On the Cover

One of Man's Oldest Foods

FISH HAVE been an important source of man's food since time immemorial. Other sea foods, such as oysters, clams, crustaceans of various sorts, have been used also. But there is a considerable amount of life in the sea which is not used for food. Partially because it was not economically practical and partially because not enough was known about some of these forms of sea life, they have not come into our diet. Changing economics, new knowledge and techniques, and the great pressure for more food for an increasing population might possibly change this situation to bring new marine products into use in the future. Another possible source of increased food is fish farming or fish husbandry which now is being stuided.

form the public of the facts pertaining to pesticide hazards.

"A modest expansion of our information program for the purpose of assembling data on the economic importance to the grower of pesticides.

"A program for the improvement of the quality of our materials and the possible establishment of standards (not standardization), with particular reference to physical characteristics, analytical methods, maintenance of quality in storage, and the like.

"The development of a cooperative promotional program in the world markets to publicize American pesticides.

"A study of economic factors pertaining to the industry which would include time of purchase, warehouse and storage customs, and credits."

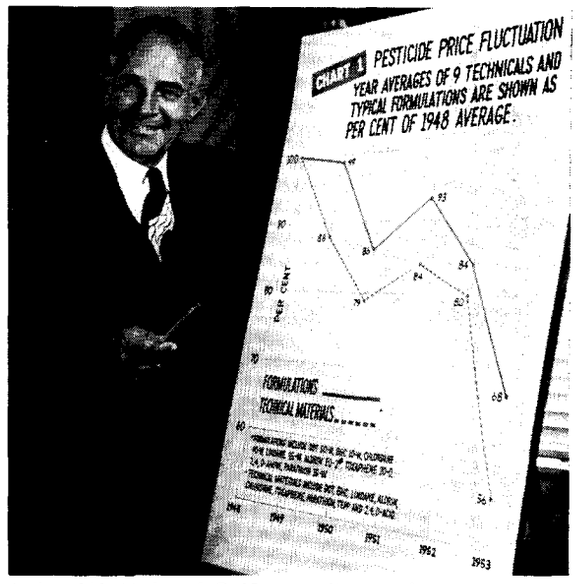
He said he felt that these recommendations must be put into effect and effectively carried out before the "industry can get into a healthy position."

The economic status of the industry was discussed by Arthur W. Mohr, president of California-Spray Chemical and outgoing NAC president. Although he said that he was of the opinion that more pounds and gallons of agricultural chemicals have been sold this year than during the 1952 season, profits for the most part have vanished. He frankly termed the past season as one of price war, brought on by overproduction. He had prepared a chart (see photograph) which showed the falling prices received for the technical materials and formulations of popular pesticides, choosing the prices received in 1948 as 100% Looking into the future, he said that it was hard to be optimistic, chiefly because of the industry's high inventory requirements in relation to sales, product liability, and indications of acreage allotments on certain crops next year. He said he felt that the industry's high inventory requirements, in comparison with those of the chemical industry as a whole, and product liability are factors which should bring industry a greater return on its sales dollar, because of the higher risks involved. He said he saw little chance of betterment until some of the excess manufacturing capacity is converted to the manufacture of other chemicals with better profit potential.

Fungicide Future

Fungicide research is coming of age, according to George L. McNew, managing director of the Boyce Thompson Institute for Plant Research. Much work still needs to be done on plant fungi, he said, but at the present time, it is possible to write out some chemical specifications for the ideal fungicide. The requirements, as he sees them, are:

Choice of a basic nucleus which is relatively inexpensive to synthesize. This nucleus should be chemically reactive or else be capable of bearing a reactive grouping. The toxaphore grouping must be exposed so it will react with a vitally important cell substituent such as the enzymes. The toxaphore must be protected from excessive detoxification by cell secretions by proper substituents which regulate electron density and other factors. The group must be capable of penetrating the fungus spore. It may be necessary to add a lipoid-solubilizing group as a strategically located substituent. The lipoid-solubilizing group must be selected carefully so it will not promote excessive penetration of foliage and fruit. The molecule must be photostable and otherwise persistent through



Arthur W. Mohr of CalSpray discussed the industry's economic status in his NAC presidential address. Chart shows price drops in the past few years

all sorts of weather conditions. The chemical must be formulated according to its chemical attributes so it may be deposited in an economical, enduring film.

Basic studies of the past few years have demonstrated these requirements, Dr. McNew stated. If such fundamental work does not continue, he said, and development work by empirical testing goes on alone, the program will eventually become unprofitable as standards of performance in fungicides increase and expenses such as for toxicological research are added to the cost of development. He said there is a great need, as evidenced by the $2 billion dollar loss annually from plant diseases, for fungicides, and the rewards are enticing, but industry must plan beyond its immediate future if it is to realize its potentials.

Antibiotic Spray Useful Against Apple Blight

MADISON, WIS.—The successful use of antibiotics for the treatment of blight disease in apples was one of the major presentations at the meeting of the American Institute of Biological Sciences here Sept. 6 to 10.

Robert N. Goodman of the University of Missouri reported on the results of research on the use of combination sprays of terramycin and streptomycin in the control of fireblight, a disease of apples.

Dr. Goodman reported that up to the present time no adequate control methods have been available for fireblight, which is a bacterial disease particularly active against apple trees of the Jonathan variety.

The terramycin-streptomycin mixture was administered by innoculation into the trunk of greenhouse plants which had previously been innoculated with the disease organism applied to the leaves. Within 24 hours the disease was under control, indicating that not only was the antibiotic mixture effective against the blight but that it could also be transported within 'the plant system.

Subsequent field trials with the antibiotic formulation applied as a spray

containing from 100 to 500 parts per million of the antibiotics were also effective in controlling the blight.

The unparalleled development of the antibiotic industry in the United States from a laboratory curiosity in 1942 to a $152 million industry 10 years later was the topic of Robert D. Coghill's address before the Society of Industrial Microbiology. Dr. Coghill reviewed the accomplishments of the antibiotic decade as an introduction to the Symposium on Mycological Production of Penicillin.

Dr. Coghill estimated that the fantastic growth of the antibiotics industry has resulted in a capital investment for production facilities of about $200 million. However, he warned that the future for that industry is not complacently secure, despite its mushroom growth. However, he emphasized that the future is probably secure for those companies which are willing to invest research money for the future.

Basic Research Lags Application of Growth Regulators

The economic uses of growth regulators have outdistanced the basic knowledge concerning the reactions of plants to them. This statement was one of the themes of E. J. Kraus, the discoverer of 2,4-D.

He stressed the importance which has been subsequently attached to basic research studies in plant physiology and structure. The relationship between structure and function in the growing plant is, according to Dr. Kraus, the area which holds the greatest promise for future research on growth regulators. He criticized much of the current research in the field, which follows the empirical approach, applying new untried chemicals to growing plants, and observing the results. He acknowledged that although this "trying out method" may have found many uses for growth regulators, more critical experimentation would probably speed up their applied use. "As a matter of fact," he said, "the economic uses of these compounds have, in many cases provided suggestions for basic research to be done."

The basic studies which he thinks are needed concern the individual tissue systems of the plant, rather than such tissue systems as roots, stem, and leaves. Biochemical studies of these tissue systems, although tedious, would provide a basic frame of reference for creative research in the development of new herbicides. He advised botanists to turn to a more general use of microchemical techniques to solve these problems.

At present the closest approach to this study of the response of tissue systems to chemicals is the observation of the histological changes of the plant initiated by the chemical treatment. He believes that eventually botanists and chemists should team up to find out the chemical reactions occurring in these systems.

Dr. Kraus predicted that when this research has been done the time will come when "any vital plant process, together with the associated physiological, histological or morphological changes that any plant may express, may, as time goes on be brought under control through the use of growth regulating substances."

An example of the type of basic research which Dr. Kraus called for was presented at the meeting. A plant hormone which encouraged normal cellular development was described by R. H. Roberts and B. H. Struckmeyer of the University of Wisconsin.

The hormone was isolated in the course of research investigating the blossoming of plants. It was found to be present at the time blossoming starts. The growth regulator, which has not yet been completely identified chemically, has the property of reducing the abnormal cell growth caused by other regulators of the 2,4-D type. It has the effect of inhibiting the injurious effects of the herbicide.

This is believed to be the first instance of the isolation of a growth regulator which has the effect of maintaining normal cellular development.

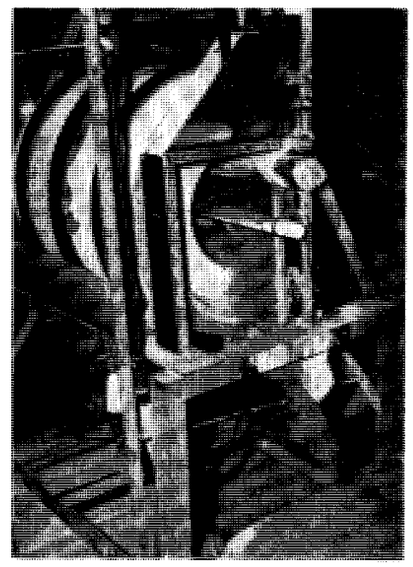
TVA Demonstrates Continuous Ammoniator to Fertilizer Industry

MEMBERS OF THE FERTILIZER INDUSTRY were treated to a demonstration of a pilot-scale continuous ammoniator for superphosphate at Wilson Dam, Ala., by the Tennessee Valley Authority on Sept. 15. The continuous ammoniator was developed by TVA in a study of methods of ammoniating superphosphate and superphosphate mixtures without serious reversion of P_2O_5 and loss of ammonia.

The demonstration, arranged with the help of the National Fertilizer Association, consisted of two runs, one producing a 6-12-12 analysis and another producing a 10-10-10 analysis.

Although still in the pilot plant stage, results seem promising. Advantages of the equipment are that nitrogen can be used in the least expensive forms to fertilizer manufacturers—liquid anhydrous ammonia or ammonia solutions; a high degree of ammoniation; and a not-excessive loss of ammonia. Continuous operation means no loss of time in charging and discharging as is the case with a batch ammoniator, and possible reduction of labor. In some cases granulation of the charge appears to be feasible during the ammoniating process, thus obviating the need for special granulation equipment. Water vapor released during the process is swept out by an air current, eliminating condensation and wetting of the incoming charge.

The ammoniator consists of a revolving drum with retaining rings at each end, a superphosphate feed into the cylinder, a discharge for removing the ammoniated product; and a means of removing the water vapor. Anhydrous ammonia or an ammoniating solution is fed through a slotted tube placed under the bed of solids, which prevents excessive loss of ammonia. Provision can also be made for incorporating sulfuric acid under the bed of materials in the ammoniator. The ammonia tube is almost as long as the cylinder and means are provided to distribute the ammoniating medium into the various sections of the charge in predetermined proportions. The TVA people said that in most of the work the greater portion of the medium emerged along the midpoint of the tube with lesser portions at either end.



Photograph of the TVA pilot scale continuous ammoniator