Pest control strategy uses insect viruses

UNIVERSITY PARK — Scientists at Penn State are experimenting with insect viruses, finding ways to combine them with chemical pesticides.

The viruses attack caterpillars, the larval stage of lepidopteran pests, but do not harm beneficial insects, declared William J. McCarthy, plant pathologist in charge of this research at Penn State's Agricultural Experiment Station.

Research to combine insect viruses with chemicals has been spurred by concern for chemical toxicity and the cancer-causing potential of pesticides, he said. Equally important, many caterpillar-type pests are becoming resistant world's lepidopteran species, he commented.

As planned, the pesticide combinations will contain low levels of chemicals — still capable of quick "knock down" of caterpillars — coupled with residual control of pests from viral infection.

Under a microscope the viruses are seen as rod-shaped viruses embedded in crystalline protein particles. The protein protects the baculoviruses (their correct name) from damage by heat, sunlight, and humidity.

The caterpillars become infected by eating a virus that has been sprayed on a crop. When insects die and decompose, the virus becomes distributed over other foliage and soil, thereby providing more virus for pest control purposes.

McCarthy indicated that over 300 baculoviruses have been isolated from some 250 insect species of importance to agriculture. Several formulations of viruses have been registered for use in biological pesticides by the Environmental Protection Agency. Included are baculoviruses attacking the gypsy moth, cotton bollworm, and tobacco budworm.

"Chemical pesticides will remain a significant part of pest management programs since baculoviruses alone are not sufficient at this time for adequate control" McCarthy stated. "Viruses take days to bring pests under control while chemicals take effect in hours," he affirmed, adding that, "the cost of using baculoviruses alone would be too high related to the benefits."

The strategy of using insect viruses combined with chemicals has been tested in field trials on cotton, vegetable crops, and forests with generally promising results, it was noted. Baculovirus safety, effect on crops, and formulation have been discussed in several national and international meetings of scientists, Dr. McCarthy said. In general, the conclusions are that the viruses are efficient and safe.

However, more research is needed to prove that chemical pesticides and baculoviruses are efficient and safe when combined, it was noted.

"One of our research priorities is to investigate the potential of certain pesticides to alter baculorviruses," McCarthy said. "We do this by using continuous cultures of caterpillar cells to study the effects of chemical pesticides on baculovirus development and stability."

He mentioned Penn State studies showing that a synthetic pyrethroid, a common type of pesticide, had no effect on stages of virus development. However, two other prominent pesticides, and organophosphate and a carbamate, restricted virus development at certain stages.

Several field studies on cotton in the South and Southwest tested the combined effects of a synthetic pyrethroid and a virus known to attack the cotton bollworm. This pesticide-virus combination gave equal or better results than any other treatment.

The research has been supported by grants from the Environmental Protection Agency and the Jessie Smith Noyes Foundation.

Plan winter feeding program to keep costs down

UNIVERSITY PARK — Profitable dairy feeding programs are built around forage supplies and supplemental feeding of grains. Now that the cropping season is over, it is time to plan a feeding program for the non-cropping season, says Sam Dum, Penn State Extension farm management specialist.

Frequently, dairy farmers go into the non-cropping feeding period without any definite plans of how to control the use of available forage supplies, says Dum. As a result, some dairy farmers find forage supplies exhausted before another cropping season. Carrying out a feeding program requires the purchase of hay and possibly additional grain which in many cases result in less profitable feeding programs.

In some situations farmers restrict feed to cut costs. This results in reduced milk production and reduced net returns, warns Dum. With proper planning early in the non-cropping feeding period for the use of available forages means more flexibility in purchasing needed forage or grain and for adjusting feeding rates, explains Dum.

The first step in planning a non-cropping feeding period is to inventory the quantity and quality of different kinds of forages available to feed. Then determine how to control the use of available supplies so that at least required minimum forage feeding levels are met over an entire feeding period.

For extended periods of 3-4 months, milking cows should receive two pounds hay equivalent daily per one hundred pounds body weight — for a shorter period of 100 days or less it could be restricted to 1.5 pounds. Dry cows should receive 1.8 pounds hay equivalent daily per 100 pounds body weight.

When several kinds of forage, such as hay-crop and corn silage, are available, plan the daily feeding rate of each so as to stretch the total supply over an entire feeding period, says Dum. Also feed several different hay cuttings daily so that the quality of hay fed will be more uniform during a feeding period.