

SYMPOSIUM

The Past, Present and Future Use of Insecticides

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Highlights in the History of Insect Control

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Earliest records in fossil remains show that insects existed on this earth several hundred millions of years ago, certainly many millions of years before man. Many of these early insects were of enormous size, and like the huge mammals, the larger insects have disappeared and our more important pests of the present day are of comparatively small size. At the same time, the structure of insects has persisted very much the same through these millions of years of evolution.

Earliest written records of insects are found in the Old Testament of the Bible. There we find records of pestilence of mice in granaries, plagues of locusts, lice, flies, canker worms and others. During the middle ages we find records of 25 million deaths from bubonic plague or black death. During all this time, little was known of the life histories of insects, nor was anything known of the role played by insects in the transmission of diseases. Knowing nothing about the biology of insects, little could be done regarding controls. There does seem to be some evidence that incense, used hundreds or thousands of years ago in religious rituals, may have first been suggested as a repellent for annoying insects.

More recently, perhaps three hundred years ago, insect control became a church problem. Perhaps religious superstitions prevailed. At any rate I recall an account in a Danish publication reporting a serious white grub problem. The Church reported a trial against the white grubs which had been destroying the crops. The Church appointed an attorney for the grubs. He made an eloquent plea, saying that God had established the grubs on this earth and they had a right to feed and live. The appointed attorney made such an eloquent plea that the Church decided to be lenient and set aside a field where the grubs were supposed to come and feed. A field was assigned with a sign indicating that this was where the grubs were to feed and those which refused and continued to devastate crops would be excommunicated from the Church. The recorder reported "it did no good".

There came a period when all kinds of concoctions were recommended. These so-called remedies usually included a variety of materials, usually materials obnoxious to humans, not realizing that what might be objectionable to a human might be attractive to an insect. In this connection I would like to give tribute to E. G. Lodeman, who wrote a thesis for his Master's Degree at Cornell University. It was published by the Macmillan Company in 1906, in book form under the title "The Spraying of Plants". It is a fine history of the use of insecticides on plants. Just as an example I'd like to quote one formula suggested by a Mr. Hamilton. It reads:

Sulphur	8 ounces
Scotch snuff	8 ounces
Hellebore powder	6 ounces
Nux vomica	6 ounces
Soft soap	6 ounces
Cayenne powder	1 ounce
Tobacco liquor	1 quart
Water (boiling)	1 gallon

Apparently Hamilton did not appear to be confident of the action of even this array of death-dealing materials, so he advised in addition, that the plants be washed with it and the insects removed while washing.

Such was chemical control 85 years ago.

It was late in the sixties that the Colorado potato beetle, a native of the foothills of Colorado, became a pest of cultivated potatoes. There seems to be little authentic information regarding the original use of paris green, a paint pigment, except that in the late sixties it became a standard control for the Colorado potato beetle. Although several chemicals were used effectively before this time, the use of paris green may be considered as the beginning of scientific control of insects with chemicals. Thus we see that scientific control dates back perhaps only 85 years ago.

Then followed the development of other materials, each because of a special need. Thus in the nineties, arsenate of lead was developed because of a need for a stomach poison for the control of the gypsy moth, which attacked a great variety of plants, many of which were damaged by paris green because the latter contained a relatively large percentage of soluble arsenic. Oil sprays were developed for scale control because insects were becoming resistant to lime-sulphur and furthermore lime-sulphur destroyed parasitic fungi of scales in Florida. And so we could continue our history of the development of stomach and contact insecticides, each development brought about because of a specific need.

In the early 40's with the beginning of World War II, it became evident we would be fighting in the southwest Pacific, where a major problem was the several major diseases caused or carried by insects. The need for means of preventing and controlling such insects, resulted in further insecticide developments, first with DDT and followed by many other chlorinated hydrocarbons, along with aerosols, which were undoubtedly responsible for control of insect borne diseases, the saving

of many lives, and ending the war with Japan, perhaps years before it would have otherwise ended, regardless of the atomic bomb.

The several chlorinated hydrocarbons have many things in common. All are more or less compatible with each other and most other insecticide and fungicide chemicals; all may be formulated the same, as solutions in oil, emulsions, wettable powder, granular, and as dusts; and all are oil soluble and water insoluble; all have more or less residual properties. On the other hand, many insects have developed a resistance to these chlorinated hydrocarbons.

Because of the ineffectiveness of the chlorinated hydrocarbons against such pests as mites, the organic phosphates were developed. Then came the development of systemic insecticides, which show great promise. These include materials which are translocated in the sap of plants and blood of animals, and destroy pests which feed thereon. To date these have proven effective only for arthropods with sucking mouthparts.

Another development, which I consider highly significant, is the discovery of synergists, that is, those chemicals which, when added to another insecticidal chemical, increases its effectiveness and residual properties. This includes also synergists which make insects more susceptible to the material. It seems to me one of the major developments of the future will be the development of synergists which will increase the value of an insecticide and increase the susceptibility of an insect to the insecticide.

My assignment was to discuss insecticide control but I would fail if I did not comment on other controls and their relation to insecticide control. With the development of the so-called miracle insecticides, entomologists have apparently forgotten, or at least have neglected, the old reliable inorganic insecticides, most of which are still valuable and dependable insecticides. Similarly, entomologists have neglected to emphasize the importance of good practices, which have, in the past, played such an important part in insect control and especially insect prevention. They have depended entirely too much on the new insecticides and forgotten that good practices, which prevent insect outbreaks, are still the cheapest and most dependable methods of avoiding insect losses. To be sure, chemicals are essential, but how much more valuable could they be if we followed good practices, whether they be plowing procedures, time of planting, time of harvesting, rotation of crops, sanitation, etc.

Furthermore, we should not discount the value of biological control and the use of mechanical devices.

The future of insect prevention and control depends not on chemicals alone but on an understanding of the biology and physiology of insects and the use of good practices, mechanical devices and biological control procedures.