DEVELOPMENTS IN ECONOMIC ENTOMOLOGY

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We have all been told on one or more occasions that at stated intervals it is desirable to take time from our daily tasks to consider the progress being made and the direction in which these changes are leading us. From such considerations there should naturally follow a reorientation of our efforts to the end that our individual activities will be in harmony with the general trend of events, provided trends are toward a desirable goal. On the other hand, such meditations may indicate that efforts should be directed toward changing these trends to a more desirable course. This thirty-fifth annual meeting of the Florida Entomological Society is a convenient and appropriate time to pause for consideration of some of the factors which have influenced the progress being made in economic entomology and the direction of future advances.

One of the factors which has and is influencing entomological progress is the application of statistical methods to the study of entomological problems. The early entomologists were concerned largely with naming and classifying insects. The development of a sizable amount of taxonomic knowledge of insects, along with the expanding agricultural acreage, and consequent increasing insect damages, created a demand for information on insect control. As the body of economic entomological knowledge grew, workers in this field became more and more aware of the need for more accurate measurements and methods for simplifying the mass of accumulated data. Workers in other fields, notably, Pearson, Harris, Pearle, and Lotka, were among the biologists who began using statistical methods during the latter part of the nineteenth century. During the second and third decades of the twentieth century, economic entomologists began employing statistical methods in the study and interpretation of their data. As an example of the awakening interest in the use of statistical methods, a symposium on this subject was led in 1924 by Hyslop, Burgess, Hartzell, Davis, Hunter, Lockwood and Larrimer at the twenty-sixth annual meeting of the Association of Economic Entomologists. At that time tests for the validity of data depended upon

a determination of the standard deviation from the mean. During the period between 1900 to the early 1930’s, progress in the techniques of statistics made rapid strides. With the publication in 1927 of Fisher’s “Statistical Methods for Research Workers” and in 1935 of his “Design of Experiments”, valuable tools for the critical examination of data were made available to biologists. There was a period when these tools were abused. But it has now come to be generally recognized that a carefully designed experiment is one which provides for a statistical treatment of the resulting data; and that a statistical analysis of the accumulated data provides a more critical and dependable interpretation of the results. Thus we see that during the past twenty years the use of statistical methods has brought about great changes in the methods of studying problems of economic entomology. No doubt future refinements in statistical techniques will accelerate advances in economic entomology.

Because of the present day wide usage and common acceptance of insecticides, we are inclined to forget that the general practice of insect control had its early beginnings only slightly more than one-hundred years ago. Finely ground tobacco mixed in water with lime for the control of aphids was first recommended in France in 1763. But it was not until 1828 that the volatile poison was isolated and named nicotine. In this same year of 1763 kerosene was first recommended as an insecticide to be used without modification. Although these early attempts to use kerosene and kerosene mixed with water, were very effective as insecticides, they caused severe injury to the plants to which they were applied. The first formula for an emulsion of kerosene, soap and water was published in 1874, and in 1904 the first miscible oil was placed on the market. During the period 1919 to 1923 the lubricating oil emulsions were developed for the control of scale insects. Then in the late 1920’s Volck introduced the summer oils and white oil emulsions. Pyrethrum, which was widely used before World War II for the control of household insects and pests of vegetable crops, was first marketed about 1800 as a flea and louse powder. London purple and Paris green were first used as stomach poisons for the control of the Colorado potato beetle during the 1860’s. Then in 1892 lead arsenate was introduced for the control of the gipsy moth. The first commercial batch of calcium arsenate was manufactured in 1912. Following the eastward spread of the cotton boll weevil, as much as 20,000 tons a year of this one
insecticide were used. The extensive use of arsenate of lead on fruits and vegetables brought about the establishment of tolerance levels for arsenic, lead and fluorine compounds. This stimulated the search for non-cumulative insecticides which resulted in the wide use of rotenone during the 1920's and 1930's. With the discovery of the insecticidal properties of DDT in 1942, economic entomology entered a new era.

This period of the past ten years has been characterized by the rapid development and release for growers' use of the chlorinated hydrocarbon and the phosphatic insecticides. This has created conditions which have drastically changed the economic entomologists' method of approaching insect control problems. In the first place these newer chemicals have provided spectacular control of a number of insects which were previously very difficult to control. As examples: pickleworm and melon worm on cucurbits are readily controlled with lindane; stink bugs and the larger plant bugs are very effectively controlled with chlordane or toxaphene; and serpentine leaf miner is very susceptible to applications of parathion. Furthermore, recent years have witnessed the demonstration of the fact that the use of the newer insecticides has advantages in the control of many insects that we previously considered satisfactorily controlled by the older insecticides. The more effective control of aphids on vegetable crops by parathion under Florida growing conditions, the reduction of tree injury and the reduction of coloring problems of early citrus by the use of parathion for scale control, are only three illustrations of advantages of the newer insecticides over those in use prior to 1942. The newer chemicals have the additional advantage, in many instances, of producing results much more rapidly than insecticides previously used. All of these factors, combined with the favorable returns growers were receiving for their crops, hastened the acceptance and general use of these insecticides. In fact, the adoption of these chemicals has progressed to the point that insecticide dealers rarely have calls for previously widely used materials such as Cryolite, Arsenate of lead, calcium arsenate and rotenone.

During the past three or four years chemists and entomologists have been developing a group of chemicals known as systemic insecticides. Because these chemicals can be absorbed and translocated from one part of the plant to another and because plants treated with these systemic insecticides remain
toxic to insects over a period of six to eight weeks, economic entomologists are keenly interested in this group of insecticides. Some of the materials in this group are selective. That is: some are toxic to plant pests and are not toxic to the beneficial insects. Some of these systemic insecticides must become a part of the physiological processes of the plant to be toxic, while others act as contact insecticides as well as systemics. Thus the systemic insecticides have opened up an entirely new and almost completely unexplored field of activity to the economic entomologists. Some of the chemists working with this group of insecticides tell us that there are very good prospects for the development of potent systemic insecticides which are less toxic to humans than those available to entomologists at present.

Another difference in our approach to insect control problems is the almost complete dependence upon chemicals for insect control. During recent years very little time has been devoted to the study of the ecological factors which influence insect abundance. In our dependence upon chemicals we have forgotten about the effectiveness of parasites and predators in reducing insect populations. In most cases we have also failed to consider the effect of the chemicals we are using upon these parasites and predators. The benefits to be derived from crop rotations and sanitation are being overlooked. I do not wish to appear to minimize the importance or the need for chemicals, but as economic entomologists we should not neglect these other methods of insect control.

Since the chlorinated hydrocarbon insecticides have been placed on the market, many of the insecticide manufacturers have expanded by several fold the number of economic entomologists on their various staffs. These entomologists employed by the commercial companies are serving three very useful purposes. First they are conducting entomological research along the lines of particular interest to their companies. Second, they are acting as liaison men between their companies and State and Federal workers. In their capacities as liaison men they are bringing to State and Federal entomologists the most recent information on the products in which their Companies are interested. In many instances they have made contributions by suggesting methods of procedure or improvements in the procedures being used. This exchange of information through these entomologists employed by the commercial companies is a definite contribution to the advancement of economic entomology.
Finally, they have become a very important and reliable medium for transmitting the accumulated information to the farmers. Prior to World War II most of the information accumulated by research workers reaching the farmer was channeled through the County Agents office. Since the end of World War II, technically trained representatives of commercial insecticide companies have made this information much more readily available to the growers. In many areas the representatives of commercial companies are now the principal channel through which farmers obtain information on disease and insect control. This is not said in a spirit of criticism of the County Agent. In most Counties there are only one or two men in the County Agent’s office, while there may be available in that same County a number of technically trained representatives of various commercial companies. In actively assisting the growers with their problems of insect identification, selection, and application of insecticides, the commercial entomologists are helping increase the per acre production of food and fiber crops, thereby helping to create favorable conditions for future developments in economic entomology.

When the chlorinated hydrocarbon, phosphatic and systemic insecticides became available the problems of the toxicology of these chemicals, problems of residues upon the edible portions of crops, problems of soil residues and many other problems connected with the introduction of new insecticides demanded immediate attention. The development of solutions to these problems has required close cooperation between entomologists, chemists and other scientists. Such cooperation between these branches of science is certain to stimulate future rapid advancement in our field of endeavor by broadening the thinking and outlook of economic entomologists.

Another very definite trend which has developed during the period of the past ten years is an increased willingness of individual entomologists to cooperate more closely with other entomologists. This spirit of cooperation is not limited to individuals belonging to the same organization but is general among all having a common interest. A number of cases could be cited as illustrations but one will suffice. During the meetings of the Cotton States Branch of the Association of Economic Entomologists held in Atlanta in February, 1952, entomologists from most of the Southern States, the United States Department of Agriculture, and some insecticide companies gathered in a hotel
room to discuss corn earworm control problems. This gathering was not a part of the scheduled program. At this meeting, methods of attacking the corn earworm problems were discussed and these problems were separated into related groups. It was agreed that more progress could be made if each man present select a phase or phases of the problem upon which he would work. In this way the whole corn earworm control problem was covered and each particular phase of the problem will receive more attention than if each man attempted to cover the whole problem alone. It was further agreed that each man present would make every effort to participate in a similar discussion at the next meeting of the Cotton States Branch. A meeting of this same nature had been held during the parent Association meetings in December. This mutual exchange of information and coordination of effort is apparent among most economic entomologists. It is an attitude which all of us can encourage and help promote.

All of these changes indicate that the science of economic entomology is alive and dynamic. Because it is alive and dynamic, more and more young men will be attracted to economic entomology as a profession. Through the combined efforts of present and future members of our profession, the science of economic entomology will move on to greater developments and larger services to mankind.