

THE OBSERVATION POST

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Some New Food Processing Techniques

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THIRTY-SEVEN YEARS AGO, L. C. Maillard, a Frenchman, published a learned and lengthy paper dealing with browning brought about by the reaction of amino acids and sugars, but it was not until recently that the importance of the browning reaction to many food processing problems was seriously considered. As a result of recent investigations in this field, the quality of many food products has been improved. An outstanding development has been the production of an improved egg powder essential in the manufacture of ready made cake mixes.

Over 30 years ago, Power and Chestnut laboriously separated a few drops of the odorous constituents of apples. The lay public knew little of this work, and would not have been impressed had they known more. Through the application of modern techniques, the job of extracting odorous constituents of fruits has been greatly improved and facilitated. Now, annual production of essences has been increased to many thousands of pounds. A new industry has been established and the flavor of many food products has been enhanced.

The concept of utilizing the bactericidal action of ionizing radiations goes back over 50 years, but it has been only since about 1947 that industrial application of such radiations has been given serious thought. This technique for "cold" sterilization of foods is still in its infancy. What the future holds depends on further scientific and economic research.

In the following paragraphs these developments are briefly described.

Enzymatic Processing

Considerable improvement in quality and stability of dried egg products has been achieved since 1942, resulting in increased amounts used in the domestic economy. A stable dried whole egg is particularly important for the widespread acceptance of packaged pancake, waffle, and cake mixes for the housewife. Fundamental research has shown that the most important type of de-

terioration in dried whole egg is brought about by the reaction of free glucose in the egg with the phospholipid constituent, cephalin. Glucose can be removed from the egg magma prior to drying by a short-time resting - cell yeast fermentation or by an enzyme, glucose oxidase, which converts glucose to gluconic acid. Glucose-free dried eggs are now in commercial production.



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Preservation by Ionizing Radiations

Sterilization of foods by ionizing radiations has aroused considerable interest, several research organizations are engaged in this field and an impressive literature has been built up. Such radiation research has included beta particles, "hard" and "soft" x-rays, and gamma rays. Hard x-rays have not been seriously considered for commercial application because of the expense involved when compared to other ionizing radiations. Soft x-rays have been reported to have possibilities, but they do not have the penetrating power of either hard x-rays or gamma rays. Beta particles, which are high-speed electrons, can be obtained from radioactive sources or from some form of electron accelerator such as the Van de Graaff generator or the Capacitron. These two machines are the ones primarily used in present research on the treating foods with high-speed electrons.

High-speed electrons have only limited penetration, effective depth for sterilization being about 3 mm. per m.e.v. Since present electron accelerators of the Van de Graaff and Capacitron type are limited to around 5 m.e.v., effective depth of sterilization is about 15 mm. (0.6 inch). Gamma rays, on the other hand, have a considerable degree of penetration, but because of smaller absorption and limitation of intensity of

radiation as compared to that produced by electron accelerators, a longer time is required to sterilize with gamma radiation than with high-speed electrons. Another disadvantage of using gamma radiation is that the source cannot be shut off when not needed.

Present sources of gamma radiation are cobalt-60 and tantalum-182 which are serving as a substitute for radioactive fission products. Because these isotopes are made by neutron bombardment in a reactor, they are quite expensive. Ultimately, it is expected that radioactive fission products may provide gamma rays in amounts large enough for commercial food processing.

It has been shown that foods can be preserved from spoilage by microorganisms by bombardment with high-speed electrons and by gamma rays. But it has not as yet been conclusively demonstrated that such irradiated foods are free from toxic compounds, the most important criterion as to whether such foods can be safely offered the consumer.

Fractional Distillation

Although the recovery of volatile flavoring constituents from fruit juices has been studied more or less spasmodically since about 1930, it was not until around 1946 that the method became commercially feasible. The technique involves separating the fruit volatiles from the fresh material by partial distillation, and then concentrating the volatiles thus separated. Today at least 23 commercial processors of fruit juices recover volatiles during concentration, either for the purpose of adding back to the fruit concentrate, or for sale for flavoring such products as confections, sirups, ice cream products and beverages. Recovery of volatiles (other than the oil) in the concentration of citrus juices has not as yet proven satisfactory. More recent work has shown that it is even possible to recover volatiles lost during the manufacture of preserves. Because cooking develops the flavor of certain fruits, such as blackberries, and in some cases, strawberries, desirable flavors not found in the raw fruit are formed. For this reason, volatiles recovered from preserves may be stronger and more "characteristic" than those obtained from fresh fruit juices and may have potential use as flavor concentrates for ice cream, confections, and beverages.