

In all this we have departed somewhat from what some consider to be the conventional advertising technique. We have avoided exaggeration. We have tried to limit our claims not only to what can be scientifically demonstrated, but further, to what we think will be acceptable to the thinking agricultural leaders of the area in which we are working.

Has this sold more fertilizers? We think so—a lot more. We think it has sold fertilizers on the soundest possible basis—through benefiting our customers. It is the settled policy of NFA that this program will be continued and intensified.

Fertilizer-Insecticide Mixtures Reduce Application Costs

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IT IS PHYSIOLOGICALLY necessary for the plant to develop an extensive feeding area for its roots in order to find food and water for the above-ground parts. Insects can destroy the roots of plants either mechanically or by using the roots as food. In either case the damage that they cause will limit the plant development. Insects that have adopted certain crops as their preferred host may so seriously injure the plants as to make the growth of the crop unprofitable.

Use of fertilizers has become a standard practice in most farm operations. Machines are available to apply fertilizer in almost every desirable manner. It is then almost a logical assumption that if something is to be applied to the soil, why not follow the procedures used for fertilizers. The bulk of fertilizers applied per acre is rather large. Relatively simple fertilizer machines are in common use. The amount of pesticide required per acre is relatively small, and essentially no satisfactory machines are available for distributing pesticides. Where insecticides and fertilizers can be applied together, a single operation may do the job. Where fertilizer-pesticide mixtures are broadcast and worked into the soil by machines, they are extremely satisfactory.

Already vast areas of farmlands have been rid of certain pests by the treatment of their soils with pesticides. In some states the bulk of materials has been applied as fertilizer-pesticide mixtures.

Granular insecticides now available provide a medium of purchase whereby a

farmer can buy a pesticide under a label. Purchasing the pesticide in this manner assures a full value, as compared to an item of uncertainty where the pesticide is mixed with the fertilizers. The problem of labeling and testing fertilizer-pesticide mixtures is confusing. There are many ways of handling the problem. None is completely satisfactory.

The procedure for uniformly mixing a small volume of pesticide with a large volume of fertilizer has not been satisfactorily established. Routine sampling of mixtures would indicate that formulators will have to improve their processes for mixing. Data to date has shown a very variable analysis which would indicate a poor mixture of the fertilizer and the insecticide. Since the amount of insecticide is so small, a premix of the insecticide will probably be necessary in order to develop a uniform product.

The present methods appear to be satisfactory when based on results on the farm. Most producers have been well satisfied with results obtained following the use of fertilizer-pesticide mixtures. "Control wise," however, much work needs to be done in order to ensure a uniform product that will be satisfactory to both the manufacturer and the producer.

Technical Problems Can Be Worked Out

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THE INVESTIGATION OF CROP RESIDUES and the persistence of the pesticide in the soil are chemical and biological problems requiring the development of analytical techniques of extreme sensitivity and accuracy. Even with one given insecticide, the development of an analytical procedure for soil residues requires almost as many different procedures as there are soil types. Similarly, different analytical techniques must be developed for the analysis of pesticide residues in different crops.

Residues in the soil have been of considerable concern from two particular points of view: The question of whether repeated applications will result in a gradual build-up to harmful levels and the economic question of how long the pesticide will persist in the soil to give control before retreatment is necessary. Controlled experiments show that insecticides applied for soil infestations gradually but definitely decrease in content

in the soil even though insect control is still obtained. The inference from these experiments is that once infestation is under control, there is less probability of reinfestation.

In almost all cases, pesticides are used at a low concentration when combined with fertilizer. A typical formulation which is to contain 0.5% pesticide is preferably prepared by blending in a premix 10% pesticide concentrate amounting to 5% of the total. In this case, sufficient time must be allowed for practical and uniform distribution of all ingredients. Depending upon efficiency of the equipment and assuming a ribbon-type of blender is used the blending cycle has been stated to require from 10 to 20 minutes. Because of the possibility of small particles of dry powder segregating themselves from the bulk of the fertilizer during storage, care must be exercised in the choice of form of insecticides to be used. Rigid control of the mixing and blending operation must be maintained and it is desirable that each lot be chemically analyzed to assure uniform distribution.

Since most of the insecticides used with fertilizers for the control of soil insects are of the chlorinated hydrocarbon types, it must not be assumed that merel analyzing for organically bound chlorine is adequate. Because of the rather high percentage of inorganic chlorides in fertilizer, it is advisable to extract the insecticide from the mixture with techniques suitable to the insecticide in question.

Fertilizer-pesticide mixtures have been demonstrated to be entirely practical and economical. Yet, there still is reluctance on the part of some authorities to recognize or sanction their use. This is certainly understandable since there are specific questions which do arise. We should, however, recognize the advantages and consider possible disadvantages, if any, with regard to their order of significance so that a most effective yet economical product can be made available to the grower.

Mixtures Effective And Economical

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FERTILIZERS have been applied to soils for many years. We know that many insects exert their destructive action at the roots of plants. Then it seems

only logical to apply fertilizer-insecticide mixtures *in situ* for easy access to plant roots.

The farmer readily accepts the idea of controlling insects in the soil by application of pesticides, especially if the insecticide can be applied along with the fertilizer. He does not have suitable equipment, in most cases, to apply soil insecticides as they should be applied.

There is no secret about the interest insecticide manufacturers and formulators have in fertilizer-insecticide combinations. They afford a new market of great potentialities. Soil insects long have taken enormous toll. The economy of applying soil insecticides along with fertilizers will greatly expand the market for insecticides. The manufacturer of insecticidal chemicals must be in a position to assure the fertilizer manufacturer and farmer that the addition of insecticidal chemicals to the fertilizer will not result in phytotoxic or toxic residue hazards and will not adversely affect flavor.

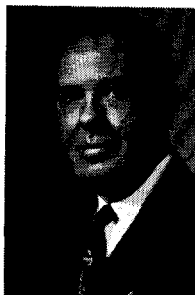
The fertilizer manufacturer seems to stand to be the big gainer in this new approach to insect control. Addition of insecticides to fertilizers offers a means of increasing fertilizer consumption. Fertilizers will make the farmer a bigger profit if his crops have a good root system and plants have good root systems when the proper insecticide is applied. He will always be able to compete with conventional insecticide formulations and make a substantial profit. He has the added selling point of no increased cost of application for the farmer.

Present indications are that soil applications of insecticides will increase yields as much or more than fertilizer applications. Equipment manufacturers can look forward to greater use of fertilizer distributing equipment.

Fertilizer Industry Has Doubts About Combinations

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I WOULD LIKE to present some of the advantages, if any, in the admixture of fertilizers and pesticides as we see the problem today in the fertilizer industry.

The farmer can place both the insecticide and fertilizer in the field with one application. This method also eliminates some of the necessary equipment for separate application. It reduces the danger of contaminating other farm supplies that may be stored in the farmer's

barn or storehouse. The farmer believes that he gets a more uniform distribution when he drills in a fertilizer-pesticide mixture. There is less danger to the applicator than when he handles the concentrated poisonous insecticides.

From our point of view there are no advantages to the fertilizer industry, but there are many disadvantages.

Few, if any fertilizer plants have the equipment necessary for mixing the pesticides with fertilizers. The time cycle for proper mixing would seriously affect the service which the fertilizer industry is now giving the farmer.

The multiplicity of grades which would follow the practice of incorporating odd amounts of various insecticides into the different grades of fertilizer already being produced, would present a serious storage problem.

The toxicity of most of the insecticide materials would require additional safety facilities and specially trained supervisory personnel.

With the much greater limitation of these mixtures to use on specific crops, the farmer would have to buy the exact amount of a specific mixture he wished to use on a specific crop. Many popular grades of commercial fertilizer can be applied to a number of different crops throughout the entire planting season.

In order to handle the mixture problem properly a special plant would probably have to be designed with proper mixing facilities and safety equipment. To assure safety of the workers not engaged in this operation, the plant should be separated from the main fertilizer building.

Insecticide development is progressing so rapidly that the fertilizer industry has no assurance that goods made for sale in a given year will be saleable in the next season. The fertilizer industry cannot afford to mix goods containing these materials except on specific order.

It is our opinion, and certainly the opinion of quite a number of others in the fertilizer industry, that the farmer should employ some means of applying his insecticides other than the fertilizer-pesticide route.

Mixtures Will Probably Require New Laws

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MAJOR DIFFERENCES in fertilizer and pesticide laws are being eliminated and we are approaching uniform enforcement.

Farmers are fairly well informed about fertilizers, and few farmers are likely to injure themselves or crops through the use or misuse of fertilizers. Fertilizer regulations are on an intrastate basis. Most of these laws provide that the fertilizer shall not contain ingredients which may damage crops or soil.

Pesticides are regulated by both federal and state laws, and most of the laws have been enacted or amended within the last 10 years. Under most of these laws the manufacturer is held responsible if the pesticide is injurious to living man or other vertebrate animals or vegetation, except pests and weeds.

Under the federal insecticide act, fertilizer-pesticide mixtures are registered as pesticides. The pesticide is the active ingredient and the fertilizer is regarded as inactive. These mixtures must be registered as pesticides if they pass through interstate commerce.

Many states have regulations for the sale of both fertilizers and pesticides. Where this situation exists, the manufacturer of fertilizer pesticide mixtures will probably be required to comply with the provisions of both the laws.

The Southern Association of Feed and Fertilizer Control Officials passed a resolution on fertilizer pesticide mixtures, recommending that permits for sale of these mixtures not be granted unless the agriculture experiment station has recommended the use of the mixture. The resolution also states:

"It is believed that the use of mixtures of fertilizers and pesticides is generally based on the economics of the practice and that the danger of contaminating crops or soils or both by misapplication . . . is real and does not warrant the savings in labor costs.

"Mixtures of pesticides and fertilizers which are registered for sale should be properly labeled and meet all the requirements for both the fertilizer and pesticide laws of the state."

This statement has also been endorsed by the Association of American Fertilizer Control Officials, the Association of Economic Poison Control Officials, and the Association of Presidents of the Land Grant Colleges.

Most fertilizer manufacturers are familiar with the regulatory provisions of the state fertilizer laws, but many of these manufacturers are probably unaware of the responsibilities they will acquire with the marketing of fertilizer pesticide mixtures.

I predict that the general use of mixtures of this type will probably necessitate more laws and regulations. Before entering this field of operation, both the fertilizer and pesticide manufacturers should consider the complications and responsibilities which may result in the marketing of these mixtures.