Protection Under Insecticide Act

The insecticide act affords the same protection against misbranded insecticides and fungicides that the food and drugs act does against misbranded foods and drugs. Farmers use large quantities of insecticides and fungicides to keep their crops, farm animals, and poultry free from insect pests and fungous diseases. The Food, Drug, and Insecticide Administration systematically tests these articles and compares the actual results produced by using them as directed with the claims made upon the labels. Where misrepresentations are found appropriate steps are taken to effect a correction.

An interesting case on record is one where a manufacturer labeled and represented his product as composed of lead arsenate, sulphur, and lime. The analysis of the product showed it to consist of lime only. He had left out the two effective ingredients and was selling a small quantity of lime at a fancy profit. To add insult to injury, the following statement appeared upon his labels, "If you want a cheaper insecticide, mix one part of the contents of this package with three parts lime."

GEORGE P. LARRICK.

FOOD Spoilage, Which Causes Heavy Losses, Due to Many Causes

It has been estimated that the losses sustained by American agriculture and by the industries which utilize agricultural products, as a result of the deterioration of foodstuffs, amount each year to several hundred millions of dollars. The destructive agencies that produce these enormous losses are exceedingly complex, but they may be classified, for the most part, under the following four general subdivisions: (1) Enzymes, (2) microorganisms, (3) atmospheric influences, and (4) internal chemical changes. Illustrations will be given of the deteriorative changes produced in foods by each of the four factors mentioned.

Action of Enzymes

When apples, bananas, or other starch-containing fruits of hard texture are stored for a few days in a warm place a gradual softening of the tissues is observed. In this so-called process of afterripening, which is necessary for improving the edible qualities and sweetness of the fruit, part of the starch is converted into sugar, a change brought about by a ferment or enzyme known as amylase that occurs naturally in the cells of many fruits and vegetables. The activity of this enzyme may exceed, however, the stage which is necessary for obtaining the optimum degree of flavor and palatability. Too much of the starch is converted into sugar, this and the partial solution of the cellular tissues by cytases and other enzymes causing the fruit to become soft and acquire a condition known as overripe. Deterioration has set in and the market value of the fruit begins to decline. A similar condition exists in certain vegetables, such as the sweet potato, whose agreeable flavor is due to the conversion of a part of its starch into sugar by means of an amylolytic or starch-dissolving enzyme. If sweet potatoes are stored too long in a warm place the excessive conversion of their starch into sugar causes a softening of the tissues which then become very susceptible to decay.

Another vegetable enzyme which produces the deterioration of agricultural products is invertase. When sugar cane is stored in the factory yard after cutting there is a gradual daily loss in its sugar content (more rapid in warm weather than in cold) which is due to a splitting of the cane sugar by the naturally occurring enzyme, invertase, into its simple constituents, glucose and fructose. The losses from this cause, which are very great in tropical countries, can be reduced by grinding the sugar cane as rapidly as possible after it is cut.

A third type of deterioration which is produced by vegetable enzymes results from the splitting of the neutral oil that is contained in the germ of cereal grains and other seeds into free-fatty acids which impart to the food products (such as germ-containing meal) that are made therefrom a disagreeable rancid taste. The action of this fat-splitting enzyme, called lipase, is very rapid when the oil-bearing tissues of plants are exposed to the air. For this reason edible oils should be expressed as rapidly as possible after the seeds or other plant organs are crushed. Any prolonged delay between the time of crushing and pressing will greatly diminish the market value of the resultant oil.

In the drying of many fruits, potatoes, and other vegetable products, an objectionable darkening of the dehydrated product, which greatly injures its market value, is produced. This darkening is produced by an oxidizing enzyme, called oxidase, and it is for the prevention of its action that fruits and vegetables before dehydration are exposed to the fumes of burning sulphur. Owing to disadvantages connected with the sulphuring process chemists are now in search of other methods for preventing the enzymic darkening of fruits and vegetables during dehydration.

Microorganisms

The most deleterious agents concerned in the deterioration of food products are microorganisms. The souring of milk, the molding of bread and pastry, the heating of grain, the swelling of canned goods, the decay of fruits and vegetables, and the putrefaction of meat products are all familiar examples of the destructive changes which are produced by the activity of yeasts, molds, bacteria, and other forms of microorganic life. The monetary losses from this cause, which are almost incalculable, affect every class of the public—the farmer, the manufacturer, the distributor, and the consumer. An excessive rainfall, an unexpected period of hot weather, a delayed shipment, a neglectful employee, a break down in a refrigerating plant, and a multitude of other causes create conditions that result each year in many millions of dollars loss from the spoilage of food. There are five general methods for reducing the losses from the deterioration of foods by microorganisms. The first of these is selection of sound raw material and cleanliness in surroundings and in the methods of handling foods. Improved sanitary measures that remove the sources of pollution by which bacteria gain access to milk and other foods is one of the most effective means of counteracting the attacks of microorganisms. A second method is the destruction, by means of heat, of the organisms which produce the spoilage of foods. The sterilization may be only partial, as in the pasteurization of milk, or it may be practically complete, as in the processing of canned goods at high temperature and pressure, the particular type of treatment depending on the nature of the product and the probable length of time before it will be consumed.

Preservation by Refrigeration

A third method of reducing the spoilage of foods by microorganisms, employed especially in the case of such products as fruits, vegetables, and meat which it is desired to keep in the raw condition, is artificial refrigeration. This does not destroy microorganic life but simply retards its growth and multiplication. It is, therefore, not so effective a method as sterilization, but it has the advantage of preserving the natural flavor and other qualities which are affected or destroyed by heat. A fourth method of protecting foods against the destructive action of microorganisms is dehydration. A definite percentage of moisture is necessary for the growth of yeasts, molds, and bacteria, and if the quantity of water in fruits, vegetables, grains, meat, flour, and sugar is reduced to the necessary minimum the product can be preserved under ordinary conditions of temperature and humidity for an indefinite time. A fifth method for preventing the deterioration of food products by microorganisms consists in the use of preservative agents, such as sugar, vinegar, and salt, which inhibit the growth of yeasts and bacteria. The use of sugar in the canning of fruits and that of salt in the pickling of meats are examples of this method of preservation. Chemical preservatives, such as sulphur dioxide and benzoic acid, which have no nutritive or condimental value, are sometimes used for this purpose, but their employment is not usually necessary and furthermore is not to be recommended because of their deleterious physiological effects upon susceptible people.

Atmospheric Influences

The two most important atmospheric influences which are involved in the deterioration of foods are moisture and oxygen. Food products of a hygroscopic or water-attracting character may absorb so much moisture from the air as to become easily subject to the attacks of molds and bacteria. Edible fats, such as lard, which contain unsaturated fatty acids, absorb oxygen from the air, with the production of objectionable rancid flavors that greatly impair the market value of the product. The sealing of foods in durable air-tight containers is the most general method for preventing the deleterious effects of atmospheric influences. Maintenance of a vacuum in the container, and the replacement of the air which surrounds the food by an inert gas, such as carbon dioxide, have been employed in special cases.

Food products which are perfectly protected against the destructive action of enzymes, microorganisms, and atmospheric influences may yet undergo deterioration as a result of internal chemical changes caused by the interreaction of substances contained within the product itself. Amino acids, sugars, aldehydes, organic acids, and other ingredients of the food may interreact chemically, resulting in a darkening of color, production of gas, and the formation of objectionable flavors which impair the value of the product.

Interaction of Causes

In most cases of deterioration of food products, not one but several of the major causes that have been mentioned are involved. Plant enzymes decompose the food product into substances that are easily attacked by microorganisms, which in turn secrete enzymes that fur-

ther decompose the food. Many substances of enzymic origin, such as invert sugar, attract atmospheric moisture, which in turn favors the growth of microorganisms. The amino acids, sugars, aldehydes, and other compounds of enzymic and microbic origin react with one another with the production of substances which further impair the value of the commodity. The cycles of deteriorative changes are thus seen to be exceedingly complex. The chemist must study carefully the peculiar characteristics of each individual article of food and summon to his aid that method which is most effective in preventing deterioration and at the same time least detrimental to the appearance, flavor, aroma, palatability, and nutritive value of the product.

C. A. BROWNE.

FOOT-AND-MOUTH Disease Eradication By Slaughter Proved Cheapest for U. S.

Two methods of controlling foot-and-mouth disease are recognized, one being the stamping out or slaughter method, and the other the isolation and quarantine method. The first method consists in the slaughter of all infected and exposed animals as soon as possible after the establishment of the disease, the disposal of the carcasses by deep burial or burning, the cleaning and disinfection of the infected premises, and the adoption of certain quarantine measures.

This is the method used in the United States in eradicating the disease when outbreaks occur. It is also the method used in England and to a limited extent in several of the continental European countries.

The second method consists in the isolation of the affected and exposed animals, allowing the disease to run its course, and by quarantine measures attempting to limit or prevent its spread. This is the method used in many of the countries of Europe. The adoption of one or the other of these two methods is not made arbitrarily but is dependent on the conditions existing in a country.

Slaughter Method Is Most Effective

The slaughter, or stamping-out method, has for its object the complete eradication of the disease in the shortest possible time. Its practical use is limited to outbreaks of disease in countries like the United States and England, which are normally free from the disease and are protected from its ready introduction by geographical location and quarantine measures.

Thus, when outbreaks have occurred in the United States, the prompt use of the stamping-out method has resulted in complete eradication of the disease within a comparatively short time, as a consequence of which the country has been entirely free of foot-and-mouth disease except during the time required for eradication.

However, when foot-and-mouth disease is once firmly established in a country over a wide area and in addition is subject to frequent introductions of the diseases from other countries, the use of the stamping-out method is either restricted, or it must be abandoned for economic reasons.

This is the condition in which many countries of Europe find themselves, and as a consequence they are compelled to resort to the quarantine and isolation method. That this method fails to eradicate