two general types: light, high-wing monoplanes carrying maximum chemical loads from 300 to 600 pounds and somewhat larger biplanes carrying maximum chemical loads from 600 to 1200 pounds. None were originally designed for dusting or spraying.

Special attention has been paid in recent years to the selection of the best swath patterns to be used in aircraft spraying and also to the best distribution of spray nozzles. Improved spraying techniques should result, he said, in substantial reductions in the amount of material wasted by overdosing and in a corresponding saving in cost.

Air Sprayers. Hydraulic sprayers are today used to a considerable extent and, no doubt, will continue to have their place in pesticide spraying, especially for smaller operations. The use of air sprayers, however, is growing rapidly, and they are now widely accepted by orchardists, farmers, and shade-tree experts as an important step forward in spraying technology, according to a paper by James P. Carr and Joseph M. Patterson of Food Machinery & Chemical Corp. The primary reason for the acceptance and rapid growth of air sprayers has been the sizable cost savings that can be achieved, partly because use can be made of more concentrated solutions. The basic principle of operation of hydraulic sprayers requires that a sufficient volume of liquid be projected from the nozzle or gun. With air equipment, the liquid volume can be greatly reduced.

In Lansing, Mich., in 1951, the cost of spraying for mosquito control in nine city parks with hydraulic equipment was $197.20 per round. In 1952, the same areas, plus three additional parks, were sprayed with an air sprayer for a total cost of $91.75 per round. The time required for hydraulic spraying was 20 hours while the air sprayer work was completed in nine hours.

Carr and Patterson emphasized that the necessity for chemical and equipment manufacturers to recognize the requirements and limitations of each other's products has existed ever since the practice of spraying began 70 years ago. This need has increased in importance to the point where such considerations are prime, basic factors determining the success of these products.

Herbicide Sprays. Herbicides that are effective in very low quantities per acre and which are readily mixed with water or oil lend themselves to aircraft applications, said L. L. Coulter of Dow Chemical. Most aerial applications are made with a total spray volume of 1 to 5 gallons per acre. The lower volumes increase the number of acres that can be sprayed with a given load and make the work more economical. These applications are most useful where large acreages are involved, such as in weed control in the grain of the plain states or brush control in rangeland. The control of spray drift is one of the major unsolved problems.

The actual spray equipment used in airplanes consists of a boom attached to the wing, a small wind-driven pump, and a tank to carry the spray. The pump may operate at low pressures but must be capable of volume output in the range of 20 to 30 gallons per minute. Each nozzle should have a positive shutoff so that none of the spray can escape from the boom while spraying is in progress.

Chemical Mechanisms Affecting Milk Flavor Explored

KANSAS CITY.—Heat, light, air agitation, trace metal contamination, and a host of microorganisms are a continuous threat to the chemical stability of many milk components, said D. V. Josephson of Pennsylvania State University in his Borden Award address before the ACS Division of Agricultural and Food Chemistry. Frequently, the only measurable indication of these chemical reactions is a change in flavor or odor, he said. Since flavor is the primary index of food acceptance and product improvement, research in this area is of considerable importance.

Milk and many dairy products made from it pose two main flavor problems: the prevention of off-flavors and the maintenance or development of characteristic flavors. In general, the dairy industry has had to rely heavily on trial and error methods for attaining these objectives, Josephson commented. However, recent efforts by dairy researchers have centered around the determination of the exact chemical mechanisms involved in flavor change. Indications are that greatly improved flavor control in dairy products can be achieved.

Recent studies have led to a number of conclusions. It has been found, for example, that the photolysis of methionine in milk is responsible for the "sunlight" flavor. The heat denaturation of β-lactoglobulin results in a "cooked" flavor. The decomposition of lactose and the formation of furan compounds are associated with a "caramelized" flavor. The secretion of acetone bodies in milk results in a "cowy" flavor. These areas of study, said Josephson, represent a very small part of the many aspects of dairy technology which would benefit from further research on flavor-producing mechanisms.

Steroidal Saponins. The partial hydrolysis of steroidal saponins was the subject of a paper by Merle M. Krider and Monroe E. Wall of Eastern Regional Research Laboratory. Steroidal sapogens occur in nature in a combined, glycosidal form called saponins. In most saponins obtained from leaves of agaves or yuccas, the kind and number of the sugars of the glycosidic side chain are such that the saponin is water-soluble. Upon removal of one or more of the monosaccharides from the side chain, however, the saponin usually becomes water-insoluble. Hence, water extraction followed by partial hydrolysis of the saponin establishes a simple process for physical separation of a concentrated, partially purified saponin from most of the original aqueous plant extractives.

The partial hydrolysis of the glycosidic side chain has been achieved by use of plant enzymes and weak mineral acids, the report stated. The application of one of these agents, especially the latter, to heconin in agave juice or sarsasaponin in yucca wastes permits an economical recovery of these saponins, even though they are present in the original solution in very low concentration.

Flour Proteins. Wheat flours vary widely in their baking characteristics and in their response to oxidation. These variations, said Betty Sullivan of Russell-Miller Milling Co., are determined in large measure by the amount and physical properties of the proteins in the flour. The reactive groups of gluten involved in the oxidation and reduction of flour are the sulfur-containing amino acids, cysteine, cystine, and methionine. Maturing agents exert their beneficial effect by their action on a sulfhydryl compound that is apparently held in a phosphoric acid linkage that only alkali or enzyme treatment can release. Some preliminary work on the isolation of this compound is under way.

Stability of Carotene. H. L. Mitchell, R. E. Beauchene, and Ralph E. Silker of Kansas State College reported on the ability of various compounds to inhibit the oxidation of carotene in alfalfa meal during storage. Appreciable antioxidant activity has been found in compounds related to aniline. The most promising of these is *N,N'*-diphenylhexamethylenediamine.

Carotene retention during storage is influenced by the amount of oil used in applying the antioxidants to the meal. Applications of Wesson oil at the rate of 80 pounds per ton of meal has been found to be much more effective in reducing oxidation than 16 pounds per ton. Heating of the samples at 100° C. for an hour after oil spraying results in a further increase in carotene retention.