BIOLOGICAL INVESTIGATIONS OF BLACK FIELD CRICKET

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THE Plant Diseases Division first became interested in crickets when restrictions were placed on the use of dieldrin and an alternative control was wanted quickly. After trying a number of materials it was decided that wheat/malathion baits could be a satisfactory stop-gap. However, it is not intended to discuss here control measures or the relative merits of different formulations, but rather to give a brief account of work being done on the biology and habits of the insect, a thorough knowledge of which is essential if efficient, reliable control measures are to be developed.

A good place to start is the egg. Cricket eggs are laid about $\frac{1}{4}$ in. below the surface of the ground where they lie through the winter. The primary points of interest are the following: Over what period and under what conditions are eggs laid? What are preferred egg laying sites? In what kind of density are they laid? What affects their survival in the soil and determines when eggs hatch? A method for soil sampling to get information on the first group of these questions has been developed. This entails collecting soil samples, wet sieving to remove soil and plant material—the eggs sink in water—and then separating the eggs by flotation in strong salt solutions.

This year most attention has been paid to egg survival and development pattern. Like many other insects, the cricket has a period of quiescence during the development, a period of diapause, to carry it through the part of the year when conditions are unfavourable. With crickets, diapause takes place during the egg stage. The phenomenon has been well studied in the cricket, mainly because people interested in the mechanism of diapause have found the insect a convenient experimental animal. Nevertheless, the behaviour in the field is not very well known. Briefly, the general idea is this: Embryonic development proceeds for a few days and then stops only to commence again when the soil warms up in the spring. The egg is permeable and can desiccate or perhaps drown. An attempt is being made to find out what the soil moisture limits are at the different stages of development—pre-diapause, diapause and post-diapause periods. There are probably periods when a supply of free water is essential to further development. What are these periods?

Temperature has been shown to be the main factor controlling diapause. If eggs are kept warm—above 80°F—true diapause does not take place and hatching commences in about 14 days, but it continues for about 3 months so evidently some mechanism delaying development of many eggs is operating. When full diapause is broken, eggs hatch much more evenly. Is this what happens in spring?

Samples of eggs planted in the field, in the open, and under shelter, with controlled moisture levels, are expected to give some answers to these questions. In the meantime, a watch is being kept on their condition and development by taking up samples from

time to time, clearing the eggs to observe the embryos. This should give some idea of when hatching occurs with eggs laid early and laid late, and of the upper and lower limits of soil moisture tension which eggs can stand at different stages of development. This same approach is being given to a study of the baby nymphs and succeeding stages.

An endeavour is also being made to accumulate data on the quantity of herbage eaten by crickets at different stages to provide a basis for estimating the amount of damage they do to pastures and also to show at what stages they are most likely to take baits, so that eventually it is hoped to be able to suggest ways for improving control measures.