Oklahoma

Cultural Practices for Management of Pod Decay Diseases of Snap Bean

Grant Amount: $64,676

Project Team:
John Damicone, OSU
Jennifer Dominiak, OSU
Craig Rothrock, University of Arkansas
Jeremy Taylor, University of Arkansas

Project Leader:
John Damicone

Lead Institution:
Oklahoma State University

Source of Funding:
Southern Regional IPM Grant

"While farmers do benefit from planting a cover crop, there would be more economic benefit if the grain could be harvested, leaving a natural stubble for planting no-till."
—John Damicone

When mature snap beans began developing soft areas that would change to a white, fluffy mold while still on the plant, Oklahoma snap bean growers knew they had a problem. Local food processors reported finding several shipments of beans with the same symptoms. The beans had developed cottony leak (caused by *Pythium* and *Phytophthora* spp.), a disease that develops on vegetables usually during wet weather. In fact, during a snap bean trial at the Oklahoma Vegetable Research Station near Tulsa, researchers had already identified cottony leak as a problem.

Beans infected with cottony leak disease

What also concerned growers was that the diseased beans were contaminating the healthy beans while on the trucks, making some loads unmarketable.

"The beans get moldy in the fields, and then they're harvested in bulk for processing," said John Damicone, plant pathology professor at Oklahoma State University. "The moldy pods and the healthy pods are transported together. While sitting in the truck, the disease grows. If there is too much of it in the field, processors won't take the fields, so the farmer and the processor lose out."

At first researchers tried to battle the disease with fungicides, but the disease prevailed. Some trials plots were sprayed up to three times a year, costing $75 an acre, with few results. So Damicone decided to try something different—changing growing techniques themselves.

Damicone first tested different snap bean varieties to find one that had an upright growth habit and set pods higher on the plant that the standard variety. The variety trial yielded one that not only was upright and set pods high, but also manifested a lower level of pod decay: Romano 942. Because cottony leak occurs on lower beans that grow on or near the ground, Damicone tested different tillage practices hoping to find one that would provide a physical separation of the pods from the soil. Treatments included conventional tillage and no tillage with and without a small-grain stubble. Stubble is the standing residue from a previous crop that acts much like mulch.

Previous research in other states had shown that no-till planting into a stubble increased the length of the lower stem resulting in lower pods that grew higher up from the ground. Research had also shown that the stubble may also act to reduce puddling and water splash which favor spread of water mold pathogens like those that cause cottony leak. He also tested how nitrogen levels affected the disease as well, since one study on the research station had suggested that plants receiving higher nitrogen seemed to be more susceptible to cottony leak. His hope was to find a combination of practices that would reduce the level of the disease without reducing yield.Results from the first year of testing showed that variety selection had the greatest impact on disease control. Romano 942 had significantly less disease than the standard variety. The no-till planting also tended to have less disease than plantings in conventional tillage or no-till without stubble, but the effect was not quite statistically significant. Results also indicated that nitrogen level did not affect disease level at all, contrary to the earlier observations. Using zero nitrogen did not reduce the disease, but did reduce yields. Another lesson learned during the first year was that planting no-till into a cover-crop stubble requires a no-till planter.

"We had delayed stand establishment with the no-till and some stand variability, but yields of no-till plots were comparable to conventional tillage," said Damicone.

Snap beans in tillage rows: no-till w/ stubble (foreground), conventional tillage (middle), no-till w/out stubble (rear)

Cultural Practices for Management of Pod Decay Diseases of Snap Bean

They repeated the experiment in 2006, armed with a no-till planter.

"The new planter worked great and we achieved a perfect stand with no-till," Damicone said.

However, rains in late April delayed planting, and the extreme summertime heat dampened both disease development and snap bean production. While the yields and disease levels were low, results were similar to the previous year.

"When the pods were higher off the ground, there was less disease," said Damicone. "There weren't any interactions among the tillage, variety or nitrogen treatments, meaning the effects are additive. If you plant an upright variety in no-till soil with stubble, you get the least disease, regardless of nitrogen fertilization."

One limitation of no-till planting into a small-grain stubble in the spring in this area is that beans have to be planted before the grain can be harvested.

"We have had to artificially create the small grain stubble by letting the cover crop grow up and killing it with herbicide," Damicone said. "While farmers do benefit from planting a cover crop, there would be more economic benefit if the grain could be harvested, leaving a natural stubble for planting no-till."

"No-till may be better suited for fall beans in this region. With the stubble shading the ground, the soil may be cooler, but we haven't looked at enough fall beans to make a conclusion. We have also seen the disease in fall crops."

Damicone will run a third trial this year to see if he can get more conclusive results. But that also depends on the weather this spring. Hopefully we'll have good weather so we can get them in early," Damicone said.

Several farmers in the region have tried no-till successfully, but not with disease control in mind. If the combination of variety selection and no-till planting into winter wheat stubble tests proves to help lower the disease, Oklahoma farmers can be at ease when the trucks leave their farms.