WILL THE INSECTS TAKE OVER?

By Fred V. Grau

What is the future of turfgrass without the traditional control insecticides? Alternative natural controls presently are being explored, which will help the superintendent reconcile the problems of turf care and pollution

INCREASED pressure to curtail the uses of certain insecticides will continue to be exerted by both governmental agencies and the public. However, denial of a favorite insecticide does not mean that, overnight, insects will destroy turfgrass areas. Effective control programs have reduced populations to a point where minor depredations can be tolerated. What then lies ahead? Will there be safe biodegradable agents that will keep insect populations at tolerable levels?

One problem with chemical insecticides is that with time, insects develop resistance. Another serious disadvantage is the unavoidable destruction of beneficial insects which associate with the "bad guys."

Turfgrasses that are resistant to insect attack have not yet been announced. In fact, there is virtually no work in this direction. In 1942 the first variety of wheat resistant to the Hesian fly was introduced. In time this one variety loses its resistance. Then another resistant variety (out of 22) is planted and the problem is postponed for another 10 years.

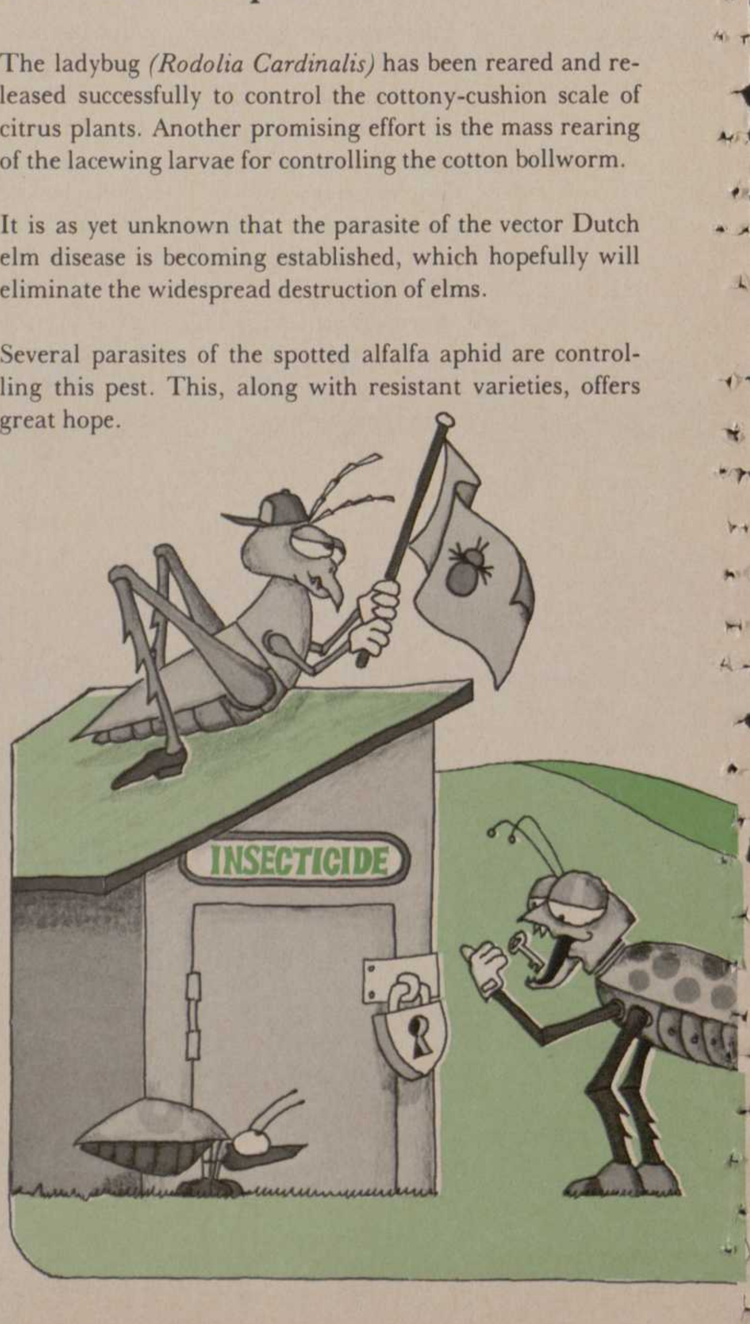
Other crop varieties, resistant to a number of insects, have been developed. They include alfalfa (weevil, aphid, leafhopper), barley (greenbug), corn (borer, earworm, rootworm) and wheat (cereal leaf beetle). This should give hope to researchers in turfgrass even though 10 to 15 years may be needed to breed resistance into a crop.

Natural enemies offer hope in long-lived crops such as turfgrass where the predator population builds up without interruption. One excellent example of this approach is the Milky Spore Disease of Japanese beetle grubs. It seems strange that a similar approach has not been made for other pests. So far over 700 insect enemies have been introduced, but less than 170 have become established. Problems of increasing enemy populations and effectively dispersing them continue to plague the industry.

The ladybug *(Rodolia Cardinalis)* has been reared and released successfully to control the cottony-cushion scale of citrus plants. Another promising effort is the mass rearing of the lacewing larvae for controlling the cotton bollworm.

It is as yet unknown that the parasite of the vector Dutch elm disease is becoming established, which hopefully will eliminate the widespread destruction of elms.

Several parasites of the spotted alfalfa aphid are controlling this pest. This, along with resistant varieties, offers great hope.



Bacterial toxins appear promising for large scale applications to crops. *Bacillus thuringiensis* was identified as an insect pathogen in 1927. Since 1950 when the toxin was isolated, 11 types from all over the world have been isolated. Several pharmaceutical companies are working to develop their own pathogenic strains. This toxin would act as a broad spectrum insecticide. Insects would be unable to develop resistance as easily as they do to conventional insecticides.

Insect viruses seem to be more promising than insect bacteria. Of some 250 viruses that are pathogenic to insects, about 10 are "nearly ready" for use. So far these viruses have shown no response in over 2,000 tests on animals. One trouble lies in mass producing the virus. Another is that of dispersing it in such a way that ultraviolet radiation will not kill it before it has a chance to kill the insect.

There are chemicals that fall into the category of "attractants." One chemical will act as a food attractant. Methylbutanol attracts and kills male fruit flies. The first sex attractant (called a pheromone) was isolated from the female gipsy moth in 1960. More than 200 others have been discovered since then. Commercially available materials include attractants for 1) male pink bollworm, 2) cabbage looper and 3) fall army worm. Originally extracted from the females, they are now made synthetically. Concentration and timing of a spray can make or break the program. Too heavy a dose can repel the insect.

The juvenile hormone (ecdysone), which must be ingested, is very difficult to synthesize and, though extremely interesting, does not seem to offer too much hope for the future. Even so, one company has invested about $10 million over five years trying to produce a marketable hormone-like compound for insect control.

The technique of attracting male insects, then sterilizing them and releasing them to mate with females which then lay infertile eggs, has been highly successful in reducing the screw-worm fly in Florida and the Southwest. Each week 125 million sterile males are released along a 300-mile buffer zone along the United States-Mexican border. This sterile male technique is being broadened to include several economic crop pests. Costs of developing pest control vary but generally are far less than the economic damage suffered. The cost of the screw-worm program is reported to be one-fifteenth of the estimated annual damage to livestock and control costs before elimination.

Considering the broad range of techniques that have been successful on certain insects, control of turfgrass insects by similar methods is foreseeable. If the female cutworm moth and the female sod webworm moth laid only unfertilized eggs there would be no larvae to eat the grass roots. I am not enough of an entomologist to carry the analogy through, but hopefully there will be methods developed which will permit the growth of insect-free turf without the need for poisons that degrade the environment. □

Illustrated by Martin Trossman