

BIOLOGICAL CONTROL OF ALFALFA INSECT PESTS

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Alfalfa is a succulent plant that obviously is good feed for large herbivores such as cattle and horses. Therefore, it should not be surprising that a large number of small herbivores such as insects also find this plant delicious. Fortunately, most of these insects are not major pests. However, we do have a couple pest insects that annually attack this valuable crop and often cause economic damage.

Controlling insect pests is expensive and time consuming. However, not controlling them can be disastrous to the profit margin of the alfalfa producer. Entomologists who work on the insect pests of alfalfa have been constantly on the alert for more effective natural control measures.

In Kentucky, the alfalfa insect research program has been oriented toward developing a total management program for alfalfa insect pests. The introduction of biological control organisms for alfalfa pests has been an important part of this effort. Let's discuss some of the biocontrol agents introduced to help control these alfalfa insects.

Alfalfa Weevil

The alfalfa weevil is an imported pest. When it first entered Kentucky it had no natural enemies or diseases. This insect was devastating to alfalfa. It was not uncommon to have to apply two or three insecticide applications to control these pests on the first cutting. Since those years, extensive efforts have been made to introduce natural control agents to help to control the alfalfa weevil including those listed below:

1. Bathyplectes curculionis - This is a very small parasitic wasp that lays its eggs in the wormlike alfalfa weevil larvae. The eggs hatch into wasp larvae which then feed on the internal organs of the host alfalfa weevil larva eventually killing it. Unfortunately, about 40% of B. curculionis females have nonfunctional ovaries which reduces the effectiveness of this parasite as a biological control agent. In addition, alfalfa weevil larvae are able to encapsulate the parasite larvae which further reduces their effectiveness. Currently B. curculionis is established in all alfalfa fields in the state.

2. Bathyplectes anurus - This wasp parasite is a close relative of B. curculionis. It is a much more efficient parasite in that each female wasp seeks out and stings more alfalfa weevil larvae during her life. In addition, these parasites do not have

the undeveloped ovary problem that is present in the B. curculionis population and these parasites are not encapsulated by the alfalfa weevil larvae. Unfortunately, B. anurus does not move from field to field very well. Therefore, this parasite has been spread throughout the state by setting up parasite nurseries in the alfalfa fields of cooperating alfalfa producers. Currently, B. anurus is found in all the major alfalfa producing counties in Kentucky.

3. Microctonus aethiopoides - This insect is also a small wasp that parasitizes adult alfalfa weevils. The eggs that are laid in the adult weevils hatch into larvae which consume the ovaries or testes of the parasitized weevil. This parasite has only recently been recovered in Kentucky. It has been released several times but has had difficulty becoming established. Currently, it is found in Fayette and Hart counties. M. aethiopoides is a very effective parasite in the Northeastern states and is a welcome addition to the alfalfa weevil parasite complex in Kentucky.

4. Patasson luna - This is a very tiny wasp parasite that lays its eggs in the eggs of alfalfa weevils. These tiny wasps seek out the weevil eggs in the stem of the alfalfa plant and lays one or two of their eggs in each of them. This activity takes place in the fall before cold weather restricts the activity of the adult wasps. Patasson luna has been recovered in Kentucky in some of the river counties.

The effort to establish alfalfa weevil parasites in Kentucky was part of a nationwide effort by alfalfa insect researchers. Foreign parasites were collected in Europe and Asia and evaluated in the USDA European Parasite Laboratory. Those showing promise were brought to the USDA quarantine laboratory in Moorestown, NJ and further observed to insure they would not cause more problems than they cured. Finally eleven species were selected and made available to researchers in various states.

In Kentucky this parasite release program was initially coordinated by entomologists at the University of Kentucky. In 1982 APHIS (Animal Plant Health Inspection Service) became involved in this project and have been heavily involved in parasite releases.

The effectiveness of these releases has been most dramatic in the northeastern states where these parasites have greatly reduced the economic importance of the alfalfa weevil. In Kentucky, we currently have three of the most effective alfalfa weevil parasites established.

Erynia phytonomi - In the early 1970's a very effective alfalfa weevil disease became apparent in Kentucky and other states. This disease, Erynia phytonomi infected the alfalfa weevil larvae and is dramatically effective. When the disease is in an epidemic status it virtually eliminates the alfalfa weevil as an economic pest.

This disease usually comes on a bit late in the spring to eliminate all weevil damage but it does greatly reduce the number of overwintering adults, thus reducing the potential for damage the following year.

Potato Leafhopper

The potato leafhopper is a native pest and, therefore, it already has an established parasite complex. However, researchers at the University of Kentucky have been looking at the impact of the predators in the group Nabis sp. These insects have piercing mouthparts and suck the juices out of their prey. They will feed on leafhoppers but are not limited to these insects.

Pea Aphids

These insects are found annually on alfalfa especially early in the spring. They seldom reach economic numbers because of the control exerted by natural enemies including lady bird beetles and a small imported wasp called Aphidius smithii. This is a parasite that was released into the state in the late 1960's.

This insect was brought from India to the U.S. in 1959 and provides a great deal of control over pea aphids in Kentucky. In addition, a fungus disease also takes a heavy toll on these insects. The pea aphid population was very high in the spring of 1984. However, these populations were decimated over a seven day period when the fungus epidemic hit the population in mid-May.

IMPACT OF BIO-CONTROL ORGANISMS

Biological control organisms have had a very favorable impact on alfalfa insect pest populations (from the alfalfa's standpoint). Some pests such as the pea aphid are virtually non-pests because biological controls keep their populations below economic threshold levels.

The impact of parasites and diseases are more dramatically illustrated in the case of the alfalfa weevil. This pest which was originally so devastating is entirely manageable in part due to the extensive biological control complex that affects its populations. Where farmers once needed at least two and sometimes three insecticide treatments to maintain the crop we now see many situations where no treatment is needed at all. It is never necessary to use two insecticide treatments. The successful establishment the fungus disease Erynia phytonomi has completely eliminated the need for stubble sprays following treatment.

The spring of 1984 was an excellent example of how effectively this pest has been reduced in economic importance by biological controls. There were very few alfalfa fields in which alfalfa weevil larval populations were large enough to justify insecticidal treatment. Most farmers controlled their weevil problems with a timely harvest.

Biological control effects are hard to see because the best evidence of their success is a lack of a pest problem. We are rapidly approaching that status with alfalfa weevil and other pests in Kentucky. Remember that these unseen insect pathogens and parasites are saving you thousands of dollars each year.