H. H. Schwardt, New York State College of Agriculture, said that livestock diseases caused by flies and ticks constitute one of the principal deterrents to progress in agriculture in Africa and the American tropics

Present usage of pesticides on sugar cane breaks down approximately to: 2 million pounds of herbicides, 500,000 pounds of fungicides, 3 million pounds of insecticides, 25,000 pounds of rodenticides, and 250,000 pounds of bactericides. He figures that maximum possible usage could be extended to 10 million pounds each of herbicides, and fungicides, 40 million pounds of insecticides, and one million pounds each of rodenticides and bactericides. The probable usage, he states, might be something in the order of three million pounds of herbicides, two million pounds of fungicides, 10 million pounds of insecticides, 100,000 pounds of rodenticides, and one million pounds of bactericides.

Use of weed killers, particularly 2,4-D, has become standard practice in many sugar cane areas, not only on the sugar cane fields themselves, but also among the railways and pastures that are often connected with large plantations. In many sugar growing areas, labor is becoming more expensive, thus making chemical weed control more attractive economically. A combined insecticide and fungicide for soil treatments would be highly useful to sugar growers, said Mr. Summers.

Fungus Damage. Coffee rust is without doubt the most dangerous, most feared, and most troublesome disease of the coffee crop in the world, according to Frederick L. Wellman, Regional Consultant in Plant Pathology for the Foreign Operations Administration. Losses to this disease amount to about 70% of the crop each year in South India and about 30% in Uganda. In Ceylon and Java, rust caused growers to abandon Arabian coffee plantations and it was not until more robust, but lower quality, varieties were introduced that Java eventually became a coffee exporter again. Proper timing of Bordeaux mixture applications can give good control of this disease, but it can be toxic if wet and dry seasons are not well defined.

In the Western Hemisphere, another fungus disease, American leaf spot, is almost as dangerous. Its devestations have caused the complete abandonment of large coffee acreages in Guatemala, Mexico, Costa Rica, Columbia, and Brazil. Copper - containing fungicides have been found effective, but the zinc materials were not.

Dr. Wellman said that it was his opinion that the annual world coffee crop could be increased by at least a third if proper measures were used to counteract coffee pests and disease. The present shortage he attributes to the fact that technological advances in coffee growing have not kept pace with demand.

Another tropical crop in short supply, cacao, would be augmented by more than a third if pests and diseases were adequately controlled. Rodrigo G. Orellana estimated that insects and virus disease subtract 210,000 long tons from the annual production of about 702,000 long tons. If fungicidal control were applied to the world's cacao acreage, at a concentration of only 2 pounds per 100 gallons of spray six times a year, there would be a need for about 189 million pounds of fungicide annually.

A soil fungicide with high residual effectiveness is the need in banana growing, according to N. C. Thornton, to combat Panama wilt, the limiting factor in banana production in Central America. Crag 974 and Dithane D-14 have shown promise of economic control.

A fungicide for controlling Sigatoka, which is as destructive as Panama wilt, is also needed, said Dr. Thornton. Bordeaux mixture is effective, but its application properties are poor, because of the waxy surface of the banana leaf, and consequently Bordeaux must be applied 16 to 22 times a year.

Radiation Sterilization of Food Held Up by Side Reactions

Three approaches to elimination of side effects and off-flavors being studied

NEW YORK.—The era of radiation sterilization of foods may be approaching but it is still very much in the future. Research workers present at the symposium on radiation sterilization at the recent ACS meeting were emphatic in the opinion that there are still several important problems to be resolved before cold sterilized foods hit the supermarkets.

The fundamental principles of ionizing radiation as a device for the eradication of bacteria were known before World War II. Since that time development of high energy particle accelerators and the potential availability of fission materials produced as a by-product of nuclear weapon manufacture have aroused an increasing interest in the possible practical applications of radiation energy. Since the war the fundamental research problems associated with the techniques for the eradication of bacteria from food products have generally been resolved so that it is now possible to sterilize foods with radiation produced either by machines or isotopes. However, although practical techniques have been developed to obtain sterile food products, it has not been possible to obtain a commercial product satisfactory for human consumption.

The status of current research in this area was summed up by participants in the symposium on radiation sterilization at the New York meeting. In the concluding paper of the symposium S.A. Goldblith of the Department of Food Technology, MIT, said that the greatest single problem holding up commercial utilization of this technique is the undesirable side reactions resulting from the radiation of foods at levels necessary to ensure sterilization.

Current research in the field is directed toward this problem of side reactions, believed to be responsible for the "off flavor" of irradiated foods. The side effect problem is being approached at two levels. Several groups of workers are studying the fundamental chemistry of these side reactions in an attempt to find what chemical compounds are modified by radiation forming the new compounds responsible for changes in flavor. Results obtained by these workers are in turn of interest to those who are concentrating on techniques for reducing the side reactions. Research results from each of these avenues of approach were presented at the symposium.

Thus far three possible methods for reducing undesirable side reactions have been proposed: irradiation in the frozen state; irradiation in inert atmosphere; addition of free radical acceptors.

All of these proposals are predicated on evidence that "off flavor" is due to

the production of free radical or activated molecules in material being radiated. Ionizing radiation produces free ions on portions of stable molecules; these free ion radicals in turn may recombine with molecules to which they were not previously attached, forming new chemical compounds.

Radiation in the frozen state is proposed as method to decrease the diffusion rate of free radicals produced by ionizing radiation. In the frozen state the free radicals do not have as much freedom to combine randomly with other molecules and produce undesirable compounds. Radiation in an inert atmosphere, devoid of oxygen, reduces the potential number of free radicals and thus cuts down on the degree of side reactions.

The third approach is one of adding compounds before radiation of the food which will preferentially combine with the free radicals. These chemical compounds, called free radical acceptors (FRA), are added as "expendables" to be inactivated by free radicals produced during radiation. The basic criterion for a FRA is that it have a greater affinity for the free radicals produced than that of the compounds present in food which are to be protected. Ascorbic acid is one compound which has been proposed as a FRA.

The problem of side reactions has also stimulated as yet unsupported speculation that radiation could produce new compounds within foods which are not only unpleasant but harmful to health. As yet no materials of this type have been reported; however some workers believe that theoretical possibilities of production of antimetabolites by radiation of such normal metabolites as vitamins must be extensively investigated.

Further study of the fundamental chemistry of the compounds produced in foods by ionizing radiation may open new approaches to the off flavor problem. Meanwhile the FDA has adopted an unofficial attitude that the radiation researchers will have to find the degree of radiation which is capable of producing harmful side effects or categorically prove that materials harmful to health cannot be produced by radiation of foods, before there will be any consideration by the FDA of commercial applications of cold sterilization.

Based on present knowledge there do seem to be some areas of application which might find use in the relatively near future. These applications are not based on sterilization, but rather on cutting down bacterial populations. The term "radiation pasteurization" has been coined to describe this technique, analogous to heat treatment of milk which kills the majority of bacteria present and increases the storage life of the product.

Surface sterilization of foodstuffs, frankfurters for example, is seen as a possible application in the not too distant future. Much lower levels of radiation could be used than those necessary for sterilization, yet the shelf life of the product could be greatly increased.

A. M. Doty and his coworkers at the American Meat Institute have demonstrated the practicality of increasing the shelf life of meat five fold by exposure to radiation at levels about one tenth of those necessary for sterilization. This pasteurized meat is claimed to be relatively free from offensive "off flavor."

Participants in the symposium were rather strongly of the conviction that the public should not be led to believe that the era of commercial radiation sterilization is just around the corner. It may be someplace around the block, for there are still a vast number of problems to be solved. It seems certain that the solution to the problems of the various corners will reside primarily with the food chemists and food technologists.

Evaluation of Surfactants in Fertilizers Calm Enthusiastic Claims

Experimental testing indicates benefits of surfactant addition not revolutionary

NEW YORK.—Optimism over the use of surfactants in fertilizer manufacture rose to a high peak two years ago. Claims included speedier curing of superphosphates and ammoniated goods as well as improved physical condition of the product even after short storage periods. By the beginning of 1954 further study had cooled the enthusiasm. A group of papers at the recent National Meeting of the AMERICAN CHEMICAL SOCIETY appears to have assessed the value of surfactants objectively with claims at a moderate level.

Selected surface active agents were used at Battelle Memorial Institute in large-scale acidulation and ammoniation runs. The effect on curing, in terms of P-205 conversion appeared negligible. Physical condition may have been improved to some extent, but recommendation of use in replacement of inert conditioners depends on effectiveness of the latter and relative costs of the inert and surface active materials.

No reduction in caking tendency in bagged fertilizer can be expected from incorporating surfactants into mixed fertilizers according to William Tucker, of GLF Soil Building Service, if they are to be bagged within a week of manufacture and stored for more than three weeks. He concluded that no reduction in caking tendency can be expected from the presence of an anionic surfactant if the fertilizer has been cured for four weeks prior to bagging.

USDA work at Beltsville, Md., has

Edwin Cox, vice president in charge of research for Virginia-Carolina Chemical Corp. (center) poses with G. L. Bridger, Iowa State College (left), and J. D. Romaine, American Potash Institute at the luncheon of the Division of Fertilizer and Soil Chemistry. Cox, the speaker, proposed revolutionary and not evolutionary philosophy as the most effective means of advancing agriculture and helping it to meet the ever growing demands of an increasing population. New approaches to such basic phenomena as photosynthesis and soil microbiology are typical examples