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**EDITORIAL CORRESPONDENCE**: 1515 Massachusetts Ave., NW, Washington, D.C. 20005. Phone: 202-387-7171. Cable: Advancenci, Washington. Copies of "Instructions for Contributors" can be obtained from the editorial office. See also page xv, *Science*, 25 December 1970. **ADVERTISING CORRESPONDENCE**: Room 1740, 11 W 42 St., New York, N.Y. 10036. Phone: 212-PE-6-1858.

## Control of Agricultural Pests

Our nation has been blessed with high-quality, dependable supplies of low-cost food and fiber. But few people are aware of the never-ending battle that makes this possible. Among the insects, about 10,000 species are known to damage crops, forests, or livestock. If left undisturbed, some of these pests would take more of the crop than would the farmer. Agriculture must cope not only with native enemies but also with invaders from abroad. Increasing air travel has expanded the probability of bringing in pests from all over the world. For these, natural controls such as parasites are often absent.

During more than two decades, agriculture has depended heavily on chemical pesticides such as DDT. But even in the 1950's it was apparent that DDT was not the final answer; resistant insect forms were emerging. The use of degradable chemicals such as the organic phosphates and carbamates has been expanding. However, these are acutely toxic to warm-blooded animals, including man, and to useful insects such as bees, parasites, and predators. For the long term it is desirable to develop methods of control that minimize the use of broadly toxic chemicals.

Some of these methods antedate the use of the chemical pesticides—for instance, the use of insect-resistant varieties of plants and the fostering of natural enemies. Promising methods of control that have recently been developed include the use of sex attractants and the release of competitive radiation-sterilized males. About 20 of the sex attractants have now been identified. Of particular importance is that of the gypsy moth, an insect that has been ravaging a rapidly increasing fraction of the hardwood trees of northeastern United States. The synthesis of the attractant and its use in conjunction with localized applications of insecticides give promise of timely intervention in what otherwise might be a dreadful destruction of vast stands of trees.

At the AAAS meeting in Chicago, E. F. Knipling described proposals to exploit techniques that he had previously used successfully to eradicate the screwworm in Florida. These same techniques have been employed to minimize the population of screwworms in Texas and adjoining states. In that area, eradication is impossible because of reinvasion from Mexico. However, the pest is more than 99 percent controlled at an annual cost of about \$6 million and with annual benefits estimated at \$100 million. Knipling pointed out that a limited number of pests account for a very major fraction of all crop damage. Under especially close study are the boll weevil, the codling moth, and the corn borer. The boll weevil alone causes losses of about \$200 million a year, and about \$70 million is spent by growers for chemical control. About one-third of all insecticides used for agricultural purposes are employed to control this single insect. Knipling discussed plans for a large-scale demonstration experiment to suppress populations of this insect in an area 250 kilometers in diameter. The plans involve a combination of treatments to diminish the overwintering population and an intensive program in the spring to trap insects by use of sex attractants. The survivors would be subjected to repeated release of 100 times their number of sterilized males.

The suppression or elimination of the use of DDT and related pesticides will constitute a hardship to many farmers. Prospects are reasonably bright, however, that satisfactory methods of specific pest management will be devised, and these methods will be more in keeping with our desire to minimize man's destructive impact on the environment.

—PHILIP H. ABELSON