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(An Autonomous Institution)



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UNIT-I INTRODUCTION TO BAKING AND CONFECTIONERY

Essential and optional. Leaveners and yeast foods. Structure builders. Tenderizers, moisteners and flavor enhancers

Essentially the common ingredients among the baking items include flour or *maida*, fat, eggs and sugar. In addition, various ingredients such as chocolate, nuts, spices or fruits are used to add the variety

Flour

Eggs

Fats

Sugar

Liquids

Leavening agents

Flavoring Ingredients

Optional Ingredients

To produce a variety of quality breads, optional ingredients are required. They result in uniformity of products and efficiency of operations, assist in increasing the tolerances of doughs due to production variables, and help to satisfy the demand for variety in the flavor and taste of breads.

- **Mold inhibitors** prevent bread from becoming molded.
- **Mineral yeast food** helps to stabilize water by adding mineral salts, which are essential in dough fermentation and conditioning.
- **Mineral salts** when added to water condition the soft water; antacid salts neutralize alkaline water which is harmful to yeast and gluten. Doughs made with mineral yeast foods are soft but not sticky and thus enable proper molding in machines free of air pockets.
- **Malt Products** These are obtained from cereal grains usually barley. It is classified as malt flour, malt syrups and dried malt syrup. Each of, which is further, classified as non-diastatic and diastatic malt. They provide nutrients to yeasts. Malt syrups are concentrated

products made by evaporating the water extract of malted barley and other cereal grains. They contain diastases and proteases that convert starch to dextrins and maltose sugar while protease enzymes condition the gluten in dough.

- **Non-diastatic malt** is used principally to impart flavour and colour to baked products. They also have some effects on texture and supply fermentable carbohydrates and other nutrients to yeast. These are high in sugars.
- **Diastatic malts** have considerable enzyme activity. Malted grain from which these products are derived, is a source of enzymes which convert starch to reducing substances.
- **Dough Improvers**
It is usually mixture of several inorganic salts together with starch or flour as an extender. Gluten oxidizing agents such as potassium bromate, potassium iodate or calcium peroxide. Calcium salts usually as phosphate or sulphate which corrects any lack of hardness in dough water and provide buffering action to partially offset alkaline condition of water. Ammonium salts supply nitrogen which can be used by yeast for protein building.
 - **Dough Strengthening Enzymes** strengthen doughs by breaking down the pentosans present in flour and improve the baked product
 - **Oxidizing Agents** Proper use of oxidizing agents results in larger volume, brighter crumb, better texture and improved appearance of finished loaf, *e.g.* potassium bromate, calcium oxide and potassium iodate.
 - **Yeast Foods** Use of ammonium salts, phosphates and sulphate in dough improvers and yeast foods improves the fermentation capacity of yeast in dough.

Flour

Also called as refined flour, white flour or maida is obtained from wheat. It is the basic structural component of most bakery products. Wheat flour contains two proteins- gliadin and glutenin which form gluten by addition of water. No other cereal flours form gluten. Rye flour contains both glutenin and gliadin but is incapable of forming gluten because there are substances in rye flour that interferes with its ability to form gluten.

When water is added to the flour these proteins interact with each other to form a unique protein known as gluten. Gluten is an elastic substance that forms a mesh-like structure in the batter or dough. This elastic structure holds gases in the form of small bubbles that expand leavening gases (carbon dioxide, air or steam) during heating giving a spongy texture (as in bread) or raised effect (in cakes). The gluten when heated is denatured due to coagulation to give rigidity to the structure. The gluten continues to stretch as the gases expand during heating until the heat of the oven coagulates the gluten.

Different types of wheat flours contain varying amounts of the gluten-forming proteins and influence strength of gluten.

- Hard wheat flour has high protein content and forms a strong gluten framework when mixed with water. This strong gluten framework provides the structure needed for bread.
- Soft wheat flour contains less protein and cannot form strong gluten but is suitable for cakes, quick breads and pastries, where a tender product is desirable.

- All purpose flour is obtained by blending different types of wheats during milling to achieve medium protein content. This flour may be used for all baking purposes.
- Whole wheat flour contains the nutritious wheat germ, bran and the starchy endosperm which make smaller, heavier but nutritious baked products.

Eggs

Perform many vital functions in baking. Egg protein can be readily whipped into foam that gives volume to cake-batters. On heating, the egg protein network coagulates and contributes rigidity thereby holding the structure. Egg-yolk exerts a tenderizing function and accounts for the softness in the cake. Substitution of eggs with condensed milk, milk powder or whey protein concentrate alters the formula and also the product quality. Eggs perform many important functions in preparation of bakery foods, they are

- contribute to the structure of the baked product
- incorporate air when beaten
- add colour and flavour
- provide protein, fat and liquid
- emulsify fats to achieve characteristic texture, mouth feel and taste to the product.

Fats

Fats are used in almost all bakery products. Fats are available in many forms. All fats are shortening agents.

- **Butter:**A fat processed from milk. It has a low melting point. The yellow color of butter depends on the feed of the cow and varies with seasonal changes. Butter contains 80-84% fats and 16-20% moisture. It is normally available in salted and unsalted form.
- **Ghee:**Also called clarified butter; it is a fat processed from butter. It contains at least 99.6% fats. It is used to enhance flavor in traditional Indian dishes. However not commonly used in baking.
- **Oil:**Oils are fat extracts from nuts, seeds and fruits such as soybean, sesame, sunflower and peanut. It is used in some muffin, bread and cake recipes and as a cooking medium for frying. If oil is used in place of a solid fat for some cake recipes, the texture will be heavier unless the sugar and egg are increased.
- **Vanaspati:**A semi-solid form of hydrogenated vegetable oil with a minimum of 97% fat. It can substitute butter in baking 4 to 5 cup of vanaspati equals one cup of butter.
- **Margarine:** A plastic hydrogenated fat used for cakes and pastry, commonly called bakery fats.
- **Shortening:** A plastic hydrogenated fat used for cakes and pastry
- **Lard:** Animal fat from pig

Fats are used in bakery for the following reasons:

- Make the dough more pliable
- Prevent stickiness and reduce the amount of dusting flour required or the make-up process

- Prevent formation or toughness of gluten according to the method and the amount used
- Add to the food value as enriching agents adding to calories.
- Contribute and enhance flavour, moistness, mouth feel to baked products
- Make the crust more tender
- Improve keeping quality and produce a crumb that is soft and chewy.

Sugar

Sugar is another common ingredient used in bakery foods. Sugar, table sugar, cane sugar or beet sugars are principally same with sucrose being the component disaccharide. Sugar is used in a variety of products and in many ways in cakes, buns, biscuits, cakes, meringues, macaroons and for icing. A small amount of sugar aids the process of fermentation, while a large amount reduces the rate of fermentation and volume in breads or rolls. When used in small amounts, sugar helps yeast to initiate producing carbon dioxide for raising yeast dough. Sugar tenderizes dough and batter products and helps baked products to brown more readily through **Maillard reaction**. Sugar has important functions in baking. They are as follows

- Provides necessary sweetness
- Imparts golden brown color to the crust
- Improves the texture of the crumb
- Helps to retain moisture in the crumb and
- Adds to the nutritional value of the products

Liquids

Liquids used in the preparation of baked products are water, milk, sour milk or sour cream. Liquids contribute moistness to the texture and improve the mouth-feel of the baked products. Water is necessary for hydrating the ingredients. When hydration occurs, water is absorbed and the chemical changes necessary for structure and texture development take place. When water vaporizes in a batter or dough, the steam expands the air cells, increasing the final volume of the product. Liquids perform following functions in baking. They are

- Development of gluten
- Gelatinization of starch while baking
- As solvent for dry ingredients such as sugar
- Trigger action of chemical leavening agents.
- Hydration of protein, starch and leavening agents
- Contribute moistness and
- Improve mouth feel
- Increase the volume of baked product through release of steam.
- Liquids such as milk when added as a moistening agent contribute valuable nutrients besides enhancing flavour and colour of the products.

Leavening Agents

Leavening agent or leavener is a substance used to leaven (to make light or to rise) a dough or batter. It may be natural such as air or steam or chemicals like baking powder or baking soda or biological agent like yeast. These produce or stimulate production of carbon dioxide in baked goods to impart a light texture. Leavening agents are responsible for the volume in most baked food products. They expand the air bubbles that have been mixed, creamed, kneaded or whipped into the batter. This results in increasing the volume resulting in better texture, taste and aroma. The sensory properties of leavened products depend on the amount of leavening gas in the mixture, the rate and time of gas formation. The three principal leavening gases are

- **Air:** Air is introduced mechanically into ingredients by heating, creaming and sifting; and into mixtures by beating and folding.
- **Carbon dioxide:** Carbon dioxide is released by either chemical leavener or by biological agents such as **yeast** cells.
- **Water vapor:** Water vapor or steam is formed in any batter or dough on heating. It is the principal leavening agent to cream puffs and popovers.
Yeast *Saccharomyces cerevisiae* is a microscopic, single celled plant which under suitable conditions of moisture, nutrients and temperature it produces carbon dioxide from simple sugars derived from starch and or sugar. In addition to glucose, baker yeast ferments hexose, fructose and mannose, disaccharides sucrose, maltose, the trisaccharides raffinose and tetrasaccharides stachyose. Lactose (milk sugar) is not attacked by baker yeast. Yeast exists active in air as well as in absence of air. In presence of air it grows rapidly and forms little alcohol. In absence of air it grows slowly but alcohol formation increases. Fermentation is an important process in baking. Most favorable temperature for baker yeast growth and fermentation is in the range of 84° to 90° F depending on strain used. Yeast grows and ferment best in acidic environment, tolerating acidities as low as pH 2. In bread making yeasts raise the dough improving palatability by producing several compounds including alcohol, aldehydes, ketones and acids contributing to aroma and taste. However, some times the yeast activity cannot be controlled in some items, fermentation flavour can be undesirable.

Moistening Agents

Liquids have several functions in baking. Liquids are necessary in baked foods for hydrating protein, starch and leavening agents. When hydration occurs, water is absorbed and the chemical changes necessary for structure and texture development can take place. Liquids induce enzyme activity, help in dispersing non flour ingredients uniformly and dissolve salts. They also contribute moistness to the texture and improve the mouth feel of baked products. When water vaporizes in a batter or dough, the steam expands the air cells, increasing the final volume of the product. Milk contributes water and valuable nutrients to baked foods. It helps browning to occur and adds flavor. Liquids keep bread palatable longer if they are retained in the finished loaf. When making yeast dough, milk should be scalded and cooled before adding to other ingredients. This is done to improve the quality of the dough and the volume of the bread and should not be substituted with water. Fruit juices may be used as the liquid in a recipe if water is specified. Because fruit juices are acidic, they are probably best used in baked products that have baking soda as an ingredient. But juice in bread baking slows fermentation because of its high sugar which reduces yeasts activity.