Bean Leaf Beetles and Bean Pod Mottle Virus in Wisconsin

Tom H. Klubertanz [1/]

SUMMARY

The soybean aphid (*Aphis glycines* Matsumura) is not the only disease-transmitting pest that has made an impact on Wisconsin soybean in recent growing seasons. In southern Wisconsin, it is accompanied by another common and significant pest -- the bean leaf beetle, *Cerotoma trifurcata* (Forster). The bean leaf beetle (BLB) has increased in abundance in the upper Midwest in recent years, likely due in part to the increased acreage of soybean. But a new concern is the beetle=s ability to vector bean pod mottle virus (BPMV). In several Midwest states, this beetle-virus system has caused significant yield losses and reductions in seed quality for several years. We are just beginning to see this virus in Wisconsin.

High incidence of BPMV has been found in scattered locations in southern Wisconsin, but only south of Madison. This distribution likely mirrors the distribution of the BLB, but a beetle survey has not been conducted. BPMV symptoms often resemble herbicide injury, or do not even appear, so many infected fields are not identified. In 2001, one field in Janesville at V5 (prior to flowering) had 42% of plants (n = 720) infected with BPMV. During the interval from 25 June to 3 August, 63 samples, each with 1 to 5 beetles, and an overall total of 210 beetles, were taken from the same field. Only 4 of these samples were BPMV negative. High incidences of BPMV-positive BLB in the field have been documented studies from other states. It should be noted, though, that a positive ELISA test on a beetle does not necessarily mean that the virus is transmissible.

The phenology of BLB in Wisconsin has not previously been studied. Studies from Iowa and Illinois have found two generations of beetles per year, whereas a study from Minnesota found only one. In 2001, we found BLB completing two summer generations in two Janesville fields. The bean leaf beetle overwinters as adults and colonizes emerging soybean in the spring. The first summer generation of adults, progeny of the overwintered beetles, broadly peaked from 18 July to 7 August. A second generation of adults rapidly appeared from 1 to 7 September, as plants were maturing, and fed heavily on pods. Many of the seeds in these injured pods with damaged and/or discolored. Because late-season pod feeding by BLB can be very destructive, the presence of two full generations greatly increases the potential severity of this pest in southern Wisconsin.

The traditional recommendation for avoiding BLB injury has been to delay planting. Early-planted fields attract BLBs coming out of overwintering habitats and result in greater first- and second-generation beetle densities. Because the severity of BPMV infection increases with the duration of infection, delaying the movement of beetles into the field may be an effective manage-

---

[1/] Department of Biological Sciences, UW-Rock County, Janesville, WI.

ment strategy for both BPMV and BLB. We do not yet have reliable data regarding the use of early-season insecticidal treatments to control the spread of BPMV through a field. Initial work on these management options has been done in several states. Much of the screening of Midwest cultivars for resistance/tolerance to both BPMV and BLB is being done here in Wisconsin, although recommendations are not yet available.

Unfortunately, little is known about the movement of BPMV into and within a soybean field. What is the source of BPMV inoculum in spring? Workers in Kentucky were unable to transmit BPMV directly from overwintering beetles to soybean, whereas recent workers in Iowa were successful. What role do perennial legumes and forages play in the epidemiology of BPMV? Do virus particles in larvae remain infective after pupation? What other vectors are involved? Are there differences in the rate of seed transmission of BPMV among cultivars? These and many other questions are yet unanswered.

Several studies have shown that infections of BPMV and soybean mosaic virus are synergistic, with co-infected plants being much more severely impacted. BLB and the soybean aphid occur together in southern Wisconsin. Because of the synergism between the viruses they transmit, we must deal with these two pests and their viruses as an entire complex of yield-reducing agents, rather than as separate factors. Reliable economic injury levels will be difficult to establish until the interactions between all of these factors are more fully understood. In addition, little is known about the causes of green-stem, an emerging problem in soybean. We may find that many of the green-stem symptoms currently found are caused by complex interactions between agronomic practices, insects, and pathogens.

BLBs have been found by Iowa workers to have greater overwintering survivorship under warmer conditions. So far, the fall and winter of 2001-2002 has been exceedingly mild. If this pattern continues, we may see even larger and more widespread infestations of BLB in 2002. Early-planted beans in southern Wisconsin should be scouted for BLB after emergence as well as during pod fill. Growers should be aware of the potential for insect-transmitted viruses in the field, and of the potential for subsequent losses in yield and seed quality.

References

Calvert, L. A., & S. A. Ghabrial. 1983. Enhancement by soybean mosaic virus of bean pod mottle virus titer in doubly infected soybean. Phytopath. 73: 992-997.

Ghabrial, S. A., & D. E. Hershman. 1990. Distribution of bean pod mottle virus in soybeans in Kentucky. Plant Dis. 74:13-134.

Horn, N. L., L. D. Newsom, & R. L. Jensen. 1973. Economic injury thresholds of bean pod mottle and tobacco ringspot virus infection of soybean. Plant Dis. Rep. 57:811-813.

Hunt, T. E., L. G. Higley, & J. F. Witkowski. 1995. Bean leaf beetle injury to seedling soybean: consumption, effects of leaf expansion, and economic injury levels. Agron. J. 87:183-188.

Kogan, M., W. G. Ruesink, & K. McDowell. 1974. Spatial and temporal distribution patterns of the bean leaf beetle, *Cerotoma trifurcata* (Forster), on soybeans in Illinois. Environ. Entomol. 3: 607-617.

Krell, R., & M. E . Rice. 2000. Beetles transmit a new soybean virus. Integrated Crop Management,

Iowa State University Extension Publication IC-484(6): 43-45, Ames, Iowa.

Lam, W. F., & L. P. Pedigo. 2000. A predictive model for the survival of overwintering bean leaf beetles (Coleoptera: Chrysomelidae). Environ. Entomol. 29(4): 800-806.

Lam, W. F., M. E. Rice, L. P. Pedigo, & R. Pope. 2000. New concept for bean leaf beetle management. Integrated Crop Management, Iowa State University Extension Publication IC-484(17): 125-132, Ames, Iowa.

Loughran, J. C., & D. W. Ragsdale. 1986. Life cycle of the bean leaf beetle, *Cerotoma trifurcata* (Coleoptera: Chrysomelidae): density of populations, temporal patterns of movement, and survival. Environ. Entomol. 79: 34-38.

Smelser, R. B., & L. P. Pedigo. 1991. Phenology of *Cerotoma trifurcata* on soybean and alfalfa in central Iowa. Environ. Entomol. 20(2): 514-519.

Smelser, R. B., & L. P. Pedigo. 1992. Population dispersion and sequential count plans for the bean leaf beetle (Coleoptera: Chrysomelidae) on soybean during late season. J. Econ. Entomol. 85(6): 2404-2407.

Smelser, R. B., & L. P. Pedigo. 1992. Soybean seed yield and quality reduction by bean leaf beetle (Coleoptera: Chrysomelidae) pod injury. J. Econ. Entomol. 85(6): 2399-2403.