NEW PESTICIDES—CAUTIONS AND INFORMATION

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Historians tell us that there is evidence to indicate that the struggle of man to subdue pests began long before civilization was recorded and will, no doubt, continue as long as man exists. It is doubtful if either will ever be able to claim a final victory.

Many pests are very versatile, being able to adjust themselves to changing conditions in seemingly impossible fashion. They are found in the air, in the soil and in the sea. There are few objects, dead or living, which are not, either directly or indirectly, affected by pests of some kind at some, or during all, stages of their existence.

The tangible results of pest ravages take on varied aspects including disease transmission to plants and animals, plant and plant product destruction to say nothing of the staggering losses as would be measured in terms of monetary values. It has been estimated that the losses due to cotton pests alone exceed $250,000,000 each year. Accurate figures as to losses due to pest damage are not known to me. It is reported that in one state in the United States the total value of farm receipts from agricultural crops for one year was approximately $191,000,000. Of the above there were eight major farm crops with an estimated value of $75,000,000, which were almost entirely dependent upon pest control for economic commercial production. An additional $18,000,000 worth required nearly complete protection, making a total of approximately 49% of the crop value of that state dependent upon pest control measures. The balance, or 51%, required periodic or partial protection to some degree. These few and sketchy figures should serve to indicate the staggering world wide loss which may be sustained each year from pests. There is a need for the economic evaluation of pest damage annually by each state in the United States to crops, public health, structures, commercial products, etc.

The problem of pest control is not a local one, or even a national problem, but is a world-wide problem. In order to cope with the situation, man has developed an undetermined number of chemicals to combat these pests, and this number is increasing almost daily. These chemicals, including the insecticides,

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* A talk presented at the Annual Agricultural Extension Conference, College of Agriculture, University of Florida, October 20, 1949.
fungicides, herbicides and rodenticides, have all been grouped under a recently coined word "pesticides."

This is the subject which I wish to discuss with you. It is a large assignment and one which, if covered properly, would require far more time than allotted to me here, and more, I am sure, than any of you would care to listen to at one, or even several such sessions.

Of these pesticides the relative importance to an individual of insecticides, fungicides, herbicides or rodenticides, may depend upon the region in which one lives or what business he is in, but they are all important at some time to most people, and although we may not realize it, affect all of us either directly or indirectly.

A few years ago the number of these chemicals was relatively few as compared to the list we have today. I am sure that most of you can well remember that when a farmer or home owner presented a pest control problem to you, you could make an approved recommendation to him to cover almost any situation using one or more of the following: nicotine, pyrethrins, rotenone, oil emulsion, lime sulphur, sulphur, calcium arsenate, lead arsenate, paris green, cryolite, sodium fluoride, borax, copper sulphate, soap, etc.

This is not true today. Many of these so-called old pesticides are being replaced by the new organic chemicals. This new wave of organic chemical development started early in World War II and the end does not appear to be in sight at this time, since each day seems to reveal new, more powerful, and amazing tools to the farmer and person interested in pest control.

One of the first of these new chemicals is the well known DDT, chemically dichloro diphenyl trichloroethane. DDT was first synthesized about 15 years ago by a German chemist and was first patented as a pesticide in this country about 1939. Since then, chemically similar compounds such as DDD (dichloro diphenyl dichloroethane) and methoxychlor (dimethoxy diphenyl trichloroethane) have been introduced.

The uses of DDT are fairly well known today. It is interesting to note that resistant strains have developed in certain pests, specifically in flies and mosquitoes. DDD has been found to be useful on certain vegetables (i.e., tomatoes) and on certain fruit crops. Methoxychlor has been found to be very useful on certain DDT sensitive plants and on animals (i.e., cats).

The first phosphate compound was hexaethyl-tetraphosphate (HETP) known as Bladan in Germany. This was a mixture of
two or more phosphate compounds. Later, one of these tetra-
ethyl-pyrophosphate (TEPP), was isolated and it is said to be
several times more toxic to pests than HETP.

The most recent phosphate development is parathion (diethyl
nitrophenyl thiophosphate) which was developed in Germany
and first used commercially to any extent in this country in
1948. These phosphate compounds are all highly toxic to warm
blooded animals upon contact, inhalation or ingestion. The
HETP and TEPP readily hydrolyze upon exposure. Parathion is
a more stable compound. They are all good aphicides, and
parathion is effective against a rather wide range of sucking
and soft bodied pests.

Benzene hexachloride, or BHC, is another relatively new
pesticide. This is the chemical characterized by a musty odor.
Of the five isomers which have been identified, the gamma
isomer appears to have the most insecticidal value.

Quite recently scientists have been able to isolate this gamma
isomer in essentially pure form. This chemical is now known as
Lindane. Lindane is Practically odorless.

One of the major uses of BHC is on cotton, usually in com-
bination with DDT and sulphur. Lindane is an excellent in-
secticide for use on certain crops such as cucumbers and is also
used against DDT resistant flies.

Chlordane, one of the chlorinated hydrocarbons, also known
as 1068, is a relatively new organic insecticide used against
roaches, mole crickets, grasshoppers and a number of truck
crop and animal pests.

More recently new chlorinated hydrocarbons such as Aldrin
and Dieldrin have been under tests with limited commercial
use to date. Very promising results have been reported follow-
ing the use of these chemicals for certain specific uses.

Toxaphene or chlorinated camphene, was first commercially
available about 1947. The use of this new insecticide has ex-
panded rapidly in the cotton pest control program, for use
against worms and grasshoppers and against certain animal
pests.

Piperonyl butoxide is a new non-hazardous insecticide espe-
cially designed for use against flies and certain other pests where
non-poisons are required.

Against mites on plants “DN”, selocide, and K1875 have been
used in varying degrees.
The early fungicides consisted basically of sulphur or copper in some form. Today, these same two materials are still used extensively in one form or another. There appears to have been many more radical changes in the forms and formulations of the coppers than with the sulphurs.

In addition to the above, there are a number of new fungicides including the carbamates, quinoline compounds, chlorinated quinones, chlorophenates, various organic mercury compounds, and various chromate compounds.

One of the difficult problems connected with referring to these new chemicals other than by brand name, is the long "tongue-twisting" and little understood and difficult to remember chemical names.

Some progress has been made to remedy this situation by adopting coined words which may be used in lieu of the chemical name when referring to the active content. Typical examples of these in the insecticide field are: chlorinated camphene may be referred to as T'oxaphene. The essentially pure gamma isomer of BHC may be referred to as Lindane.

Very recently, it has been reported that the Sub-Committee on Fungicide Nomenclature of the American Phytopathological Society and their associates, have adopted the following coined words as they refer to certain of the new organic fungicides:

- Ferbam—ferric dimethyl dithiocarbamate
- Ziram—zinc dimethyl dithiocarbamate
- Naban—disodium ethylene bisdithiocarbamate
- Zineb—zinc ethylene bisdithiocarbamate
- Thiram—tetramethylthiuram disulfide

One of the largest single increases in the pesticide business which has occurred in recent years has been the herbicide field. This is especially true in the corn, grain, flax, and rice belt. There appears also to be a large field still to be developed in the open range pasture of the great plains, against brush and, possibly, in other areas.

The major chemical used for this purpose has been 2,4-D in some form, or a similar compound such as 2,4,5-T. There have been millions of pounds of 2,4-D weed killers used this past year. The results obtained are reported as generally satisfactory, although if improperly used, these weed killers can be very damaging to commercial crops. Certain of them are volatile and the fumes can be injurious to nearby economic plants.
Other weed killers for specific uses include the dinitrophenol compounds designed for burning back potato tops and pre-emergent weed control. Other weed killers include the acetate compounds, sulfamate, and such non-selective materials as the arsicals, the chlorates, the borates, oil, etc. The herbicide field is still in its infancy and there are many opportunities in this field to be developed.

A number of new rodenticides have been introduced. No attempt will be made to list them.

With the very rapid development of these new chemicals, it is very difficult for anyone to keep abreast of them, and especially the person who works with them only occasionally.

For maximum results and proper safety it is suggested that those responsible for supervision of pest control familiarize themselves with the use of the pesticides concerned. This usually can be done by either reading the literature on the product or the label or both.

A properly labeled product should provide directions for use, give an analysis of the product, cautions, antidotes, where necessary, and other pertinent data pertaining to the product. These instructions should be understood and followed by the applicator.

Most of these new organic insecticides are available in the form of dusts, wettable powders, emulsive liquids, with some in bait and others in aerosol forms.

Normal precautions of handling economic poisons are usually adequate for DDT, Methoxychlor, BHC, Lindane, Toxaphene, Chlordane, etc., however, certain of these materials, particularly the phosphate insecticides and specifically parathion, should receive special attention and should be handled with great care. The person operating the machine and the applicator should wear effective toxic respirators. They should wear protective clothing and natural rubber gloves so that the skin will not come in contact with the material. Neither the fumes, the dilute dust, or spray mist should be inhaled. They should wash their hands and face before either smoking or eating. Clean and uncontaminated clothing should be provided for each shift. If exposed, the skin surface should be washed at once. At the first sign of headache, nausea, tightening of the chest, or constriction of the pupils of the eyes, consult a physician at once. The indicated treatment is atropine, followed by oxygen as directed by a physician.

A number of authorities have stated that if proper precautions are followed these good pesticides can be used safely.
Some suggestions as to the use of pesticides, especially the new ones are:

1—Handle and use pesticides safely. Store away from food and feed.
2—Read, understand and follow label data and other directions for use.
3—Know pest to be controlled and use measure recommended to control it.
4—Do not overdose.
5—Apply pesticide in manner and time recommended.

The National Agricultural Chemicals Association, Barr Building, Washington, D. C., recently published an 8½ x 11 sheet entitled, "How to Choose and Use Pesticides Properly." It lists ten concise clear points. If you do not have a copy of this and would like one, they may be obtained upon request.

An interesting article appeared in the April 1949 issue of the Farm Journal entitled "How Dangerous are the New Bug Killers?"

I am confident you are all familiar with and probably have a copy of the "Handbook on Pesticides and their Uses in Florida Agriculture" as published by the Florida Agricultural Experiment Station, Gainesville, Florida, February 1, 1949.

There are also other somewhat similar new releases available, including:


"Pest Control Materials 1949," published jointly by the Pennsylvania Agricultural Experiment Station and the Maine Agricultural Experiment Station, dated January, 1949.


There are probably other such works and no attempt has been made to list them all.

I am sure that we are all aware that many of these pesticides, if taken in sufficient quantities, are poisonous to warm-blooded animals.

We all recognize that their use is essential to protect health and produce the amount and quality of products the entire world needs today.
I believe we can also agree that if these pesticides, which are so valuable and essential to us and our well being, are correctly used they are harmless to those who apply them and also to those who consume the products protected.

It is my belief that this goal can best be attained through education, a field to which the Extension Service is dedicated. To this end we pledge to you our complete support.

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THE BEHAVIOR OF PURPLE SCALE POPULATIONS ON CITRUS TREES IN FLORIDA *

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During the past 50 years in Florida, purple scale, *Lepidosaphes beckii* (Newm.), has been the primary scale problem on citrus trees in Florida. The amount of damage due to this pest has varied from year to year and from decade to decade, but, in a general sort of way, the first half of the 20th Century may be divided into the three periods as defined by distinct differences in the problems which have been encountered with this insect. Prior to 1925 scale infestations were fairly common, and some control measures were undertaken. However, regular spray programs for scale control were not applied, because satisfactory means did not exist. From 1925 to 1935, definite changes took place in citrus groves in Florida. Plantings were shifted to the sand hills of central Florida, and there was a change from organic to inorganic fertilizers. As a result of improper feeding, magnesium, manganese, copper and zinc deficiencies developed. In the early 1930's, trees grown in the sandy soils were in very poor growing condition, deficiency symptoms were common, and scale populations were at a very low ebb. Although oil emulsion sprays were available during this period, very few sprays were applied for scale control. Beginning in 1936, new fertilizer practices were instituted. These involved the use of magnesium, manganese and copper in the fertilizer, and the use of copper, zinc and manganese sprays, with copper and zinc sprays being applied regularly. The change in fertilization practice resulted in increased yields and improvement in the general size and the vitality of the

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*Presented before the 1949 annual meeting of the Entomological Society of America.*