LIVING INSECTICIDES

That attack only the cabbage looper and corn earworm

(Editors Note. The following article was taken from the December issue of Agricultural Research. Since "worms" have been a problem in North Carolina, a new approach to their control is certainly welcomed.)

Living insecticides containing viruses that in nature infect and kill two destructive insect pests--the cabbage looper and the corn earworm--have been mass produced and successfully used to spray test crops.

Laboratory and field experiments conducted by the Agricultural Research Service indicate that these two viruses are safe and reliable biological controls. Research has established these important points:

Both of these experimental viruses are highly specific. One infects only the cabbage looper. The other infects the corn earworm and possibly the closely related tobacco budworm.

Both viruses are regarded as harmless to man, animals, plants, and pollinating insects, as well as to other natural enemies of each target pest.

Objectionable residues are not left on treated crops; in fact, infective forms of the viruses occur naturally on crops attacked by these two pests.

Although natural virus infections occur frequently, they do not always provide control at the right time. Even when a natural infection eventually eliminates a high insect population, the epidemic phase of the disease may not have come until after the crop is seriously damaged. In their tests with mass-produced viruses, ARS entomologists were able to create epidemics that brought the insects under control before they could damage crops.

The cabbage looper and corn earworm, two of the most widespread and destructive insect pests in the united States, annually damage or destroy crops worth several hundred million dollars. The corn earworm, which likes a varied diet, is also known as the cotton bollworm when it feeds on cotton. Only the boll weevil destroys more cotton in this country.

ARS scientists say that basic studies on insect-rearing methods and on ways to culture and produce the viruses have made it possible to eventually produce and sell viruses at prices farmers can afford. Several firms are already interested in producing the viruses, and uniform standards are being developed for commercial production. However, the virus insecticides are still in an experimental stage; they have not yet been approved for public use.

Current research on the viruses is aimed at getting more information on the optimum time, rate, and frequency of application. More data is being collected on their effectiveness; so far, preliminary tests show that

they compare favorably with available insecticides for controlling the looper and the earworm. Viruses are not as fast-acting as insecticides--a disadvantage if heavy insect populations are allowed to build up before treatment. However, entomologists believe this can be remedied by properly timed preventive treatments, perhaps combining the viruses with fast-killing organisms now under study.

ARS also reports encouraging progress in developing techniques to produce and use at least 10 of the 200 known viruses that attack specific insect species. These studies were initiated after decisions were made in the mid-1950's to focus more research on this aspect of biological control.

Both the cabbage looper and the corn earworm can be infected by what scientists call a nuclear polyhedral virus that develops in the nucleus of infected cells. Once a virus infects the cells of its host insect, the cells produce virus instead of carrying on their normal functions. During this process, virus particles cluster under a protective covering of protein and form a polyhedron (a many-sided body), which is tough and durable and can live in the soil for years.

Scientists in this country and abroad have long been aware of the great potential of viruses in biological insect control; the University of California, for example, has emphasized research on insect pathogens in recent years. However, it was not possible to exploit this opportunity because there was no known way of mass producing the virus polyhedra economically. ARS scientists have been conducting basic studies on the cabbage looper and corn earworm viruses for 5 years, and the breakthrough came when they worked out a method of artificially rearing large numbers of the insects--in whose bodies the polyhedra must develop.

To mass produce the virus materials, the scientists infect the artificially reared worms by feeding them virus polyhedra. These multiply rapidly in the infected worms, then are extracted and processed for field use.

Polyhedra multiply at a fantastic rate. Estimates are that one artificially reared cabbage looper can produce nearly 2 1/2 billion polyhedra. A man could probably hold enough powdered cabbage looper virus on the nail of his little finger to treat 5 acres. Processed virus, depending on how prepared, may be in either liquid or powder form. Because polyhedra are durable, they pose no difficult problems in handling or applying them.

Once the virus is on the crop and consumed by the target insect, the insect in turn becomes a virus producer. The process is the same in both native and artificially reared insects. Infected worms become literally loaded with polyhedra, which are dispersed when the worm dies and its body decomposes. Under some field conditions, these artificially induced infections may build up enough virus to infect subsequent generations of of the insect.

Natural dispersal of polyhedra, however, is not sufficiently reliable to assure dependable insect control. The small, heavy particles usually settle into the soil, away from feeding worms. Consequently, repeat applications of artificially produced polyhedra may be necessary to insure adequate seasonlong crop protection.