise the 1 1/2 inch deep pans for upside down cakes.

After cakes are baked and removed from oven: Turn upside down on cake circles. Allow pans to remain over cakes for a short period of time (about 3 min.) before removing pan. This allows the syrup to run down over the cake instead of adhering to the pan. If desired, the finished cakes may then be further "dressed up" by brushing with a good shine.

7. Yellow Cake

| PER CENT | INGREDIENTS | LBS. | OZS. | METHODS |
|---|---|---|---|---|
| .284 | Sugar | 2 | 13 1/2 | Mix one minute on medium speed. Scrape down sides of mixing bowl. |
| .008 | Salt | | 1 1/4 | |
| .013 | Baking Powder | | 2 | |
| .022 | Dry Milk Solids | | 3 1/2 | |
| .110 | Emulsifying Shortening | 1 | 1 1/2 | |
| .220 | Cake Flour | 2 | 3 1/4 | |
| .124 | Water | 1 | 3 3/4 | |
| .041 | Water | | 6 1/2 | Mix 6 minutes on medium speed. Scrape down sides of mixing bowl. |
| .132 | Whole Egg | 1 | 5 1/4 | Add slowly to above and mix 1 minute on low speed. Scrape down sides of mixing bowl. |
| .046 | Water<br>Vanilla (to taste) | | 7 1/4 | Add and mix 4 minutes on low speed. |
| 1.000 | Totals | 10 | | |

Batter Temperature: 65° to 75° F., NEVER OVER 75° F.

8. Yellow Cake

## Batter Weights

| | 2 Lbs. | | 10 Lbs. | | 12 Lbs. | | 14 Lbs. | |
|---|---|---|---|---|---|---|---|---|
| Ingredients | Gms. | Ozs. | Lbs. | Ozs. | Lbs. | Ozs. | Lbs. | Ozs. |
| Sugar | | 9 | 2 | 13 1/2 | 3 | 6 1/2 | 3 | 15 1/2 |
| Salt | *7 1/4 | 1/4 | | 1 1/4 | | 1 1/2 | | 1 3/4 |
| Bak. Powd. | *12 3/4 | 1/2 | | 2 | | 2 1/2 | | 3 |
| Dry Milk Solid | *20 | 3/4 | | 3 1/2 | | 4 1/4 | | 5 |
| 1) Emul. Short. | | 3 1/2 | 1 | 1 1/2 | 1 | 5 1/4 | 1 | 8 1/2 |
| Cake Flour | | 7 | 2 | 3 1/4 | 2 | 10 1/4 | 3 | 1 1/4 |
| Water | | 4 | 1 | 3 3/4 | 1 | 7 3/4 | 1 | 11 |
| | | | | | | | | |
| 2) Water | | 1 1/4 | | 6 1/2 | | 8 | | 9 |
| | | | | | | | | |
| 3) Whole Egg | | 4 1/4 | 1 | 5 1/4 | 1 | 9 1/4 | 1 | 14 1/2 |
| | | | | | | | | |
| 4) Water | | 1 1/2 | | 7 1/4 | | 8 3/4 | | 10 1/4 |
| Vanilla | To Taste | | To Taste | | To Taste | | To Taste | |

Batter Temperature: 65° to 75° F., NEVER GO OVER 75°.

First Stage: Mix one minute on medium speed. Scrape down sides of mixing bowl.
Second Stage: Mix 6 minutes. Scrape down sides of mixing bowl.
Third Stage: Add slowly to above and mix 1 minute. Scrape down sides of mixing bowl.
Fourth Stage: Add and mix 4 minutes.

NOTE: Mix 1st and 2nd stages on medium speed and the 3rd and 4th on low speed.

* Equivalents for fractions of ounces.

Yellow Cake

## Batter Weights

| | | 16 Lbs. | | 18 Lbs. | | 20 Lbs. | | 22 Lbs. | |
|---|---|---|---|---|---|---|---|---|---|
| | Ingredients | Lbs. | Ozs. | Lbs. | Ozs. | Lbs. | Ozs. | Lbs. | Ozs. |
| | Sugar | 4 | 8 3/4 | 5 | 1 3/4 | 5 | 11 | 6 | 4 1/4 |
| | Salt | | 2 | | 2 1/4 | | 2 1/2 | | 2 3/4 |
| | Bak. Powd. | | 3 1/4 | | 3 3/4 | | 4 1/4 | | 4 1/2 |
| (1) | Milk (dry) | | 5 3/4 | | 6 1/4 | | 7 | | 7 3/4 |
| | Emul. Short. | 1 | 12 1/4 | 1 | 15 3/4 | 2 | 3 1/4 | 2 | 6 3/4 |
| | Cake Flour | 3 | 8 1/4 | 3 | 15 1/4 | 4 | 6 1/2 | 4 | 13 1/2 |
| | Water | 1 | 15 3/4 | 2 | 3 1/2 | 2 | 7 1/2 | 2 | 11 1/2 |
| | | | | | | | | | |
| (2) | Water | | 10 1/2 | | 12 | | 13 1/4 | | 14 1/2 |
| | | | | | | | | | |
| (3) | Whole Egg | 2 | 6 | 2 | 6 | 2 | 10 1/4 | 2 | 14 1/2 |
| | | | | | | | | | |
| (4) | Water | | 11 3/4 | | 13 1/4 | | 14 3/4 | 1 | 1/4 |
| | Vanilla | To Taste | | To Taste | | To Taste | | To Taste | |

Batter Temperature: 65° to 75° F., NEVER GO OVER 75°.

First Stage: Mix one minute on medium speed. Scrape down sides of mixing bowl.

Second Stage: Mix 6 minutes. Scrape down sides of mixing bowl.

Third Stage: Add slowly to above and mix 1 minute. Scrape down sides of mixing bowl.

Fourth Stage: Add - mix 4 minutes.

NOTE: Mix 1st and 2nd stages on medium speed and the 3rd and 4th on low speed.

Yellow Cake

## Batter Weights

| | | 24 Lbs. | | 26 Lbs. | | 28 Lbs. | | 30 Lbs. | |
|---|---|---|---|---|---|---|---|---|---|
| | Ingredients | Lbs. | Ozs. | Lbs. | Ozs. | Lbs. | Ozs. | Lbs. | Ozs. |
| | Sugar | 6 | 13 | 7 | 6 1/4 | 7 | 15 1/4 | 8 | 8 3/4 |
| | Salt | | 3 | | 3 1/4 | | 3 1/2 | | 3 3/4 |
| | Bak. Powd. | | 5 | | 5 1/2 | | 5 3/4 | | 6 1/4 |
| 1) | Milk (dry) | | 8 1/2 | | 9 1/4 | | 9 3/4 | | 10 1/2 |
| | Emul. Short. | 2 | 10 1/4 | 2 | 13 3/4 | 3 | 1 1/4 | 3 | 4 3/4 |
| | Cake Flour | 5 | 4 1/2 | 5 | 11 1/2 | 6 | 2 1/2 | 6 | 9 1/2 |
| | Water | 2 | 15 1/4 | 3 | 3 | 3 | 7 1/2 | 3 | 11 1/4 |
| | | | | | | | | | |
| 2) | Water | 1 | | 1 | 1 1/2 | 1 | 2 1/2 | 1 | 10 1/4 |
| | | | | | | | | | |
| 3) | Whole Egg | 3 | 2 3/4 | 3 | 7 | 3 | 11 1/4 | 3 | 15 1/4 |
| | | | | | | | | | |
| 4) | Water | 1 | 1 1/2 | 1 | 3 1/4 | 1 | 4 1/2 | 1 | 6 |
| | Vanilla | To Taste | | To Taste | | To Taste | | To Taste | |

Batter Temperature: 65° to 75° F., NEVER GO OVER 75°.

First Stage: Mix one minute on medium speed. Scrape down sides of mixing bowl.

Second Stage: Mix 6 minutes. Scrape down sides of bowl.

Third Stage: Add slowly to above and mix one minute. Scrape down sides of mixing bowl.

Fourth Stage: Add and mix 4 minutes.

NOTE: Mix 1st and 2nd stages on medium speed and the 3rd and 4th on low speed.

Yellow Cake

## Batter Weights

| | | 32 Lbs. | | 34 Lbs. | | 36 Lbs. | | 38 Lbs. | |
|---|---|---|---|---|---|---|---|---|---|
| | Ingredients | Lbs. | Ozs. | Lbs. | Ozs. | Lbs. | Ozs. | Lbs. | Ozs. |
| | Sugar | 9 | 1 1/2 | 9 | 10 1/2 | 10 | 3 1/2 | 10 | 12 1/2 |
| | Salt | | 4 | | 4 1/4 | | 4 1/2 | | 4 3/4 |
| | Bak. Powd. | | 6 3/4 | | 7 | | 7 1/2 | | 8 |
| (1) | Dry Milk | | 11 1/4 | | 12 | | 12 3/4 | | 13 1/2 |
| | Emul. Short. | 3 | 8 1/4 | 3 | 11 3/4 | 3 | 15 1/2 | 4 | 3 |
| | Cake Flour | 7 | 1/2 | 7 | 7 3/4 | 7 | 14 3/4 | 8 | 5 3/4 |
| | Water | 3 | 15 | 4 | 3 1/4 | 4 | 7 | 4 | 11 1/4 |
| (2) | Water | 1 | 5 1/2 | 1 | 6 1/2 | 1 | 6 | 1 | 9 |
| (3) | Whole Egg | 4 | 3 1/2 | 4 | 7 3/4 | 4 | 12 | 5 | 1/4 |
| (4) | Water | 1 | 7 1/2 | 1 | 9 | 1 | 10 1/2 | 1 | 12 |
| | Vanilla | To Taste | | To Taste | | To Taste | | To Taste | |

Batter Temperature: 65° to 75° F., NEVER GO OVER 75°.

First Stage: Mix one minute on medium speed. Scrape down sides of mixing bowl.

Second Stage: Mix 6 minutes. Scrape down sides of bowl.

Third Stage: Add slowly to above and mix one minute. Scrape down sides of mixing bowl.

Fourth Stage: Add and mix 4 minutes.

NOTE: Mix 1st and 2nd stages on medium speed and the 3rd and 4th on low speed.

Yellow Cake

## Batter Weights

| | | 40 Lbs. | | 42 Lbs. | | 44 Lbs. | | 47 Lbs. | |
|---|---|---|---|---|---|---|---|---|---|
| | Ingredients | Lbs. | Ozs. | Lbs. | Ozs. | Lbs. | Ozs. | Lbs. | Ozs. |
| | Sugar | 11 | 5 3/4 | 11 | 14 3/4 | 12 | 8 | 13 | 5 1/2 |
| | Salt | | 5 | | 5 1/2 | | 5 3/4 | | 6 |
| | Bak. Powd. | | 8 1/4 | | 8 3/4 | | 9 1/4 | | 9 3/4 |
| 1) | Dry Milk | | 14 | | 14 3/4 | | 15 1/2 | 1 | 1/2 |
| | Emul. Short. | 4 | 6 1/2 | 4 | 10 | 4 | 13 1/2 | 5 | 1 3/4 |
| | Cake Flour | 8 | 12 3/4 | 9 | 3 3/4 | 9 | 11 | 10 | 5 1/2 |
| | Water | 4 | 15 | 5 | 3 | 5 | 7 1/4 | 5 | 13 |
| 2) | Water | 1 | 10 1/2 | 1 | 11 3/4 | 1 | 13 | 1 | 15 |
| 3) | Whole Egg | 5 | 4 1/2 | 5 | 8 3/4 | 5 | 13 | 6 | 3 1/4 |
| 4) | Water | 1 | 13 1/2 | 1 | 15 | 2 | 1/4 | 2 | 2 1/2 |
| | Vanilla | To Taste | | To Taste | | To Taste | | To Taste | |

Batter Temperature: 65° to 75° F., NEVER GO OVER 75°.

First Stage: Mix one minute on medium speed. Scrape down sides of mixing bowl.

Second Stage: Mix 6 minutes. Scrape down sides of mixing bowl.

Third Stage: Add slowly to above and mix 1 minute. Scrape down sides of mixing bowl.

Fourth Stage: Add and mix 4 minutes.

NOTE: Mix 1st and 2nd stages on medium speed and the 3rd and 4th on low speed.

Yellow Cake

## Batter Weights

| | | 50 Lbs. | | 54 Lbs. | | 58 Lbs. | | 62 Lbs. | |
|---|---|---|---|---|---|---|---|---|---|
| | Ingredients | Lbs. | Ozs. | Lbs. | Ozs. | Lbs. | Ozs. | Lbs. | Ozs. |
| | Sugar | 14 | 3 1/4 | 15 | 5 1/2 | 16 | 7 1/2 | 17 | 9 3/4 |
| | Salt | | 6 1/2 | | 7 | | 7 1/2 | | 8 |
| | Bak. Powd. | | 10 1/2 | | 11 1/4 | | 12 | | 13 |
| (1) | Dry Milk | 1 | 3/4 | 1 | 3 | 1 | 4 1/2 | 1 | 5 3/4 |
| | Emul. Short. | 5 | 8 | 5 | 15 | 6 | 6 | 6 | 13 |
| | Cake Flour | 11 | | 11 | 14 | 12 | 12 1/4 | 13 | 10 1/4 |
| | Water | 6 | 3 | 6 | 11 | 7 | 2 1/2 | 7 | 10 |
| (2) | Water | 2 | 1 | 2 | 3 1/2 | 2 | 6 1/4 | 2 | 9 |
| (3) | Whole Egg | 6 | 9 1/2 | 7 | 2 | 7 | 10 1/2 | 8 | 3 |
| (4) | Water | 2 | 4 3/4 | 2 | 7 1/2 | 2 | 10 1/2 | 2 | 13 1/2 |
| | Vanilla | To Taste | | To Taste | | To Taste | | To Taste | |

Batter Temperature: 65° to 75° F., NEVER GO OVER 75°.

First Stage: Mix one minute on medium speed. Scrape down sides of mixing bowl.

Second Stage: Mix 6 minutes. Scrape down sides of mixing bowl.

Third Stage: Add slowly to above and mix 1 minute. Scrape down sides of mixing bowl.

Fourth Stage: Add and mix 4 minutes.

NOTE: Mix 1st and 2nd stages on medium speed and the 3rd and 4th on low speed.

9. Devil's Fudge Cake

| PER CENT | INGREDIENTS | LBS. | OZS. | METHODS |
|---|---|---|---|---|
| .276 | Sugar | 5 | 8 | Mix 1 minute on medium speed. Scrape down sides of mixing bowl. |
| .005 | Salt | | 1 1/2 | |
| .042 | Cocoa Powder | | 13 1/2 | |
| .008 | Baking Powder | | 2 1/2 | |
| .003 | Soda | | 1 | |
| .022 | Dry Milk | | 7 | |
| .106 | Emulsifying Shortening | 2 | 2 | |
| .171 | Cake Flour | 3 | 6 1/2 | |
| .095 | Water | 1 | 14 1/2 | |
| .031 | Water | | 10 | Mix 6 minutes on medium speed. Scrape down sides of bowl. |
| .116 | Whole Egg | 2 | 5 | Add slowly to above and mix 1 minute on low speed. Scrape down sides of mixing bowl. |
| .041 | Egg White | | 13 1/4 | |
| .084 | Water | 1 | 11 | Add and mix 4 minutes, on low speed. |
| | Vanilla (to taste) | | | |
| 1.000 | Totals | 20 | | |

Batter Temperature 65° to 75° F., NEVER GO OVER 75°.

10. Devil's Fudge Cake

Batter Weights

| | | 2 Lbs. | | 10 Lbs. | | 12 Lbs. | | 14 Lbs. | |
|---|---|---|---|---|---|---|---|---|---|
| | Ingredients | Gms. | Ozs. | Lbs. | Ozs. | Lbs. | Ozs. | Lbs. | Ozs. |
| | Sugar | | 8 1/2 | 2 | 12 | 3 | 4 3/4 | 3 | 13 1/2 |
| | Salt | 7 1/4 | | | 3/4 | | 1 | | 1 |
| | Cocoa Powd. | | 1 1/4 | | 6 3/4 | | 8 1/2 | | 9 1/2 |
| | Bak. Powd. | 4 1/2 | | | 1 1/4 | | 1 1/2 | | 2 |
| (1) | Soda | 2 3/4 | | | 1/2 | | 1/2 | | 1/2 |
| | Dry Milk | | 3/4 | | 3 1/2 | | 4 1/4 | | 5 |
| | Emul. Short. | | 3 1/2 | 1 | 1 | 1 | 4 1/4 | 1 | 7 3/4 |
| | Cake Flour | | 5 1/2 | 1 | 12 1/4 | 2 | 1 1/4 | 2 | 6 |
| | Water | | 3 | | 15 1/4 | 1 | 2 1/4 | 1 | 5 1/2 |
| | | | | | | | | | |
| (2) | Water | | 1 | | 5 | | 6 | | 7 |
| | | | | | | | | | |
| (3) | Whole Egg | | 3 3/4 | 1 | 2 1/2 | 1 | 6 1/4 | 1 | 10 |
| | Egg White | | 1 1/4 | | 6 1/2 | | 8 | | 9 1/2 |
| | | | | | | | | | |
| (4) | Water | | 2 1/2 | | 13 1/2 | 1 | | 1 | 3 |
| | | | | | | | | | |
| | Vanilla | To Taste | | To Taste | | To Taste | | To Taste | |

Batter Temperature: 65° to 75° F., NEVER GO OVER 75°.

First Stage: Mix one minute on medium speed. Scrape down sides of mixing bowl.

Second Stage: Mix 6 minutes. Scrape down sides of bowl.

Third Stage: Add slowly to above and mix one minute. Scrape down sides of mixing bowl.

Fourth Stage: Add and mix 4 minutes.

NOTE: Mix 1st and 2nd stages on medium speed and the 3rd and 4th on low speed.

Devil's Fudge Cake

## Batter Weights

| Ingredients | 16 Lbs. Lbs. | 16 Lbs. Ozs. | 18 Lbs. Lbs. | 18 Lbs. Ozs. | 20 Lbs. Lbs. | 20 Lbs. Ozs. | 22 Lbs. Lbs. | 22 Lbs. Ozs. |
|---|---|---|---|---|---|---|---|---|
| Sugar | 4 | 6 1/2 | 4 | 15 1/4 | 5 | 8 | 6 | |
| Salt | | 6 1/4 | | 1 1/2 | | 1 1/2 | | 1 3/4 |
| Cocoa Powd. | | 10 3/4 | | 12 | | 13 1/2 | | 15 |
| 1) Bak. Powd. | | 2 | | 2 1/2 | | 2 1/2 | | 3 |
| Soda | | 3/4 | | 3/4 | | 1 | | 1 1/4 |
| Dry Milk | | 5 1/2 | | 6 | | 7 | | 7 3/4 |
| Emul. Short. | 1 | 11 1/4 | 1 | 14 1/2 | 2 | 2 | 2 | 5 1/4 |
| Cake Flour | 2 | 11 1/2 | 3 | 1 | 3 | 6 1/2 | 3 | 12 |
| Water | 1 | 8 1/4 | 1 | 11 1/2 | 1 | 14 1/2 | 2 | 3/4 |
| | | | | | | | | |
| ;) Water | | 8 1/4 | | 9 | | 10 | | 11 |
| | | | | | | | | |
| ) Whole Egg | 1 | 13 3/4 | 2 | 1 1/2 | 2 | 5 | 2 | 8 3/4 |
| Egg White | | 10 3/4 | | 12 | | 13 1/4 | | 15 |
| | | | | | | | | |
| ) Water | 1 | 5 1/2 | 1 | 8 | 1 | 11 | 1 | 14 |
| Vanilla | To Taste | | To Taste | | To Taste | | To Taste | |

Batter Temperature: 65° to 75° F., NEVER GO OVER 75°.

First Stage: Mix one minute on medium speed. Scrape down sides of mixing bowl.

Second Stage: Mix 6 minutes. Scrape down sides of bowl.

Third Stage: Add slowly to above and mix one minute. Scrape down sides of mixing bowl.

Fourth Stage: Add and mix 4 minutes.

NOTE: Mix 1st and 2nd stages on medium speed and the 3rd and 4th on low speed.

Devil's Fudge Cake

## Batter Weights

| | | 24 Lbs. | | 26 Lbs. | | 28 Lbs. | | 30 Lbs. | |
|---|---|---|---|---|---|---|---|---|---|
| | Ingredients | Lbs. | Ozs. | Lbs. | Ozs. | Lbs. | Ozs. | Lbs. | Ozs. |
| | Sugar | 6 | 9 1/2 | 7 | 2 1/2 | 7 | 11 1/4 | 8 | 4 |
| | Salt | | 2 | | 2 | | 2 1/4 | | 2 1/2 |
| | Cocoa Powd. | 1 | 1/4 | 1 | 1 1/2 | 1 | 2 3/4 | 1 | 4 1/4 |
| (1) | Bak. Powd. | | 3 | | 3 1/2 | | 3 1/2 | | 3 3/4 |
| | Soda | | 1 1/4 | | 1 1/4 | | 1 1/2 | | 1 1/2 |
| | Dry Milk | | 8 1/2 | | 9 1/4 | | 9 3/4 | | 10 1/2 |
| | Emul. Short. | 2 | 8 1/2 | 2 | 12 | 2 | 15 1/2 | 3 | 2 3/4 |
| | Cake Flour | 4 | 1 1/4 | 4 | 6 3/4 | 4 | 12 | 5 | 1 1/2 |
| | Water | 2 | 4 1/2 | 2 | 7 1/2 | 2 | 10 3/4 | 2 | 13 3/4 |
| (2) | Water | | 12 1/4 | | 13 1/4 | | 14 1/4 | | 15 1/4 |
| (3) | Whole Egg | 2 | 12 1/4 | 3 | 1/4 | 3 | 4 1/4 | 3 | 7 1/2 |
| | Egg White | 1 | 1/4 | 1 | 1 1/2 | 1 | 2 3/4 | 1 | 4 1/4 |
| (4) | Water | 2 | 1/2 | 2 | 3 | 2 | 5 1/2 | 2 | 8 1/2 |
| | Vanilla | To Taste | | To Taste | | To Taste | | To Taste | |

Batter Temperature: 65° to 75° F., NEVER GO OVER 75°.

First Stage: Mix one minute on medium speed. Scrape down sides of mixing bowl.

Second Stage: Mix 6 minutes. Scrape down sides of bowl.

Third Stage: Add slowly to above and mix one minute. Scrape down sides of mixing bowl.

Fourth Stage: Add and mix 4 minutes.

NOTE: Mix 1st and 2nd stages on medium speed and the 3 rd and 4th on low speed.

Devil's Fudge Cake

## Batter Weights

| | | 32 Lbs. | | 34 Lbs. | | 36 Lbs. | | 38 Lbs. | |
|---|---|---|---|---|---|---|---|---|---|
| | Ingredients | Lbs. | Ozs. | Lbs. | Ozs. | Lbs. | Ozs. | Lbs. | Ozs. |
| | Sugar | 8 | 12 | 9 | 5 1/2 | 9 | 14 1/2 | 10 | 7 1/4 |
| | Salt | | 2 1/2 | | 2 3/4 | | 3 | | 3 |
| | Cocoa Powd. | 1 | 5 1/2 | 1 | 6 3/4 | 1 | 8 1/4 | 1 | 9 1/2 |
| (1) | Bak. Powd. | | 4 | | 4 1/4 | | 4 1/2 | | 4 3/4 |
| | Soda | | 1 1/2 | | 1 3/4 | | 1 3/4 | | 1 3/4 |
| | Dry Milk | | 11 1/4 | | 12 | | 12 3/4 | | 13 3/4 |
| | Emul. Short. | 3 | 6 1/4 | 3 | 11 | 3 | 13 | 4 | 1/4 |
| | Cake Flour | 5 | 8 | 5 | 12 | 6 | 2 | 6 | 7 1/4 |
| | Water | 3 | | 3 | 3 3/4 | 3 | 6 3/4 | 3 | 9 3/4 |
| (2) | Water | 1 | | 1 | 1 1/4 | 1 | 2 1/4 | 1 | 3 1/4 |
| (3) | Whole Egg | 3 | 12 | 3 | 15 | 4 | 2 3/4 | 4 | 6 1/2 |
| | Egg White | 1 | 5 1/2 | 1 | 6 3/4 | 1 | 8 1/4 | 1 | 9 1/2 |
| (4) | Water | 2 | 12 | 2 | 13 1/2 | 3 | 1/4 | 3 | 3 |
| | Vanilla | To Taste | | To Taste | | To Taste | | To Taste | |

Batter Temperature: 65° to 75° F., NEVER GO OVER 75°.

First Stage: Mix one minute on medium speed. Scrape down sides of mixing bowl.

Second Stage: Mix 6 minutes. Scrape down sides of bowl.

Third Stage: Add slowly to above and mix one minute. Scrape down sides of mixing bowl.

Fourth Stage: Add and mix 4 minutes.

NOTE: Mix 1st and 2nd stages on medium speed and the 3rd and 4th on low speed.

Devil1s Fudge Cake

## Batter Weights

| | | 40 Lbs. | | 42 Lbs. | | 44 Lbs. | | 48 Lbs. | |
|---|---|---|---|---|---|---|---|---|---|
| | Ingredients | Lbs. | Ozs. | Lbs. | Ozs. | Lbs. | Ozs. | Lbs. | Ozs. |
| | Sugar | 11 | | 11 | 8 3/4 | 12 | 1 1/2 | 12 | 14 3/4 |
| | Salt | | 3 1/4 | | 3 1/4 | | 3 1/2 | | 3 3/4 |
| | Cocoa Powd. | 1 | 11 | 1 | 12 1/4 | 1 | 13 1/2 | 1 | 15 1/2 |
| (1) | Bak. Powd. | | 5 | | 5 1/4 | | 5 1/2 | | 6 |
| | Soda | | 2 | | 2 | | 2 | | 2 1/4 |
| | Dry Milk | | 14 | | 14 3/4 | | 15 1/2 | 1 | 1/2 |
| | Emul. Short. | 4 | 3 3/4 | 4 | 7 1/4 | 4 | 10 1/2 | 4 | 15 3/4 |
| | Cake Flour | 6 | 12 3/4 | 7 | 2 1/4 | 7 | 7 3/4 | 7 | 15 3/4 |
| | Water | 3 | 13 | 4 | | 4 | 3 1/4 | 4 | 7 1/2 |
| (2) | Water | 1 | 4 1/4 | 1 | 5 1/4 | 1 | 6 1/4 | 1 | 8 |
| (3) | Whole Egg | 4 | 10 1/4 | 4 | 14 | 5 | 1 3/4 | 5 | 7 1/4 |
| | Egg White | 1 | 11 | 1 | 12 1/4 | 1 | 13 1/2 | 1 | 15 1/2 |
| (4) | Water | 3 | 5 3/4 | 3 | 8 1/4 | 3 | 11 | 3 | 15 |
| | Vanilla | To Taste | | To Taste | | To Taste | | To Taste | |

Batter Temperature: 65° to 75° F., NEVER GO OVER 75°.

First Stage: Mix one minute on medium speed. Scrape down sides of mixing bowl.

Second Stage: Mix 6 minutes. Scrape down sides of bowl.

Third Stage: Add slowly to above and mix one minute. Scrape down sides of mixing bowl.

Fourth Stage: Add and mix 4 minutes.

NOTE: Mix 1st and 2nd stages on medium speed and the 3rd and 4th on low speed.

Devil's Fudge Cake

## Batter Weights

| | Ingredients | 50 Lbs. Lbs. | 50 Lbs. Ozs. | 54 Lbs. Lbs. | 54 Lbs. Ozs. | 58 Lbs. Lbs. | 58 Lbs. Ozs. | 62 Lbs. Lbs. | 62 Lbs. Ozs. |
|---|---|---|---|---|---|---|---|---|---|
| | Sugar | 13 | 12 | 14 | 13 1/2 | 15 | 15 1/4 | 17 | 3/4 |
| | Salt | | 4 | | 4 1/4 | | 4 1/2 | | 5 |
| | Cocoa Powd. | 2 | 1 1/2 | 2 | 4 1/4 | 2 | 7 | 2 | 9 3/4 |
| 1) | Bak. Powd. | | 6 1/2 | | 7 | | 7 1/2 | | 8 |
| | Soda | | 2 1/2 | | 2 1/2 | | 2 3/4 | | 3 |
| | Dry Milk | 1 | 1 1/2 | 1 | 3 | 1 | 4 1/2 | 1 | 5 3/4 |
| | Emul. Short. | 5 | 4 3/4 | 5 | 11 1/2 | 6 | 2 1/4 | 6 | 9 |
| | Cake Flour | 8 | 8 | 9 | 3 | 9 | 13 3/4 | 10 | 8 1/2 |
| | Water | 4 | 12 1/4 | 5 | 2 1/4 | 5 | 8 | 5 | 14 1/2 |
| 2) | Water | 1 | 9 1/4 | 1 | 11 1/2 | 1 | 13 1/4 | 1 | 15 1/2 |
| 3) | Whole Egg | 5 | 12 3/4 | 6 | 4 1/4 | 6 | 11 1/2 | 7 | 3 |
| | Egg White | 2 | 1 1/2 | 2 | 4 1/4 | 2 | 7 | 2 | 9 3/4 |
| 4) | Water | 4 | 3 1/4 | 4 | 8 1/2 | 4 | 14 | 5 | 3 1/2 |
| | Vanilla | To Taste | | To Taste | | To Taste | | To Taste | |

Batter Temperature: 65° to 75° F., NEVER GO OVER 75°.

First Stage: Mix one minute on medium speed. Scrape down sides of mixing bowl.

Second Stage: Mix 6 minutes. Scrape down sides of bowl.

Third Stage: Add slowly to above and mix one minute. Scrape down sides of mixing bowl.

Fourth Stage: Add and mix 4 minutes.

NOTE: Mix 1st and 2nd stages on medium speed and 3rd and 4th on low speed.

11. Devil's Food Cake No. 1

| PER CENT | INGREDIENTS | LBS. | OZS. | METHODS |
|---|---|---|---|---|
| .269 | Granulated Sugar | 7 | | Mix 4 to 6 minutes on |
| .039 | Cocoa | 1 | | medium speed. |
| .007 | Salt | | 3 | |
| .005 | Soda | | 2 | |
| .007 | Baking Powder | | 3 | |
| .039 | Milk Powder | 1 | | |
| .173 | Cake Flour | 4 | 8 | |
| .096 | Emul. Shortening | 2 | 8 | |
| .144 | Water | 3 | 12 | |
| .096 | Whole Egg | 2 | 8 | Add and mix 1 to 2 |
| .029 | Egg White | | 12 | minutes. Add whole egg, |
| .096 | Water | 2 | 8 | egg white, and mix 1 to |
| | Vanilla | | | 2 min., then add water |
| | | | | and mix 2 to 3 min. on |
| | | | | low speed. |
| 1.000 | Totals | 26 | | |

Batter temperature 70° to 80° F., NEVER GO OVER 80°.

12. Devil's Food Cake No. 2

| PER CENT | INGREDIENTS | LBS. | OZS. | METHODS |
|---|---|---|---|---|
| .163 | Flour | 4 | | Mix on 2-speed of 4 speed |
| .102 | Emul. Shortening | 2 | 8 | vertical mixer for 3 min. |
| .266 | Sugar | 6 | 8 | Mix for 3 min. at 2-speed |
| .041 | Cocoa | 1 | | on a 4-speed vertical mix- |
| .008 | Salt | | 3 | er, scraping down sides |
| .008 | Baking Powder | | 3 | of bowl thoroughly during |
| .021 | Non-fat Dry Milk | | 8 | mixing. |
| .082 | Water | 2 | | |
| .111 | Whole Egg | 2 | 12 | Scale Water, eggs, and |
| .044 | Egg White | 1 | | flavor together and stir. |
| .151 | Water | 3 | 12 | Then add in 3 equal parts. |
| | Vanilla (to taste) | | | Mix until smooth for 3-5 min. at 2-speed on a 4-speed vertical mixer, scraping down the sides of bowl thoroughly during mixing. |
| 1.000 | Totals | 24 | 7 | |

Scale 9 in. 15 oz.
Scale 7 in. 9 oz.
Scale sheet cake 5 1/2 Lb.
Batter temperature 65° to 75° F., allow rest on bench 10-15 minutes before baking.

13. Apple Sauce Cake

| PER CENT | INGREDIENTS | LBS. | OZS. | METHODS |
|---|---|---|---|---|
| .1442 | Cake Flour | 3 | 12 | Mix 3 to 4 minutes on |
| .0962 | Emul. Shortening | 2 | 8 | second speed. |
| .2694 | Sugar | 7 | | Add to above and mix on |
| .0481 | Cake Flour | 1 | 4 | second speed, 5 minutes, |
| .0072 | Salt | | 3 | scraping down twice. |
| .0036 | Soda | | 1 1/2 | |
| .0072 | Baking Powder | | 3 | |
| .0006 | Cinnamon | | 1/4 | |
| .0003 | Nutmeg | | 1/8 | |
| .962 | Apple (ground) | 2 | 8 | |
| .1154 | Whole Egg | 3 | | Weigh eggs and apple to- |
| .2116 | Water Packed Apples (drained and ground) | 5 | 8 | gether. Add one-half of the amount. Mix on first speed till smooth. Scrape down. Add balance and mix 3 to 5 minutes. |
| 1.000 | Totals | 25 | 11 7/8 | |

REMARKS: Scale 2 oz. heavier than normal cake batter.
Bake at 375° F.

Batter temperature 65° to 70° F. Bake immediately after panning.

## GERMAN SWEET CHOCOLATE CAKE

| PER CENT | INGREDIENTS | LBS. | OZS. | METHODS |
|---|---|---|---|---|
| .264 | Granulated Sugar | 4 | | Cream 3 min. on low |
| .132 | Cake Shortening | 2 | | speed of 3-speed mixer. |
| .004 | Salt | | 1 | |
| .049 | Fortified Type Egg | | 12 | Add and cream in. |
| .198 | Cake Flour | 3 | | Add and barely mix in. |
| .100 | Fresh Buttermilk | 1 | 8 | |
| .066 | German Sweet Choc. | 1 | | Let chocolate melt in hot water. |
| .066 | Hot Water | 1 | | Mix with water and chocolate, then add in |
| .033 | Fresh Buttermilk | | 8 | two parts. Mix 3-4 minutes on low speed. |
| .002 | Baking Soda | | 1/2 | |
| .004 | Vanilla | | 1 | |
| .066 | Egg Whites | 1 | | Beat to stiff meringue and fold into above. |
| .016 | Granulated Sugar | | 4 | |
| 1.000 | Totals | 15 | 2 1/2 | |

Scale 11 1/2 ounces to 8" pan and bake at 360°.

## FILLING AND TOPPING

| PER CENT | INGREDIENTS | LBS. | OZS. | METHODS |
|---|---|---|---|---|
| .239 | Liquid Milk | 2 | | Cook to rolling boil. |
| .267 | Granulated Sugar | 2 | 4 | |
| .178 | Bakers Margarine | 1 | 8 | Add and cook in, then |
| .119 | Fortified Type Egg | 1 | | remove from fire. |
| .119 | Chopped Pecans | 1 | | |
| .074 | Shredded Cocoanut | | 10 | Add and stir in. |
| .004 | Vanilla | | 1/2 | Let cool before using. |
| 1.000 | Totals | 8 | 6 1/2 | |

14. Spice Cake

| PER CENT | INGREDIENTS | LBS | OZS. | METHODS |
|---|---|---|---|---|
| .043 | Margarine | 1 | | Mix 3 minutes. |
| .054 | Emul. Shortening | 1 | 4 | |
| .1281 | Cake Flour | 3 | | |
| .2672 | Sugar | 6 | 4 | Mix 3 minutes. |
| .086 | Cake Flour | 2 | | |
| .007 | Salt | | 2 1/2 | |
| .032 | Powdered Milk | | 12 | |
| .007 | Baking Powder | | 2 3/4 | |
| .001 | Soda | | 1/2 | |
| .005 | Cinnamon | | 2 | |
| .003 | Ginger | | 1 | |
| .001 | Cloves | | 1/2 | |
| .0007 | Mace | | 1/4 | |
| .107 | Water | 2 | 8 | |
| .108 | Egg White | 2 | 8 | Mix 3 minutes. |
| .096 | Water | 2 | 4 | Mix 5 minutes. |
| .054 | Molasses | 1 | 4 | |
| 1.000 | Totals | 23 | 5 1/2 | |

Batter Temperature 70° to 80° F., NEVER OVER 80°.

15. Fruit Cake

| PER CENT | INGREDIENTS | LBS. | OZS. | METHODS |
|---|---|---|---|---|
| .100 | Bread Flour | 2 | | Soak cubed fruit, raisins, and red and green cherries in wine and rum for 24 hours. Cream sugar and margarine on low speed, avoiding excessive creaming. Add small amounts of flour and egg alternately mixing on low speed until all is incorporated. Add a small quantity of rum and vanilla while mixing. Avoid over flavoring. Also add while mixing, a small amount of cinnamon, allspice, nutmeg, cloves and ginger. Flavors and spices must be of best quality and correct proportions. Due to the great variation in these no definite amounts are given. Add nuts to soaked fruit and blend well. Then pour on batter and mix well by hand. |
| .100 | Whole Egg | 2 | | |
| .100 | Granulated Sugar | 2 | | |
| .050 | Margarine | 1 | | |
| .050 | Emul. Shortening | 1 | | |
| .050 | Muscatel Raisins | 1 | | |
| .050 | Blanched Almonds | 1 | | |
| .150 | Pecans | 3 | | |
| .150 | Cubed Fruit | 3 | | |
| .025 | Port Wine | | 8 | |
| .025 | Rum | | 8 | |
| .100 | Red Cherries | 2 | | |
| .050 | Green Cherries | 1 | | |
| | Flavor (Rum and Vanilla) | | | |
| 1.000 | Totals | 20 | | |

Scale 3 lb. 4 oz. in angel food pan, 7 1/2" top inside, 6 1/2" bottom and 4" high; cone 1 1/2" top and 3" bottom and 4" high. Fluted liner to be used in pans. Cover pans with wrapping paper and bake on bun pan, at 330° F. with steam in oven until thoroughly baked, removing paper cover after about 20 minutes baking. Avoid overbaking. While still hot, brush cakes with gum Arabic wash. This is made by grinding gum Arabic to a fine powder and placing in a copper kettle with 1 Lb. water to 2 ounces gum and heating till gum is dissolved. Then remove and strain through a cloth before using. Remove cakes from pans and cool. When cool, wash again with hot gum Arabic wash and decorate tops with pieces of candied cherries, almonds, pecans and candied pineapple. Avoid over-decorating. Wrap in cellophane as soon as cool to keep fresh. If instructions above are followed, this cake will not crumble, but will slice like cheese. Batter temperature 70° to 80° F., NEVER GO OVER 80°.

16. Banana Cake

| PER CENT | INGREDIENTS | LBS. | OZS. | METHODS |
|---|---|---|---|---|
| .145 | Flour | 1 | 14 | Cream 3 to 5 minutes |
| .096 | Emul. Shortening | 1 | 4 | on first speed. |
| .193 | Brown Sugar | 2 | 8 | Mix 3 to 5 minutes |
| .076 | Granulated Sugar | 1 | | on first speed. |
| .048 | Flour | | 10 | |
| .008 | Baking Powder | | 1 1/2 | |
| .002 | Soda | | 1/4 | |
| .009 | Salt | | 1 3/4 | |
| .076 | Liquid Non-fat Milk | 1 | | |
| .131 | Whole Egg | 1 | 11 | Mix 3 to 5 minutes |
| .024 | Liquid Non-fat Milk | | 5 | on second speed. |
| .192 | Bananas (crushed) | 2 | 8 | |
| 1.000 | Totals | 12 | 15 1/2 | |

Batter temperature 70° to 80° F., NEVER GO OVER 80°.

17. White Pound Cake

| PER CENT | INGREDIENTS | LBS. | OZS. | METHODS |
|---|---|---|---|---|
| .130 | Shortening | 2 | 14 | Cream until light; use |
| .295 | Sugar | 6 | 8 | wire whip all stages. |
| .057 | Milk (liquid) | 1 | 4 | Emulsifying by heating at 2nd speed. |
| .226 | Cake Flour | 5 | | Add and mix in thorough- |
| .008 | Salt | | 3 | ly. |
| .006 | Baking Powder | | 2 1/4 | |
| .142 | Egg White | 3 | 2 | Add and mix till smooth. |
| .136 | Milk (liquid) | 3 | | Add in 2 parts and mix |
| | Flavor (to taste) | | | till very smooth. |
| 1.000 | Totals | 22 | 1 1/4 | |

Baking temperature: 1 lb. loaf - 350° to 360° F.
3 to 5 lb. slabs - 325° to 340° F.

Batter temperature: 70° to 80° F., NEVER GO OVER 80°.

18. White Pound Cake (125% Sugar)

| PER CENT | INGREDIENTS | LBS. | OZS. | METHODS |
|---|---|---|---|---|
| .070 | Margarine | 1 | 8 | Mix to a mass, then mix |
| .070 | Emul. Shortening | 1 | 8 | two minutes. |
| .140 | Cake Flour | 3 | | |
| .290 | Sugar | 6 | 4 | Sift dry ingredients to- |
| .100 | Cake Flour | 2 | | gether. Add to above. |
| .007 | Salt | | 2 1/2 | Add water, then mix a |
| .023 | Milk Powder | | 8 | few turns. Scrape down |
| .007 | Baking Powder | | 2 1/2 | thoroughly. Mix four |
| .105 | Water | 2 | 4 | minutes. |
| .164 | Egg White | 3 | 8 | Add to above, then mix a few turns and scrape down thoroughly. Mix two minutes. |
| .024 | Water<br>Flavor (to taste) | | 8 | Add to above. Mix a few turns and scrape down thoroughly. Mix five to eight minutes. |
| 1.000 | Totals | 21 | 5 | |

MIXING REMARKS: on 3-speed mixer use 2nd speed for mixing first and second stages and 1st speed on third and fourth. On 4-speed mixer use 3rd speed for 1st and 2nd stages, 2nd speed for 3rd and 4th stages.

For best results follow above mixing times. Be sure margarine is soft for proper mixing. Use high grade cake flour.

Do not over-bake.

Batter temperature 70° to 80° F., NEVER GO OVER 80°.

19. Butter Rum Cake

| PER CENT | INGREDIENTS | LBS. | OZS. | METHODS |
|---|---|---|---|---|
| .077 | Emul. Shortening | 1 | | Cream |
| .077 | Butter or Margarine | 1 | | |
| .271 | Granulated Sugar | 3 | 8 | |
| .005 | Salt | | 1 | |
| | Orange and Lemon Rind (to taste) | | | |
| .213 | Whole Egg | 2 | 12 | Add slowly. |
| .116 | Liquid Milk | 1 | 8 | Sieve flour and baking |
| .233 | Cake Flour | 3 | | powder together. Add |
| .008 | Baking Powder | | 1 1/2 | flour and milk alternate- |
| | | | | ly. |
| 1.000 | Totals | 12 | 14 1/2 | |

Scale 12 ounces in Turk head pan.

Batter temperature 70° to 80° F., NEVER GO OVER 80°.

20. Butter Rum Syrup

| PER CENT | INGREDIENTS | LBS. | OZS. | METHODS |
|---|---|---|---|---|
| .529 | Sugar | 3 | | Bring to boil; cool, add |
| .176 | Glucose | 1 | | rum flavor to taste. |
| .008 | Cream of Tartar | | 1/4 | |
| .287 | Water | 1 | 10 | |
| 1.000 | Totals | 5 | 10 1/4 | |

21. Lemon Lime Cake

| PER CENT | INGREDIENTS | LBS. | OZS. | METHODS |
|---|---|---|---|---|
| .156 | Cake Flour | 3 | 12 | Mix 3 to 5 minutes. |
| .094 | Emul. Shortening | 2 | 4 | |
| .292 | Granulated Sugar | 7 | | Add and mix 3 to 5 |
| .052 | Cake Flour | 1 | 4 | minutes. |
| .008 | Salt | | 3 | |
| .001 | Soda | | 1/2 | |
| .011 | Baking Powder | | 4 | |
| .084 | Liquid non-fat Milk | 2 | | |
| .031 | Ground Whole Lemons | | 12 | |
| .115 | Egg Yolk | 2 | 12 | Add and mix 2 minutes. |
| .156 | Liquid non-fat Milk | 3 | 12 | |
| 1.000 | Totals | 23 | 15 1/2 | |

Batter Temperature 70° to 80° F., NEVER GO OVER 80°.

22. Chop Suey Cakes (Small)

| PER CENT | INGREDIENTS | LBS. | OZS. | METHODS |
|---|---|---|---|---|
| .006 | Soda | | 2 | Scale soda and add to |
| .300 | Water | 6 | 3 | water. Put other in- |
| .073 | Sugar | 1 | 8 | gredients in bowl, then |
| .036 | Hydrogenated Short. | | 12 | add soda water and mix |
| .097 | Raisins | 2 | | well - about 2 minutes. |
| .076 | Molasses | 1 | 9 | |
| .194 | Crumbs (any dried cake or cookie) Crushed in cake mixer at medium speed. | 4 | | |
| .218 | Cake Flour | 4 | 8 | |
| | Spice and Flavor | | | |
| 1.000 | Totals | 20 | 10 | |

23. Macaroon Cup Cakes

| PER CENT | INGREDIENTS | LBS. | OZS. | METHODS |
|---|---|---|---|---|
| .250 | Egg White | | 4 | Whip to wet peak. |
| .203 | Granulated Sugar | | 3 1/4 | |
| .250 | Granulated Sugar | | 4 | Add and whip again to wet peak. |
| .281 | Cocoanut | | 4 1/2 | Add to above and fold in. |
| .016 | Cake Flour | | 1/4 | |
| | Vanilla (to taste) | | | |
| 1.000 | Totals | | 16 | |

Scaling weight: one pound of batter per dozen. Bake at 360° F.

24. Angel Food Cakes

Angel Food Cake may be made by several methods. Some bakers use all of the sugar in the egg white and whip to a wet peak. Then fold in the flour. Others use a portion of the flour with the egg white and sugar. Still others use half of the sugar with the egg and half with the flour. By each of these methods the baker is endeavoring to obtain different results. Some desire volume, some texture, and some tenderness. The baker who wishes to produce the best all around cake will usually use egg white, salt, (which will give or add strength to the egg white) and cream of tartar, which will act as a bleach and a slightly increase volume, in the first stage. This is then whipped until it starts to foam. Then 1/2 of the total sugar is added and whipped to a wet peak. The third stage consists of adding flavor and the folding in of flour and sugar, which has been sifted together 2 or 3 times. This should be done by hand if possible, but can be done by machine if production demands. Care must be taken not to over-mix. Over mixing at this stage is one of the causes of cripples and failures. Fat or oil in egg white in the amount of 1/10 of 1 percent will also cause damage or produce failure. The main cause of failure is in the whipping of egg whites. For most bakers it is difficult to recognize a wet peak; therefore, they will add their flour too early or too late. A wet peak is when the whites will come to a point and retain it and still have a shine or glazed appearance.

If a light crust color is desired pans should be dipped in water and drained just before scaling.

Cream of tartar should be used in the amount of 1% to 2% of batter weight. This bleaches and will result in a finer texture.

Cakes should be baked from 325° to 350° F., depending on the size of the cake.

Egg white should be around 65°. They will whip faster at this temperature. Any higher temperature will cause damage to the whites.

Angel Food cake is approximately 42% white, 42% sugar, 14% flour, and 2% flavor, salt and cream of tartar. The sugar is the only tenderizing agent in the cake. The flour and whites are both toughners. Some bakers use a small amount of water to produce tenderness. This will produce a more tender cake but one of less volume.

Whipping of whites should be done on 2nd speed on a 3-speed machine or on 3rd speed on a 4-speed machine.

CAUTION: Be sure the mixing bowl and whip are free of fat, or oil.

25. Angel Food Cake No. 1

| PER CENT | INGREDIENTS | LBS. | OZS. | METHODS |
|---|---|---|---|---|
| .421 | Egg White | 3 | | Beat to a wet peak (about 5 minutes). |
| .105 | Granulated Sugar | | 12 | Blend together. |
| .006 | Cream of Tartar | | 3/4 | Add slowly; beat in for |
| .002 | Salt | | 1/4 | 1/2 to 1 minute. |
| .002 | Vanilla (variable) | | 1/3 | Add and mix in. |
| .315 | Granulated Sugar | 2 | 4 | Sift together and fold in. |
| .149 | Cake Flour | 1 | 1 | |
| 1.000 | Totals | 7 | 2 1/3 | |

REMARKS: Scale large cakes 1 pound 12 ounces.

Scale small cakes 1 pound 2 ounces.

Scale sheet cakes 3 pounds.

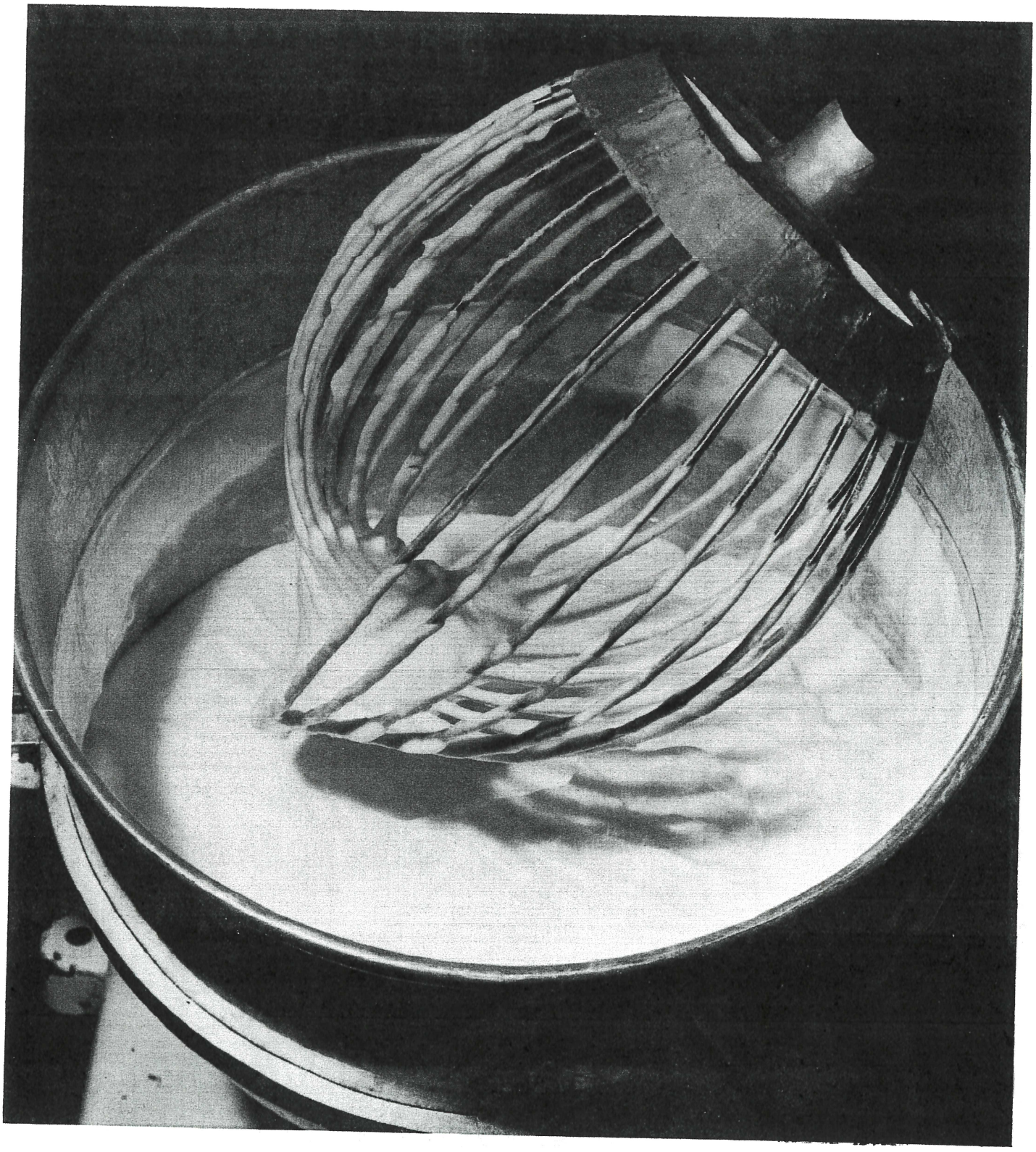
Batter temperature 65° to 70° F.

Bake immediately after panning.

26. Angel Food Cake No. 2

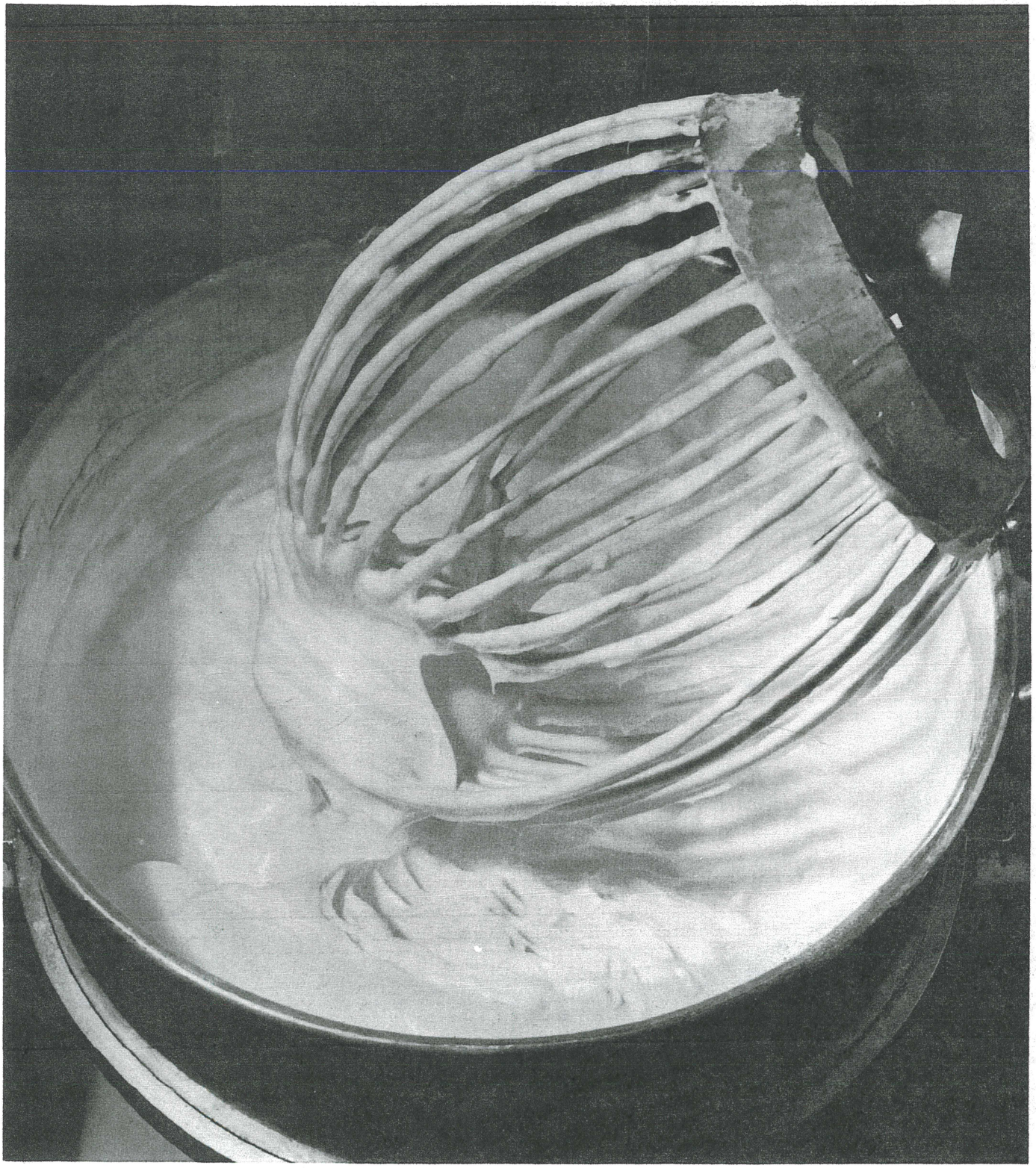
| PER CENT | INGREDIENTS | LBS. | OZS. | METHODS |
|---|---|---|---|---|
| .461 | Egg White | 5 | 4 | Mix on 3rd speed till egg. foams. |
| .008 | Cream of Tartar | | 1 1/2 | Add to above. Mix in on 2nd speed, and then on 3rd to wet peak. |
| .003 | Salt | | 1/2 | |
| | Vanilla and Almond | | | |
| .176 | Cane Sugar | 2 | | Add 1/2 sugar while whipping on 3rd speed. Reduce to 2nd speed and add remainder of sugar. Bring to peak. |
| .154 | Cake Flour | 1 | 12 | Sift 3 or 5 times and fold in by hand. |
| .198 | Cane Sugar | 2 | 4 | |
| 1.000 | Totals | 11 | 6 | |

Batter temperature 70° to 80° F., NEVER GO OVER 80°.



27. Angel Food - Wet Peak

This photograph shows the egg white whipped to a wet peak at the end of second stage before the sugar is added.



28. Angel Food - Dry Peak

This photograph shows the batter at the end of the third stage before the flour is added.

29. Chiffon Cakes

Chiffon Cakes: These are semi-foam or foam type cakes. They are made from a mixture of batter and foam. The cakes have the properties of foam cakes but are very tender and contain much more moisture than a foam cake. The batter is made during the first or, the first and second stages of mixing. This includes flour, fat or oil, part of the sugar, baking powder, flavor or juice, salt, egg, and water. The foam is made during the last stage. This is composed of the beaten egg white and sugar, and sometimes cream of tartar. The foam is beaten to almost a dry peak and folded into the batter. This folding should be done by hand as machine mixing has a tendency to over mix, or break down the egg white. A liquid salad oil should be used as shortening as plastic fat does not produce good results.

Care should be used in mixing a Chiffon Cake, as over mixing may occur at any stage. The batter may also be broken down, by over mixing, or folding in of the egg white.

Baking time varies with the different sizes of cakes. This usually requires from 30 to 45 minutes at a temperature of 350° F.

All dry ingredients should be sifted to insure an even distribution of all ingredients. Egg white, sugar or the Foam should be mixed at 2nd speed on a 3-speed machine; and 3rd speed on a 4-speed machine. Temperature of the egg white for whipping should be 70° to 75° F.

30. Orange Chiffon Cake

| PER CENT | INGREDIENTS | LBS. | OZS. | METHODS |
|---|---|---|---|---|
| .186 | Cake Flour | 3 | 6 | Blend together by sifting. |
| .009 | Baking Powder | | 2 3/4 | |
| .004 | Salt | | 1 1/4 | |
| .128 | Granulated Sugar | 2 | 5 | |
| .096 | Liquid Vegetable Oil (see note below) | 1 | 12 | Add to above and mix on medium speed until smooth. |
| .096 | Egg Yolk | 1 | 12 | |
| .096 | Water | 1 | 12 | |
| .048 | Orange Juice | | 14 | Add slowly to above and thoroughly incorporate. |
| .014 | Grated Orange Rind | | 4 | |
| .193 | Egg White | 3 | 8 | Place in another mixing bowl. Beat until stiff. Then add above mixture to beaten egg and mix only enough to lightly incorporate. DO NOT OVERMIX. |
| .128 | Granulated Sugar | 2 | 5 | |
| .002 | Cream of Tartar | | 1/2 | |
| 1.000 | Totals | 18 | 2 1/2 | |

IMPORTANT: Have all ingredients at approximately room temperature so that the finished batter will be between 72° and 78° F.

31. Lemon Chiffon Cake

| PER CENT | INGREDIENTS | LBS. | OZS. | METHODS |
|---|---|---|---|---|
| .184 | Cake Flour | 2 | 8 1/2 | Sift together three times. |
| .009 | Baking Powder | | 2 | |
| .005 | Salt | | 1 | |
| .129 | Sugar | 1 | 11 3/4 | |
| .020 | Lemon Powder | | 4 1/2 | |
| .095 | Vegetable Oil | 1 | 5 | Mix with above, by hand, |
| .157 | Egg Yolk | 2 | 2 1/2 | until smooth. Do not over- |
| .061 | Water | | 13 1/2 | mix. |
| .014 | Lemon Rind | | 3 | Add to above. |
| .191 | Egg White | 2 | 10 | Whip to wet peak- (almost |
| .134 | Sugar | 1 | 13 3/4 | dry). Fold into above light- |
| .001 | Cream of Tartar | | 1/4 | ly by hand. Don't overmix. |
| 1.000 | Totals | 13 | 11 3/4 | |

32. Chocolate Chiffon Cake

| PER CENT | INGREDIENTS | LBS. | OZS. | GMS. | METHODS |
|---|---|---|---|---|---|
| .158 | Cake Flour | | 15 1/4 | | Sift together three times. |
| .003 | Baking Powder | | 1/4 | | |
| .004 | Salt | | 1/2 | | |
| .001 | Soda | | | 3 | |
| .187 | Sugar | 1 | 2 | | |
| .082 | Salad Oil | | 7 3/4 | | Mix with above by hand |
| .082 | Egg Yolk* | | 7 3/4 | | until smooth. Do not |
| .047 | Chocolate | | 4 1/2 | | over-mix. |
| .094 | Water | | 9 | | |
| .058 | Water | | 5 1/2 | | Add to above and mix |
| .002 | Vanilla | | | 6 | until smooth. |
| .164 | Egg White | | 15 3/4 | | Whip to wet peak (almost |
| .001 | Cream of Tartar | | | 3 | dry). Fold in lightly to |
| .117 | Sugar | | 11 1/4 | | above by hand. Don't |
| | | | | | over-mix. |
| 1.000 | Totals | 6 | | | |

*Val Tex may be substituted.

Batter temperature 70°. Oven temperature 350°.

Baking time 45 minutes.

33. Jelly Roll

| PER CENT | INGREDIENTS | LBS. | OZS. | METHODS |
|---|---|---|---|---|
| .255<br>.024 | Whole Egg<br>Powdered Milk | 2 | <br>3 | Whip on 2nd speed to almost wet peak. |
| .304<br>.002 | Granulated Sugar<br>Salt | 2 | 6<br>1/4 | Whip on 2nd speed to a wet peak. |
| .158 | Warm Water<br>Vanilla (to taste) | 1 | 4 | Mix in on 2nd speed until a light yellow is produced. |
| .256<br>.001 | Cake Flour<br>Baking Powder | 2 | <br>1 | Sift and fold in by hand. |
| 1.000 | Totals | 7 | 14 1/4 | |

Batter temperature 70° to 80° F., NEVER GO OVER 80°.

CHAPTER 21

# VEGETABLE GUMS*

## THEIR PROPERTIES AND USES IN BAKING

The vegetable gums are no longer curiosities to the baking industry. Over the past ten or twenty years these materials have become familiar colloids to the progressive baker, who realizes that they are not cure-alls but extremely useful tools, applicable to fill certain specific requirements.

Although this group of water dispersible colloids may be considered, as a whole, to be water absorbers and controllers of moisture, the individual gums vary sufficiently in properties so that they usually do not compete for any one purpose, but rather fit into particular niches, depending upon definite requirements. Moreover, often a combination of properties is desired, and two or more of the vegetable gums are blended to perform the necessary function. These combinations are usually purchased, by the baker, in the form of commercial stabilizers. In this manner, he obtains preparation of commercial stabilizers by blending vegetable gums in a carefully laboratory controlled process and can be compared to the blending of flours, the importance of which every baker realizes.

However, even though "tailor made" stabilizers are available for most purposes in the baking industry, it is logical to assume that, by knowing some of the more general properties of the individual gums which are commonly used in the field, the baker who is more familiar with everyday practical baking problems may become a working partner of the laboratory chemist, and thus increase the usefulness of this group of colloids.

### The Water-Soluble Gum Family:

The Water-Soluble Natural Gums do not form an easily-recognizable family of products. What gives them their family character is the fact they all exhibit so-called hydrophilic colloidal qualities--that is, they swell in, disperse in, or absorb water.

Generally speaking, the gum family can be classified into three subdivisions:

Those derived from the exudation or sap of trees or other plants: Arabic, Karays, Tragacanth, Ghatti, Shiraz, Mesquite, Angico, Talha, etc.

Those extracted from seeds: Locust, Guar, Quince, Payllium, etc.

Those processed from seaweeds: Agar, Kelp, Alginate, Irish Moss, etc.

There are many kinds and grades, and many uses for each of these gums. In this short booklet we would like to describe the four major gums: Gum Arabic, Tragacanth, Karaya and Locust Bean--where they come from, what they are, how we merchandise them. For additional information on these or other gums, our Natural Gum Department is at your service.

1. Gum Arabic

Gum Arabic, sometimes called Gum Acacia, is the name commonly used to describe the Gum produced by trees of the Acacia genus. Gums from any species of the Acacia tree enter commerce from the Anglo-Egyptian Sudan, Senegal and Tanganyika. These species include Acacia Senegal, Acacia Verek, Acacia Arabica and many others.

Oddly enough, only weakened and diseased trees produce gum. The sick trees are tapped and an exudation collects in the form of globules or tears which are collected by natives. The gum is gathered after the rainy season, with heavy collecting from December through May.

The total world crop of Arabic is approximately 25,000 to 30,000 tons, with the Anglo-Egyptain Sudan accounting for over 80% of the total. The Sudan Gum Arabic is largely sorted in Khartoum; virtually all Gum is shipped to the countries of the world through Port Sudan on the Red Sea. The United States historically has imported about 5,000 tons a year.

Gum Arabic has been in use since Biblical times. But only in recent years has an understanding of the chemistry of the Gum been partially realized.

Gum Arabic is a complex substance. The molecular weight is of the order of 240,000 and its chemical composition is a mixture of Calcium, Magnesium and Potassium Salts of Arabic acid (a complex consisting of galactose, rhamrose, arabinose and glycuronic acid). The difference in various species and grades of Arabic (or Acacia) is mainly in color shade and impurities, with only small if any chemical difference.

The physical and chemical properties of Gum Arabic are such as to make its use widespread in a great number of products and processes. Gum Arabic--unlike other Gums--is completely soluble in water and insoluble in most other solvents. It is almost tasteless and odorless and gives only a pale amber color in solution. Owing to its solubility, aquenous solutions of low surface tensions can be prepared ranging from very low to very high viscosities with corresponding variation in the solid content.

Concentrated solutions with high viscosities are still clear enough to allow good light transmission. As aqueous solution of Gum Arabic is a good emulsifying agent, the Gum Arabic behaving as a protective colloid. Gum Arabic, when mixed with equal parts of cold or hot water, will produce a solution about similar in viscosity or body to an ordinary table syrup.

Gum Arabic is an exudate of multiple varieties of acacia trees, grown over large expanses of Africa. The gum is cold-water soluble and forms clear solutions, whose viscosity is roughly twice that of sugar. Because of this comparatively low water absorption, it is not extensively used in the baking industry. However, arabic has good adhesive properties and when used to help stabilize emulsions appears to impart a certain smoothness to them. Often combinations of tragacanth and arabic are used in flavor emulsions, rather than either one alone. This is another example of the superiority of a blend of gums in order to obtain additive properties. The tragacanth, in this case, is the true emulsion stabilizer, while the arabic provides a better type of emulsion.

Occasionally, gum arabic is incorporated into glazes where stability, in conjunction with free flowing or brushing characteristics, are desired, as in the following bun glaze formula:

| | |
|---|---|
| Brown sugar | 5 lbs. |
| 43° Be Corn Syrup | 1 lb. |
| Shortening | 4 oz. |
| Water 1 1/2 lbs. | (variable) |
| Gum Arabic | 2 ozs. |

The gum arabic is dry mixed with one pound of the brown sugar and dissolved in the water. The corn syrup is then added and heat applied. Then the rest of the brown sugar and shortening are added, and boiled. The glaze is applied while still warm.

Here, the adhesive properties of the gum arabic also come into play in helping the glaze to remain on the bun.

2. Gum Karaya

Gum Karaya is the dried exudation of Stericulia Urens, a large tree found almost exclusively in India. The Stericula trees are slashed to induce gum formation and then picked during the collecting season which begins in March. The gum is largely gathered in forests located from several hundred to 2,000 miles up-country and inland from Bombay, the port of shipment.

The picked gum is pooled at collection centers and then shipped to Bombay where it is sorted by native women according to color and foreign matter. The total crop runs to about 5,000 tons, over half of which goes to the United States.

There is very little known about the chemical structure of Karaya Gum at present. The principal constituent is a galactan called gelose. In contrast to the other water-soluble gums, Karaya is characterized by a high volatile acid content. This is mainly in the form of free and combined acetic content. The equivalent titer on one tenth normal alkali required to neutralize the volatile acid in Karaya varies from 4 to 6 cc. The variation in viscosity of crude samples of Karaya is great, but research has established no relations between the volatile acid content and viscosity to other characteristics of the gum. Viscosities of Karaya solutions are

sensitive to alkali, and as much as a fourfold increase in viscosity is noted when the solution is adjusted to a pH of 8.5. It is worthy of note that solutions of Karaya tend to become stringy in the alkaline range.

Gum Karaya swells more quickly in cold water than Gum Tragacanth, and in many uses is more desirable for this reason. Gum Karaya solutions, like Gum Tragacanth, exhibit high viscosities in dilute concentration. While the better grades of Gum Tragacanth will usually have a higher viscosity than Karaya, solutions of the latter may be preferable from a price view point.

During the hot season, gum karaya is gathered as the exudate from incisions made in the trunk of a large tree, Stericulia Urens, found in India. Shipments are largely dispersion forms a thick paste. Locust bean gum should be heated in an aqueous medium to fully gelatinize. This can be accomplished by boiling for two to three minutes, or by heating at 180° F. to 190° F. for ten minutes. Lower cooking temperatures require longer heating intervals. This colloid holds approximately six times as much water as does the average starch. It is very attractive, costwise, and is one of the principal ingredients of most bakers' stabilizers. Locust bean gum has little or no "setting" qualities, and is usually combined with a gum of seaweed origin to impart this characteristic. Another advantage of using locust bean gum lies in its compatibility with low pH solutions and with edible salts. It is also fairly resistant to acid hydrolysis.

3. Gum Tragacanth

Gum Tragacanth is the name given to gums produced by the various species of a thorny shrub called Astragulus. These shrubs grow in semi-desert places. Strangely enough, when moisture is received by the plant, there is no production of Gum. The Gum itself is produced by an exudation of the shrub when it is cut. The higher grades of material are white, have the form of thin ribbons, and are known as ribbon Aleppo. The lower grades, known as Persian Flake, are yellow and have a heavier, more flake-like appearance.

Gum Tragacanth comes principally from Turkey and Iran. In the latter country, it is first gathered in May and September, depending on the locality.

The Gum is assorted and then shipped from the port of Khorramshahr to various consuming countries in the world. Total Iranian production of Gum Tragacanth is estimated at from 3,000 to 4,000 tons, with the United States taking anywhere from a third to two-thirds of the total. Prior to the war, Turkey produced in small quantity, some of which found its way to the United States market. However, best grades and qualities, as well as bulk, originate in Iran.

Gum Tragacanth consists of two portions, a soluble portion called Tragacanthin and an insoluble portion called Bassorin, in about the proportions of 30% to 70%

respectively. The soluble portion, Tragacanthin, is believed to be composed of gulcuronic acid and arabinose in equal amounts. The Bassorin has a composition analagous to pectin in that it is made up of complex methoxylated acids. The swell power of the Gum Tragacanth is due entirely to the Bassorin portion of the Gum. Gum Tragacanth varies widely in viscosity according to grade, the highest grades having viscosities in dilute solutions (about 1% comparable to that of olive oil).

Tragacanth solutions increase in viscosity upon standing, with the maximum rise occurring in the first 48 hours after solution. Elevating the solutions of temperatures of about 70° C. decreases the length of time needed to achieve comparable viscosity to about 2 hours. With the addition of small amounts of preservatives, stable water solutions of high viscosities may be attained.

Pastes and jellies of Tragacanth will remain soft, keeping their solution characteristics for extended periods of time. The emulsifying properties are due chiefly to the heavy viscosity of the Tragacanth solution. When used in conjunction with a protective colloid such as Gum Arabic, highly stable emulsions are obtainable. The high degree of purity and viscous nature of Tragacanth have made it a desirable ingredient in a great many products.

Gum tragacanth, one of the oldest used in the baking industry, is obtained from the shrub-like plants, generally classified in the Astralagus family. The plants grow in desert-like land, and the gum is largely imported from Turkey and Iran. Tragacanth can be obtained in ribbon, flake, or powdered form the latter being most practical for food use. Many grades of this gum are produced and quality must be balanced against cost in order to find the most economic usable type. Good suppliers usually have this information available.

Gum tragacanth is exceptionally efficient in stabilizing oil in water emulsions, and is used in many food preparations of this kind, as, for example, French dressing. A number of flavor emulsions are also stabilized with tragacanth. This gum gelatinizes completely, although rather slowly, in cold water. Gelatinization is considerably accelerated by the application of heat. Thus, a gel can be prepared by soaking overnight in cold water, or by heating the aquenous dispersion for ten minutes at 180° F.

Tragacanth has certain adhesive and working properties which make it suitable for use in gum paste for decorative icings. A typical example of such a formulation follows:

| | |
|---|---|
| 4x sugar | 10 lbs. (variable) |
| Cold Water | 1 pt. |
| Powdered corn starch | 1 lb. |
| Gum Tragacanth | 2 ozs. |

The tragacanth is mixed with about five times its weight of sugar and dissolved in the water. The corn from Bombay, Karaya, like tragacanth and arabic, swells

in cold water. It is easily recognized as it carries a distinct odor of acetic acid and, very often, possess a characteristic pink color. While karaya forms rather viscous gels, the gel structure is somewhat of a discontinuous nature. Unlike tragacanth and arabic, gum karaya is not acid resistant and hydrolyzes rapidly when, for example, it is heated in fruit juices.

Since the largest use of the vegetable gums, as far as the baker is concerned, lies in the stabilization of fruit fillings and glazes, not much karaya is sold to this branch of the food industry. Sometimes it is found as a constituent of merigue powder where it serves the double purpose of accelerating the whip, because of its acidic nature, and helping to stabilize the foam structure. Quantities of karaya incorporated into meringue powder are in the range of a 2 to 4 percent, based upon the weight of the powder.

4. Locust Bean Gum

Locust Bean Gum is the name given to Gum processed from the seeds of the Locust Bean Tree, botanically known as ceratonea siligua, L. Among the many other names for Locust Bean are St. John's Bread and Carob Beans. The Locust Beans grow most extensively in Spain, but important growth is also found in other countries around the Mediterranean Sea area, notably Greece, Italy and Sicily, Cyprus, North Africa and Portugal. The sugar-rich pods are gathered in these areas to be chopped up and used as a cattle food or in alcohol production, after the seeds have been extracted.

The seeds are processed into Gum mainly in England, Portugal, Spain, France, Italy, Switzerland, Cyprus, Greece and Palestine. The Gum is produced by removing the dark hard, outer hull of the seed, cracking the endosperm and removing the germ which is high in protein content and not mucilaginous. The two parts of the endosperm are then further processed and finally powdered in various meshes from about fifty up to about 200 mesh. The world produces about 5,000 tons of Locust Bean Gum a year of which the United States has, in the past, taken from a quarter to a half.

Locust Bean Gum is a hemicellulosic material whose molecular weight is approximately 310,000. It is essentially composed of about 30% galactan and 60% mannan, with small percentages of nitrogen, cellular tissue, mineral matter and the enzyme, ceratoniase. It contains no uronic acids or pentoses such as those found in other water-soluble gums. The Gum is completely dispersible in cold water and forms viscous solutions or heavy opaque pastes depending upon the concentration. As little as 0.5% gum will produce a solution that is highly viscous, and a paste of 5% is practically non-flowing. On the addition of borax, a 0.5% solution will be converted to a solid irreversible transparent gel which is dry, firm and cohesive but will no longer stick to glass or other substances.

The Gum is precipitated by basic salts but not by neutral salts except at high concentrations. Alcohol precipitates the gum complex from its aquenous solutions as a white gelatinous mass. To achieve maximum body the Locust Bean Gum should be cooked. For best results, the Gum (a fine white powder) should be gradually sifted into cold water with agitation, and when dispersed, the solution brought to a boil. Locust Bean Gum has many times the viscosity, or swelling properties, of the usual gums or starches and in some cases can be used to replace a much greater quantity of the more common gums and starches.

One of the most important of the natural gums is locust bean gum, also known as locust kernel gum, carob seed gum, and by various trade names. It is a member of the family of gums known as hemicelluloses and is prepared from the de-hulled bean, or endosperm, of the carob bean tree, grown largely in the Mediterranean area. For economic reasons, most of the gum is processed in Switzerland, Italy, Greece, France, Spain, and England.

Locust bean gum gelatinizes to hold more water than any of the other widely used vegetable gums. A one percent dispersion in water is rather viscous, while a two percent starch is then slowly added and then the rest of the sugar. A little certified blue color can also be incorporated to improve the whiteness of the paste. The sugar content should be controlled to produce desirable stiffness. The paste should be stored in airtight containers.

5. Pectin

Pectin, an important water soluble gum, is obtained from fruit sources. It is not of much interest to the baker, except as a consituent of pure fruit jams and jellies which he may be using. Pectin is acidic in nature, requires heat to dissolve, and is quite resistant to acid hydrolysis. Pectin solutions are on the thin side. However, the important property of pectin is its ability to form a heavy gel in the presence of high sugar solids (about 65 percent), and upon the addition of acid. Before gums precipitate they very often form gel structures. As pectin acid is relatively insoluble, the addition of acid is an aid to gelling the pectin solution. Moreover, the presence of high soluble solids, such as sugar solids, also tends to "de-hydrate", in a manner of speaking, the pectin. However, before actual precipitation occurs the pectin solution "sets" to a gel. This affords us a theoretical explanation of the necessary control of total solids and pH in preparing stable pectin preserves.

There are now available certain modifications of pectin, like low methoxy pectin and sodium pectate, which may have more direct application to the baking field. Their possibilities have not been fully explored.

The best known gums of seaweed origin are agar, Irish moss, and the alginates.

Agar is produced from the gelidium seaweeds, mostly in Japan and on the West Coast of the United States. In this connection, it should be remembered that there are many types of seaweeds, just as there is a large variety of land plants, and that the individual gum extracted from any one class of seaweed may differ markedly from a gum extracted from another type.

Agar should be boiled in water for a minute or two to properly dissolve it, although heating at 200° F. for a longer period of time will also take it into solution. Agar cooks thin and sets upon cooling to a heavy brittle gel. Agar solutions are quite clear. Agar is an excellent stabilizer for boiled icings and glazes. It is an important constituent of many of our present bakers stabilizers. This gum is not particularly acid resistant and hydrolyzes easily when heated in fruit fillings.

Irish moss, or carragheen, is the dried seaweed, Chondrus crispus, found along many coastal areas, including those of New England. While formerly the cleaned ground moss itself was used, the extract is now generally preferred. The extract is prepared by cooking the cleansed moss to extract the gum, filtering to remove the insoluble matter, and then recovering the colloid from aqueous solution. The production of Irish moss extract, sometimes referred to as carragheening, is a growing domestic industry. Irish moss extract, like agar, requires heating to dissolve in water, but will do so at lower temperatures, as low as 160° F. When this gum is heated in milk media, it thickens and stabilizes it. Thus, Irish moss extract has a definite place in custard fillings of all types. The thickening property of Irish moss extract, in milk is approximately thirty times that of starch, although the effect is somewhat different as the gum provides a more tender, custardy gel structure. Approximately 0.2 to 0.3 percent of Irish moss extract, based upon the weight of the milk, will produce this effect. While this specific action upon milk is common to seaweeds, other than Irish moss, the latter is most adaptable for the purpose.

Sodium alginate is produced from kelp on both the Atlantic and Pacific coasts of the United States. It is often referred to as algin, in spite of the fact that this is better used as a more generic title to cover all the derivatives of alginic acid. Sodium alginate is a very useful cold-water soluble colloid. In the baking field it performs satisfactorily as an icing stabilizer. Since acids insolubilize Sodium alginate to alginic acid its use in fruit fillings is limited. However, a more recent propylene glycol alginate is less sensitive to acid insolubilization and may be somewhat better for this purpose. Calcium salts also combine with Sodium alginate to form insoluble calcium alginate. Here, some similarity exists between the alginates and the pectates. Controlled additions of acid or calcium salts actually increase gel strength and setting properties, while excess quantities render them insoluble.

Carboxymethocellulose, usually sold in the form of its sodium salt, is a synthetic gum manufactured from cellulose. It is an excellent thickening agent, on the order of locust bean gum, differing in that it is cold-water soluble. On the other hand, it is more expensive than locust bean gum and not nearly as

compatible with natural fruit acids.

Guar seed gum, something of a newcomer to the field, is being produced domestically from the cluster bean which is grown in the southwest part of the United States. Like locust bean gum, it is a mannogalactan and exhibits many of the same properties. However, unlike locust bean gum, guar gum will fully gelatinize in cold water, thus opening a new vista for this colloid. Its full possibilities in the baking field have not yet been explored although, at the present time, it seems to offer considerable promise. A great deal of laboratory and field work along these lines is now being undertaken.

Commercial stabilizers, carefully laboratory controlled blends of appropriate gums, are used as protective colloids for icings, meringues, glazes and fruit fillings. The manufacturer's recommendation should be obtained to secure the best level of use of any particular product.

a. Use in Icings

Even in an icing of the most elementary form possible, a simple mixture of powdered sugar and water, a stabilizer can be of distinct aid by increasing the body and eliminating sticking to the wrapper, as for example:

| | | |
|---|---|---|
| Powdered Sugar | 13 lbs. | 4 ozs. |
| Water | 2 lbs. | 5 ozs. |
| Stabilizer | | 1/2 oz. |

If a cold water type stabilizer is used it may be just mixed with the sugar and worked into the water.

Stabilized Meringues

Stable meringue toppings can be prepared from fresh or frozen egg whites in the following manner:

Beat dry, in medium speed, 2 quarts of egg whites.
Boil for 3 minutes the following:
- 6 pints of water
- 7 pounds of sugar
- 5 ounces of stabilizer

Thread the boiled mixture, while hot, into the beaten whites and continue whipping until fairly cool.

Here the stabilizer not only prevents bleeding and collapse of the meringue, but also vastly increases volume since it facilitates addition of extra sugar and water without breaking the whip. The finished product, if properly prepared,

is more palatable than an unstabilized meringue topping. Nearly all commercial bakers who prepare meringue toppings for pies, use a stabilizer. As a matter of fact, this was probably the introductory medium for the natural gums in the industry. While the cooked stabilizer type of meringue, as already outlined, is generally considered superior to an all cold preparation, there are certain pie bakers who prefer not to heat the stabilized syrup. An example of cold meringue stabilization is given in this formula:

| | |
|---|---|
| Egg whites | 6 pints |
| Sugar | 4 1/2 pounds |
| Cold type stabilizer | 5 pounds |
| Cold water | 9 pints |

Here 3 pounds of sugar are dissolved in 9 pints water. The remaining 1 1/2 pounds sugar are dry mixed with the stabilizer. After whipping the egg whites stiff, the sugar solution is slowly added with continued whipping. Then the stabilizer and sugar blend is carefully dusted in. Finally, whipping is continued for seven minutes longer in medium speed.

b. Use in Glazes

In glazes and fruit fillings the vegetable gum stabilizers differ from the starches in these respects:

1. They boil thinner, thus causing less destruction of fruit structure during the cooking operation, as well as assuring ease of handling.

2. The finished gels are clearer than those prepared from starch.

3. The vegetable gum stabilizers have less flavor masking effect than have starches.

4. The structure of the gels produced with vegetable gum stabilizers are fruit-like in texture.

A typical fruit glaze can be prepared along the following lines:

| | |
|---|---|
| Sugar | 5 pounds |
| Salt | 1/2 ounce |
| Glaze Stabilizer | 4 1/2 ounces |
| Water and fruit juice | 1 gallon |

The stabilizer and salt are mixed with one pound of the sugar and the blend added to the water and juice, and boiled 3 minutes, stirring well. The rest of the sugar is then added and stirred to dissolve.

## c. Pie Fillings

Sometimes the thin boiling characteristics of the vegetable gums are somewhat detrimental, as in closed pie fillings where "boiling out" in the oven may occur. Here, a combination of vegetable gum stabilizer and starch will yield the desired results. Generally, the starch of the average formula can be reduced to 50% of the normal amount, the difference being made up by the stabilizer. Each five parts of starch omitted can be replaced by approximately two parts of stabilizer. The following formula may serve as a guide to this method of preparing a filling:

## d. Lemon Pie Filling

Dry Mix:

| | |
|---|---|
| 2 pounds | Sugar |
| 3 ounces | Pie filling stabilizer |
| 2 ounces | Grated lemon rind (optional) |
| 1/2 ounce | Salt |

Add to 6 pounds of water and boil for three minutes, stirring well. Add to cook a well mixed slurry of:

| | |
|---|---|
| 1/2 pound | Whole Egg (beaten) |
| 1/2 pound | Starch |
| 2 pounds | Water |

Cook until thick, allowing to come back to a boil. Add 3 pounds of sugar, and then 4 ounces of melted butter or shortening. Stir the whole mixture well and finally add a pint of lemon juice or 6 ounces of lemon powder, dissolved in 10 ounces of water. If desired, a little acid can be used with the lemon powder. Add flavor and acid as late as possible.

These few formulas are not offered with the idea that they may meet any specific production requirements but rather as guides to the methods of use of vegetable gum stabilizing materials.

While the use of this valuable group of colloids has been confined thus far in the baking industry to adjuncts in the way of fillings, icings, meringues, and glazes, they are constantly growing in importance and a certain familiarity with their basic properties may lead to their further exploitation by the practical baker.

*Courtesy Stein, Hall Company

# CHAPTER 22

## CAKE ICINGS AND FILLING

### 1. Ingredients used in Icings

Sugar is the basic ingredient of icings. Powdered sugar is used in most icings. The finer the granulation of sugar the smoother the icing. 4xxxx or 6xxxxxx proves very satisfactory. A smoother icing can be obtained if a simple syrup is used instead of water in the preparation of an icing. A simple syrup is composed of 2 parts of sugar and 1 part water. Emulsifying type shortening should be used in icings. A small quantity of salt will improve the taste of an icing. Milk Powder will improve both the taste and aroma of icing. Icings should be of a proper consistency. If too stiff they will tear cakes and will not produce desired sheen and smoothness. However, if too soft, they will have a tendency to run and be watery.

### 2. Amounts to Use on Cakes

The quantity used on cakes will vary with the type of icing. The amounts of fudge, foundant, and cream icings used is usually a little less than one-half the weight of the cake to be iced. The amounts of boiled or marshmallow icings used is about one-fourth that of the weight of the cake.

### 3. Types of Icings

(a) Water Icing: Water icing is usually used on sweet dough products and doughnuts. The formula for this icing is approximately 85% powdered sugar, 10% water, 5% milk, shortening, flavor, salt and stabilizer. It can be made with 85% powdered sugar and 15% water but this type of icing will crack, or break very easily when dry. When a product finished with this icing is wrapped the icing will become syrupy and form small droplets of watery syrup.

(b) Fudge Icing: During the cooking or heating of most fudge icings the sugar crystals are reduced in size. This type of icing will have a much smoother appearance than other types. Most fudge icings contain 75% sugar, 10% water, 7% chocolate, and 1% of other ingredients, such as, milk powder, salt, flavor and stabilizer. This type of icing is used mostly on cakes that can be wrapped successfully.

(c) Foundant Icing: Foundant icing is composed of 80% sugar, 15% water, and 5% invert sugar. This icing is used by pouring on such products as Pettis Flours. It can be mixed with (water icing) making (a glaze) and also a (sweet dough icing), or mixed with (butter cream). This icing is used mostly for mixing with other types of icing. Products on which used can be wrapped successfully.

(d) Cream Icing: Cream icing contains about 70% sugar, 20% shortening, 8% water, 2% of salt, milk powder, flavor, and stabilizer. The high percentage of fat in this icing causes it to incorporate air and become light. This type of icing is usually used on cakes. By heating, it can be made into a flat type icing. The heat melts the shortening and releases the air held by it. The use of boiling water while making this icing also produces a flat type. Such icings should be heated to a 110° when used.

(e) Marshmallow or Boiled Icing: Marshmallow is usually made with 45% sugar, 20% water, 2% gelatin, 18% corn syrup, and 15% invert sugar, this provided gelatin is used as a foam agent. If egg whites are used the formula is: 60% of sugar, 25% water, 12 1/2% egg white, and 2 1/2% of salt, stabilizer, flavor, and bleach, usually cream of tartar. This type of icing is usually used on cakes. It does not have a long shelf life and products on which used can not be wrapped very successfully, except where some type of dryer is used such as, cocoanut, powdered sugar, etc.

(f) Jelly Icing: Jellies are sometimes classed as icing. Actually they are as a rule, a filler. Jellies usually contain 65% solids, the larger percent of which is sugar, about 10% of the solids being a jellying agent, usually Pectin. Thirty-four percent of jelly is water. Some jellies are made with gum stabilizers, such as Agar Agar.

A combination of 2 or more of these icings will produce a variety of icings that will aid in increased sales of products on which used. Most of these icings, containing stabilizers and can be used on products to be wrapped. There are many kinds of stabilizers and dryers. Dryers are flour, starch, etc. Gums are Agar Agar, etc. Dryers usually produce a taste that is not desirable, due to the large percent necessary to use. Gums are more expensive but will produce much better results.

1. Chocolate Icing

| INGREDIENTS | LBS. | OZS. | METHODS |
|---|---|---|---|
| Sugar<br>Chocolate Liquor<br>Vanilla | 10<br>2 | <br><br>1/4 | Introduce into mixing bowl and mix for about one minute. |
| Hot Water | 2 | | Add hot water and cream to desired consistency. |

2. Chocolate Icing
(Using Melted Chocolate)

| PER CENT | INGREDIENTS | LBS. | OZS. | METHODS |
|---|---|---|---|---|
| .400 | Powdered Sugar | 12 | | Place all ingredients in mixing bowl and cream to desired consistency. |
| .050 | Hydrogenated Shortening | 1 | 8 | |
| .133 | Melted Chocolate | 4 | | |
| .133 | Corn Syrup | 4 | | |
| .033 | Water | 1 | | |
| .250 | Prepared Agar Base | 7 | 8 | |
| .001 | Vanilla | | 1/2 | |
| 1.000 | Totals | 30 | 1/2 | |

Icing should be 100° to 105° for best results when applying to cakes. Temperature below this will tend to impair gloss and spreading properties.

3. Chocolate Icing

| PER CENT | INGREDIENTS | LBS. | OZS. | METHODS |
|---|---|---|---|---|
| .054 | Glucose | 1 | | Bring to 242° F. |
| .054 | Water | 1 | | |
| .162 | Granulated Sugar | 3 | | |
| .054 | Margarine | 1 | | Place in bowl and pour on above mixture. |
| .081 | Water | 1 | 8 | Add to above, mix till smooth, adding water slowly, keeping icing very smooth. |
| .054 | Chocolate Fudge | 1 | | |
| .541 | Powdered Sugar | 10 | | |
| 1.000 | Totals | 18 | 8 | |

Add hot water until icing is right consistency.

4. Chocolate Butter Cream Icing

| PER CENT | INGREDIENTS | LBS. | OZS. | METHODS |
|---|---|---|---|---|
| .0406 | Emulsifying Shortening | | 6 1/2 | Cream slightly. |
| .0406 | Butter or Margarine | | 6 1/2 | |
| .0406 | Egg Whites | | 6 1/2 | Add and cream. |
| .6499 | Powdered Sugar | 6 | 8 | Add and cream. |
| .0406 | Milk Powder | | 6 1/2 | |
| .0025 | Salt | | 1/2 | Add and cream. |
| .0812 | Water | | 13 | |
| .0025 | Vanilla | | 1/2 | |
| .1015 | Melted Bitter Chocolate | | 1/4 | |
| 1.0000 | Total | 10 | 1/4 | |

5. Butter Cream Icing

| PER CENT | INGREDIENTS | LBS. | OZS. | METHODS |
|---|---|---|---|---|
| .679 | Powdered Sugar | 30 | | Introduce into mixing bowl and cream on medium speed until smooth. |
| .136 | Emulsifying Shortening | 6 | | |
| .023 | Non-fat Dry Milk | 1 | | |
| .045 | Cake Flour | 2 | | |
| .023 | Egg White | 1 | | |
| .045 | Water (40°) | 2 | | |
| .003 | Salt | | 2 | |
| .001 | Vanilla | | 1 | |
| .045 | Water (variable) | 2 | | Add water and continue creaming until light. |
| 1.000 | Totals | 44 | 3 | |

6. Boiled Icing

| PER CENT | INGREDIENTS | LBS. | OZS. | METHODS |
|---|---|---|---|---|
| .428 | Granulated Sugar | 3 | | Heat to 242° F. in copper kettle. In hot humid weather heat to 244° F. |
| .143 | Water | 1 | | |
| .143 | Corn Syrup | 1 | | |
| .143 | Egg White | 1 | | Add hot syrup to egg white operating machine on second speed. Continue whipping to desired consistency. |
| | Vanilla (to taste) | | | |
| .143 | Sifted powdered sugar | 1 | | Add to above and mix in well. If whipped too stiff this icing can be thinned down with warm water without undesirable affect. |
| 1.000 | Totals | 7 | | |

REMARKS: All utensils must be entirely free of grease.

7. Marshmallow Topping

| PER CENT | INGREDIENTS | LBS. | OZS. | METHODS |
|---|---|---|---|---|
| .124 | Water | 1 | | Bring to boil and allow to stand. |
| .003 | Agar-Agar | | 1/2 | |
| .124 | Water | 1 | | Bring sugar solution to 240° F. and add cream of tartar, stirring. |
| .624 | Granulated sugar | 5 | | |
| .001 | Cream of Tartar | | 1/4 | |
| .124 | Egg White | 1 | | Beat to wet peak, then add above sugar solution slowly while beating. |
| | | | | Add agar-agar solution and continue beating to proper consistency. |
| 1.000 | Totals | 8 | 3/4 | |

8. Marshmallow Topping (Cold Process)

| INGREDIENTS | LBS. | OZS. | METHODS |
|---|---|---|---|
| Hot Water | 2 (One quart) | | Add hot water and powder to mixing bowl and mix for about 5 minutes. |
| KWIK Mallow | | 6 | |
| Powdered Sugar | 6 | | Add these ingredients and whip until dry, or until it will stand to a point. |
| Corn Syrup | 1 | | |
| Vanilla | | 1/4 | |
| Salt | | 1/4 | |

9. Caramel Icing

| PER CENT | INGREDIENTS | LBS. | OZS. | METHODS |
|---|---|---|---|---|
| .401 | Brown Sugar | 6 | | Bring to boil. |
| .2 | Glucose | 3 | | |
| .133 | Water | 2 | | |
| .133 | Melted Butter | 2 | | Pour in above. |
| .133 | Hot Water | 2 | | Add. |

Stir in Powdered Sugar until right consistency.
Butter Scotch flavor to taste.

10. White Fudge Icing

| PER CENT | INGREDIENTS | LBS | OZS. | METHODS |
|---|---|---|---|---|
| .052 | Pet Milk | 2 | 2 | Mix and bring to 1. |
| .052 | Water | 2 | 2 | 160° F. |
| .055 | Emulsifying shortening | 2 | 4 | |
| .055 | Butter | 2 | 4 | |
| .785 | Powdered Sugar | 32 | | Place in mixing 2. |
| .001 | Salt | | 1/2 | bowl. |
| | Flavor | | | |

Add No. 1 to No. 2 gradually, mix until right consistency.

11. Cream Filling for Cup Cakes

| PER CENT | INGREDIENTS | LBS | OZS | METHODS |
|---|---|---|---|---|
| .390 | Powdered Sugar | 7 | 8 | Beat light for 7 minutes on high speed. |
| .195 | Emulsifying Shortening | 3 | 12 | |
| .078 | Cake Flour | 1 | 8 | |
| .013 | 1/4 Pint Whole Egg | | 4 | |
| .013 | 1/4 Pint Egg White | | 4 | |
| .003 | Butter Culture or Butter Flavor (optional) | | 1 | |
| .002 | Salt | | 3/4 | |
| | Vanilla (to taste) | | | |
| .130 | Water | 2 | 8 | Boil water, and add stabilizer sugar while boiling. Let cool, then add to above. Whip up light. |
| .013 | Sugar | | 4 | |
| .007 | Stabilizer (agar-agar) | | 2 | |
| .052 | Cake Flour | 1 | | Add. Whip until light. |
| .104 | Powdered Sugar | 2 | | |
| 1.000 | Totals | 19 | 3 3/4 | |

12. Swiss Meringue Icing

| PER CENT | INGREDIENTS | LBS. | OZS. |
|---|---|---|---|
| .333 | Egg White | 2 | 1 |
| .667 | Sugar (granulated) | 4 | 2 |

Heat to 150° F.
Whip 15 minutes.

13. Special Icings

(a) Swiss Meringue

| INGREDIENTS | LBS. | OZS. | METHOD |
|---|---|---|---|
| Egg Whites | 1 | 1 (1 pt.) | Heat to 150° F. in hot water bath. Mix on 2nd speed of a 3 speed machine for 12 to 15 minutes. |
| Granulated Sugar | 2 | | |

Keep machine operating while using.

(b) Cream Icing for Decorating

| INGREDIENTS | LBS. | OZS. | METHOD |
|---|---|---|---|
| 6x Powdered Sugar | 10 | | Mix by hand till smooth. |
| Shortening | 2 | 8 | |
| Non-fat dry milk | | 6 | |
| Water | 1 | 8 | Add and mix by hand or machine till smooth. Avoid over mixing. |
| Vanilla (to taste) | | | |
| Salt | | 1 1/4 | |

(c) Gum Paste

| INGREDIENTS | LBS. | OZS. | METHOD |
|---|---|---|---|
| Pure granular gelatin | | 1 1/2 | Dissolve gelatin in warm water and strain. |
| Water | 1 | (1 pt.) | |
| 6x Powdered sugar | 12 | | Mix till smooth. Keep covered when using to prevent crusting. |
| Corn Starch | | 6 | |

(d) Royal Icing

| INGREDIENTS | LBS. | OZS. | METHOD |
|---|---|---|---|
| 6x Powdered sugar | 8 | | Mix till smooth. Keep |
| Egg white | 2 | 2 (1 pt.) | covered while using to |
| Cream of tartar | | 1 | prevent crusting. |

(e) Marzipan

| INGREDIENTS | LBS. | OZS. | METHOD |
|---|---|---|---|
| Almond paste | 2 | | Mix till smooth and keep |
| 6x Powdered sugar | 2 | 8 | covered. |
| Egg white | | 3 | |
| Glucose | | 2 | |

(f) Rock Sugar

| INGREDIENTS | LBS. | OZS. | METHOD |
|---|---|---|---|
| Granulated sugar | 2 | 8 | Bring to 280° F. No acid |
| Water | 1 | (1 pt.) | needed for conversion. |

Add royal icing made from egg white and sugar and stir. Allow to raise and drop. Continue to stir until it raises again. When beginning to drop, pour out into a prepared box, or frame. It should then raise the third time and stay up.

14. Jelly Made From Pectin Powder

| PER CENT | INGREDIENTS | LBS. | OZS. | METHODS |
|---|---|---|---|---|
| .391 | Water | 12 | | Bring to boil. |
| .024 | Pectin Powder | | 12 | Add and bring to boil. |
| .585 | Granulated Sugar | 18 | | Stir in. |
| | Pour into can immediately and do not disturb till cool. | | | |

15. Casting Jelly

| PER CENT | INGREDIENTS | LBS. | OZS. | METHODS |
|---|---|---|---|---|
| .425 | Water | 10 | 6 | Bring to boil. |
| .010 | Pectin (100 grade) | | 4 | Add and stir in until |
| .041 | Granulated sugar | 1 | | dissolved. |
| .287 | Granulated sugar | 7 | | Add and heat to about |
| .205 | Corn syrup | 5 | | 200° F. |
| .020 | Honey | | 8 | |
| .005 | Powdered citric acid | | 2 | Dissolve citric acid in |
| .007 | Water | | 3 | water and add to above. |
| | | | | Allow to set for about |
| | | | | 3 minutes. |

REMARKS: To speed-up setting add somewhat more powdered citric acid.

Color and flavor should be added before the acid solution is added.

16. Prepared Agar Base

| PER CENT | INGREDIENTS | LBS. | OZS. | METHODS |
|---|---|---|---|---|
| .002 | Agar-Agar | | 1/2 | Dissolve Agar-Agar in |
| .344 | Water | 2 | 4 | water and bring to boil. |
| .458 | Granulated Sugar | 3 | | Add to above and bring to |
| .005 | Salt | | 1/2 | another boil. Let cool be- |
| .191 | Nulomoline or invert syrup | 1 | 4 | fore using. |

The Agar Base may be made up in a large batch and used when needed.

17. Whipped Cream

| PER CENT | INGREDIENTS | LBS. | OZS. | METHODS |
|---|---|---|---|---|
| .530 | Whole Milk | 4 (2 qts.) | 5 | Add to copper bowl and |
| .185 | Emulsifying shortening | 1 | 8 | bring to 145° F. Pass |
| .185 | Sweet Cream Butter | 1 | 8 | through hemogenizer in- |
| .023 | Non-fat Dry Milk | | 3 | to a stone jar. |
| .077 | Cane Sugar | | 10 | |
| 1.000 | Totals | 8 | 2 | |

REMARKS: Place in refrigerator and stir each fifteen minutes till cool. Allow to stand for 24 hours; whip in chilled bowl on second speed. Avoid over-whipping. Flavor while whipping.

# CHAPTER 23

## COOKIES

Numerous varieties of bakers cookies are produced in the various states, mostly by retail bakers. Bakers cookies are quite different to so called wholesale factory type cookies, the latter of which are smaller, harder, and packaged. Cookies of this type are made from specially constructed formulas containing no ingredients that interfere with machine operating; such as fruits, cocoanut, etc.

"Bagged" and "hand dropped" cookies are usually produced in bakeries. However, some bakers produce types of "machine cut" cookies highly excellent in quality.

Bakers type cookies of good quality are one of the baked foods in great demand at retail bakery stores and are also one of the most profitable products produced.

The following formulas are representative of some of the better types of cookies being made by retail bakers throughout the country.

1. Preparation of Pans

Pans should be cleaned before greasing by wiping with a clean burlap cloth. This will remove any parts of cookies adherring to used pans. If a scraper is used it will scratch the pans and encourage sticking of the cookies. Always use cool pans as warm pans will melt shortening in batter. Pans should be greased very lightly. Any excess pan grease should be wiped off with a small cloth. If the cookies spread too much and have a sharp thin edge, the pans should be dusted, before using, with flour. That will correct this trouble.

2. Types of Ingredients to Use

Unbleached pastry flour should be used. Shortening should be "All-Hydrogenated". If a long shelf life is desired a "High Stability Shortening" should be used. Fine granulated sugar proves satisfactory for most cookies.

However, for greater spread a coarse granulated sugar should be used.

3. Methods of Incorporation of Ingredients

Most cookies are made by creaming sugar and shortening together; then adding eggs, next water, and finally flour. Many bakers are using the one stage method of adding all ingredients at one time and mixing. Either method is satisfactory, but one should remember the more a cookie dough is mixed after the flour is added the tougher the cookies will be. If a great spread is desired it is recommended to add half of the sugar with the flour in the last stage.

4. Dough Consistency

Dough consistency depends upon the type of the cookie one desires. A rock cookie dough should be very stiff and a drop cookie, or bag cookie dough should be very soft. Correct consistency may be determined by experiments.

5. Panning Cookie Doughs

Most cookies are small. When hand dropped or bagged they should be approximately the size of a walnut. Machine cut cookies should be somewhat smaller. Cookies, as a rule, have a better taste when made thin.

6. Time of Cookie Baking

Baking time of cookies will depend upon the type of cookie. Some cookies are baked at a very low temperature to produce a chewy type, such as brownies. Usually the best way to determine when a cookie is baked is by observing their crust color. One must remember that cookies will continue to bake on the hot pans after being removed from oven. There is no definite time for baking cookies. Each type of cookie

requires a different baking time - this depending upon the amount of moisture, sugar, milk, and syrup in the dough.

7. Oven Temperature

Most cookies are baked at 360° F. to 380° F.; however, some cookies, such as macaroons, are baked at 335° F. to 350° F. A hot oven will set cookies before they have a chance to spread. A cold oven will produce cookies that will be dry, crumbly, light in color, and cause excessive spreading.

8. Removing from Pans

Most cookies should be removed from pans while they are still warm. A light striking of the pan is usually enough to jar them loose. However, some types will release easily when cold.

9. Excessive Spreading

Too heavy pan greasing causes excessive spreading. However, this is not the only cause. Too much leveling agent, or too much sugar in dough produce the same result. A cold oven, a high percentage of water in dough, a high percentage of shortening, and an insufficient amount of egg are other reasons for excessive spreading while baking. The desired type of sugar to use is a fine granulated. If coarse granulated is used, this also causes excessive spreading. If granules are too large, there will be very little spread, since the sugar will not have had time to dissolve or become converted while the cookies are baking.

10. Types of Cookies

There are many types of cookies with varying moisture content. The rock type cookie contains about 20% moisture, hand cut about 27% moisture, machine

cut about 40% moisture, hand dropped about 35% moisture, and the bag type about 55% moisture. The amount of moisture, sugar, shortening, and other ingredients will determine the appearance, the amount of spread, etc. Most cookie formulas can be changed so as to produce different types. As an example, one can change the moisture content in a formula so as to make rock cookie, hand cut, machine cut, hand dropped or bagged type. Another formula change is that of the leveling agent. Soda and ammonia cause spreading of cookies. Baking powder increases volume. Soda produces an undesirable taste and should not be used in excess. Ammonia should be used only in a flat type cookie that is dry, as excessive moisture will retain the aroma of ammonia.

1. Short Wafer (Fancy)

| PER CENT | INGREDIENTS | LBS. | OZS. | METHODS |
|---|---|---|---|---|
| .377 | Cake Flour | 2 | | Cream all together till light. Color in various shades. Bake at 325° F. |
| .283 | Hydrog. Shortening | 1 | 8 | |
| .118 | Sugar | | 10 | |
| .009 | Salt | | 3/4 | |
| .047 | Milk Powder | | 4 | |
| .048 | Honey | | 4 | |
| .118 | Egg White | | 10 | |
| | Vanilla | | | |
| 1.000 | Totals | 5 | 4 3/4 | |

2. Orange Dainties

| PER CENT | INGREDIENTS | LBS. | OZS. | METHODS |
|---|---|---|---|---|
| .156 | Granulated Sugar | 1 | 8 | Cream light. |
| .214 | Hydrogenated Shortening | 2 | | |
| .104 | Butter | 1 | | |
| .308 | Bread Flour | 3 | | |
| .104 | Cake Flour | 1 | | |
| .104 | Ground Pecans | 1 | | |
| .019 | Grated Orange Peel | | 3 | |
| | Salt | | | |
| | Vanilla | | | |
| 1.000 | Totals | 9 | 11 | |

Bag out 1 1/2" long with medium Plain Tube and bake. Roll in icing Sugar when cool. Baking Temperature: 360° F.

3. Torte Cookies

| PER CENT | INGREDIENTS | LBS. | OZS. | METHODS |
|---|---|---|---|---|
| .181 | Sugar | 1 | 10 | Introduce into mixing bowl |
| .222 | Shortening (hydrogenated) | 2 | | and mix till smooth. |
| .472 | Cake Flour | 4 | 4 | |
| .007 | Salt | | 1 | |
| .007 | Fruit Flavor | | 1 | |
| .111 | Whole Egg | 1 | | |
| 1.000 | Totals | 9 | | |

Remarks: To make Chocolate - Replace fruit flavor with 6 oz. cocoa.

To make Butterscotch - Replace fruit flavor with 6 oz. Butterscotch Fudge.

Roll out 1 lb. strips as for Fruit Bars - cut into 1/2 oz. pieces - place on pan - make impression in center, using end of small rolling pin.

Bake (dry) at 300° F.

Ice with any type icing available, using star type tube to fill center hole.

4. Ice Box Cookies - No. 1

| PER CENT | INGREDIENTS | LBS. | OZS. | METHODS |
|---|---|---|---|---|
| .241 | Powdered Sugar | 3 | 8 | Cream together. |
| .310 | *Vegetable Shortening and Margarine | 4 | 8 | |
| .002 | Salt | | 1/2 | |
| | Vanilla and lemon (to taste) | | | |
| .034 | Whole Egg | | 8 | Add. |
| .413 | Pastry Flour | 6 | | Sift and add. |
| 1.000 | Totals | 14 | 8 1/2 | |

*All vegetable shortening: 50% vegetable shortening and 50% Margarine: or all margarine may be used.

Form dough into 1 1/2 inch rolls and wrap in waxed paper. Chill in refrigerator until firm. Slice 1/8 inch thick and lay slices on ungreased cookie pans.

Bake light at 375° F.
Plain cookies can be topped with candied fruits and nuts.

Candied fruits, nuts, cocoa, melted chocolate, coloring, etc., can be added to this basic dough, as desired. Suitable for checkerboards, whirligigs, etc.

5. Ice Box Cookies - No. 2

| PER CENT | INGREDIENTS | LBS. | OZS. | METHODS |
|---|---|---|---|---|
| .184 | Icing Sugar | 2 | 8 | Mix for 1/2 minute. |
| .220 | Hydrogenated Shortening | 3 | | |
| .074 | Butter | 1 | | |
| .009 | Salt | | 2 | |
| | Vanilla | | | |
| | Lemon Flavor | | | |
| .073 | Egg Whites | 1 | | Add to above and mix for 1/2 minute. |
| .440 | Cake Flour (var.) | 6 | | Add to above and mix smooth. |
| 1.000 | Totals | 13 | 10 | |

For Chocolate dough add 2 oz. Cocoa, 2 oz. Hydrogenated Shortening, 2 oz. Icing Sugar and mix smooth by hand. Pink, Green, or Yellow color may be added parts of dough to make up various designs. Made-up dough should be refrigerated, sliced while cold, then cut and baked.

Baking Temperature: 370° F.

6. Cocoanut Macaroons

| PER CENT | INGREDIENTS | LBS. | OZS. | METHODS |
|---|---|---|---|---|
| .373 | Granulated Sugar | 4 | | Mix together well and |
| .373 | Macaroon cocoanut | 4 | | heat in water bath to |
| .047 | Cake Flour | | 8 | about 110° F. |
| .003 | Salt | | 1/2 | |
| .003 | Vanilla | | 1/2 | |
| .201 | 1 Qt. egg white | 2 | 2 1/2 | |
| 1.000 | Totals | 10 | 11 1/2 | |

Bag out on papered pans using No. 8 or No. 9 star tube.
Bake at 325° F. - 350° F.

7. Cocoanut Kisses and Macaroon Cup Cakes

| PER CENT | INGREDIENTS | LBS. | OZS. | METHODS |
|---|---|---|---|---|
| .183 | Egg White | 2 | 4 | Whip to wet peak. |
| .003 | Salt | | 1/2 | |
| .407 | Granulated Sugar | 5 | | Add slowly to above and beat until stiff. |
| .407 | Macaroon Cocoanut | 5 | | Fold in by hand. |
| | Vanilla | | 1/2 | |
| 1.000 | Totals | 12 | 5 | |

Bake at 325° F.

8. Turkish Macaroons

| PER CENT | INGREDIENTS | LBS. | OZS. | METHODS |
|---|---|---|---|---|
| .421 | Powdered Sugar | 3 | | Mix. |
| .158 | Cocoanut | 1 | 2 | |
| .070 | Flour - cake or pastry | | 8 | |
| .105 | Pecans | | 12 | Chop up and add to above. |
| .105 | Dates | | 12 | |
| .141 | Egg White (1 pt.) | 1 | | Add to above. |
| 1.000 | Totals | 7 | 2 | |

9. French Macaroons

| PER CENT | INGREDIENTS | LBS. | OZS. | METHODS |
|---|---|---|---|---|
| .167 | Granulated Sugar | 1 | 4 | Break up fine. |
| .167 | Icing Sugar | 1 | 4 | |
| .267 | Macaroon Paste | 2 | | |
| .266 | Almond Paste | 2 | | |
| .133 | Egg White (var.) | 1 | | Add or reduce Egg White so that mix will be medium stiff. |
| 1.000 | Totals | 7 | 8 | |

Bag out on paper-lined pans. Decorate with Fruit or Nuts. Let stand out for 3 hours and then bake on double pans in very hot oven for only a few minutes. Glaze while still hot with a hot mixture of 2 parts Glucose and 1 part Water. Baking Temperature: 450° F.

10. Chocolate Pastels

| PER CENT | INGREDIENTS | LBS. | OZS. | METHODS |
|---|---|---|---|---|
| .186 | Almond Paste | 1 | | Break up fine. |
| .233 | Granulated Sugar | 1 | 4 | |
| .233 | Icing Sugar | 1 | 4 | |
| .186 | Egg White | 1 | | Add very slowly to above. |
| .069 | Melted Chocolate (110° F.) | | 6 | Add to above and mix smooth. |
| .093 | Finely Ground Nuts | | 8 | Mix into above. |
| 1.000 | Totals | 5 | 6 | |

Heat entire mix on double boiler to 110° F. and bag out on greased and dusted pans. Dry for 2 hours and bake with door and damper open. Baking Temperature: 350° F.

11. Light Fruit Bars

| PER CENT | INGREDIENTS | LBS. | OZS. | METHODS |
|---|---|---|---|---|
| .145 | Granulated Sugar | 4 | | Cream light. |
| .073 | Hydrogenated Shortening | 2 | | |
| .002 | Salt | | 1 | |
| .001 | Soda | | 1/2 | |
| .001 | Cinnamon | | 1/2 | |
| .109 | Honey | 3 | | |
| .027 | Whole Egg | | 12 | Add slowly to above. |
| .018 | Water | | 8 | Add slowly to above. |
| .182 | Cake Flour | 5 | | Sift, add to above and |
| .006 | Baking Powder | | 3 | mix smooth. |
| .145 | Medium Cocoanut | 4 | | Add to above and mix |
| .291 | Mixed Fruits and Raisins | 8 | | smooth. |
| 1.000 | Totals | 27 | 9 | |

Scale into 12 oz. pieces, roll into strips, flatten and wash. After baking, cut while still warm.

Baking Temperature: 360° F.

12. Chocolate Bars

| PER CENT | INGREDIENTS | LBS. | OZS. | METHODS |
|---|---|---|---|---|
| .320 | Granulated Sugar | 5 | | Cream light. |
| .064 | Hydrogenated Shortening | 1 | | |
| .095 | Melted Chocolate 110° F. | 1 | 8 | |
| .010 | Salt | | 2 1/2 | |
| .064 | Whole Egg | 1 | | Add slowly to above. |
| .095 | Glucose | 1 | 8 | Add slowly to above. |
| .048 | Water | | 12 | |
| .256 | Bread Flour | 4 | | Add to above and mix smooth. |
| .048 | Chopped Pecans | | 12 | Add to above and mix smooth. |
| | Vanilla | | | |
| 1.000 | Totals | 15 | 10 1/2 | |

Scale into 10 oz. pieces, roll into strips, flatten and wash. After baking cut while still warm.

Baking Temperature: 360° F.

13. Fruit Bar Cookies

| PER CENT | INGREDIENTS | LBS. | OZS. | METHODS |
|---|---|---|---|---|
| .197 | Sugar | 4 | | Cream. |
| .074 | Hydrogenated Shortening | 1 | 8 | |
| .049 | Whole Egg | 1 | | |
| .00152 | Salt | | 1/2 | |
| .071 | Dark Molasses (1 pt.) | 1 | 7 | Add and mix in. |
| .0354 | Malt Syrup (1/2 pt.) | | 11 1/2 | |
| .00004 | Cinnamon | | 1/8 | |
| .00004 | Allspice | | 1/8 | |
| .172 | Raisins | 3 | 8 | |
| .101 | Water (1 qt.) | 2 | 1 | Add and stir in. |
| .005 | Soda | | 1 3/4 | |
| .196 | Cake Flour | 4 | | Add and mix enough to in- |
| .098 | Bread Flour | 2 | | corporate. Do not overmix. |
| 1.000 | Totals | 20 | 6 | |

14. Vanilla Jumbles

| PER CENT | INGREDIENTS | LBS. | OZS. | METHODS |
|---|---|---|---|---|
| .234 | Granulated Sugar | 4 | | Cream light. |
| .176 | Hydrogenated Shortening | 3 | | |
| .003 | Salt | | 1 | |
| | Vanilla | | | |
| .117 | Whole Egg | 2 | | Add slowly to above. |
| .058 | Liquid Milk (var.) | 1 | | Stir and add slowly to above. |
| .002 | Ammonia | | 1/2 | |
| .410 | Cake Flour | 7 | | Add to above and mix smooth. |
| 1.000 | Totals | 17 | 1 1/2 | |

Bag out in rings with large Star Tube on greased and dusted pans.
Rest for 30 minutes before baking.

Baking Temperature: 380° F.

15. Oatmeal Cookies

| PER CENT | INGREDIENTS | LBS. | OZS. | METHODS |
|---|---|---|---|---|
| .254 | Brown Sugar | 3 | | Cream. |
| .126 | Hydrogenated Shortening | 1 | 8 | |
| .042 | Whole Egg | | 8 | |
| .001 | Salt | | 1/4 | |
| .105 | Ground Raisins | 1 | 4 | Add and Cream. |
| .084 | Water | 1 | | Add and mix well. |
| .008 | Soda | | 1 1/2 | |
| .126 | Oatmeal | 1 | 8 | Add and mix well. |
| .254 | Pastry Flour | 3 | | |
| 1.000 | Totals | 11 | 13 3/4 | |

REMARKS: Before grinding Raisins, soak for 15 to 20 minutes and drain thoroughly.

Scale cookies 1 1/4 oz. each. — 153 servings

16. Oatmeal Raisin Cookies

| PER CENT | INGREDIENTS | LBS. | OZS. | METHODS |
|---|---|---|---|---|
| .304 | Granulated Sugar | 3 | 8 | Scale all the ingredients |
| .141 | Vegetable Shortening | 1 | 10 | in the mixing bowl and |
| .005 | Soda | | 1 | mix at medium speed to |
| .006 | Salt | | 1 1/4 | a smooth dough. (About |
| .001 | Cinnamon | | 1/8 | 1 to 2 minutes). |
| | Vanilla (to taste) | | | |
| .109 | Oatmeal (whole) | 1 | 4 | |
| .043 | Raisins (ground) | | 8 | |
| .282 | Pastry Flour | 3 | 4 | |
| .109 | Water (variable) | 1 | 4 | |
| 1.000 | Totals | 11 | 13 3/4 | |

MAKE UP: Scale the dough into 16 oz. pieces. Mold and roll up by hand into round strips 16" long. Cut into twenty-four equal pieces, place on lightly greased pans and flatten by hand. Use a cookie stamp or some other design to produce an embossed effect. This mix can be used for hand-cut and machine cookies.

SCALING: Scale the cookies about 8 ozs. per dozen.

17. Oatmeal Rocks

| PER CENT | INGREDIENTS | LBS. | OZS. | METHODS |
|---|---|---|---|---|
| .199 | Granulated Sugar | 6 | | |
| .132 | Hydrogenated Shortening | 4 | | |
| .017 | Milk Powder | | 8 | |
| .004 | Soda | | 2 | |
| .002 | Cinnamon | | 1 | |
| .002 | Salt | | 1 | |
| | Vanilla | | | |
| .066 | Whole Egg | 2 | | Add slowly to above. |
| .066 | Water | 2 | | Add slowly to above. |
| .215 | Bread Flour | 6 | 8 | Add to above and mix smooth. |
| .198 | Raisins | 6 | | Add to above and mix smooth. |
| .066 | Rolled Oats | 2 | | |
| .033 | Chopped Nuts | 1 | | |
| 1.000 | Totals | 30 | 4 | |

Drop out small on greased and dusted pans. Flatten with a die or fork and wash.

Baking Temperature: 360° F.

18. Chocolate Rocks

| PER CENT | INGREDIENTS | LBS. | OZS. | METHODS |
|---|---|---|---|---|
| .261 | Granulated Sugar | 5 | | Cream light. |
| .104 | Hydrogenated Shortening | 2 | | |
| .003 | Soda | | 1 | |
| .007 | Salt | | 2 | |
| | Vanilla | | | |
| .104 | Whole Egg | 2 | | Add slowly to above. |
| .104 | Glucose | 2 | | Add to above and mix smooth. |
| .052 | Melted Chocolate | 1 | | Add to above and mix smooth. |
| .235 | Cake Flour | 4 | 8 | Sift, add to above and mix smooth. |
| .026 | Bread Flour | | 8 | |
| .104 | Chopped Pecans | 2 | | |
| 1.000 | Totals | 19 | 3 | |

Drop out small on greased and dusted pans. Flatten with a die or fork and wash.

Baking temperature: 360° F.

19. Butterscotch Rocks

| PER CENT | INGREDIENTS | LBS. | OZS. | METHODS |
|---|---|---|---|---|
| .301 | Brown Sugar | 7 | 8 | Cream light. |
| .181 | Hydrogenated Shortening | 4 | 8 | |
| .008 | Salt | | 3 | |
| | Vanilla | | | |
| .120 | Whole Egg | 3 | | Add slowly to above. |
| .240 | Cake Flour | 6 | | Sift, add to above and |
| .030 | Bread Flour | | 12 | mix smooth. |
| .120 | Chopped Pecans | 3 | | |
| 1.000 | Totals | 24 | 15 | |

Drop out small on greased and dusted pans.

Baking temperature: 360° F.

20. Cherry Rock Cookies

| PER CENT | INGREDIENTS | LBS. | OZS. | METHODS |
|---|---|---|---|---|
| .078 | Butter | | 12 | Cream well. |
| .078 | Hydrogenated shortening | | 12 | |
| .156 | Sugar | 1 | 8 | |
| .039 | Egg Yolk | | 6 | Add gradually to above. |
| .039 | Whole Egg | | 6 | |
| .002 | Soda | | 1/4 | Dissolve soda in |
| .080 | Honey (1/2 pint) | | 12.2 | honey. Add to mix with |
| .003 | Vanilla | | 1/2 | vanilla and salt. |
| .002 | Salt | | 1/4 | |
| .104 | Chopped Cherries | 1 | | Add to above. |
| .104 | Chopped Pecans | 1 | | |
| .313 | Sifted Cake Flour | 3 | | Add to above. Incorpor- |
| .002 | Baking Powder | | 1/4 | ate lightly together without overmixing. Place in re- frigerator for at least one hour. |
| 1.000 | Totals | 8 | 13 1/4 | |

Scale at 2-lb. pieces.

21. Raisin Rocks

| PER CENT | INGREDIENTS | LBS. | OZS. | METHODS |
|---|---|---|---|---|
| .004 | Soda | | 1 1/2 | Cream. |
| .009 | Cream of Tartar | | 3 | |
| .183 | Granulated Sugar | 4 | | |
| .160 | Hydrogenated Shortening | 3 | 8 | |
| .092 | Whole Egg | 2 | | |
| .001 | Vanilla | | 1/2 | |
| .001 | Lemon Emulsion | | 1/8 | |
| .001 | Salt | | 1/2 | |
| .183 | Raisins (soaked) | 4 | | Mix in. |
| .366 | Pastry Flour | 8 | | Mix in only until flour has taken up all moisture and flour is mixed in. |
| 1.000 | Totals | 21 | 13 5/8 | |

22. Butter Cookies

| PER CENT | INGREDIENTS | LBS. | OZS. | METHODS |
|---|---|---|---|---|
| .112 | Hydrogenated Shortening | 2 | | Cream well. |
| .112 | Butter | 2 | | |
| .251 | Sugar | 4 | 8 | |
| .105 | Whole Egg | 1 | 14 | Add slowly. |
| .028 | Liquid Milk | | 8 | Add. |
| .390 | Sifted Cookie Flour | 7 | | |
| .001 | Soda | | 1/2 | Add and fold in. |
| .001 | Salt | | 1/4 | |
| | Flavor (lemon to taste) | | | |
| 1.000 | Totals | 17 | 14 3/4 | |

23. Butter Rocks

| PER CENT | INGREDIENTS | LBS. | OZS. | METHODS |
|---|---|---|---|---|
| .188 | Granulated Sugar | 4 | | Cream till light. |
| .094 | Hydrogenated Shortening | 2 | | |
| .047 | Butter | 1 | | |
| .006 | Cream of Tartar | | 2 | |
| .003 | Soda | | 1 | |
| .003 | Salt | | 1 | |
| | Lemon Flavor | | | |
| .094 | Whole Egg | 2 | | Add slowly to above. |
| .189 | Bread Flour | 4 | | Sift, add to above and mix smooth. |
| .094 | Cake Flour | 2 | | |
| .188 | Raisins | 4 | | Add to above and mix lightly. |
| .047 | Chopped Nuts | 1 | | |
| .047 | Chopped Cherries | 1 | | |
| 1.000 | Totals | 21 | 4 | |

Drop out small on greased and dusted pans. Flatten with a die or fork and wash.

Baking Temperature: 360° F.

24. Cocoanut Butter Crisps

| PER CENT | INGREDIENTS | LBS. | OZS. | METHODS |
|---|---|---|---|---|
| .172 | Granulated Sugar | 2 | 8 | Cream sugars, butter, shortening, etc., several minutes on 2nd speed. |
| .068 | Brown Sugar | 1 | | |
| .068 | Margarine | 1 | | |
| .068 | Hydrogenated Shortening | 1 | | |
| .002 | Salt | | 1/2 | |
| .004 | Vanilla | | 1 | |
| .026 | Whole Egg | | 6 | Add egg & yolk gradually. |
| .026 | Egg Yolk | | 6 | |
| .116 | Milk (approx. 1 1/2 pt.) | 1 | 11 | Dissolve soda in milk and add alternately with cocoanut. |
| .002 | Soda | | 1/2 | |
| .206 | Fine Macaroon Cocoanut | 3 | | |
| .172 | Cake Flour | 2 | 8 | Add sifted flours and baking powder, mix lightly. Do not toughen this mix. |
| .068 | Whole Wheat Flour | 1 | | |
| .002 | Baking Powder | | 1/2 | |
| 1.000 | Totals | 14 | 9 1/2 | |

Fill bag and large star tube with the mix, and run out evenly on greased and floured pans, in even finger shape. When all are run out, allow to stand for at least one hour; this will insure a more uniform shape during baking.

Bake at 350° to 380° F. to delicate golden color. Avoid overbaking and dark colored edges.

25. Hermits

| PER CENT | INGREDIENTS | LBS. | OZS. | METHODS |
|---|---|---|---|---|
| .184 | Sugar | 8 | | Cream. |
| .003 | Salt | | 2 | |
| .006 | Soda | | 4 | |
| .003 | Nutmeg | | 2 | |
| .091 | Hydrogenated Shortening | 4 | | |
| .046 | Whole Egg | 2 | | Add gradually. |
| .034 | Corn Syrup | 1 | 8 | Add. |
| .063 | Water | 2 | 12 | Add. |
| .323 | Pastry Flour | 14 | | Sift, add, and mix till smooth. |
| .069 | Chopped Nuts | 3 | | Fold in. |
| .069 | Cherries | 3 | | |
| .109 | Raisins | 4 | 12 | |

REMARKS: Scale 1 lb. pieces; roll out; and place lengthwise on lightly greased pans. Wash with rich egg wash and bake at 375° F. While warm ice with thin water icing and cut.

26. Brownies

| PER CENT | INGREDIENTS | LBS. | OZS. | METHODS |
|---|---|---|---|---|
| .244 | Sugar | 4 | 8 | Cream. |
| .122 | Hydrogenated Shortening | 2 | 4 | |
| .003 | Salt | | 1 | |
| .002 | Cinnamon | | 1/2 | |
| .081 | Glucose | 1 | 8 | Add to above. |
| .163 | Whole Egg | 3 | | Add gradually. |
| .081 | Melted Chocolate | 1 | 8 | Add, and mix slowly. |
| .163 | Cake Flour | 3 | | Sift together and add. |
| .005 | Baking Powder | | 1 1/2 | |
| .136 | Nuts | 2 | 8 | Finally, fold in. |
| 1.000 | Totals | 18 | 7 | |

27. Chocolate Pecan Drop Cookies

| PER CENT | INGREDIENTS | LBS. | OZS. | METHODS |
|---|---|---|---|---|
| .205 | Granulated Sugar | 4 | | Cream well. |
| .153 | Hydrogenated Shortening | 3 | | |
| .002 | Salt | | 1/2 | |
| .002 | Vanilla | | 1/2 | |
| .102 | Whole Eggs | 2 | | Add to creamed mixture and cream slightly. |
| .127 | Corn Syrup | 2 | 8 | Add to above and mix in. |
| .102 | Melted chocolate | 2 | | Add to above and mix in. |
| .205 | Pastry flour | 4 | | Fold in by hand. |
| .102 | Chopped Pecans | 2 | | |

Drop in sizes about size of a quarter on lightly greased 9 x 6 pans.

28. Chocolate Chip Cookies

| PER CENT | INGREDIENTS | LBS. | OZS. | METHODS |
|---|---|---|---|---|
| .119 | Brown Sugar | 1 | 8 | Scale all the ingredients into the mixing bowl at one time and mix at medium speed to a smooth dough. Mix about 2 1/2 minutes on second speed. |
| .119 | Granulated Sugar | 1 | 8 | |
| .118 | Hydrogenated Shortening | 1 | 8 | |
| .005 | Salt | | 1 | |
| .004 | Soda | | .75 | |
| .238 | Pastry Flour | 3 | | |
| .079 | Chopped Nuts | 1 | | |
| .039 | Water (variable) | | 8 | |
| .120 | Whole Egg | 1 | 8 | |
| | Flavor(to taste) | | | |
| .159 | Chocolate pieces | 2 | | |
| 1.000 | Totals | 12 | 9.75 | |

MAKE UP: Drop out the cookies by hand or with large tube bag on lightly greased pans.

SCALING: Scale the cookies approximately 8 ozs. per dozen. – approximately 25 dozen

*Chocolate pieces can be purchased through bakery supply houses, or sweet or semi-sweet chocolate can be broken up into small pieces.

BAKING: Bake very light at 375° to 400° F.

29. Peanut Butter Cookies

| PER CENT | INGREDIENTS | LBS. | OZS. | METHODS |
|---|---|---|---|---|
| .182 | Hydrogenated Shortening | 1 | 12 | Cream until mixed together. |
| .182 | Peanut Butter | 1 | 12 | |
| .182 | Granulated Sugar | 1 | 12 | Add and cream in. |
| .104 | Brown Sugar | 1 | | |
| .005 | Soda | | 3/4 | |
| .002 | Salt | | 1/4 | |
| .078 | Whole Egg | | 12 | Cream. |
| .262 | Cake Flour | 2 | 8 | Fold on. |
| .003 | Baking Powder | | 1/2 | |
| 1.000 | Totals | 9 | 9 1/2 | |

Scale 10 ozs. to the dozen. – 15 dozen

Bake at 380° F.

30. Sugar Cookies

| PER CENT | INGREDIENTS | LBS. | OZS. | METHODS |
|---|---|---|---|---|
| .278 | Granulated Sugar | 4 | | Cream. |
| .139 | Hydrogenated Shortening | 2 | | |
| .002 | Salt | | 1/2 | |
| .069 | Whole Egg | 1 | | |
| .002 | Vanilla | | 1/2 | |
| .018 | Powdered Milk | | 4 | |
| .003 | Ammonium Bicarbonate | | 3/4 | Dissolve together and mix into above creamed mass. |
| .002 | Soda | | 1/2 | |
| .070 | Water | 1 | | |
| .417 | Pastry Flour | 6 | | Add and mix until moisture has been taken in by flour and all flour is mixed in. Avoid over-mixing. |
| 1.000 | Totals | 14 | 6 1/4 | |

Scale 9 oz. to the dozen. 25 dozen

Pan 7 x 4 on lightly greased cookie sheet.

Press down with 1 pound weight that has been dipped into granulated sugar.

Bake at 360° F.

31. Sugar Cookies - Machine

| PER CENT | INGREDIENTS | LBS. | OZS. | GRAMS | METHODS |
|---|---|---|---|---|---|
| .2834 | Sugar | 2 | 3 1/4 | | Cream. |
| .1271 | Hydrogenated Shortening | 1 | 4 1/4 | | |
| .0047 | Salt | | 1 | | |
| .0019 | Soda | | 1/3(.304) | 8 1/2* | Add. |
| .0037 | Ammonia | | 2/3(.529) | 16 3/4* | |
| .0376 | Water | | 6 | | |
| .0752 | Whole Egg | | 12 | | Add. |
| .0752 | Liquid Milk | | 12 | | |
| .3875 | Flour | 3 | 14 | | Add. |
| .0037 | Baking Powder | | 2/3(.592) | 16 3/4* | |
| 1.0000 | Totals | 10 | | | |

*Equivalents of fractions of ounces.

32. Belgian Slices

| PER CENT | INGREDIENTS | LBS. | OZS. | METHODS |
|---|---|---|---|---|
| .320 | Brown Sugar | 5 | | Cream well. |
| .006 | Salt | | 1 1/2 | |
| .002 | Soda | | 1/2 | |
| .160 | Hydrogenated Shortening | 2 | 8 | |
| .064 | Whole Egg | 1 | | Add and cream. |
| | Vanilla | | | |
| .128 | Chopped Nuts | 2 | | Add and stir in. |
| .320 | Pastry Flour | 5 | | Add to above and mix to a smooth dough only. |
| 1.000 | Totals | 15 | 10 | |

Pack dough into a well-dusted 18x24 inch cake pan and chill thoroughly. Cut into 1 1/4 inch square bar and slice 1/4-inch thick. Place on lightly greased cookie pans. Bake at 375° F.

The above batch formula will produce one sheet.

33. Cinnamon-Pecan Cookies

| PER CENT | INGREDIENTS | LBS. | OZS. | METHODS |
|---|---|---|---|---|
| .2900 | Sugar | 7 | 4 | Cream until smooth. |
| .0025 | Salt | | 1 | |
| .0050 | Soda | | 2 | |
| .0100 | Cinnamon | | 4 | |
| .0900 | Margarine | 2 | 4 | |
| .0725 | Hydrogenated Shortening | 1 | 13 | |
| .0900 | Whole Egg | 2 | 4 | Add water, egg, molasses and vanilla slowly and cream smooth and light. |
| .0200 | Molasses | | 8 | |
| .0200 | Water | | 8 | |
| | Vanilla (to taste) | | | |
| .3300 | Cake Flour | 8 | 4 | Add flour, mix smooth. Add pecans and mix to distribute evenly. |
| .0700 | Pecan Pieces | 1 | 12 | |
| 1.0000 | Totals | 25 | (or 400 ounces) | |

# CHAPTER 24

## PIES

One type of pies made by bakers is known as "Cream Pies" such as; Chocolate, Lemon, Cocoanut and Banana. Another type is "Custard Pies" such as Egg, Pecan, and Pumpkin. A third type is "Fruit Pies" such as; Apple, Apricot, Peach, Cherry, Raisin, Pineapple, and Berry and a fourth, "Chiffon".

Both frozen and canned fruits are used by pie bakers. Properly prepared filling from either of these types of fruit produce pies quite similar in quality.

Bakers differ in their opinions as to crust thickness, but are in agreement in that a tender mealy, or flaky type crust is greatly preferred. Strength of flour, amount, and kind of shortening percent of water, and degree of mixing a pie dough largely determines the quality of pie crust made therefrom. The use of an excessive quantity of water produces a pie dough that results in a tough crust. Pastry flour containing about 10% protein is preferable for pie doughs. A good grade of lard may be used if short shelf life is assured. However Hydrogenated animal or vegetable shortening, used in the amount of 60% to 75%, based on flour as 100%, is generally preferred. When lard is used a mealy type crust results. Correct finishing of pie crusts just prior to baking is desirable.

Pie Shells should be baked for about 18 minutes at a temperature of 385° to 410° F. The temperature and time of baking fruit pies will vary with the type of filling and crust thickness. The average baking time is about 25 minutes at 475° F. Custard pies should be baked 20 to 25 minutes at a temperature of 385° to 400°.

# PIE CRUST

There are two distinct types of pie crust viz: Mealy and flaky. The flaky type is somewhat more popular than the mealy. The method of mixing will determine the type of crust produced. If the size of the particles of fat are large or about the size of marbles, such a dough will produce a flaky type crust. The smaller the particles the more mealy the crust becomes. Very small particles can be mixed in completely. Crusts made from a dough of this kind will produce a very tender crust that will break into meal when cut. Two generally accepted methods of mixing pie doughs are as follows: (1) Mix all of the shortening and all the flour together; add water and bring to a mass. (2) Mix thoroughly all the shortening and one half of the flour; add the other one-half of the flour and mix until lumps become about the size of marbles; then add the water and complete the mixing. The first type of dough will produce a flaky type crust and the second a short flaky type crust. If a mealy type is desired break lumps of shortening until they become about the size of peas and then add water.

The main thing to remember is the longer the dough is mixed after the water is added the tougher the dough becomes. The mixing of the shortening and the flour has very little effect on the toughness of the crust. Only after water is added does it commence to toughen.

Extreme care should be exercised in the amount of water used. A sufficient quantity should be used to produce an easy handling plastic dough but, excessive water greatly reduces the tenderness of the dough. Cold water should be used. Salt should be dissolved in the water. If shortening is very warm a mealy type

pie crust will be the result. Hydrogenated, vegetable or animal fat should be used for making pie doughs. Pure lard may be used but crusts made from a dough containing this shortening will usually be of the mealy type. Short shelf life of pies made with dough of this type becomes necessary to avoid rancidity.

Baking powder may be used in a pie dough. This will cause a separation of the layers of dough. It will appear to be more tender due to this separation of layers of the dough. Many bakers use a pie wash brushed on the top crust of pies. These may be made with non-fat milk, sugar, syrup, or special flours - (soya, cottonseed, etc.). Some bakers use a butter, milk, cream, or egg wash. A good wash may be made from 1 part oil, 1 part egg, and 1 part water. Washes should be brushed on lightly in the center of the pie leaving the rim unbrushed as this reaches a higher temperature and would brown more rapidly than the rest of the crust. There is somewhat disadvantage to both the washes as most of them tend to make a pie crust soggy.

Many pie doughs are spoiled by the use of excessive amounts of water.

# PIE DOUGH

| PER CENT | INGREDIENTS | LBS. | OZS. | METHODS |
|---|---|---|---|---|
| .089 | Pastry Flour | 1 | 12 | Mix into smooth thin paste by machine. |
| .152 | Water | 3 | | |
| .013 | Salt | | 4 | |
| .417 | Pastry Flour | 8 | 4 | Mix by hand until lumps the size of a pea are formed. Then add above and mix until smooth. DO NOT OVER MIX. |
| .329 | Shortening | 6 | 8 | |
| 1.000 | Totals | 19 | 12 | |

## A. VARIETY PIES

1. Cocoanut Cream Pie Filling

| PER CENT | INGREDIENTS | LBS. | OZS. | METHODS |
|---|---|---|---|---|
| .358 | Water | 3 | | Bring to rolling boil. |
| .060 | Corn Syrup | | 8 | |
| .119 | Sugar | 1 | | |
| .045 | Powdered Milk | | 6 | |
| .004 | Salt | | 1/2 | |
| .119 | Water | 1 | | Dissolve and add slow- |
| .019 | Corn Starch | | 2 1/2 | ly. |
| .007 | W 13 or clear jel | | 1 | |
| .060 | Whole Egg | | 8 | |
| .060 | Egg White | | 8 | Whip and fold in. |
| .060 | Granulated Sugar | | 8 | |
| .015 | Butter or Margarine | | 2 | Add and mix in. |
| .074 | Cocoanut | | 10 | |
| 1.000 | Totals | 8 | 6 | |

2. Butterscotch Pie Filling

| PER CENT | INGREDIENTS | LBS. | OZS. | METHODS |
|---|---|---|---|---|
| .341 | Water | 4 | | Bring to boil. |
| .255 | Brown Sugar | 3 | | |
| .085 | Cake Flour | 1 | | Mix into paste and add |
| .17 | Water | 2 | | to above while stirring. |
| | | | | Cook until clear. |
| .096 | Whole Egg | 1 | 2 | Pour above mixture in- |
| .053 | Margarine | | 10 | to cake mixing bowl. |
| | | | | Add whole egg and mar- |
| | | | | garine immediately; mix |
| | | | | on 2nd speed. |
| 1.000 | Totals | 11 | 12 | |

3. Chocolate Pie Filling

| PER CENT | INGREDIENTS | LBS. | OZS. | METHODS |
|---|---|---|---|---|
| .519 | Water | 5 | 3 | Bring to boil. |
| .189 | Sugar | 1 | 14 1/4 | |
| .085 | Water | | 13 3/4 | Mix well and add to above and cook until smooth. |
| .042 | Milk Powder | | 6 3/4 | |
| .038 | Starch | | 6 | |
| .005 | Salt | | 3/4 | |
| .075 | Whole Eggs | | 12 | Add to above. |
| .047 | Chocolate | | 7 1/2 | Chop fine and add to above. |
| 1.000 | Totals | 10 | | |

4. Pumpkin Pie Filling

| PER CENT | INGREDIENTS | LBS. | OZS. | METHODS |
|---|---|---|---|---|
| .111 | Granulated Sugar | 2 | | Mix well, but do not whip in machine as this will form air bubbles which will float on top of pies, giving a dull appearance. |
| .010 | Bread Flour | | 3 | |
| .001 | Cinnamon | | 1/4 | |
| .0005 | Nutmeg | | 1/8 | |
| .0005 | Allspice | | 1/8 | |
| .0005 | Ginger | | 1/8 | |
| .0005 | Cloves | | 1/8 | |
| .056 | Corn Syrup | 1 | | |
| .111 | Whole Egg | 2 | | |
| .375 | Pumpkin ( 1 #10 can) | 6 | 12 | Add to above and mix well. |
| .334 | Liquid Milk | 6 | 12 | Add to above and mix in well. Let stand a few minutes before baking. |
| 1.000 | Totals | 17 | 15 3/4 | |

This mix will fill 14 - 8" pies.

Bake at 400° F.

5. Egg Custard Pie Filling

| PER CENT | INGREDIENTS | LBS. | OZS. | METHODS |
|---|---|---|---|---|
| .210 | Sugar | 3 | | Mix into a paste. |
| .007 | Tapioca | | 1 | |
| .001 | Salt | | 1/4 | |
| .167 | Whole Egg | 2 | 6 1/2 | |
| .597 | Liquid Milk | 8 | 8 | Melt Butter. |
| .013 | Butter | | 3 | Mix together and stir |
| .005 | Vanilla | | 1 | in above. |
| 1.000 | Totals | 14 | 3 3/4 | |

6. Pecan Pie Filling

| PER CENT | INGREDIENTS | POUNDS | METHODS |
|---|---|---|---|
| .745 | Syrup | 100 | Mix till smooth. |
| .019 | Flour | 2.5 | |
| .149 | Egg Yolk | 20 | Mix thoroughly and add |
| .076 | Egg White | 10.25 | to above. |
| .004 | Vinegar | .6 | Mix and add to above. |
| .007 | Vanilla (varible with strengths) | 1 | Incorporate well. |
| 1.000 | Totals | 134.35 | |

REMARKS: Pour correct amount of filling into previously baked pie shells.

7. Strawberry Chiffon Pie Filling

| PER CENT | INGREDIENTS | LBS. | OZS. | METHODS |
|---|---|---|---|---|
| .1686 | Egg White | 2 | | Beat until foamy on 2nd speed of a 4-speed machine. |
| .1054<br>.0026 | Sugar<br>Salt | 1 | 4<br>1/2 | Add slowly to beating egg white and beat to wet peak - NOT DRY. |
| .2109<br>.1054 | Juice<br>Sugar | 2<br>1 | 8<br>4 | Bring to a rolling boil in Copper Kettle. |
| .0843<br>.0421 | Juice<br>Cornstarch | 1 | 8 | Dissolve cornstarch in juice and add slowly to boiling syrup, stirring continuously. Cook until thick. |
| .0421<br>.0066 | Juice<br>Gelatin (clear) | | 8<br>1 1/4 | Dissolve gelatin in juice and add slowly to thickened mass, stirring vigorously, until boiling again. Remove from stove. |
| .2320 | Strawberries (drained - finely chopped) | 2 | 12 | Mix thoroughly and stir into cooked mass. |
| 1.000 | Totals | 11 | 13 3/4 | |

Fold cooked mass into beaten egg white carefully, but thoroughly.

Fill prebaked pie shells and refrigerate at 40° F., DO NOT FREEZE.

Yields: 9 - 9" Pies.

8. Fresh Apple Pie

| INGREDIENTS | LBS. | OZS. | METHODS |
|---|---|---|---|
| Granulated Sugar | 2 | | Mix thoroughly and sprinkle on bottom crust. Fill with sliced apples and cover with the sugar, starch, spice and salt mixture. Then dot with small pieces of margarine and cover with top crust. Bake at 425° - 450° F. |
| Corn Starch | | 2 | |
| Cinnamon | | 1/8 | |
| Nutmeg | | 1/8 | |
| Salt | | 1/8 | |

9. Angel Food Pie Filling

| PER CENT | INGREDIENTS | LBS. | OZS. | METHODS |
|---|---|---|---|---|
| .50 | Egg White | 1 | | Start whipping Egg White and sugar. Whip to wet peak adding flavor and salt while whipping. |
| .50 | Cane Sugar | 1 | | |
| 1.000 | Totals | 2 | | |

Add to pre-baked pie shells.

Transfer to oven and bake 30 minutes at 300° F.

Remove from oven and cool.

Top with whipped cream.

10. Apple Pie Filling - (Vacuum Dried)

| INGREDIENTS | LBS. | OZS. | METHODS |
|---|---|---|---|
| Apple Slices (vacuum dried)<br>Water | 5<br>16 | | Soak overnight. |
| Water<br>Sugar | 16<br>2 | <br>8 | Add and bring to a good boil. |
| Starch<br>Water | 1<br>4 | | Mix and stir into above. Cook until clear and remove from stove. |
| Sugar<br>Salt<br>Cinnamon<br>Nutmeg | 5 | <br>2<br>1 1/4<br>1/4 | Blend and stir into above. Allow to cool thoroughly before using. |
| Totals | 49 | 11 1/2 | |

## B. FROZEN FRUIT PIE FILLING

Most frozen fruit comes packed in 30 lb. cans. On the label of these cans will be printed 5 to 1, 6 to 1, or 7 to 1. This means that there are 5 lbs. of fruit to 1 lb. of sugar, 6 lbs. of fruit to 1 lb. of sugar, or 7 lbs. of fruit to 1 lb. of sugar.

When a can is thawed out there will be approximately 15 lbs. of solid fruit and 15 lbs. of juice or syrup. Frozen fruits are, as a rule, somewhat better in appearance than can fruits. However, one must exercise care when mixing the fruit into a filling, as it can be broken up or torn badly, resulting in an unsightly mass. Some think it is better to use frozen fruit when it is approximately 1/2 thawed. This will aid in keeping the fruit in perfect shape while incorporating the filling. It also aids in cooling the filling. This filling can then be used sooner.

The amount of starch used with a 30 lb. can of fruit is usually approximately 1 lb. 2 oz. with the 15 lbs. of juice or water. This will vary with the type of fruits used. Cherries will require more starch than most other fruits used. One and a half oz. of salt should be used with each gallon of water or juice; this depending upon the amount of sugar used. The more sugar used in the filling, the more salt required. Caution should be used in the use of water in pie filling. Excessive use of water is the most damaging ingredient used.

The best method of thawing frozen fruits is to place the can, or cans, in a water bath and circulate lukewarm water around the cans. A second method is to allow lukewarm water to run over the cans. A third method is to partially thaw the cans in a refrigerator over night and complete the thawing rapidly, in the shop at room temperature the following day. However, when this method is used the fruits must be used immediately, otherwise they will darken prior to using.

Fresh Frozen Blueberry Pie Filling

| PER CENT | INGREDIENTS | LBS. | OZS. | METHODS |
|---|---|---|---|---|
| .324 | Blueberry juice | 13 | | Bring to boil. |
| .028<br>.050 | Corn Starch<br>Blueberry juice or water | 1<br>2 | 2 | Suspend starch in liquid, and add slowly to above stirring constantly until clear. |
| .224 | Granulated Sugar | 9 | | Add to above and cook until sugar has completely dissolved. Remove from stove. |
| .374 | Drained Blueberries | 15 | | Add above mixture to fruit and stir with wooden paddle to prevent crushing fruit. Cool before using. |
| 1.000 | Totals | 40 | 2 | |

Fresh Frozen Apricot Pie Filling
(Based on one 30 lb. can.)

| PER CENT | INGREDIENTS | LBS. | OZS. | METHODS |
|---|---|---|---|---|
| .375 | Apricot Juice | 13 | | Bring to boil. |
| .027<br>.058 | Corn Starch<br>Apricot juice or water | <br>2 | 15 | Suspend starch in liquid, add slowly to above, stirring constantly until clear. |
| .108 | Granulated Sugar | 3 | 12 | Add to above and cook until sugar is completely dissolved. Remove from stove. |
| .432 | Drained Apricots | 15 | | Add above mixture to fruit. Stir with wooden paddle to prevent crushing fruit. Cool before using. |
| 1.000 | Totals | 34 | 11 | |

Fresh Frozen Peach Pie Filling
(Based on one 30 lb. can.)

| PER CENT | INGREDIENTS | LBS. | OZS. | METHODS |
|---|---|---|---|---|
| .383 | Peach Juice | 13 | | Bring to boil. |
| .028 | Corn Starch | | 15 | Suspend starch in liquid. Add slowly to above stirring constantly until clear. |
| .059 | Peach Juice or Water | 2 | | |
| .088 | Granulated Sugar | 3 | | Add to above and cook until sugar is all dissolved. Remove from stove. |
| .442 | Drained Peaches | 15 | | Add above mixture to fruit. Stir with wooden paddle to prevent crushing fruit. Cool before using. |
| 1.000 | Totals | 33 | 15 | |

Frozen Strawberry Pie Filling

| PER CENT | INGREDIENTS | LBS. | OZS. | METHODS |
|---|---|---|---|---|
| .276 | Juice | 10 | | Bring to boil. |
| .034 | Starch | 1 | 4 | Add to above and cook. |
| .055 | Juice | 2 | | |
| .221 | Sugar | 8 | | Add to above and stir in. |
| .414 | Strawberries (Approximately) | 15 | | Add to above and mix in. |
| 1.000 | Totals | 38 | 8 | |

Fresh Frozen Apple Pie Filling
(Based on one 30 lb. can.)

| PER CENT | INGREDIENTS | LBS. | OZS. | METHODS |
|---|---|---|---|---|
| .374 | Apple Juice | 13 | | Bring to boil. |
| .027<br>.058 | Corn Starch<br>Apple Juice or Water | <br>2 | 15 | Suspend starch in liquid, add slowly to above stirring constantly until clear. |
| .108<br>.001 | Granulated Sugar<br>Cinnamon<br>Juice of 1 Fresh Lemon | 3 | 12<br>1/2 | Add to above and cook until sugar is completely dissolved. Remove from stove. |
| .432 | Drained apples | 15 | | Add above mixture to fruit. Stir with wooden paddle to prevent crushing of fruit. Cool before using. |
| 1.000 | Totals | 34 | 11 1/2 | |

Fresh Frozen Cherry Pie Filling
(Based on one 30 lb. can.)

| PER CENT | INGREDIENTS | LBS. | OZS. | METHODS |
|---|---|---|---|---|
| .365 | Cherry Juice | 13 | | Bring to boil. |
| .032<br>.056 | Corn Starch<br>Cherry Juice or Water | 1<br>2 | 2 | Suspend starch in liquid, add slowly to above stirring constantly until clear. |
| .126 | Granulated Sugar | 4 | 8 | Add to above and cook until sugar is all dissolved. Remove from stove. |
| .421 | Drained Cherries | 15 | | Add above mixture to fruit, stir with wooden paddle to prevent crushing fruit. Cool before using. |
| 1.000 | Totals | 35 | 10 | |

## C. CANNED FRUIT PIE FILLING

Some bakers use fruit packed in No. 10 cans for pie filling; in fact, until frozen fruit became popular, this type was the standard pie fruit for bakers use. It is more convenient for use in small shops, where freezing space is limited. This fruit produces a pie that is as good as that from frozen fruit, prices considered. Canned fruit filling is packed in heavy syrup, solid packed, or packed in light syrup or water. The only type canned fruit a baker should consider is the solid packed. This contains very little moisture, or water and will produce a very good pie filling with the addition of water, sugar, starch, and small amounts of spices and salt. Purchasing syrup packed fruit is costly, as the cans contain less fruit and the price, as a rule, is much higher. Most solid packed fruits weigh between 6 1/2 to 7 lbs. To this can be added about 2 lbs. of water, 2 to 3 lbs. of sugar (depending upon the type of fruit) and about 4 oz. of starch. From 10 to 12 lbs. of finished filling can be produced from a No. 10 can. More water can be used if necessary. However, this lowers the quality of the filling.

It is advisable to bring the juice and water to a boil, add starch, dissolved in water, and cook until clear. Then add sugar and stir in until completely dissolved; remove from stove and pour into containers. Finally stir in solid fruit.

Over cooking of pie fillings is mainly responsible for soggy crusts. When the starch granuals are ruptured, or weakened moisture is released. This moisture is then absorbed by the crust.

There are two definite types of starch viz: regular corn starch and maze type starch. Maze type is more expensive but is probably better as far as shelf life of pies is concerned. This type remains clear and does not cloud up, or set up as hard. It will remain fluid and have a slight flow. Most starch manufacturers produce both types.

## CANNED PINEAPPLE PIE FILLING BATCHES

| No. 10 Cans | One | | Two | | Three | | Four | | |
|---|---|---|---|---|---|---|---|---|---|
| INGREDIENTS | LBS. | OZS. | LBS. | OZS. | LBS. | OZS. | LBS. | OZS. | METHODS |
| Water | 1 | 12 | 3 | 8 | 5 | 4 | 7 | | Bring to boil. |
| Water | | 6 | | 12 | 1 | 4 | 1 | 8 | Mix, add to above, and cook until clear. |
| Starch | | 4 | | 8 | | 12 | 1 | | |
| Sugar | 3 | | 6 | | 9 | | 12 | | Add and stir in. |
| Pineapple | 6 | 11 | 13 | 6 | 20 | 1 | 26 | 12 | Add above to pineapple. |
| Total Weights | 11 | 15 | 23 | 14 | 35 | 13 | 47 | 12 | |

| No. 10 Cans | Five | | Six | | Seven | | Eight | | |
|---|---|---|---|---|---|---|---|---|---|
| INGREDIENTS | LBS. | OZS. | LBS. | OZS. | LBS. | OZS. | LBS. | OZS. | METHODS |
| Water | 8 | 12 | 10 | 8 | 12 | 4 | 14 | | Bring to boil. |
| Water | 1 | 12 | 2 | | 2 | 4 | 2 | 8 | Mix, add to above, and cook until clear. |
| Starch | 1 | 4 | 1 | 8 | 1 | 12 | 2 | | |
| Sugar | 15 | | 18 | | 21 | | 24 | | Add and stir in. |
| Pineapple | 33 | 7 | 40 | 2 | 46 | 13 | 53 | 8 | Add above to pine-apple. |
| Total Weights | 59 | 11 | 71 | 10 | 83 | 9 | 95 | 8 | |

## CANNED PEACH PIE FILLING BATCHES

| No. of Cans | One | | Two | | Three | | Four | | |
|---|---|---|---|---|---|---|---|---|---|
| INGREDIENTS | LBS. | OZS. | LBS. | OZS. | LBS. | OZS. | LBS. | OZS. | METHODS |
| Juice or Water | 1 | 12 | 3 | 8 | 5 | 4 | 7 | | Bring to boil. |
| Water | | 6 | | 12 | 1 | 2 | 1 | 8 | Mix, add to above and cook until clear. |
| Starch | | 4 | | 8 | | 12 | 1 | | |
| Sugar | 2 | 4 | 4 | 8 | 6 | 12 | 9 | | Add and stir. |
| | | Gms. | | Gms. | | Gms. | | Gms. | |
| Cloves | | 2 | | 4 | | 6 | | 8 | |
| Allspice | | 2 | | 4 | | 6 | | 8 | |
| Peaches | 5 | | 10 | | 15 | | 20 | | Add above to peaches and stir with paddle. |
| Total Weights | 9 | 10 1/8 | 19 | 2 1/4 | 28 | 14 3/8 | 38 | 8 1/4 | |

| No. of Cans | Five | | Six | | Seven | | Eight | | |
|---|---|---|---|---|---|---|---|---|---|
| INGREDIENTS | LBS. | OZS. | LBS. | OZS. | LBS. | OZS. | LBS. | OZS. | METHODS |
| Juice or Water | 8 | 12 | 10 | 8 | 12 | 4 | 14 | | Bring to boil. |
| Water | 1 | 12 | 2 | 4 | 2 | 10 | 3 | | Mix, add to above and cook until clear. |
| Starch | 1 | 4 | 1 | 8 | 1 | 12 | 2 | | |
| Sugar | 11 | 14 | 13 | 4 | 15 | 12 | 18 | | Add and stir. |
| | | Gms. | | Gms. | | Gms. | | Gms. | |
| Cloves | | 10 | | 12 | | 14 | | 16 | |
| Allspice | | 10 | | 12 | | 14 | | 16 | |
| Peaches | 25 | | 30 | | 35 | | 40 | | Add above to peaches and stir with paddle. |
| Total Weights | 48 | 2 5/8 | 57 | 8 3/4 | 69 | 6 7/8 | 78 | | |

## CANNED PINEAPPLE PIE FILLING

| PER CENT | INGREDIENTS | LBS. | OZS. | METHODS |
|---|---|---|---|---|
| .147 | Water | 1 | 12 | Bring to boil. |
| .021<br>.021 | Water<br>Starch | | 6<br>4 | Mix, add to above, and cook until clear. |
| .251 | Sugar | 3 | | Add and stir in. |
| .560 | Pineapple (1 - #10 Can) | 6 | 11 | Add above to pineapple and stir with paddle. |
| 1.000 | Totals | 11 | 15 | |

## CANNED CHERRY PIE FILLING

| PER CENT | INGREDIENTS | LBS. | OZS. | METHODS |
|---|---|---|---|---|
| .1891 | Juice or Water | 1 | 12 | Bring to boil. |
| .0270<br>.0405 | Corn Starch<br>Water or Juice | | 4<br>6 | Stir and add to above. |
| .2972<br>.0004 | Sugar<br>Salt | 2 | 12<br>1/16 | Add to above immediately and stir in. |
| .4458 | #10 Can Cherries | 4 | 2 | Add to above and stir enough to mix in fruit. |
| 1.0000 | Totals | 9 | 4 1/16 | |

## CANNED CHERRY PIE FILLING BATCHES

| No. 10 Cans | One | | Two | | Three | | |
|---|---|---|---|---|---|---|---|
| INGREDIENTS | LBS. | OZS. | LBS. | OZS. | LBS. | OZS. | METHODS |
| Juice or water | 1 | 12 | 3 | 8 | 5 | 4 | Bring to boil. |
| Corn starch | | 4 | | 8 | | 12 | Stir and add to |
| Water or Juice | | 6 | | 12 | | 18 | above. |
| Sugar | 2 | 12 | 5 | 8 | 8 | 4 | Add to above im- |
| Salt | | 1/16 | | 1/8 | | 3/16 | mediately and stir in. |
| Cherries | 4 | 2 | 8 | 4 | 12 | 6 | Add to above and stir enough to mix in fruit. |
| Total Weights | 9 | 4 1/16 | 18 | 8 1/8 | 27 | 12 3/16 | |

| No. 10 Cans | Four | | Five | | Six | | |
|---|---|---|---|---|---|---|---|
| INGREDIENTS | LBS. | OZS. | LBS. | OZS. | LBS. | OZS. | METHODS |
| Juice or Water | 7 | | 8 | 12 | 10 | 8 | Bring to boil. |
| Corn Starch | 1 | | 1 | 4 | 1 | 8 | Stir and add to |
| Water or Juice | 1 | 8 | 1 | 14 | 2 | 4 | above. |
| Sugar | 11 | | 13 | 12 | 16 | 8 | Add to above im- |
| Salt | | 1/4 | | 5/16 | | 3/8 | mediately and stir in. |
| Cherries | 16 | 8 | 20 | 10 | 24 | 12 | Add to above and stir enough to mix |
| Total Weights | 37 | 1/4 | 46 | 4 5/16 | 55 | 8 3/4 | in fruit. |

## CANNED CHERRY PIE FILLING

No. 10 Cans — Seven — Eight

| INGREDIENTS | LBS. | OZS. | LBS. | OZS. | METHODS |
|---|---|---|---|---|---|
| Juice or Water | 12 | 4 | 14 | | Bring to boil. |
| Corn Starch | 1 | 12 | 2 | | Stir and add to |
| Water or Juice | 2 | 10 | 3 | | above. |
| Sugar | 19 | 4 | 22 | | Add to above im- |
| Salt | | 7/16 | | 1/2 | mediately and stir in. |
| Cherries | 28 | 14 | 33 | | Add to above and stir enough to mix in fruit |
| Total Weights | 64 | 12 7/16 | 74 | 1/2 | |

## CANNED APPLE PIE FILLING

| PER CENT | INGREDIENTS | LBS. | OZS. | METHODS |
|---|---|---|---|---|
| .1530 | Water | 1 | 12 | Bring to boil. |
| .0219 | Water | | 6 | Stir and add to above. |
| .0219 | Corn Starch | | 4 | |
| .2185 | Sugar | 2 | 8 | Add to above immediately |
| .0041 | Salt | | 3/4 | and stir in. |
| .0014 | Cinnamon | | 1/4 | |
| .0003 | Nutmeg | | 1/16 | |
| .5789 | #10 Can Apples | 6 | 10 | Add to above and stir enough to mix in fruit. |
| 1.0000 | Totals | 11 | 7 1/16 | |

## CANNED APPLE PIE FILLING BATCHES

| No. 10 Cans | One | | Two | | Three | | |
|---|---|---|---|---|---|---|---|
| INGREDIENTS | LBS. | OZS. | LBS. | OZS. | LBS. | OZS. | METHODS |
| Water | 1 | 12 | 3 | 8 | 5 | 4 | Bring to boil. |
| Water | | 6 | | 12 | 1 | | Stir and add |
| Corn Starch | | 4 | | 8 | | 12 | to above. |
| Sugar | 2 | 8 | 5 | | 7 | 8 | Add to above |
| Salt | | 3/4 | | 1 1/2 | | 2 1/4 | immediately |
| Nutmeg | | 1/16 | | 1/8 | | 3/16 | and stir in. |
| Cinnamon | | 1/4 | | 1/2 | | 3/4 | |
| Apples | 6 | 10 | 13 | 4 | 19 | 14 | Add to above and stir enough to mix in fruit. |
| Total Weights | 11 | 7 1/16 | 22 | 14 1/8 | 34 | 5 3/16 | |

| No. 10 Cans | Four | | Five | | Six | | |
|---|---|---|---|---|---|---|---|
| INGREDIENTS | LBS. | OZS. | LBS. | OZS. | LBS. | OZS. | METHODS |
| Water | 7 | | 8 | 12 | 10 | 8 | Bring to boil. |
| Water | 1 | 4 | 1 | 8 | 1 | 12 | Stir and add to above. |
| Corn Starch | 1 | | 1 | 4 | 1 | 8 | |
| Sugar | 10 | | 12 | 8 | 15 | | Add to above immediate- |
| Salt | | 3 | | 3 3/4 | | 4 1/2 | ly and stir in. |
| Cinnamon | | 1 | | 1 1/4 | | 1 1/2 | |
| Nutmeg | | 1/4 | | 5/16 | | 3/8 | |
| Apples | 26 | 8 | 33 | 2 | 39 | 12 | Add to above and stir enough to mix in fruit. |
| Totals | 45 | 12 1/4 | 57 | 3 5/16 | 68 | 10 3/8 | |

## CANNED APPLE PIE FILLING BATCHES

No. 10 Cans — Seven — Eight

| INGREDIENTS | LBS. | OZS. | LBS. | OZS. | METHODS |
|---|---|---|---|---|---|
| Water | 12 | 4 | 14 | | Bring to boil. |
| Water | 2 | 4 | 2 | 8 | Stir and add to above. |
| Corn Starch | 1 | 12 | 2 | | |
| Sugar | 17 | 8 | 20 | | Add to above immedi- |
| Salt | | 5 1/4 | | 6 | ately and stir in. |
| Cinnamon | | 1 3/4 | | 2 | |
| Nutmeg | | 7/16 | | 1/2 | |
| Apples | 46 | 6 | 53 | | Add to above and stir enough to mix fruit. |
| Total Weights | 80 | 1 7/16 | 91 | 8 1/2 | |

## CANNED APRICOT PIE FILLING BATCHES

| No. of Cans | One | | Two | | Three | | Four | | |
|---|---|---|---|---|---|---|---|---|---|
| INGREDIENTS | LBS. | OZS. | LBS. | OZS. | LBS. | OZS. | LBS. | OZS. | METHODS |
| Juice or Water | 1 | 12 | 3 | 8 | 5 | 4 | 7 | | Bring to boil. |
| Water | | 6 | | 12 | 1 | 2 | 1 | 8 | Mix, add to above and cook until clear. |
| Starch | | 4 | | 8 | | 12 | 1 | | |
| Sugar | 2 | 9 | 5 | | 7 | 8 | 10 | | Add and stir in. |
| Apricots | 5 | | 10 | | 15 | | 20 | | Add above to apricots. |
| Total Weights | 9 | 14 | 19 | 12 | 29 | 10 | 39 | 8 | |

| No. of Cans | Five | | Six | | Seven | | Eight | | |
|---|---|---|---|---|---|---|---|---|---|
| INGREDIENTS | LBS. | OZS. | LBS. | OZS. | LBS. | OZS. | LBS. | OZS. | METHODS |
| Juice or Water | 8 | 12 | 10 | 8 | 12 | 4 | 14 | | Bring to boil. |
| Water | 1 | 14 | 2 | 4 | 2 | 10 | 3 | | Mix, add to above and cook until clear. |
| Starch | 1 | 4 | 1 | 8 | 1 | 12 | 2 | | |
| Sugar | 12 | 8 | 15 | | 17 | 8 | 20 | | Add and stir in. |
| Apricots | 25 | | 30 | | 35 | | 40 | | Add above to apricots. |
| Total Weights | 49 | 6 | 59 | 4 | 69 | 2 | 89 | | |

## RAISIN PIE FILLING

| PER CENT | INGREDIENTS | LBS. | OZS. | METHODS |
|---|---|---|---|---|
| .354 | Raisins | 24 | | Bring to boil. |
| .413 | Water | 28 | | |
| .177 | Sugar | 12 | | Add to above and boil |
| .001 | Cinnamon | | | for 15 minutes. |
| .001 | Salt | | 1 1/2 | |
| .044 | Water | 3 | | Suspend starch in water, add slowly to boiling mixture, stirring constantly until clear. Remove from heat. |
| .008 | Corn Starch | | 9 | |
| .002 | Lemon Juice | | 2 | Add to above and mix in. Let cool before using. |
| 1.000 | Totals | 67 | 13 1/2 | |

## C. MERINGUES

Most bakers experience trouble with meringue by using reduced amounts of egg white. This is a costly procedure. Water can be used with egg white, but a good stabilizer must also be used. There are many good types on the markets.

Weeping can be attributed to many causes.

1. The most common fault is with pie filling over cooked. When this occurs the starch cells break down and release moisture.

2. Another is too much moisture in meringue. Water can be used to replace up to 50% of white, but a very good stabilizer must be used. Water added to meringue makes it more tender but it will break down and weep much easier.

3. Over whipping of white causes some breakdown and makes rough topping.

4. Fat may cause a break down and total loss. As little as 1/10 of 1% is enough to cause damage.

Salt can be used in meringue to add strength, or toughness. This toughens the protein in the white. 1% based on batch weight may be used for this purpose.

When adding hot syrup to egg white, some sugar should be whipped in with the white. This will prevent the white cooking when syrup is first added.

Cream of tartar can be used as a bleach when egg white has a tendency to turn pink. Most of the time this is an indication of an old egg white. About 1% of batch weight may be used.

Egg white when whipped should not be too cold. A temperature of 65° to 70° F. will reduce whipping time.

Whip powder is used by many bakers. It has the advantage of fast production but some brands produce a foreign taste.

Some bakers use stabilizers, others use dryers. Stabilizers have the ability to take on water and hold it indefinitely while a dryer will take on water and later release it. These dryers are flour, starch, etc. Stabilizers are gums such as agar, kelp, etc.

Basic meringue is 45% egg white and 55% sugar. This may vary with the use of water and stabilizers.

# CHAPTER 25

## VARIETY BREADS AND ROLLS
(Straight Dough Method)

Because of the very small margin of profit realized on standard white and wheat pan breads and buns a retail baker finds it rather unprofitable to sell such products at the prevailing prices established by wholesale manufacturers producing these in much greater quantities. Therefore a retail bakery operator finds it more advisable to make variety breads such as: Date-Nut, Cheese, Sesame Egg, French, Dutch Raisin, and Butter Bread. He also discovers that it is advantageous to make a variety of rolls such as: Parker House, Butter, Clover Leaf, Twist, Crescent and Knot.

Breads and rolls such as the following are in great demand at premium prices, proving profitable articles for retail bakers although made in rather small quantities.

The following straight dough formulas and methods are representative of those for making a variety of such products.

Example for determining water temperature to insure desired dough temperature:

| | | |
|---|---|---|
| Room Temperature | 80° | 79° |
| Flour Temperature | 80° | 3 |
| | | 237° |
| Friction | 30° | 190° |
| | 190° | 47° Water Temperature |

## White Pan Bread

| INGREDIENTS | LBS. | OZS. |
|---|---|---|
| Bread Flour | 10 | |
| Water (variable) | 6 | |
| Salt | | 10 |
| Sugar | | 4 |
| Milk | | 14 1/2 |
| Shortening | | 6 1/2 |
| Malt | | 8 |
| Yeast | | 1/2 |
| Yeast Food | | 5 |
| Mould Inhibitor | | 1/2 |
| | | 1/2 |

Mix well on 2nd speed, about 10 minutes.
Temperature 80° F.
Take on full rise (about 2 hours). No Punch.

## Wheat Bread

| INGREDIENTS | LBS. | OZS. |
|---|---|---|
| Bread Flour (strong) | 7 | |
| Whole Wheat Flour | 2 | 8 |
| Water (variable) | 6 | 8 |
| Salt | | 10 |
| Sugar | | 4 |
| Milk | | 14 1/2 |
| Shortening | | 6 1/2 |
| Malt | | 8 |
| Yeast | | 1/2 |
| Yeast Food | | 5 |
| Mould Inhibitor | | 1/2 |
| | | 1/2 |

Mix well on 2nd speed, about 10 minutes.
Temperature 80° F.
Take on full rise (about 2 hours). No Punch.

## Soft Rolls and Buns

Hamburger and Hot Dog Buns

Parker House, Clover Leaf, Dinner and Butter Rolls

| INGREDIENTS | LBS. | OZS. |
|---|---|---|
| Flour | 10 | |
| Water (variable) | 6 | 12 |
| Salt | | 3 1/4 |
| Sugar | 1 | 10 |
| Malt | | 1/2 |
| Milk (dry) | | 6 1/2 |
| Shortening | 1 | 4 |
| Yeast Food | | 1/2 |
| Yeast | | 5 |
| Mould Inhibitor | | 1/2 |

Mix well about 10 minutes. Temperature 80° F.
Fermentation about 1 3/4 hours. No Punch.

## Sesame Seed - Egg Bread

| INGREDIENTS | LBS. | OZS. |
|---|---|---|
| Flour | 12 | |
| Water (variable) | 7 | 4 |
| Malt | | 1/2 |
| Salt | | 4 1/2 |
| Sugar | 1 | |
| Milk | | 10 |
| Shortening | | 10 |
| Whole Egg | | 10 |
| Yeast | | 5 |
| Yeast Food | | 1/2 |
| Mould Inhibitor | | 1/2 |

Mix well on 2nd speed, about 10 minutes.
Temperature 80° F.
Take on full rise (about 2 hours). No punch.

Place pieces of dough on damp cloth after make up and then in pan of sesame seed before panning.

## Raisin Bread

| INGREDIENTS | LBS. | OZS. |
|---|---|---|
| Flour | 12 | |
| Water (variable) | 7 | 12 |
| Salt | | 4 |
| Sugar | 1 | |
| Milk | | 8 |
| Shortening | | 10 |
| Raisins | 6 | |
| Yeast | | 9 1/2 |
| Yeast Food | | 1/2 |
| Mould Inhibitor | | 1/2 |

Mix well on 2nd speed, about 10 minutes.
Temperature 80° F.
Add raisins last 2 or 3 minutes of mixing.
Take on full rise (about 2 hours). No punch.

## Potato Bread

| INGREDIENTS | LBS. | OZS. |
|---|---|---|
| Potato Flour | | 4 |
| Flour | 11 | 4 |
| Water (variable) | 7 | 8 |
| Malt | | 1/2 |
| Salt | | 4 |
| Sugar | 1 | |
| Milk | | 8 |
| Shortening | | 10 |
| Yeast Food | | 1/2 |
| Yeast | | 5 |
| Mould Inhibitor | | 1/4 |

Mix well on 2nd speed about 10 minutes.
Temperature 80° F.
Take on full rise (about 1 3/4 hours). No punch.

## Brown and Serve Rolls

| INGREDIENTS | LBS. | OZS. |
|---|---|---|
| Flour | 12 | |
| Water (variable) | 7 | 8 |
| Malt | | 1/2 |
| Salt | | 4 1/2 |
| Sugar | 1 | 3 1/2 |
| Milk | | 7 1/2 |
| Shortening | 1 | 3 1/2 |
| Whole Egg | | 4 |
| Yeast | | 7 1/2 |
| Yeast Food | | 1/2 |
| Mould Inhibitor | | 1/4 |

Mix well on 2nd speed about 10 minutes.
Temperature 80° F.
Take on full rise (about 1 3/4 hours). No punch.

## Cheese Bread

| INGREDIENTS | LBS. | OZS. |
|---|---|---|
| Flour | 10 | |
| Water (variable) | 6 | 10 |
| Cheese (10%) | 1 | |
| Salt | | 4 |
| Sugar | | 14 1/2 |
| Milk | | 6 1/2 |
| Shortening | | 8 |
| Malt | | 1/2 |
| Yeast | | 5 |
| Yeast Food | | 1/2 |
| Mould Inhibitor | | 1/2 |

Mix well on 2nd speed about 10 minutes.
Temperature 80° F.
Take on full rise, (about 1 3/4 hours). No punch.
Bake in round crimped pans.

## Date-Nut Bread

| INGREDIENTS | LBS. | OZS. |
|---|---|---|
| Flour | 10 | |
| Water (variable) | 6 | 10 |
| *Dates (5%) | | 8 |
| *Nuts (5%) | | 8 |
| Salt | | 4 |
| Sugar | | 14 1/4 |
| Milk | | 6 1/2 |
| Shortening | | 8 |
| Malt | | 1/2 |
| Yeast | | 5 |
| Yeast Food | | 1/2 |
| Mould Inhibitor | | 1/2 |

*Chop nuts and dates fine.

Mix well on 2nd speed, about 10 minutes.

Temperature 80° F.

Take on full rise (about 1 3/4 hours). No punch.

Bake in round crimped pans.

## Butter Bread

| INGREDIENTS | LBS. | OZS. |
|---|---|---|
| Flour | 12 | |
| Water (variable) | 7 | 8 |
| Salt | | 4 |
| Malt | | 1/2 |
| Sugar | 1 | 1 1/4 |
| Milk | | 11 1/2 |
| Margarine or butter | | 11 1/2 |
| Yeast | | 5 |
| Yeast Food | | 1/2 |
| Mould Inhibitor | | 1/2 |

Mix well on 2nd speed, about 10 minutes.

Temperature 80° F.

Take on full rise (about 1 3/4 hours). No punch.

Make into Twin Loaves.

Brush between the two dough pieces lightly with butter or margarine when panned and brush tops of loaves with butter or margarine immediately after baking.

## Rye Bread

| INGREDIENTS | LBS. | OZS. |
|---|---|---|
| Wheat Flour (strong) | 9 | |
| Rye Flour (medium) | 2 | 4 |
| Water (variable) | 6 | 12 |
| Malt | | 1/2 |
| Salt | | 3 3/4 |
| Sugar | | 7 1/4 |
| Shortening | | 4 1/2 |
| Yeast | | 5 |
| Yeast Food | | 1/2 |
| Mould Inhibitor | | 1/2 |

Mix well on 2nd speed, about 8 minutes.

Temperature 80° F.

Take on full rise (about 1 3/4 hours). No punch.

## French and Dutch Bread

| INGREDIENTS | LBS. | OZS. |
|---|---|---|
| Flour | 15 | |
| Water (variable) | 9 | |
| Malt | | 1/2 |
| Salt | | 4 3/4 |
| Sugar | | 10 |
| Shortening | 1 | 3 1/4 |
| Egg White | 1 | 3 1/4 |
| Yeast | | 5 |
| Yeast Food | | 1/2 |
| Mould Inhibitor | | 1/2 |

Mix well on 2nd speed about 8 minutes.

Temperature 80° F.

Take on full rise, (about 2 hours). No punch.

Braid three pieces or make in one piece for French and top with Caraway or Poppy Seed. Bake on Bun Pans dusted with corn meal.

Bake Dutch in round pans, dock and top with Rice Flour topping.

## Dutch Bread Topping

| INGREDIENTS | OZS. | METHODS |
|---|---|---|
| Water | 8 | Mix well by hand. Ferment for two hours. |
| Yeast | 3/4 | |
| Rice Flour | 8 | |
| Sugar | 1/2 | |
| Shortening | 1 | |
| Salt | 1/4 | |
| Mix well by hand. Ferment for two hours. | | |

# VARIETY BREADS AND ROLLS

## (SPONGE-DOUGH METHOD)

Variety Breads and Rolls made by the Sponge and Dough method possess many advantages; such as greater volume, better grain and texture, better keeping qualities and equally as good, or better flavor (aroma and taste). Several batches of breads and rolls can be made daily from one Sponge as shown in the following formulas. This sponge, if not over 82° to 84° F. when fermented, can be very safely used for a period of two hours, while making various products.

One's sales can be appreciably increased by making a variety of products using this method.

# DETERMINING DOUGH FRICTION TEMPERATURES

The following are examples for determining Dough Friction Temperatures, to insure desired Dough Temperatures when mixed.

## Examples

### STRAIGHT DOUGHS

| | No. 1 | No. 2 | No. 3 |
|---|---|---|---|
| Room Temperature | 80° | 80° | 82° |
| Flour Temperature | 79° | 81° | 80° |
| Water Temperature | 46° | 46° | 44° |
| Total | 205° | 207° | 206° |
| Desired Dough Temperature 80° | | | |
| 3 x 80 = | 240° | 240° | 240° |
| Minus | 205° | 207° | 206° |
| Difference - Dough Friction | 35° | 33° | 34° |

### SPONGE DOUGHS

| | No. 1 | No. 2 | No. 3 |
|---|---|---|---|
| Temperature of Flour | 80° | 80° | 81° |
| Temperature of Room | 79° | 80° | 81° |
| Temperature of Sponge | 82° | 80° | 84° |
| Temperature of Water | 45° | 45° | 42° |
| Total | 286° | 285° | 288° |
| Desired Dough Temperature 81° | | | |
| 4 x 81° = | 324° | 324° | 324° |
| Minus | 286° | 285° | 288° |
| Friction Temperature | 38° | 39° | 36° |

Friction temperatures will vary as the temperatures of room, flour, water, and sponges vary; also with the consistencies and mixing times of doughs. Therefore, the friction temperature should be calculated daily.

## WHITE SPONGE

| | PERCENTAGES | LBS. |
|---|---|---|
| Flour | .75 | 75.00 |
| Water (variable) | .64 | 46.50 |
| Shortening | .025 | 2.50 |
| Yeast | .03 | 3.00 |
| Malt Syrup | .0025 | .25 |
| Yeast Food | .005 | .50 |
| Grand Total | | 127.75 |
| Less 2% | | 2.55 |
| Total Sponge | | 125.20 |

Mix 4 to 5 minutes.
Temperature 76° to 78° F.
Ferment for 3 hours.

One pound flour = 1.666 lbs. sponge.

NOTE: This sponge is used in making all breads except the partial whole wheat and rye bread.

Example: for determining temperature of water to insure desired Sponge temperature.

| | | |
|---|---|---|
| Room Temperature | 82° | 77° |
| Flour Temperature | 81° | 3 |
| Friction (variable) | 20° | 231° |
| | 183° | 183° |
| | | 48° Water Temperature |

## DOUGH

### White Pan Bread

| | PERCENTAGES | LBS. |
|---|---|---|
| White Flour | .25 | 25.00 |
| Water (variable) | .74 | 18.25 |
| Salt | .025 | 2.50 |
| Sugar (Corn)* | .09 | 9.00 |
| Milk | .04 | 4.00 |
| Shortening | .025 | 2.50 |
| Paniplus | .005 | .50 |
| Mycoban | .0025 | .25 |
| Grand Total | | 65.00 |
| Less 2% | | 1.30 |
| Total Dough | | 63.70 |

*Or 7.5% Cane or Beet Sugar

Mix well, 10 to 14 minutes.

Temperature 80° to 82°.

Ferment 15 to 20 minutes before scaling.

Example: for determining water temperature to insure desired dough temperature.

| | | |
|---|---|---|
| Room Temperature | 80° | 81° |
| Flour Temperature | 81° | 4 |
| Sponge Temperature | 82° | 324° |
| Friction (variable) | 30° | 273° |
| | 273° | 51° Water Temperature |

## DOUGH

### White Pan Bread

| | PERCENTAGES | LBS. | OZS. | LBS. | OZS. |
|---|---|---|---|---|---|
| Sponge** | | | | | |
| Flour | .25 | 12 | 8 | 25 | |
| Water | .72 | 2 | 8 | 5 | |
| Salt | .025 | 1 | 12 3/4 | 3 | 9 1/2 |
| Sugar (Corn)* | .09 | | 4 | | 8 |
| Milk | .04 | | 14 1/2 | 1 | 13 |
| Shortening | .025 | | 6 1/2 | | 13 |
| Paniplus | .005 | | 4 | | 8 |
| Mycoban | .0025 | | 1 | | 2 |
| | | | 1/2 | | 1 |
| Weight of Dough | | 18 | 11 1/4 | 37 | 6 1/2 |

*Or 7.5% Cane or Beet Sugar

**12 1/2 lbs. Sponge contains 7 1/2 lbs. Flour

Mix well, 10 to 14 minutes.

Temperature 80° to 82°.

Ferment 15 to 20 minutes before scaling.

# WHEAT BREAD

| SPONGE | | | DOUGH | |
|---|---|---|---|---|
| Percentages | Lbs. | Ingredients | Percentages | Lbs. |
| .55 | 55.00 | White Flour | .25 | 25.00 |
| .20 | 20.00 | W. W. Flour | none | none |
| .63 | 47.25 | Water (variable) | .73 | 18.25 |
| none | none | Salt | .025 | 2.50 |
| none | none | Sugar (Corn)* | .075 | 7.50 |
| .0025 | .25(Reg.) | Malt (D. B.) | .02 | 2.00 |
| none | none | Milk | .04 | 4.00 |
| .025 | 2.50 | Shortening | .025 | 2.50 |
| .005 | .50 | Yeast Food | none | none |
| .03 | 3.00 | Yeast | none | none |
| none | none | Paniplus | .005 | .50 |
| none | none | Mycoban | .0025 | .25 |
| | 128.50 | Grand Total | | 62.50 |
| | 2.57 | Less 2% | | 1.25 |
| | 125.93 | Total | | 61.25 |

*Or 6.75% Cane or Beet Sugar

| | | |
|---|---|---|
| 4 to 5 minutes | Mix (Variable) | 10 to 13 minutes |
| 78° to 79° | Temperature | 80° to 82° |
| 3 hours | Fermentation Time | 15 to 30 minutes |

## SPONGE

### Wheat Bread

| | Percentages | 25 Loaves Lbs. | 25 Loaves Ozs. | 50 Loaves Lbs. | 50 Loaves Ozs. |
|---|---|---|---|---|---|
| Flour | .55 | 9 | 2 1/2 | 18 | 5 1/4 |
| W. W. Flour | .20 | 3 | 5 1/4 | 6 | 10 1/2 |
| Water (variable) | .62 | 7 | 12 | 15 | 12 |
| Shortening | .025 | | 6 1/2 | | 13 1/4 |
| Yeast | .03 | | 8 | 1 | |
| Malt | .0025 | | 1/2 | | 1 1/4 |
| Yeast Food | .005 | | 1 1/4 | | 2 1/2 |

Mix well, 4 to 5 minutes.

Temperature 76° to 78° F.

Ferment 3 hours.

DOUGH

Wheat Bread

| | Percentages | 25 Loaves Lbs. | 25 Loaves Ozs. | 50 Loaves Lbs. | 50 Loaves Ozs. |
|---|---|---|---|---|---|
| White Flour | .25 | 4 | 2 1/2 | 8 | 5 1/4 |
| Water (variable) | .70 | 2 | 10 | 6 | 1 1/4 |
| Salt | .025 | | 6 1/2 | | 13 1/4 |
| Sugar (Corn)* | .075 | 1 | 4 | 2 | 8 |
| D. B. Malt | .02 | | 5 1/2 | | 10 3/4 |
| Milk | .04 | | 10 1/2 | 1 | 5 1/4 |
| Shortening | .025 | | 6 1/2 | | 13 1/4 |
| Paniplus | .005 | | 1 1/4 | | 2 1/2 |
| Mycoban | .0025 | | 1/2 | | 1 1/4 |
| Caramel Color | | | 1 1/2 | | 3 |

*Or 6.75% Cane or Beet Sugar.

Mix well - 10 to 14 minutes.

Temperature 80° to 82° F.

Ferment 15 to 20 minutes before scaling.

## DOUGH

### Sesame Egg Bread

| | Percentages | 10 Loaves Lbs. | Ozs. |
|---|---|---|---|
| Sponge** | | 12 | 8 |
| Flour | .25 | 2 | 8 |
| Water (variable) | .72 | 1 | 12 3/4 |
| Salt | .025 | | 4 |
| Sugar (Corn)* | .09 | | 14 1/2 |
| Milk | .045 | | 7 1/4 |
| Shortening | .025 | | 4 |
| Egg | .08 | | 12 3/4 |
| Paniplus | .005 | | 3/4 |
| Mycoban | .0025 | | 1/2 |

*Or 7.5% Cane or Beet Sugar.

**12 1/2 lbs. Sponge contains 7 1/2 lbs. flour.

Mix well - 10 to 14 minutes.

Temperature 80° to 82°.

Ferment 15 to 20 minutes before scaling.

Scale 10 oz. pieces - Twist.

DOUGH

Raisin Bread

| Percentages | | Lbs. | Ozs. |
|---|---|---|---|
| | Sponge** | 12 | 8 |
| .25 | Flour | 2 | 8 |
| .72 | Water | 1 | 12 3/4 |
| .025 | Salt | | 4 |
| .09 | Sugar (Corn)* | | 14 1/2 |
| .04 | Milk | | 6 1/2 |
| .025 | Shortening | | 4 |
| .03 | Yeast | | 2 1/2 |
| .005 | Mycoban | | 3/4 |
| .50 | Raisins | 5 | |

*Or 7.5% Cane or Beet Sugar.
**12 1/2 lbs. Sponge contains 7 1/2 lbs. Flour.

Mix well - 10 to 12 minutes.
Temperature 80° to 82°.
Ferment for 15 to 20 minutes before scaling.

Scale 22 oz. pieces.

## DOUGH

### Cheese Bread

| Percentages | | Lbs. | Ozs. |
|---|---|---|---|
| | Sponge** | 12 | 8 |
| .25 | Flour | 2 | 8 |
| .77 | Water (variable) | 1 | 14 3/4 |
| .025 | Salt | | 4 |
| .09 | Sugar (Corn)* | | 14 1/2 |
| .04 | Milk | | 6 1/2 |
| .025 | Shortening | | 4 |
| .005 | Paniplus | | 3/4 |
| .0025 | Mycoban | | 1/2 |
| .10 | Cheese | 1 | |

*Or 7.5% Cane or Beet Sugar.
**12 1/2 lbs. Sponge contains 7 1/2 lbs. Flour.

Mix well - 10 to 14 minutes.
Temperature 80° to 82°.
Ferment for 15 to 20 minutes before scaling.

DOUGH

Date-Nut Bread

| Percentage | | Lbs. | Ozs. |
|---|---|---|---|
| | Sponge** | 12 | 8 |
| .25 | Flour | 2 | 8 |
| .72 | Water (variable) | 1 | 12 3/4 |
| .025 | Salt | | 4 |
| .08 | Sugar (Corn)* | | 12 3/4 |
| .04 | Milk | | 6 1/2 |
| .025 | Shortening | | 4 |
| .005 | Paniplus | | 3/4 |
| .0025 | Mycoban | | 1/2 |
| .15 | Dates | 1 | 8 |
| .15 | Nuts | 1 | 8 |

*Or 7% Cane or Beet Sugar
**12 1/2 lbs. Sponge contains 7 1/2 lbs. Flour.

Mix well - 10 to 14 minutes.
Temperature 80° to 82°.
Ferment for 15 to 20 minutes before scaling.

DOUGH

French & Dutch Bread

| Percentages | | Lbs. | Ozs. |
|---|---|---|---|
| | Sponge ** | 12 | 8 |
| .25 | Flour | 2 | 8 |
| .60 | Water | 1 | 8 |
| .045 | Salt | | 4 |
| .06 | Sugar (Corn)* | | 9 1/2 |
| .06 | Shortening | | 10 |
| .08 | Egg White | | 12 1/2 |
| .005 | Paniplus | | 3/4 |
| .0025 | Mycoban | | 1/2 |

*Or 5 lbs. Cane or Beet Sugar.
**12 1/2 lbs. Sponge contains 7 1/2 lbs. Flour.

Mix well - 10 to 14 minutes.
Temperature 80° to 82°.
Ferment for 15 to 20 minutes before scaling.

DUTCH BREAD TOPPING

| | Lbs. | Ozs. | Lbs. | Ozs. |
|---|---|---|---|---|
| Rice Flour | | 8 | 1 | |
| Water | | 8 | 1 | |
| Salt | | 1/4 | | 1/2 |
| Sugar | | 1/2 | | 2 |
| Shortening (melted) | | 1 | | 6 |
| Yeast | | 3/4 | | 2 |

Mix well by hand.
Ferment 1 hour.
Cover top of Dutch Bread after panning.

## DOUGH

### French Bread

| Percentages | | Lbs. | Ozs. |
|---|---|---|---|
| | Sponge** | 12 | 8 |
| .25 | Flour | 2 | 8 |
| .70 | Water (variable) | 1 | 12 |
| .025 | Salt | | 4 |
| .05 | Sugar (Corn)* | | 8 |
| .005 | Paniplus | | 3/4 |
| .0025 | Mycoban | | 1/2 |

*Or 7 lbs. Cane or Beet Sugar.
**12 1/2 lbs. Sponge contains 7 1/2 lbs. Flour.

Mix well - about 10 minutes.
Temperature 80° to 82°.
Ferment 15 to 20 minutes before scaling.

DOUGH

Brown and Serve Rolls
(20 dozen)

| Percentages | | Lbs. | Ozs. |
|---|---|---|---|
| | Sponge** | 12 | 8 |
| .25 | Flour | 2 | 8 |
| .73 | Water (variable) | 1 | 13 1/4 |
| .025 | Salt | | 4 |
| .095 | Sugar (Corn)* | 1 | |
| .04 | Milk | | 6 1/2 |
| .10 | Shortening | 1 | |
| .025 | Egg | | 4 |
| .005 | Paniplus | | 3/4 |
| .0025 | Mycoban | | 1/2 |

*Or 7.5% Cane or Beet Sugar.
**12 1/2 lbs. Sponge contains 7 1/2 lbs. Flour.

Mix well - 10 to 14 minutes.
Temperature 80° to 82°.
Ferment 15 to 20 minutes before scaling. Scale 13 ozs. per doz.
3 doz. - 2 lbs. 8 ozs.

# RYE BREAD
(10 Loaves)

| SPONGE | | | DOUGH | |
|---|---|---|---|---|
| Lbs. | Ozs. | | Lbs. | Ozs. |
| 5 | | Bread Flour | 2 | 8 |
| 2 | 8 | Rye Flour | — | — |
| 4 | 8 | Water (variable) | 1 | 10 |
| — | — | Salt | — | 4 |
| — | — | Sugar (Corn) | | 4 |
| | 1/2 | Reg. Malt | — | — |
| — | — | D. B. Malt | | 1 1/2 |
| — | — | Shortening | | 4 |
| | 3/4 | Arkady | | — |
| | 4 3/4 | Yeast | | — |
| | — | Mycoban | | 1/2 |
| | — | Paniplus | | 3/4 |
| | — | Caraway Seed | | 3/4 |
| 4 to 5 minutes | | Mix low speed | 8 to 10 minutes | |
| 76° | | Temperature | 80° | |
| 3 hours | | Fermentation | 20 minutes | |

## HAMBERGER AND HOT DOG BUNS

| Total Flour Ingredients | 6 Lbs. | | 8 Lbs. | | 12 Lbs. | | 14 Lbs. | |
|---|---|---|---|---|---|---|---|---|
| | Lbs. | Ozs. | Lbs. | Ozs. | Lbs. | Ozs. | Lbs. | Ozs. |
| Sponge** | 7 | 8 | 10 | | 15 | | 17 | 8 |
| Flour | 1 | 8 | 2 | | 3 | | 3 | 8 |
| Water (variable) | 1 | 1 1/4 | 1 | 7 | 2 | 2 1/2 | 2 | 8 1/4 |
| Yeast | | 1 | | 1 1/4 | | 2 | | 2 1/4 |
| Malt | | 1 | | 1 1/2 | | 2 | | 2 1/2 |
| Salt | | 2 | | 2 1/2 | | 3 3/4 | | 4 1/2 |
| Sugar (Corn)* | | 14 1/2 | 1 | 3 1/4 | 1 | 12 3/4 | 2 | 1 1/2 |
| Lard | | 9 1/2 | | 12 3/4 | 1 | 3 1/4 | 1 | 6 1/2 |
| Milk | | 3 3/4 | | 5 | | 7 3/4 | | 9 |
| Paniplus | | 1/2 | | 3/4 | | 1 | | 1 1/4 |
| Total Dough | 12 | 1 1/2 | 16 | 2 | 24 | 3 1/2 | 28 | 3 3/4 |

*Or . 03 percent less Cane or Beet Sugar.
**1. 666 lbs. Sponge contains 1 lb. Flour.

Mix well, 10 to 14 minutes.
Temperature 80° to 82° F.
Ferment 15 to 20 minutes before scaling.

# BUTTER BREAD

| Percentages | Ingredients | Lbs. | Ozs. |
|---|---|---|---|
| | Sponge** | 12 | 8 |
| .25 | Flour | 2 | 8 |
| .74 | Water (variable) | 1 | 13 |
| .025 | Salt | | 4 |
| .09 | Sugar (Corn)* | | 14 1/2 |
| .04 | Milk | | 6 1/2 |
| .05 | Margarine | | 8 |
| .0025 | Paniplus | | 1 |
| .005 | Mycoban | | 1/2 |

*Or 7.5% Cane or Beet Sugar.
**12 1/2 lbs. sponge contains 7 1/2 lbs. flour.

Mix 12 to 14 minutes
Temperature 80° to 82°.
Ferment 15 to 20 minutes.

Scale 9 1/2 oz. pieces - Twin loaves - immediately after panning brush very lightly with melted Margarine between pieces. Proof and bake.

# CHAPTER 26

## DOUGHNUTS

There are two types of Doughnuts made by bakers - one Cake, or Batter and the other Yeast Raised. The popularity of each type varies in different sections of the country.

Most bakers use prepared mixes for making Cake Doughnuts. When these mixes are used one should be sure to keep them fresh, by carrying not more than a 30 day stock. Great care should be exercised during the batter mixing. Two minutes is usually sufficient time for mixing. Correct consistency of batter is also very important.

Some prepared mixes are available for Yeast Raised Doughnut making. These require only the addition of yeast and water and some times flour. However, very few bakers use these mixes, preferring to use their own formulas and methods.

The following formulas and methods are representative of these in general use by bakers producing Yeast Raised Doughnuts.

# DOUGHNUT FRYING

One of the most important things to consider when frying doughnuts is a choice of the type of fryer. It should be a type that is not heated from the bottom. One that heats from the bottom will burn small particles of dough, dust flour, and scrap. This is converted into carbon by the heat and will cause fat to break down at a much faster rate than normal. The fryer should be thermostatically controlled.

The second important thing is the type of shortening used. This should be an all hydrogenated shortening, or a special frying fat. All hydrogenated fat is an all purpose shortening and will do a good job of frying, but a better job will be done by using a special frying fat made for this purpose. Care should be exercised in buying fat for frying. A standard shortening is only partly hydrogenated and has a much lower burning point. This is not a good grade of fat for frying. One should be sure to use an all hydrogenated fat, either vegetable or animal.

The third important thing is the frying temperature. The leaner the dough or batter, the higher the temperature should be. A leaner dough will absorb less shortening than a rich dough. Doughnuts will absorb from 15% to 24% fat while frying. Frying temperature should be about 360° to 400°. Too low a temperature will cause doughnuts to absorb excessive amounts of fat. Too high a temperature will cause shortening to burn and break down. A warm dough or batter will cause high fat absorption. Doughs should not be allowed to rest or age too long. Be sure to have one of the right consistency. Too stiff a dough will reduce the volume of products, too slack a dough will result in poor shape of products.

The fourth important thing is the care of the frying fat. Check the thermostat and be sure that the temperature is never over 400°. The tubes in the fryer should be checked to see that they are getting an even heat. See that all burners are adjusted the same. Don't heat fryer too long before using. Heating 15 minutes before frying is all that is necessary. Don't fill fryer too full of fat. The smaller the amount of shortening, allowing turning of the doughnuts, the better. Add some new fat each time you fry. This will help to keep a higher burning point. Drain fryer and strain out flour particles regularly. If possible use a filter. Give the fryer a weekly cleaning using a special detergent for this purpose. Most soaps contain an alkali that will break down the fat.

## Baking Powder - Yeast Raised Doughnuts No. 1

| PER CENT | INGREDIENTS | LBS. | OZS. | METHODS |
|---|---|---|---|---|
| .507 | Flour (Pastry) | 16 | | Sift all dry ingredients. |
| .032 | Sugar | 1 | | |
| .095 | Shortening | 3 | | Add remaining ingredients and mix on machine approximately 4 minutes. Temperature 75°. |
| .063 | Whole Egg | 2 | | |
| .032 | Yeast | 1 | | |
| .008 | Baking Powder | | 4 | Let rest 20 minutes and cut. |
| .008 | Salt | | 4 | |
| .254 | Water | 8 | | |
| .001 | Flavor (vanilla or rum) | | 1/2 | |
| 1.000 | Totals | 31 | 8 1/2 | |

## Yeast-Baking Powder Doughnuts No. 2

| PER CENT | INGREDIENTS | LBS. | OZS. | METHODS |
|---|---|---|---|---|
| .489 | Pastry Flour | 15 | 11 | Mix very little - just enough to incorporate ingredients. |
| .010 | Cottonwood Flour (specially processed) | | 5 | |
| .039 | Yeast | 1 | 4 | Temperature 75° F. |
| .259 | Water (1 gallon) | 8 | 5 | Take and make-up in 30 minutes. |
| .031 | Sugar | 1 | | |
| .008 | Salt | | 4 | |
| .008 | Baking Powder | | 4 | |
| .094 | Hydrogenated shortening | 3 | | |
| .062 | Whole Egg | 2 | | |
| | Flavor (lemon, vanilla, and mace) | | | |
| 1.000 | Totals | 32 | 1 | |

# DOUGHNUT GLAZE

| PER CENT | INGREDIENTS | LBS. | OZS. | METHODS |
|---|---|---|---|---|
| .719 | Powdered Sugar | 18 | | Mix on first speed using beater, until smooth. |
| .079 | Corn Syrup | 2 | | |
| .0012 | Salt | | 1/2 | |
| | Juice of 2 lemons | | | |
| .0012 | Vanilla | | 1/2 | |
| .079 | Hot Water | 2 | | |
| .120 | Hot Water | 3 | | Dissolve Agar-Agar in hot water, add in 3 parts to above with machine on first speed. |
| .0006 | Agar-Agar | | 1/4 | |
| 1.0000 | Totals | 25 | 1 1/4 | |

# YEAST RAISED DOUGHNUT BATCHES

| MEASURES | 1 1/2 Gal. | | 1 Gal. 3 Pt. | | 5 Quarts | | 1 Gal. 1 Pt. | |
|---|---|---|---|---|---|---|---|---|
| DOZENS | 40 | | 36 2/3 | | 33 1/3 | | 30 | |
| INGREDIENTS | Lbs. | Ozs. | Lbs. | Ozs. | Lbs. | Ozs. | Lbs. | Ozs. |
| Cake Flour | 8 | 7 | 7 | 11 3/4 | 7 | 1/2 | 6 | 5 1/4 |
| Bread Flour | 14 | 1 | 12 | 14 1/4 | 11 | 11 1/2 | 10 | 8 3/4 |
| Water | 12 | 8 | 11 | 7 1/4 | 10 | 6 1/2 | 9 | 6 |
| Salt | | 6 | | 5 1/2 | | 5 | | 4 1/2 |
| Sugar | 1 | 8 | 1 | 6 | 1 | 4 | 1 | 2 |
| Powdered Milk | 1 | 6 1/4 | 1 | 4 1/4 | 1 | 2 1/2 | 1 | 3/4 |
| Baking Powder | | 6 | | 5 1/2 | | 5 | | 4 1/2 |
| Shortening | 4 | 8 | 4 | 2 | 3 | 12 | 3 | 6 |
| Whole Egg | 3 | | 2 | 12 | 2 | 8 | 2 | 4 |
| Yeast | 1 | 8 | 1 | 6 | 1 | 4 | 1 | 2 |
| MEASURES | 1 Gallon | | 7 Pints | | 3 Quarts | | 5 Pints | |
| DOZENS | 26 2/3 | | 23 1/3 | | 20 | | 16 2/3 | |
| INGREDIENTS | Lbs. | Ozs. | Lbs. | Ozs. | Lbs. | Ozs. | Lbs. | Ozs. |
| Cake Flour | 5 | 10 | 4 | 15 | 4 | 3 1/2 | 3 | 8 1/2 |
| Bread Flour | 9 | 6 | 8 | 3 1/4 | 7 | 1/2 | 5 | 14 |
| Water | 8 | 5 1/4 | 7 | 4 3/4 | 6 | 4 | 5 | 3 1/2 |
| Salt | | 4 | | 3 1/2 | | 3 | | 2 1/2 |
| Sugar | 1 | | | 14 | | 12 | | 10 |
| Powdered Milk | | 15 | | 12 1/4 | | 11 | | 9 1/4 |
| Baking Powder | | 4 | | 3 1/2 | | 3 | | 2 1/2 |
| Shortening | 3 | | 2 | 10 | 2 | 4 | 1 | 14 |
| Whole Egg | 2 | | 1 | 12 | 1 | 8 | 1 | 2 |
| Yeast | 1 | | | 14 | | 12 | | 10 |
| MEASURES | 2 Quarts | | 3 Pints | | 1 Quart | | 1 Pint | |
| DOZENS | 13 1/3 | | 10 | | 6 2/3 | | 3 1/3 | |
| INGREDIENTS | Lbs. | Ozs. | Lbs. | Ozs. | Lbs. | Ozs. | Lbs. | Ozs. |
| Cake Flour | 2 | 13 | 2 | 2 | 1 | 14 1/2 | | 15 1/4 |
| Bread Flour | 4 | 11 | 3 | 8 1/4 | 2 | 5 1/2 | 1 | 2 3/4 |
| Water | 4 | 2 1/2 | 3 | 2 | 2 | 1 1/4 | 1 | 3/4 |
| Sugar | | 2 | | 1 1/2 | | 1 | | 1/2 |
| Powdered Milk | | 8 | | 6 | | 4 | | 2 |
| Baking Powder | | 7 1/2 | | 5 1/2 | | 2 3/4 | | 1 1/2 |
| Shortening | | 2 | | 1 1/2 | | 1 | | 1/2 |
| Whole Egg | 1 | 8 | 1 | 2 | | 12 | | 6 |
| Yeast | | 14 | | 10 | | 6 | | 2 |
| | | 8 | | 6 | | 4 | | 2 |

Mix two minutes on second speed. Scrape down and mix two minutes more.
Temperature 80° F. Vary water temperature with season.
Ferment twenty to thirty minutes.

## CAKE DOUGHNUTS

| PER CENT | INGREDIENTS | LBS. | OZS. | METHODS |
|---|---|---|---|---|
| .1560 | Powdered Sugar | 3 | | Mix together on low speed for 1/2 minute. |
| .0265 | Shortening | | 8 | |
| .0065 | Salt | | 2 | |
| .032 | Milk Powder | | 10 | Then mix for 1 1/2 minutes on 2nd speed. |
| .0015 | Soda | | 1/2 | |
| .208 | Pastry Flour | 4 | | |
| .208 | Bread Flour | 4 | | |
| .0195 | Baking Powder | | 6 | |
| .134 | Egg Yolks | 2 | 8 | |
| .208 | Water | 4 | | |
| | Flavor (to taste) | | | |
| 1.000 | Total | 19 | 2 1/2 | |

## CAKE DOUGHNUT ICING

| PER CENT | INGREDIENTS | LBS. | OZS. | METHODS |
|---|---|---|---|---|
| .103 | Water | 1 | 8 | Bring to a boil. |
| .035 | Glucose | | 8 | |
| .002 | Gelatin | | 1/2 | Dissolve gelatin in hot water and add to the above syrup. |
| .034 | Water | | 8 | |
| .826 | Powdered Sugar | 12 | | Add the syrup slowly to the sugar & beat until smooth. Bring to a temp. of 90° to 100° F. for use. |
| 1.000 | Total | 14 | 8 1/2 | |

# CHAPTER 27

## SWEET ROLLS AND COFFEE CAKES

As in the case of cakes, pies, and cookies, a great variety of Sweet Dough products are made by bakers, especially Retail and House-to-House Bakeries. There are three types of such bakery products produced viz: Roll-in and Danish. Coffee Cakes and Cinnamon Rolls are made in retail bakeries throughout the country, mostly from plain Sweet Doughs. Roll-In Rolls and Coffee Cakes are also generally produced in Retail bakeries, while Danish products are found to be in greater demand in the cold northern states, this due likely to the excessive richness of the products.

A great many types of Buns and Rolls may be made from a Plain or Roll-In Sweet Dough such as: Caramel, Honey, Filled, Butterfly, Cinnamon, Hot Cross, and Raisin Buns; also Pecan, Filbert, Twists, Butterhorn, and Apple Rolls; and a variety of Coffee Cakes such as: Streusel, Filbert, Almond, and Cocoanut Topped; and Filled and Braided Rings.

The following formulas and methods for making doughs, products, toppings, and icings are in general use throughout the states.

## Sweet Dough

| PER CENT | INGREDIENTS | LBS. | OZS. | METHODS |
|---|---|---|---|---|
| .093 | Sugar | | 8 1/2 | Cream on 1st speed. |
| .093 | Shortening (veg.) | | 8 1/2 | |
| .093 | Whole Egg | | 8 1/2 | Mix into above on 1st speed. |
| .022 | Cake Flour | | 2 | Add to above and cream on 1st speed. |
| .011 | Salt | | 1 | |
| .027 | Milk Powder | | 2 1/4 | |
| | Flavor | | | |
| .187 | Water (variable) | 1 | 1 | Dissolve yeast in water and mix with above. Scrape bowl. Mix on 1st speed. |
| .033 | Yeast | | 3 | |
| .441 | Bread Flour* | 2 | 8 | Add and mix only 2 to 3 minutes. |
| 1.000 | Totals | 5 | 10 3/4 | |

REMARKS: Temperature 78° F.
Fermentation 1 hour to 1 1/2 hours - no punch.
Soft dough.

*If spring wheat flour is used a greater percentage of cake flour should be substituted - as much as one-third.

# PECAN ROLLS

1. Pan Dressing

| | |
|---|---|
| Brown Sugar | 5 lbs. |
| Margarine | 2 lbs. 8 ozs. |
| Honey | 1 lb. 4 ozs. |

Cream Sugar and Margarine for about 5 minutes on 2nd speed. Then add Honey slowly. Keep in shop and not in refrigerator - Avoid using excessive amounts.

## Dough and Make-Up

1. Make slack dough.
2. Avoid rolling out too thin.
3. Avoid tight rolling.
4. Scale correct weight.
5. Allow cut pieces to remain on table a few minutes before panning. Then press well in cups.
6. When fully baked, remove from oven, invert pans and allow rest one or two minutes before lifting pans.

## Sweet Dough Batch Sizes

| | 8 Lbs. | | 10 Lbs. | | 12 Lbs. | | 14 Lbs. | |
|---|---|---|---|---|---|---|---|---|
| INGREDIENTS | LBS. | OZS. | LBS. | OZS. | LBS. | OZS. | LBS. | OZS. |
| Cane Sugar | | 12 | | 15 | 1 | 2 | 1 | 5 |
| Hydrog. Short. | | 12 | | 15 | 1 | 2 | 1 | 5 |
| Whole Egg | | 12 | | 15 | 1 | 2 | 1 | 5 |
| Salt | | 1 1/4 | | 1 1/2 | | 1 3/4 | | 2 |
| Milk | | 3 1/2 | | 4 1/4 | | 5 1/4 | | 6 |
| Cake Flour | | 3 | | 3 3/4 | | 4 1/2 | | 5 1/4 |
| Yeast | | 4 1/2 | | 5 1/2 | | 6 1/2 | | 7 3/4 |
| Water | 1 | 9 1/2 | 2 | | 2 | 6 1/2 | 2 | 13 |
| Bread Flour | 3 | 6 1/2 | 4 | 4 | 5 | 1 1/2 | 5 | 15 |

| | 16 Lbs. | | 18 Lbs. | | 20 Lbs. | | 22 Lbs. | |
|---|---|---|---|---|---|---|---|---|
| INGREDIENTS | LBS. | OZS. | LBS. | OZS. | LBS. | OZS. | LBS. | OZS. |
| Cane Sugar | 1 | 8 | 1 | 11 | 1 | 14 | 2 | 1 |
| Hydrog. Short. | 1 | 8 | 1 | 11 | 1 | 14 | 2 | 1 |
| Whole Egg | 1 | 8 | 1 | 11 | 1 | 14 | 2 | 1 |
| Salt | | 2 1/4 | | 2 1/2 | | 2 3/4 | | 3 1/4 |
| Milk | | 7 | | 7 3/4 | | 8 1/2 | | 9 1/2 |
| Cake Flour | | 6 | | 6 3/4 | | 7 1/2 | | 8 |
| Yeast | | 9 | | 10 | | 11 1/4 | | 12 1/4 |
| Water | 3 | 3 1/4 | 3 | 9 1/2 | 4 | | 4 | 6 3/4 |
| Bread Flour | 6 | 12 1/2 | 7 | 10 1/2 | 8 | 8 | 9 | 5 1/4 |

## Sweet Dough Batch Sizes

| INGREDIENTS | 24 Lbs. | | 26 Lbs. | | 28 Lbs. | | 30 Lbs. | |
|---|---|---|---|---|---|---|---|---|
| | LBS. | OZS. | LBS. | OZS. | LBS. | OZS. | LBS. | OZS. |
| Cane Sugar | 2 | 4 | 2 | 7 | 2 | 10 | 2 | 13 |
| Hydrog. Short. | 2 | 4 | 2 | 7 | 2 | 10 | 2 | 13 |
| Whole Egg | 2 | 4 | 2 | 7 | 2 | 10 | 2 | 13 |
| Salt | | 3 1/2 | | 3 3/4 | | 4 | | 4 1/2 |
| Milk | | 10 1/4 | | 11 1/4 | | 12 | | 13 |
| Cake Flour | | 8 3/4 | | 9 1/2 | | 10 1/4 | | 11 |
| Yeast | | 13 1/2 | | 14 1/2 | | 15 3/4 | 1 | 3/4 |
| Water | 4 | 13 | 5 | 3 1/2 | 5 | 9 1/2 | 6 | 1/4 |
| Bread Flour | 10 | 3 | 11 | 1/2 | 11 | 14 | 12 | 11 3/4 |

| INGREDIENTS | 32 Lbs. | | 43 Lbs. | |
|---|---|---|---|---|
| | LBS. | OZS. | LBS. | OZS. |
| Cane Sugar | 3 | | 3 | 3 1/4 |
| Hydrog. Short. | 3 | | 3 | 3 1/4 |
| Whole Egg | 3 | | 3 | 3 1/4 |
| Salt | | 4 1/2 | | 4 3/4 |
| Milk | | 13 3/4 | | 14 3/4 |
| Cake Flour | | 11 3/4 | | 12 3/4 |
| Yeast | 1 | 1 3/4 | 1 | 3 |
| Water | 6 | 7 | 6 | 12 3/4 |
| Bread Flour | 13 | 9 1/4 | 14 | 6 1/2 |

Sweet Dough (Roll-In)

| PER CENT | INGREDIENTS | LBS. | METHODS |
|---|---|---|---|
| .094 | Cane Sugar | 21 | Cream well on 1st speed. |
| .094 | Hydrogenated Shortening | 21 | |
| .094 | Whole Egg | 21 | Mix into above on 1st speed. |
| .009 | Salt | 2 | Add to above and cream in on 1st speed. |
| .027 | Milk | 6 | |
| .023 | Cake Flour | 5 | |
| .035 | Yeast | 8 | Disintegrate yeast in water and mix into above on 1st speed. Scrape bowl. |
| .200 | Water - 70° F. | 45 | |
| .424 | Bread Flour | 95 | Add to above and mix only 1 minute on 2nd speed and 2 minutes on 1st speed. |
| 1.000 | Totals | 224 | |
| | 2 Oz. roll-in per lb. of dough. | | |

# CHAPTER 28

## DANISH PASTRIES*

"There are several basic rules or production practices that should be followed in the making of Danish Pastries.

1. Danish doughs should be mixed cool (50° - 60° F.) and kept cool during the rolling-in and make-up periods.

2. Dough mixing time should be held to a minimum.

3. The fat used for rolling-in should be of the same consistency and placticity as the dough.

4. Rolling-in of the fat should be done in such manner that the dough will consist of alternate, unbroken layers of fat and dough.

5. Proofing temperature should not exceed 85° F. with only enough humidity to keep the dough pieces from crusting.

"The reasons behind these good production practices are as follows:

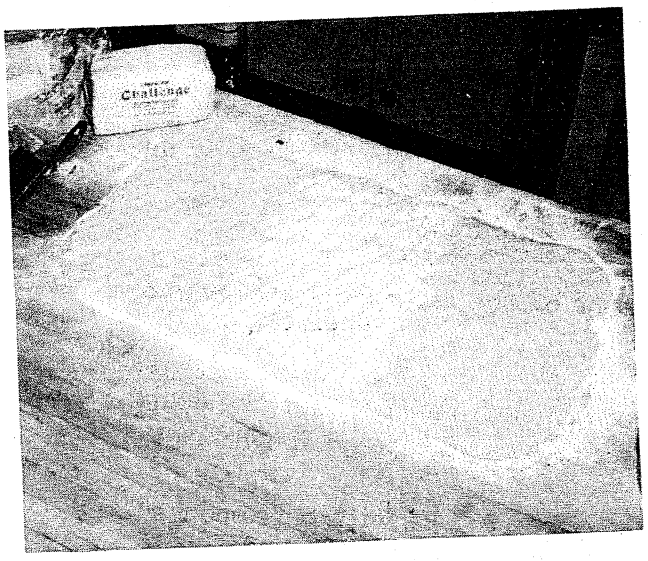
1. Danish dough should be kept cool because a low temperature retards fermentation of the dough during the make-up period. A low temperature greatly facilitates handling of the dough and a low temperature helps to maintain the alternate layers of dough and fat.

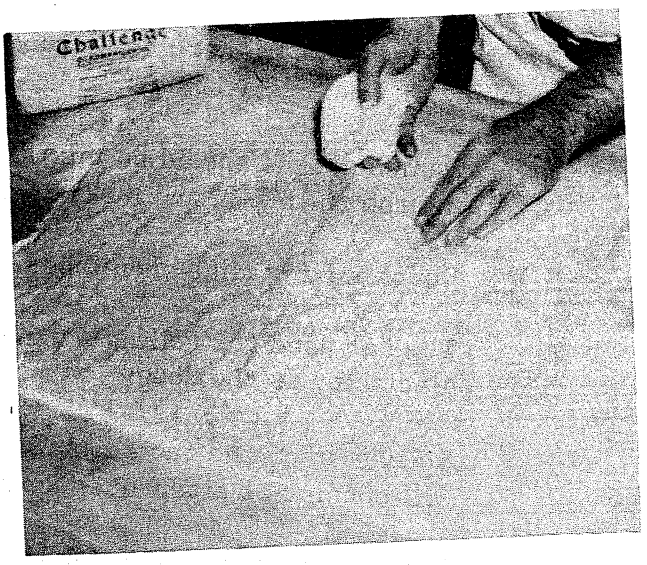
2. Dough-mixing time should be held to a minimum because the dough is worked further by the rolling-in of the fat and folding of the dough to form the necessary layers of fat and dough.

3. The fat used for rolling-in the dough should be of the proper consistency and plasticity to form even, continuous layers of fat in the dough as it is rolled in. Roll-in fat is a product made especially for this purpose and is ideal in its consistency and plasticity. By using oils of the proper melting point, making them into a margarine with the milk portion contributing the flavor, it is possible to make a roll-in fat that has the plasticity needed over the wide temperature range that is found in general bake shop conditions.

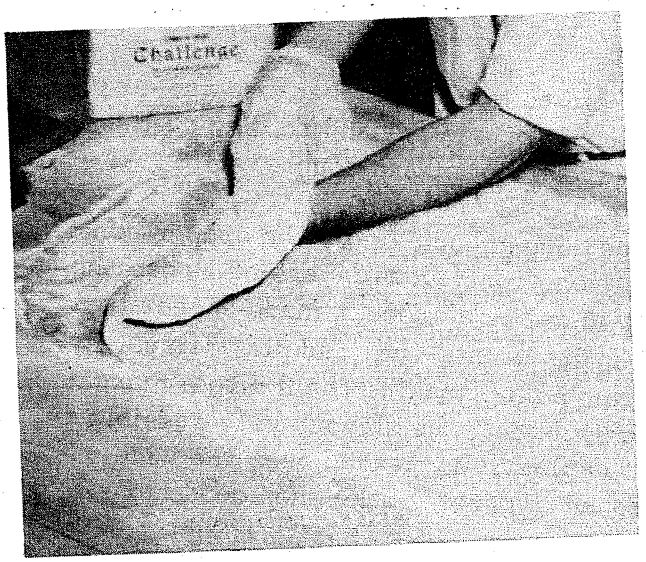
4. The rolling-in process should be done in a manner that will form unbroken, alternate layers of Roll-in and dough. If it is rolled with too much pressure or an uneven pressure, these layers will be broken. The number of layers that should be formed is controlled by richness of the dough and the type of product being made. Usually three folds of three layers each will obtain the best results.

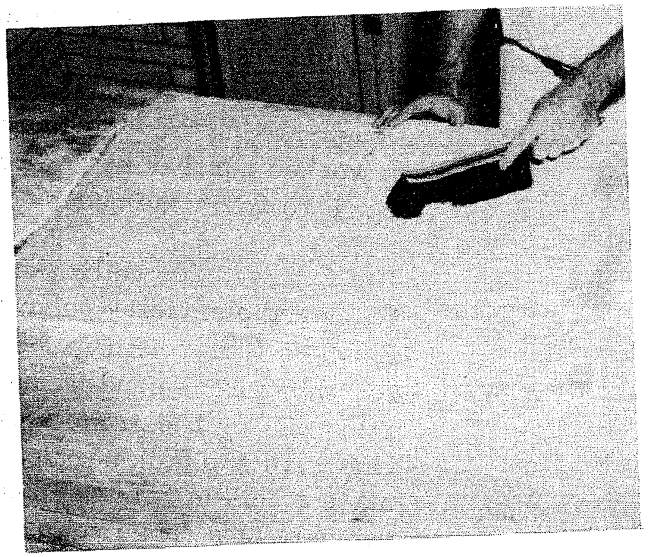
5. Proofing temperature should not be over 85°F. with only enough humidity to prevent crusting. If too high temperatures are used the fat will melt before the products are baked.



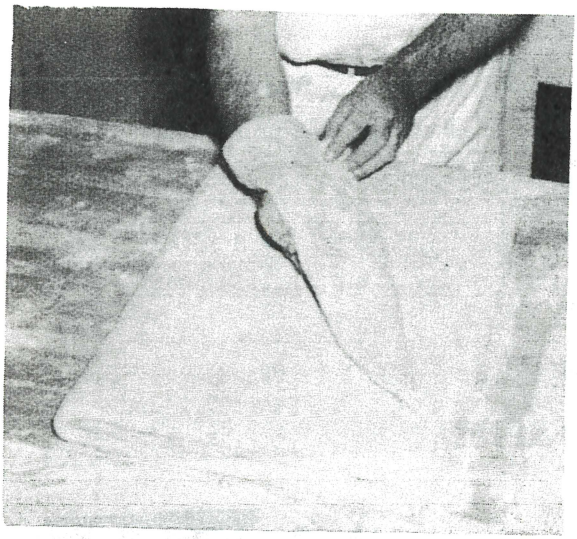


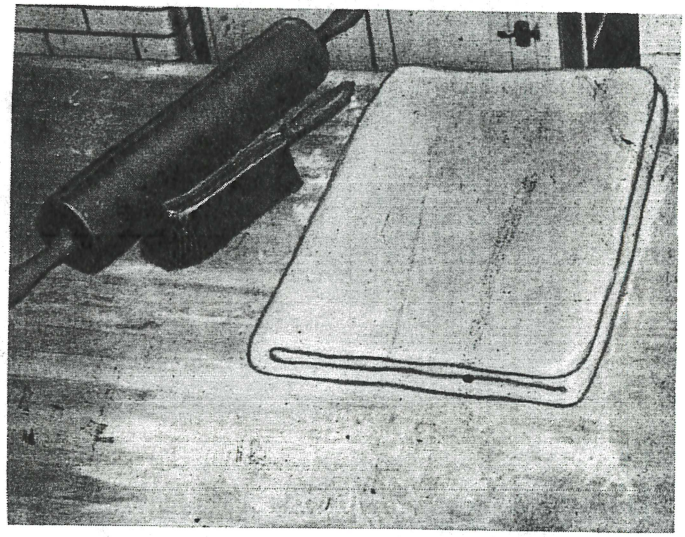
"Place the dough, as it is taken from the mixer, on the flour-dusted bench. Pat into an oblong piece or roll lightly with a rolling pin The dough shown in picture is rolled about one-inch in thickness. Four pounds of Roll-In is used, one-half placed on the center 1/3 of the dough as shown in the picture. One end of the dough is folded over this center portion and the remaining one-half of the Roll-In is placed or spotted on the part that is folded over.



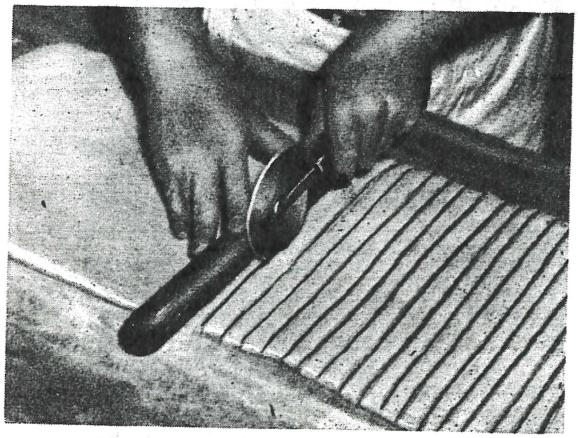


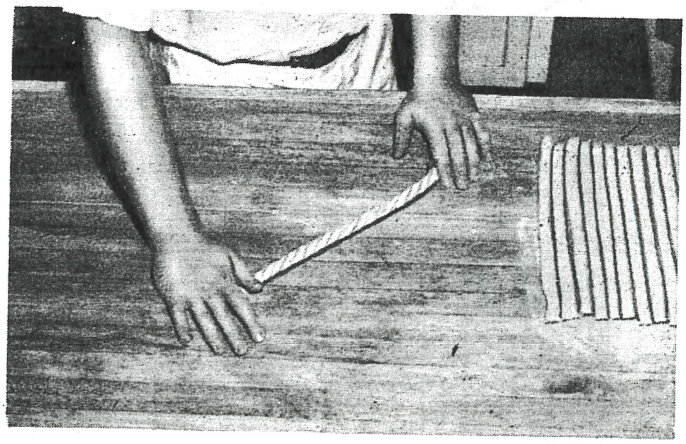
"The remaining third of the dough is then folded over to form five alternate layers of dough and Roll-In. The piece is then turned at right-angles and rolled to the size and thickness shown in the picture. Rolling should be done with light, even pressure. All excess flour should be brushed off before the folds are made.

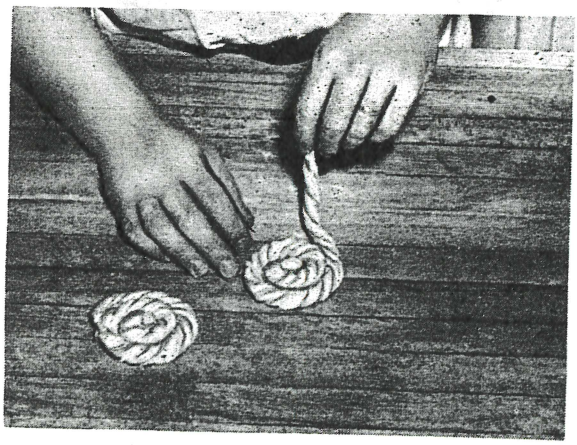


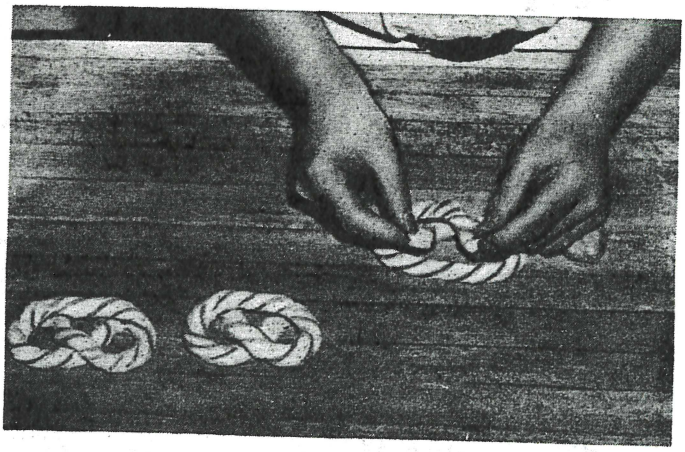


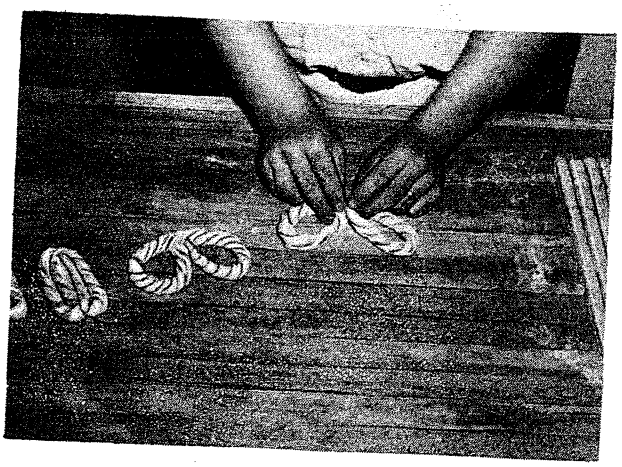
"When the dough has been rolled and folded once after spotting in the Roll-In it should be covered with a waxed or greased paper or plain paper and a damp cloth to prevent crusting; then placed in a refrigerator and allowed to stand for 20 to 30 minutes. After letting the dough stand until it is pliable, it is ready to be rolled again. Generally three rollings of three folds each are sufficient. The dough should be covered and placed in the refrigerator after each roll.

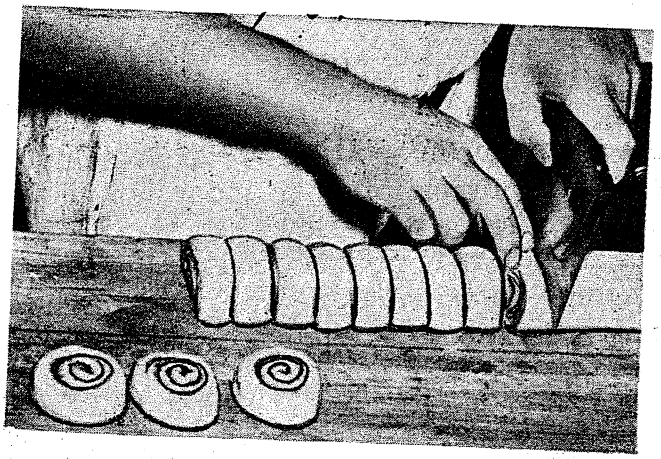


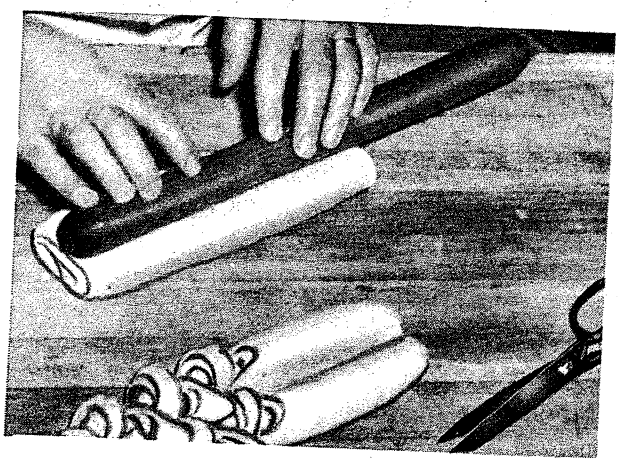


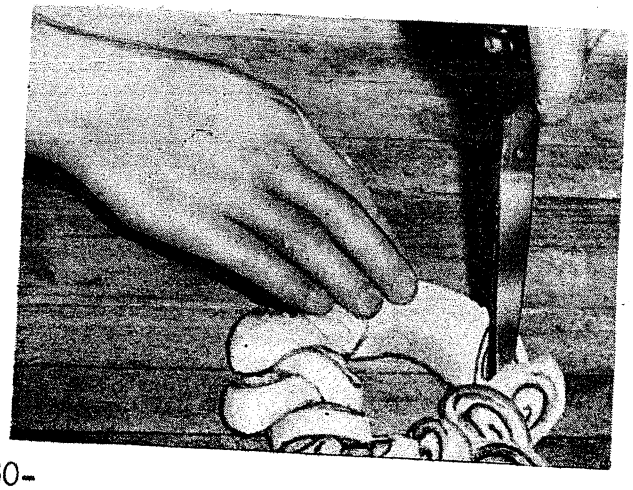












## Danish Pastry
Percent

| Ingredients | Lbs. | Ozs. | Flour Basis | Method |
|---|---|---|---|---|
| Granulated Sugar | 1 | 4 | 14 | Cream smooth only. |
| Salt | | 3 | 2.01 | |
| Milk (powdered) | | 8 | 5.6 | |
| Flavor | As desired | | | |
| Hydrogenated Shortening | 1 | | 11.1 | |
| Whole Egg | 2 | | 22.2 | Add, cream smooth only. |
| Water | 4 | | 44.4 | Dissolve yeast in water, |
| Yeast | | 12 | 8.3 | add. |
| Bread Flour | 6 | | 66.6 | Add, mix at low speed |
| Pastry Flour | 3 | | 33.3 | only enough to wet the flour. |
| Roll-In | 4 | | 44.4 | See special instructions. |
| Total Batch Weight | 22 | 11 | | |

Dough Temperature 50° - 60° F.

"Special Instructions: The dough should be allowed to rest long enough to become pliable after being mixed, preferably under refrigeration and covered to prevent crusting.

"Roll dough into an oblong sheet of about 3/4 inch thickness. Place or spot Roll-in over two-thirds of the dough surface. Fold in a manner to form three layers of dough and two layers of Roll-in. Roll again to about 1/2-inch thickness and fold into three layers. The dough should be covered again to prevent crusting and allowed to rest until it is pliable. Repeat the operation of rolling and folding two more times, making a total of three folds of three layers each.

"Care should be taken in the rolling process to keep from breaking the alternate layers of dough and fat. Enough dusting flour should be used to prevent the dough from sticking to the bench but should not be used in excess. Rolling should be done with a light, even pressure.

"Proofing temperature should not exceed 85° F., with humidity only high enough to prevent crusting. Bake small units at 400° F.; large units at a slightly lower temperature. Glaze with a glucose or apricot glaze immediately upon removing from the oven and ice with a thin roll icing when partially cooled.

Glazed Streussel

| Ingredients | Lbs. | Ozs. | Methods |
|---|---|---|---|
| Granulated sugar | 2 | | Cream. |
| Hydrogenated shortening | 2 | | |
| Salt | | 1/2 | |
| Honey or syrup | | 8 | Add. |
| Pastry flour | 2 | | Add. Mix lightly. |
| Bread flour | 1 | 8 | |
| Total Batch Weight | 8 | 1/2 | |

Peanut Butter Streussel

| Ingredients | Lbs. | Ozs. | Methods |
|---|---|---|---|
| Hydrogenated shortening | 1 | | Cream. |
| Strained Honey | 1 | | |
| Peanut Butter | 1 | 8 | |
| Pastry flour | 2 | 8 | Sift together, add, mix |
| Brown sugar | 6 | | lightly. |
| Sliced peanuts | 1 | 8 | Rub through a coarse sieve. Mix in. |

## Lemon Streussel

| Ingredients | Lbs. | Ozs. | Methods |
|---|---|---|---|
| Powdered Sugar | 3 | | Cream. |
| Hydrogenated Shortening | 2 | 6 | |
| Egg Yolk | | 8 | |
| Grated Rind of 4 Lemons | | | |
| Cake Flour | 4 | | Rub in. |

## Orange - Cocoanut Topping

| Ingredients | Lbs. | Ozs. | Methods |
|---|---|---|---|
| Granulated Sugar | 2 | | Cream. |
| Hydrogenated Shortening | 1 | | |
| Grated Rind and Juice of 6 Oranges | | | Add. |
| Egg White | | 8 | |
| Macaroon Cocoanut | 3 | | Rub in. |

## Honey - Nut Topping

| Ingredients | Lbs. | Ozs. | Methods |
|---|---|---|---|
| Hydrogenated Shortening | 2 | | Heat on low fire until |
| Granulated Sugar | 2 | | sugar is dissolved. |
| Strained Honey | 1 | | |
| Cashew Nuts (ground and toasted) | 1 | 4 | Add, bring to a boil. |
| Pecans (sliced) | 1 | 4 | |
| Milk | | 12 | |

Instructions: Spread on coffee cakes or rolls while the topping is warm. Topping should be applied before proofing.

## Almond Brittle Topping

| Ingredients | Lbs. | Ozs. | Methods |
|---|---|---|---|
| Granulated Sugar | 2 | 8 | Mix together, do not |
| Hydrogenated Shortening | 2 | 8 | cream. |
| Strained Honey | | 10 | Add. |
| Egg White | 1 | | Add. |
| Sliced Almonds | 2 | 8 | Add. |

Instructions: Spread on coffee cakes before proofing. Topping will spread in oven. Do not spread too near edge of pieces.

## Butter Cream Filling

| Ingredients | Lbs. | Ozs. | Methods |
|---|---|---|---|
| Powdered Sugar | 4 | | Cream lightly. |
| Cake Flour | | 4 | |
| Hydrogenated Shortening | 2 | | |
| Whole Egg | | 14 | Add gradually. |
| Vanilla (as desired) | | | |

Raisins, chopped fruit, ground nuts, streussel, cinnamon, sugar, etc. may be used in conjunction with this filling. Sprinkle on after dough has been spread with butter cream filling.

## Apricot - Nut Filling

| Ingredients | Lbs. | Ozs. | Methods |
|---|---|---|---|
| Apricot Jam | 1 | | Mix together. |
| Ground Raisins | 1 | | |
| Ground Walnuts | | 8 | |
| Granulated Sugar | | 8 | |
| Dry cake crumbs | | 8 | |
| Water (variable) | | 8 | Add to obtain spreading |
| Vanilla (as desired) | | | consistency. |

## Peanut Butter Filling

| Ingredients | Lbs. | Ozs. | Methods |
|---|---|---|---|
| Brown Sugar | 2 | 8 | Cream. |
| Pastry Flour | | 8 | |
| Hydrogenated Shortening | | 8 | |
| Peanut Butter | 1 | 8 | |
| Whole Egg | | 6 | Add, cream. |
| Dry Cake Crumbs | 1 | | Add, stir in. |

Add water to obtain spreading consistency.

## Almond Filling

| Ingredients | Lbs. | Ozs. | Methods |
|---|---|---|---|
| Almond Paste | 1 | | Work, smooth. |
| Whole Egg | | 6 | |
| Granulated Sugar | 2 | 4 | Add, mix smooth. |
| Dry Cake Crumbs | 2 | | |
| Cinnamon | | 1/4 | |

Add milk to obtain proper spreading consistency.

## Date Filling

| Ingredients | Lbs. | Ozs. | Methods |
|---|---|---|---|
| Granulated Sugar | 2 | 8 | Bring to a boil. |
| Glucose | | 8 | |
| Water | 2 | | |
| Ground Dates | 4 | | Add, stir in, remove from fire. |

Allow to cool to 150° F., add juice and grated rind of one lemon. Place in mixing bowl and beat with paddle at 2nd speed for 10 minutes.

## Fig Filling

| Ingredients | Lbs. | Ozs. | Methods |
|---|---|---|---|
| Granulated Sugar | 4 | | Bring to a boil. |
| Glucose | | 8 | |
| Water | 3 | 4 | |
| Ground Figs | 4 | | Add, stir in, remove from fire. |

Allow to cool to 150° F., add juice and grated rind of one lemon. Place in mixing bowl and beat with paddle at 2nd speed for 10 minutes.

## Pan Dressing for Caramel or Pecan Rolls

| Ingredients | Lbs. | Ozs. | Methods |
|---|---|---|---|
| Brown Sugar | 5 | | Mix together thoroughly. |
| Granulated Sugar | 5 | | |
| Hydrogenated Shortening | 2 | 8 | |
| Glucose | 1 | 4 | |
| Water | 1 | 4 | Add, stir smooth. |

## Syrup Glaze

| Ingredients | Lbs. | Ozs. | Methods |
|---|---|---|---|
| Granulated Sugar | 3 | | Bring to a boil. |
| Glucose | 1 | 8 | |
| Water | 2 | | |

Glaze rolls and coffee cakes as they are removed from the oven.

## Apricot Glaze

| Ingredients | Lbs. | Ozs. | Methods |
|---|---|---|---|
| Granulated Sugar | 6 | | Boil until clear. |
| Glucose | 2 | | |
| Strained Apricot Pulp (No. 10 can) | 6 | 8 | |

*Courtesy of Swift and Co.

## Danish Dough

| PER CENT | INGREDIENTS | LBS. | OZS. | METHODS |
|---|---|---|---|---|
| .089 | Sugar | 3 | 2 1/4 | Cream together 1st speed. |
| .089 | Shortening | 3 | 2 1/4 | |
| .089 | Whole Egg | 3 | 2 1/4 | Mix in above, 1st speed. |
| .021 | Cake Flour | | 12 | Add to above and cream in. 1st speed. |
| .009 | Salt | | 4 3/4 | |
| .025 | Milk Powder | | 13 1/2 | |
| | Flavor | | | |
| .222 | Water (variable) | 7 | 14 | Dissolve yeast in water and mix in with above. 1st speed. Scrape bowl. |
| .032 | Yeast | 1 | 2 | |
| .424 | Bread Flour | 15 | | Add and mix only one minute on 2nd speed. 2 minutes on 1st speed. |
| 1.000 | Totals | 35 | 5 | |

REMARKS: Roll in 2 oz. of roll-in margarine per lb. of dough. Give dough 10 minute rest between rolls.

## Danish Dough Batch Sizes

| | 12 Lbs. | | 14 Lbs. | | 16 Lbs. | | 18 Lbs. | |
|---|---|---|---|---|---|---|---|---|
| INGREDIENTS | LBS. | OZS. | LBS. | OZS. | LBS. | OZS. | LBS. | OZS. |
| Cane Sugar | 1 | 2 | 1 | 5 | 1 | 8 | 1 | 11 |
| Hydro. Short. | 1 | 2 | 1 | 5 | 1 | 8 | 1 | 11 |
| Whole Egg | 1 | 2 | 1 | 5 | 1 | 8 | 1 | 11 |
| Cake Flour | | 4 1/2 | | 5 1/4 | | 6 | | 6 3/4 |
| Salt | | 1 3/4 | | 2 | | 2 1/4 | | 2 1/2 |
| Milk (Dry) | | 5 1/4 | | 6 | | 7 | | 7 3/4 |
| Flavor | | | | | | | | |
| Water (?) | 2 | 6 1/2 | 2 | 13 | 3 | 3 1/4 | 3 | 9 1/2 |
| Yeast | | 6 1/2 | | 7 3/4 | | 9 | | 10 |
| Bread Flour | 5 | 1 1/2 | 5 | 15 | 6 | 12 1/2 | 7 | 10 1/2 |

| | 20 Lbs. | | 22 Lbs. | | 24 Lbs. | | 26 Lbs. | |
|---|---|---|---|---|---|---|---|---|
| INGREDIENTS | LBS. | OZS. | LBS. | OZS. | LBS. | OZS. | LBS. | OZS. |
| Cane Sugar | 1 | 14 | 2 | 1 | 2 | 4 | 2 | 7 |
| Hydrog. Short. | 1 | 14 | 2 | 1 | 2 | 4 | 2 | 7 |
| Whole Egg | 1 | 14 | 2 | 1 | 2 | 4 | 2 | 7 |
| Cake Flour | | 7 1/2 | | 8 | | 8 3/4 | | 9 1/2 |
| Salt | | 2 3/4 | | 3 1/4 | | 3 1/2 | | 3 3/4 |
| Milk (Dry) | | 8 1/2 | | 9 1/2 | | 10 1/4 | | 11 1/4 |
| Flavor | | | | | | | | |
| Water (?) | 4 | | 4 | 6 3/4 | 4 | 13 | 5 | 3 1/2 |
| Yeast | | 11 1/4 | | 12 1/4 | | 13 1/2 | | 14 1/2 |
| Bread Flour | 8 | 8 | 9 | 5 1/4 | 10 | 3 | 11 | 1/2 |

## Danish Dough Batch Sizes (Cont'd.)

| | 28 Lbs. | | 30 Lbs. | | 32 Lbs. | | 34 Lbs. | |
|---|---|---|---|---|---|---|---|---|
| INGREDIENTS | LBS. | OZS. | LBS. | OZS. | LBS. | OZS. | LBS. | OZS. |
| Cane Sugar | 2 | 10 | 2 | 13 | 3 | | 3 | 3 1/4 |
| Hydrog. Short. | 2 | 10 | 2 | 13 | 3 | | 3 | 3 1/4 |
| Whole Egg | 2 | 10 | 2 | 13 | 3 | | 3 | 3 1/4 |
| Cake Flour | | 10 1/4 | | 11 | | 11 3/4 | | 12 1/2 |
| Salt | | 4 | | 4 1/4 | | 4 1/2 | | 4 3/4 |
| Milk (dry) | | 12 | | 13 | | 13 3/4 | | 14 3/4 |
| Flavor | | | | | | | | |
| Water (?) | 5 | 9 1/2 | 6 | 1/4 | 6 | 7 | 6 | 12 3/4 |
| Yeast | | 15 3/4 | 1 | 3/4 | 1 | 1 3/4 | 1 | 3 |
| Bread Flour | 11 | 14 | 12 | 11 3/4 | 13 | 9 1/4 | 14 | 6 1/2 |

## Pineapple Fruit Topping for Sweet Rolls

| PER CENT | INGREDIENTS | LBS. | OZS. | METHODS |
|---|---|---|---|---|
| .137 | Water | 1 | 10 | Bring to boil. |
| .032 | Water | | 6 | Add to above and cook until clear. |
| .021 | Starch | | 4 | |
| .253 | Sugar | 3 | | Add and stir in. Bring back to boil. |
| .557 | Pineapple (1 can) | 6 | 10 | Add above to pineapple. |
| 1.000 | Totals | 11 | 14 | |

## Sweet Roll Icing

| PER CENT | INGREDIENTS | LBS. | OZS. | METHODS |
|---|---|---|---|---|
| .038 | Hydrogenated Shortening | | 8 | Mix with beater until gelatin has completely dissolved. |
| .076 | Corn Syrup | 1 | | |
| .004 | Gelatin | | 3/4 | |
| .123 | Hot Water | 1 | 10 | |
| .002 | Vanilla | | 1/2 | |
| | Juice of one fresh lemon. | | | |
| .757 | Powdered Sugar | 10 | | Add to above and mix on first speed until smooth, using beater. |
| 1.000 | Totals | 13 | 3 1/4 | |

## High Gloss Icing

For Wrapped or Unwrapped Sweet Rolls and Coffee Cakes

| PER CENT | INGREDIENTS | LBS. | OZS. | METHODS |
|---|---|---|---|---|
| .070 | Corn Syrup | 4 | | Add corn syrup to water and bring to boil. |
| .087 | Water (variable) | 5 | | |
| .667 | 4xxxx Powdered Sugar | 38 | | Introduce into mixing bowl. Add syrup solution gradually with mixer operating. Flavor with orange, lemon vanilla, or a combination of these. |
| .175 | Fondant Type Icing Base | 10 | | |
| .001 | Salt | | 1/2 | |
| 1.000 | Totals | 57 | 1/2 | |

CHAPTER 29

# PUFF PASTRY*

| Ingredients | Lbs. | Ozs. |
|---|---|---|
| Margarine | 1 | |
| Egg (for a cheaper mix reduce to 3 oz. egg) | | 10 |
| Cream of Tartar (lemon juice may be substituted) | | 3/4 |
| Bread Flour | 6 | |
| Cold Water (variable) | 3 | 4 |
| Pastry Margarine (to be rolled in) | 4 | 8 |

## Making of the Dough

"Sift the cream of tartar with the flour. Mix margarine well with the flour so that no lumps remain. Stir the egg with the water so that the yolks are broken up before adding to the flour-shortening mix. Add the water and egg and make a smooth, well-mixed dough. Mold into oblong shape and set in a cold place for about 30 minutes. Cover with damp cloth to prevent formation of crust on dough.

## Preparation of Pastry Margarine for Rolling-In

"Work the Pastry Margarine on the bench or in the mixer, if necessary, for a short time to bring it to about the same consistency as the dough.

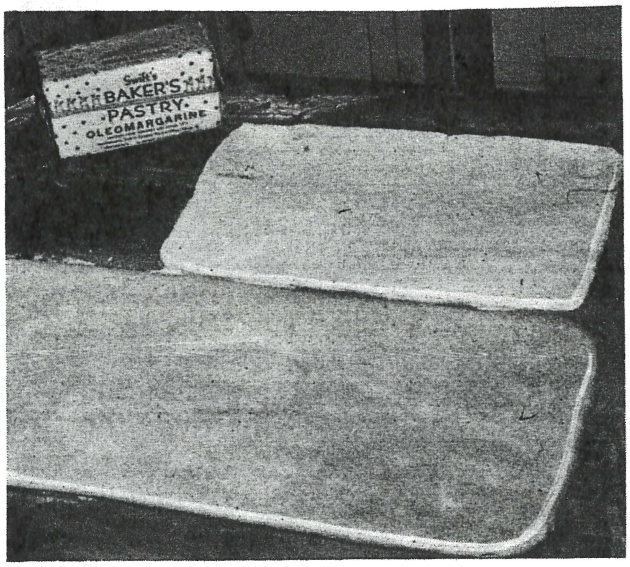
## Placing Pastry Margarine in the Dough

"Method No. 1 Roll out the dough three times as long as it is wide to a thickness of about 1/2 inch. Spot pastry margarine evenly over 2/3 of the dough. Fold the bare part of the dough over half of the pastry-covered part, and then the remaining three layers of dough, separated by two layers of Pastry Margarine. Give 3 fold rolls and 2 four fold rolls, allowing a half hour rest between rolls.

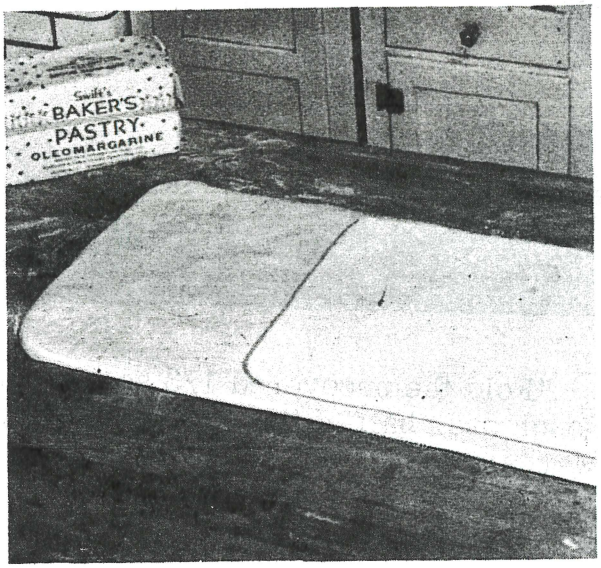
"Method No. 2 Roll the dough out three times as long as it is wide to a thickness of about 1/2 inch. Divide pastry margarine into two equal portions and roll out each portion to a length equal to a little less than the width of the dough and a width equal to about 1/3 the length of the dough. This can be done best between two sheets of oiled paper or bread wrapping paper. Then place one of the

fat layers crosswise in the center of the roll-out dough, and fold over end, covering up the layer of Pastry Margarine. Place the second layers of pastry on top and fold over the other edge of the dough, forming in all three layers of dough and two layers of Pastry Margarine. Give 3 threefold rolls and 2 fourfold rolls, allowing a half hour rest between rolls.

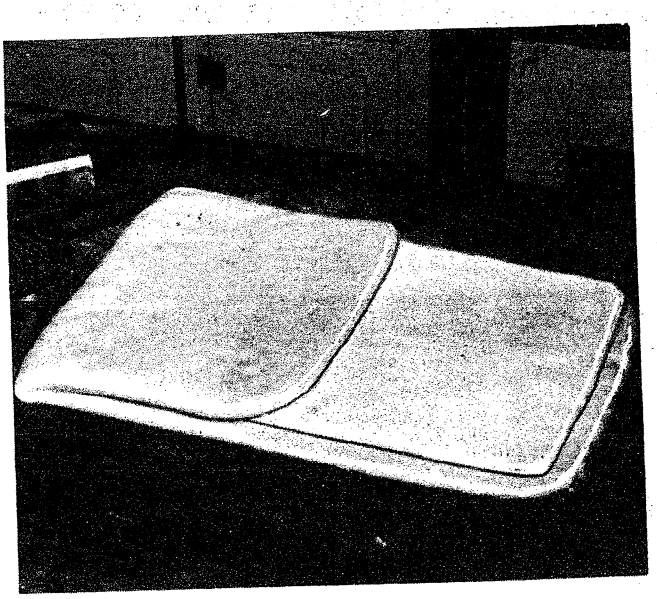
Method No. 3. Similar to Method No. 2.




"Roll the dough three times as long as it is wide to a thickness of about 1/2 inch. Roll the Pastry Margarine to a width a little less than the width of the dough and a length to about 2/3 of the dough. This can be done either by rolling the Margarine between two sheets of oiled or bread wrapping paper, or on the bench which has been dusted with flour to prevent sticking.

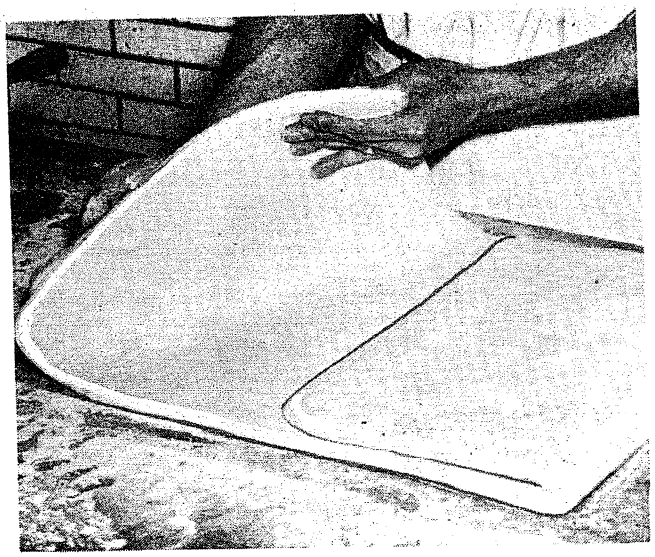



"Place the margarine on the dough leaving about 1 inch margin to insure the dough will cover the Margarine after folding.



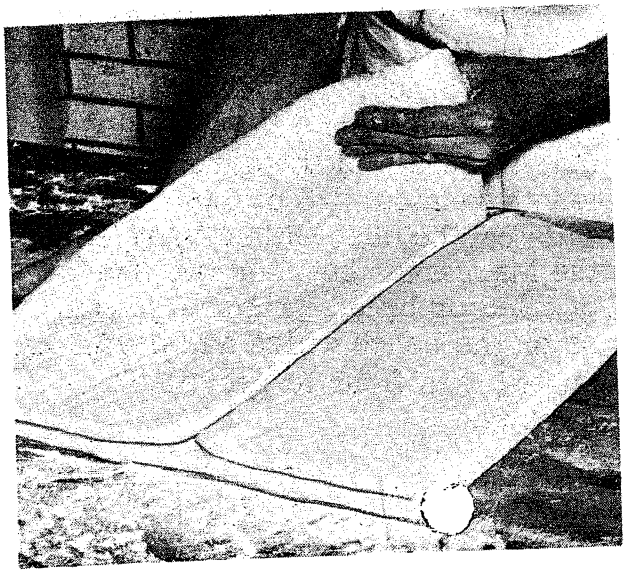
"Fold the uncovered 1/3 section of dough over half of the covered Pastry Margarine.

"Brush away any loose dusting flour and then fold the remaining Margarine covered part over the first fold of dough. This operation forms three layers of dough and two layers of fat.



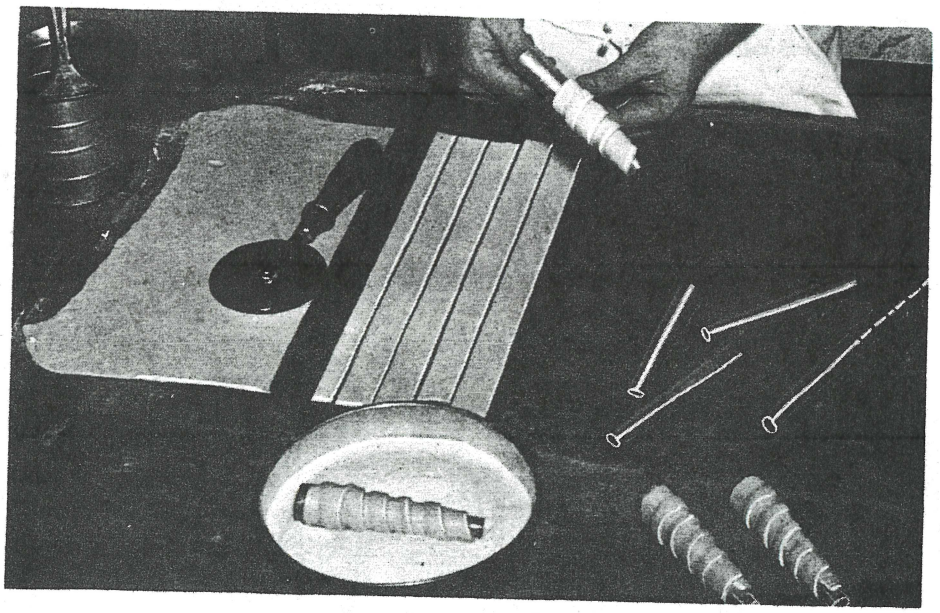
The Threefold

"After the dough has been rolled out or sheeted, fold one-third of the dough over the center one-third. Remove flour dust and fold the remaining one-third over the center folds, thus giving three layers of rolled dough.



The Fourfold

"After the dough has been rolled out or sheeted, fold one end of the dough into the middle. Fold opposite end to the middle leaving about a one-inch space. Then fold one folded section over the other, thus giving four layers of rolled dough. Be sure to brush away loose dusting flour between each fold.



Cream Horns

"Roll pastry into a strip approximately 48 inches long and 15 inches wide, and to a thickness of 1/8 inch or less. Cut into strips 1 1/4 inches wide, wash with water, and roll on cream horn tins starting at the small end of the horn. Place in crystal sugar, and pan. Allow a 30-minute rest period before baking. Bake at moderate temperature until lightly browned. When cool, fill with marshamallow or whipping cream.

Patty Shells

"Roll the dough to 1-16 inch thickness. Cut rounds with a plain edge cutter, place on a pan, dock, and wash with water. Take another portion of the dough and roll to 3/8 inch in thickness. Cut with the same cutter as before and then cut a hole in the center with a small cutter. Now place the rings very carefully upside down on top of the washed pieces already on the pan.

"Caution: To prevent Patty Shells from toppling over during baking, the following should be observed:

1. Bake Patty Shells with greased paper on top, or a metal patty shell ring, or filler the size of inside hole should be set in Patty shell before baking.

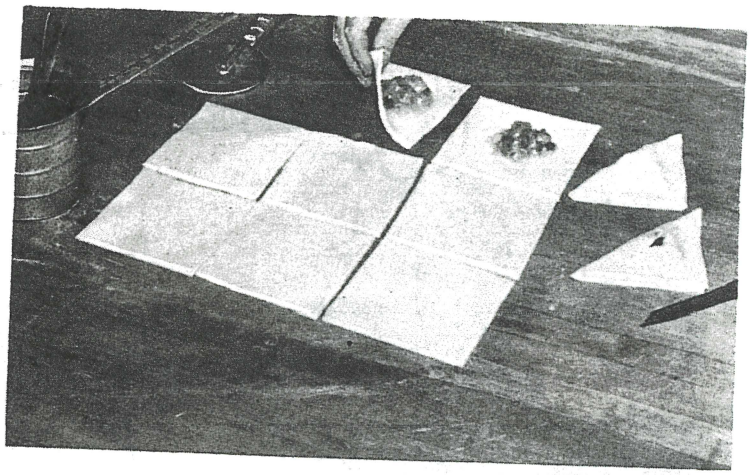
2. Cutters used must be sharp to prevent fat layers being pressed together.

3. Doughs must be rolled with even pressure at all times and care taken to fold straight.

Allow to rest for at least an hour and then bake at 380°F.

## Apple Turnovers

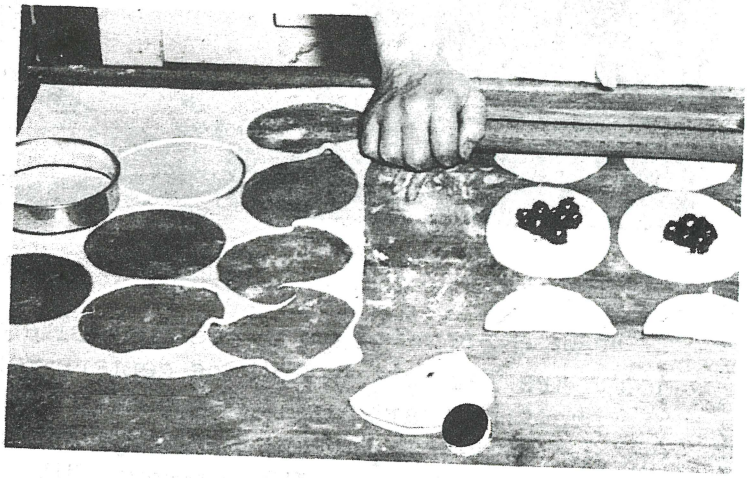
"Roll out the prepared pastry dough to 1/8 inch thickness. Cut the dough into 5 x 5 inch squares, fill with an apple filling, wash edges, and fold into a triangle. Seal edges with finger tips, wash top surface and pierce to allow steam to escape. Allow to rest 30 minutes and then bake in medium hot oven until lightly browned.



## Round Turnovers

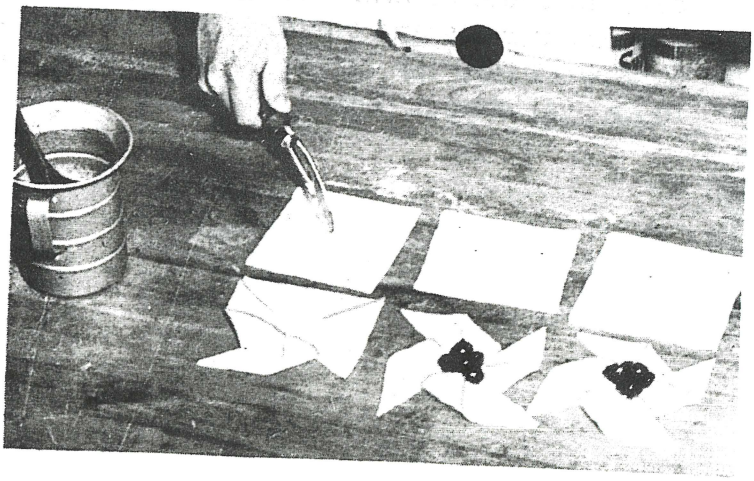
"Make the same as apple turnovers except cut with large ring cutter. Cherries, pineapple, or apples may be used for filling.

"Turnovers may also be baked without the filling and filled with applesauce at your convenience.



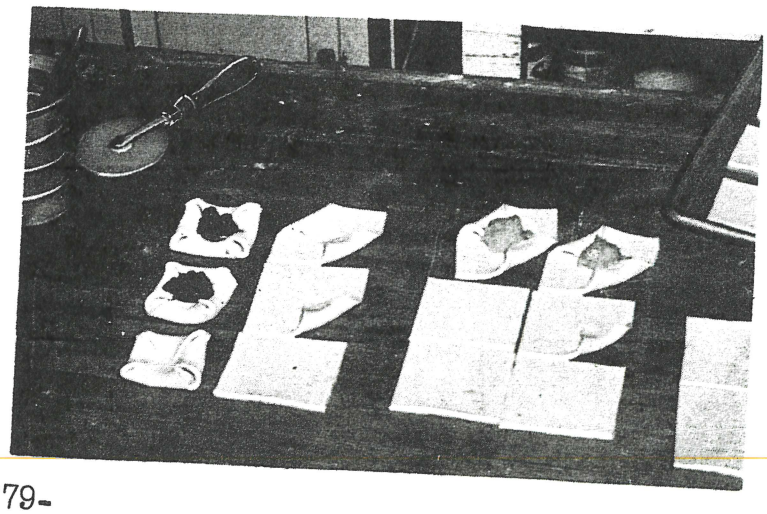
## Pin Wheels

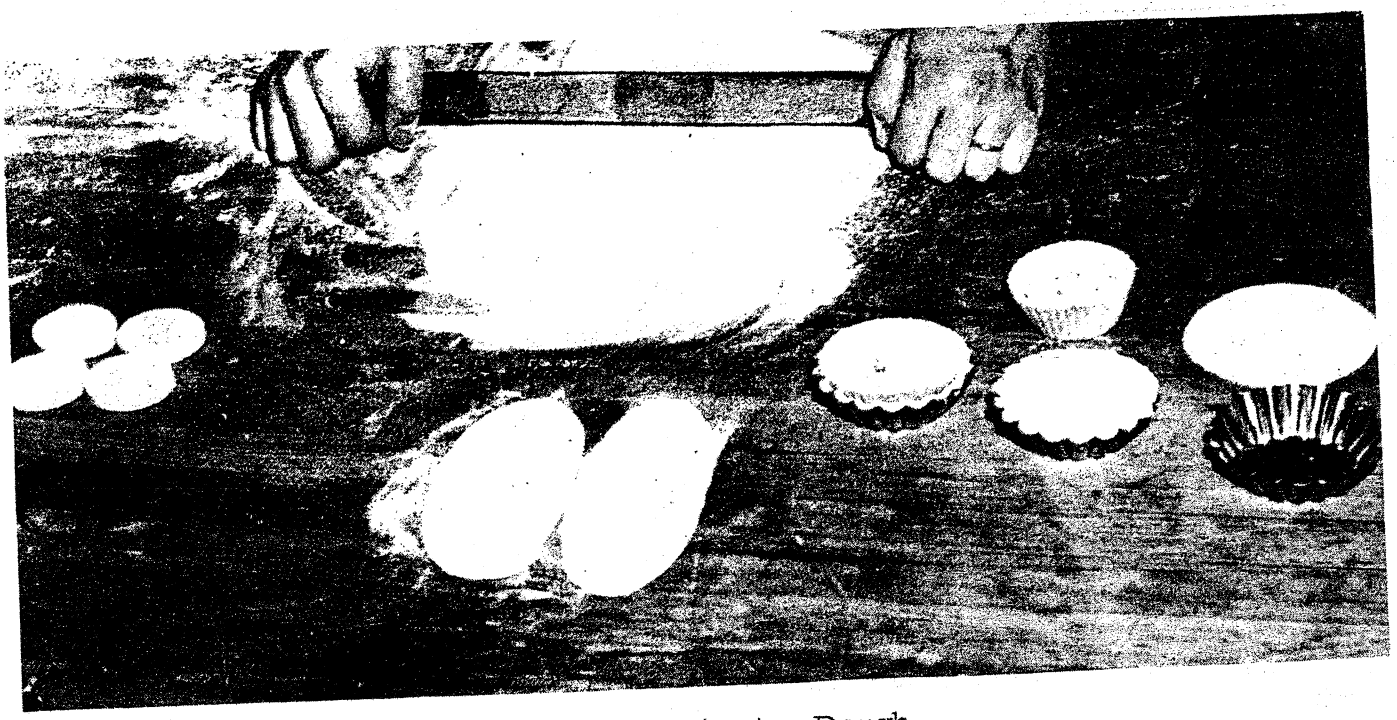
"Roll out the prepared dough to 1/8 inch thickness. Cut the dough into 5 x 5 inch squares. Wash. Use pastry wheel or scraper and cut each corner to the center.leaving about 1 inch center uncut; take every other corner and press into the center. Fill with washed or glazed fruit. Let rest for 30 minutes and bake in moderate oven until lightly browned.



## Fruit Pocketbooks

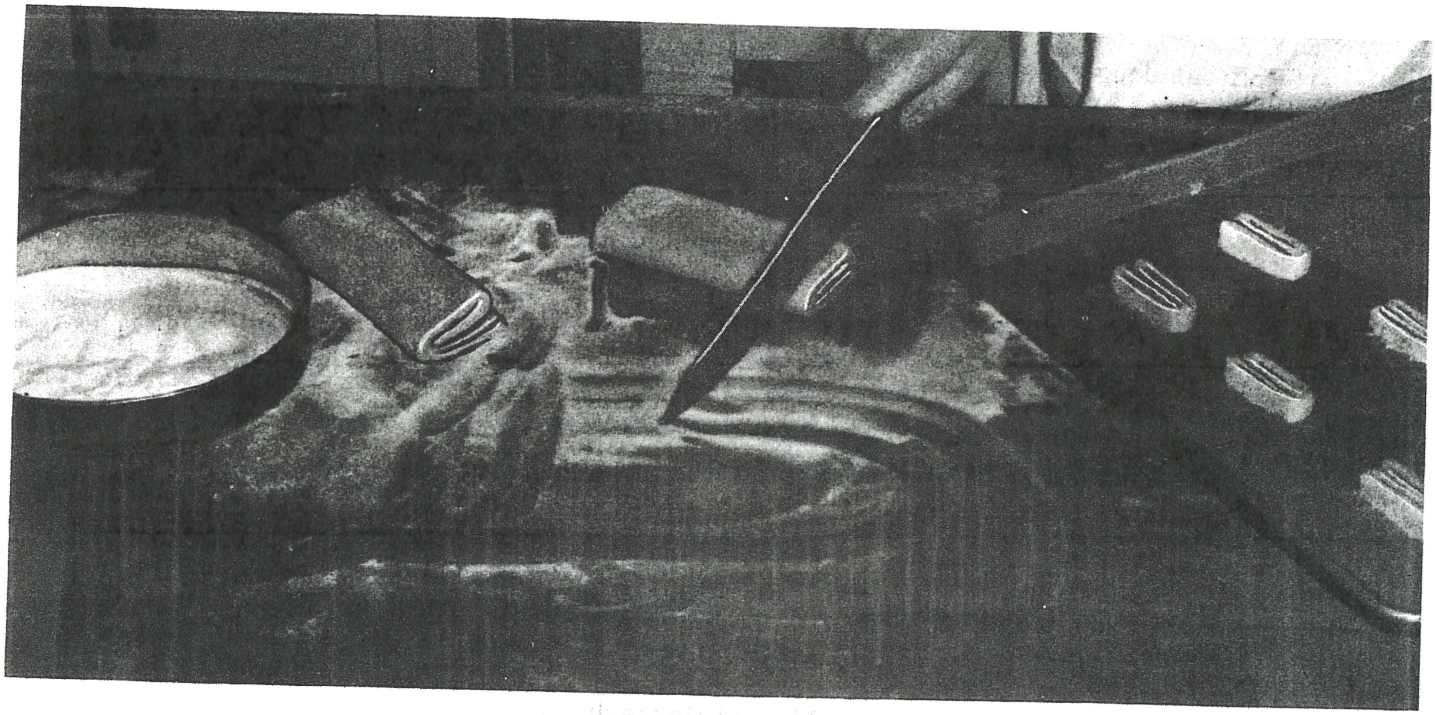
"Roll out the prepared dough to 1/8 inch thickness. Cut the dough into 5 x 5 inch squares. Wash. Use pastry wheel or scraper and cut each corner to the center leaving about 1 inch center uncut; take every other corner and press into the center. Fill with washed or glazed fruit. Let rest for 30 minutes and bake in moderate oven until lightly browned.





Use of Scrap Pastry Dough

"Two excellent ways to use the inside centers of patty shells and scrap dough are Tartlets -- Roll the centers very thin, cut with a medium sized cutter, and press into tart pans. A cup cake liner filled with beans and placed inside the tart pans will prevent shrinkage during baking. Allow to rest 30 minutes and bake medium brown. When baked, fill with pastry cream. Top with washed or prepared fruits and glaze. Sprinkle the edges with finely ground nuts. Sugar Crisps -- Roll the center or scrap dough very thin in coarse, granulated sugar to an oval shape. Place on pan, let rest, and bake medium brown.



## Palm Leaves

"Roll the dough very thin, using granulated sugar instead of flour for dusting. Sprinkle lightly with granulated sugar. Make a fourfold and allow to rest in a cold place. Repeat this process twice. Then roll the dough to 1/8 inch thickness and cut into strips 16 inches in width and as long as is convenient to handle. Fold the dough length wise to make a fourfold. Chill the dough until firm and then cut into thin slices with a sharp knife. Place the slices flat on baking pans, leaving plenty of room for spreading. Allow to rest. When half baked in a medium oven, turn over with a bowl knife and finish baking. Cool and ice with a water icing or spread one leaf with a thick jam or pastry cream and cover with a second leaf.

## Cream Slices

"Roll out a large sheet of dough very thin. Cover a standard sheet cake pan and prick surface with a fork. Allow to rest and then bake in a slow oven. Cool after baking and cut into strips about 4 inches wide. Spread with pastry cream, fresh fruits (in season), and then more pastry cream, and place one strip on the other. Ice top with water icing or foundant; use various decorations such as sliced nuts on the edges and fruit on top, or icing designs.

## Pretzels

"Roll out dough to a width of about 14 inches and a thickness of 1/8 inch. Cut into strips 1 inch wide. Form into the shape of pretzels. Wash with egg and dip into crystal sugar. Allow to rest and bake in a moderate oven. When cold, ice with water icing.

## Cheese Sticks

"Roll out dough very thin. Sprinkle with grated strong cheese that has been mixed with a small amount of paprika and salt. Fold over, roll out very thin again, and sprinkle with the prepared cheese. Cut into small strips. Place on pan, allow to rest for 1 hour, and bake in a moderate oven. For variety as to shape, the sticks may be twisted before baking.

## Salt Sticks

"Handle as for cheese sticks, but use coarse grain salt in place of cheese mix.

## Almond Horseshoes

"Roll out pastry 1/8 inch thick, cut into strips 2 1/2 inches wide, fill with almond filling, wash edges, fold over. Cut into 5-inch strips, cut edges with scraper, and shape like horseshoes. Wash and dip in crystal sugar and bake.

## Pastry Cream

| Ingredients | Lbs. | Ozs. | Methods |
|---|---|---|---|
| Water | 6 | 8 | Dissolve and bring to boil. |
| Milk Powder | | 12 | |
| Sugar | 2 | | |
| Salt | | 3/4 | |
| Egg Color | | | |
| Cornstarch | 1 | 1 | Dissolve and add. Cook until thick and smooth. |
| Water | 1 | 8 | |
| Cool in ice box, then add to the following creamed mix and mix smooth. | | | |
| Powdered Sugar | 1 | | Cream |
| Butter | 1 | | |
| Cream | 1 | | |
| Whole Egg | | 2 | |
| Pure Vanilla | | 1 | |

## Almond Filling

| Ingredients | Lbs. | Ozs. |
|---|---|---|
| Almond Paste | 1 | |
| Whole Egg | | 6 |
| Cake Crumbs | 2 | |
| Sugar | | 4 |
| Cinnamon | | 1/4 |
| Cocoa (enough to desired color) | | |
| Milk (enough to produce a filling of proper consistency) | | |

*Courtesy Swift and Company

# PUFF PASTE

## DOUGH

| PER CENT | INGREDIENTS | LBS. | OZS. | METHODS |
|---|---|---|---|---|
| .657 | Bread Flour | 8 | | Mix very little--just enough to incorporate ingredients. |
| .015 | Cream of Tartar | | 3 | |
| .082 | Whole Egg | 1 | | |
| .164 | Water | 2 | | |
| .082 | Puff Paste | 1 | | |
| 1.000 | Totals | 12 | 3 | |

Add 4 pounds Puff Paste broken in small pieces. Mix very little only about 8 revolutions. Puff Paste will remain in large pieces.

Remove from bowl and roll in usual manner. Give three folds, allowing 30 minutes rest between rolls.

From this dough the following products can be made:

Cream Horns
Turn Overs
Pin Wheels
Napoleons
Sugar Toast
Peanut Butter Sticks
Cheese Sticks
Sandwiches
Patty Shells

## CREAM PUFFS

| PER CENT | INGREDIENTS | LBS. | OZS. | METHODS |
|---|---|---|---|---|
| .306 | Water | 2 | | Bring to a rolling boil. |
| .152 | Shortening | 1 | | |
| .002 | Salt | | 1/4 | |
| .229 | Bread Flour | 1 | 8 | Add to above and cook until batter leaves the sides of bowl. Remove from stove and place in mixing bowl. (Do not over cook.) |
| .005 | Ammonia | | 1/2 | Add to above and mix on second speed. |
| .306 | Whole Egg | 2 | | Add to above about two oz. at a time. Put on 3rd speed and mix until smooth. |
| 1.000 | Totals | 6 | 8 3/4 | |

## CREAM PUFF FILLING

| PER CENT | INGREDIENTS | LBS. | OZS. | METHODS |
|---|---|---|---|---|
| .387 | Water | 3 | | Bring to rolling boil. |
| .065 | Corn Syrup | | 8 | |
| .130 | Sugar | 1 | | |
| .048 | Powdered Milk | | 6 | |
| .004 | Salt | | 1/2 | |
| .130 | Water | 1 | | Dissolve and add slowly. |
| .020 | Corn Starch | | 2 1/2 | |
| .008 | W. 13 or clear jel | | 1 | |
| .064 | Whole Egg | | 8 | |
| .064 | Egg White | | 8 | Whip and fold in. |
| .064 | Granulated Sugar | | 8 | |
| .016 | Butter or Margarine | | 2 | Add and mix in. |
| 1.000 | Totals | 7 | 12 | |