Insects and Crops*

By A. R. WOODHILL, B.Sc. (Agr.),
McCaughey Lecturer in Entomology, University of Sydney.

INSECTS play a very important part both in the realm of nature and in human affairs. There are more different species of insects than of all other classes of animals put together, and in actual numbers the insects are far greater than any other class of animals. It is quite usual to find approximately 8,000,000 insects per acre on arable land which appears poor in insect life, while 60,000,000 per acre of a single class of insects, the Collembola, has been recorded as the approximate population of a lucerne field.

Many other examples of insect numbers could be given, one of the most striking being the record of 10,000 tons of grasshoppers destroyed in a control campaign in the Sudan.

There are many reasons for the abundance of insects, the two most important being (i) their accurate adaptation to all kinds of diverse environments and food, and (ii) their remarkable powers of rapid reproduction. In connection with the latter it has been estimated that the progeny of a single female aphid at the end of one year would weigh 820,000,000 tons if all the progeny survived. It is not surprising therefore that the losses due to insect pests are very large, particularly when it is considered that almost all the common articles of organic origin serve as food for some species of insect. Losses in the United States are estimated at £400,000,000 *per annum*, in spite of the control measures carried out. If continuous control measures were not carried out throughout the civilized world it is highly probable that a severe food shortage would very soon be brought about by insect pests.

Measures adopted to control insect pests may be grouped under the following headings :

(*a*) Direct.
  (1) By the use of chemical insecticides.
  (2) By mechanical means, heat and cold sterilization, isolation, *et cetera*.

(*b*) Indirect.
  (1) By the utilisation of insect parasites or predators.
  (2) By altering other factors which regulate insect numbers or their ability to cause losses.

In connection with the last type of control, much interesting research work has been carried out during the last ten or fifteen years. Many very detailed studies of the ecology of insect pests have been undertaken with a view to discovering what factors in their environment can be altered in order to lessen their numbers or to

* This is an abstract of a lecture given during an Extension Board course of Science Lectures the University in January.

prevent losses in commercial crops. It has been found possible in some instances to upset the correlation of an insect pest with its host plant by altering the sowing dates of crops or by the use of early or late varieties, or by stimulating or retarding the growth of the vegetative or reproductive portions of the plant by the use of various manures. It has even been found possible to render a plant completely immune from the attack of a particular pest by providing an abundance of a certain chemical in the soil. Considerable advances have also been made in the selection of varieties of plants naturally resistant to the attacks of specific pests. Again a slight artificial alteration in the pH of the soil has been shown greatly to reduce the reproductive powers of certain pests which ingest soil. (A series of lantern slides was shown illustrating methods of control of specific pests by the above means.) Some most striking advances have also been made in the study of plague locusts and grasshoppers in recent years, and considerable light has been thrown on the causes underlying the outbreaks of plague locusts which occur at irregular intervals in many parts of the world.[1] (A series of slides was shown illustrating the bionomics of plague grasshoppers, with particular reference to the " phase theory " and to outbreaks of plague grasshoppers in Australia.)

(Continued from page 2.)

retained ; but the dominant modifications in their organisation were in the direction of speed as their vital need.

Side by side with this development, and in answer to increasing numbers, came bigger, stronger and speedier carnivores, to feed on prey now so much more abundant, but more difficult to catch. The answer of the grass-feeders, with their specialised hoofs, teeth and bones, better suited to flight than fight, was to seek safety in numbers, and thus develop the herd instinct, with its necessity for leadership and discipline ; but this, in turn, provoked a like rejoinder from some types of their enemies.

When it is remembered how much of the meat and drink and life of mankind is bound up with the grasses, including wheat, maize, millet and other grains, sugar-cane, rice and bamboo, we must realise how close is his link with the development just outlined. Practically his whole food supply is provided by them, either directly by the agriculturist who grows little else but grasses, or indirectly by the herdsman whose domestic animals are fed chiefly on the same food. Nor must we forget that almost every one of our domesticated animals has been derived from the gregarious types just mentioned, which have accepted the leadership of man in place of that of their own species.

It is perhaps not too much to say that the magnificent outburst of energy put out by the earth in the erection of the Alps, Andes and Himalayas in Tertiary times, was trivial in its influence for man's advent and his successful occupation of the earth in comparison with the gentle but insidious growth of " mere unconquerable grass " and its green carpet of " wise turf ", which in some form clothes by far the greater part of the land of the globe.

---

[1] *N.B.*—The term locust is only correctly applied to grasshoppers of the family Acridiidæ, the local use of the term for cicadas being most confusing.