

Soybean Germplasm Lines Show Resistance To Insect Defoliation

WOOSTER, Ohio — Two recently released soybean germplasm lines appear to resist defoliation against bean leaf beetle and western corn rootworm, insects that have been known to cause severe crop damage throughout the midwest.

Recent cross-breeding at Ohio State University has yielded two advanced germplasm lines, HC95-15MB and HC95-24MB, that may offer breeders additional management tactics where leaf feeding is a concern. The results of the study were recently published in the *Journal of Economic Entomology*.

"These lines have not been re-

leased commercially to growers because the yields they produce are not high enough. But they have potential for breeders who are looking for lines that show good insect resistance that in the future could potentially be crossed with high-yielding lines," said Ron Hammond, an entomologist for the Ohio Agricultural Research and Development Center (OARDC). "We wanted to look at them in the field against insect problems to see what value they might have."

Researchers found that over a two-year period, amount of defoliation from the adult bean

leaf beetle and the western corn rootworm was significantly reduced in the germplasm lines compared to a commercial soybean cultivar. No commercially grown lines are considered to have any level of insect resistance.

Percent defoliation from 1999 data averaged 22.5 percent for the commercial cultivar, 14.8 percent for HC95-15MB and 10 percent for HC95-24MB. In 2000, defoliation levels were 8.5 percent for the commercial cultivar, 4.1 percent for HC95-24MB and 3.9 percent for HC95-15MB.

"We saw less leaf feeding on the resistant lines," said Ham-

mond, adding that the reduction in feeding may be due to antixenosis, a plant defense mechanism that modifies the behavior of the insect without affecting plant or insect metabolisms.

The resistant lines, however, did not reduce bean leaf beetle or western corn rootworm populations. Hammond said the germplasm lines were originally developed specifically to target insects, such as caterpillars and the Mexican bean beetle, whose larvae develop and feed on plant leaves. Bean leaf beetle and western corn rootworm larvae develop in the soil and feed on the plant roots. It is the adult insects that are defoliators.

In addition, the resistant lines were not effective in reducing the pod injury levels associated with bean leaf beetle feeding. Hammond speculates that the plants' defenses rest solely in the leaves.

"These lines may not have the ability to reduce pod feeding and population density, but in terms of defoliation there is definitely some promise. Most insect problems that have historically been on soybeans have been those insects that defoliate the plant, and we know how defoliation can affect the economics of the crop," said Hammond. "With insects like the bean leaf beetle and soybean aphid present that can transmit viruses, continuing research into new soybean lines is very important."

Bean leaf beetles can cause headaches for soybean growers. Not only do they feed on plant leaves, they cause pod injury that can reduce yields. They also transmit bean pod mottle virus, a disease associated with green-stem syndrome where the stems remain tough and green and beans are too dry to harvest.

Western corn rootworm beetles are normally a concern on continuously grown corn. Rotating corn with soybeans has been the first line of defense. However, a new biotype of the western corn rootworm is laying its eggs in soybean fields that hatch into larvae and feed on first year corn that has been planted into those fields the following year. This prevents rotation from being used as a management practice. Though more problematic in such states as Indiana and Illinois, this new biotype of western corn rootworm has been recorded in Ohio.

The soybean germplasm lines were developed by Hammond and Dick Cooper, a USDA soybean breeder at OARDC, as part of on-going soybean breeding research.

Consider Risks In Planting Soybeans Early

DES MOINES, Iowa — Though it may be tempting to complete planting as soon as possible, ultra-early and early soybean planting may yield more risks than rewards, according to soybean production experts. Before heading to the field in March or April, growers need to weigh the odds for success.

"A certain amount of time is required for seed to emerge when soybean seed is planted in soils that are less than 50 degrees," explains Keith Whigham, extension soybean specialist at Iowa State University. "We've found that if we plant in March, it could be three to four weeks before soil temperatures reach 50 degrees. By then, seed may not have the viability to emerge."

Ideally, soybeans are planted the last week of April through the middle of May for optimum production, depending on geography. Typically, yield losses have been seen with early-planted (before April 15) soybeans as well as in soybeans planted after May 15.

Weather trends, the increasing size of farm operations and some reports of yield increases with early planting have lead growers to push the envelope on soybean planting dates.

"There has not been a lot of published research dealing with very early planting dates," says Jody Gander, agronomy researcher with Pioneer Hi-Bred International, Inc., in Princeton, Ill. "We initiated research in 2001 to try to quantify the potential risks or benefits associated with planting soybeans early."

"There are a few risks in planting corn early, but it is generally desirable to do so. There are a lot more risks with soybeans. Cool, wet soil conditions associated with early planting are more conducive to seedling diseases such as phytophthora root rot, pythium and fusarium, which all lead to poor emergence and growth," he says.

"When it warms up in early April, and you're tempted to plant soybeans, it's important to remember the next week it could be raining and 40 degrees," Gander cautions growers.

Early planted soybeans also appear to be more susceptible to infection from sudden death syndrome (SDS), as evidenced by widespread, severe levels of the disease in Illinois during the 2000 growing season. That year, as much as 65 percent of the soybean crop had been planted by May 15 compared to the five-year average of 20 percent.

"Fusarium, the organism which causes SDS is most damaging when soil temperatures remain at 55 to 65 degrees for a long period of time," explains Jim Trybom, soybean researcher with Pioneer in LeRoy, Ill. "In 2000, soil temperatures warmed to 68 degrees on May 15, but they dropped and continued to fluctuate below 65 degrees

through late May.

"In 2000, the soybean seedlings and roots were exposed to the ideal 55 to 65 degree soil temperatures much longer than normal because the crop was planted earlier than normal," Trybom adds. "The result was significant disease pressure and yield losses from SDS."

Other downsides to early planting are the potential for frost damage, which can kill soybeans that have germinated and emerged; compaction of wet soils, which impacts the crop all season long; and greater exposure to high populations of early soybean insects there are fewer acres in each area to attract the bugs, Whigham points out.



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