RECOGNIZING SYMPTOMS OF VIRUS DISEASES ON PROCESSING BEANS

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The prevalence of diseases caused by plant viruses on processing beans in WI has dramatically changed during the past two years. We normally observe symptoms of virus diseases affecting processing beans along field edges and where there are concentrated areas of perennial legumes. On numerous occasions in recent years when teaching field courses I've found it difficult to find even a single plant with virus-like symptoms in production fields. All this began to change in 2000 when I was called to visit several fields in eastern WI where an unusually high proportion of the plants exhibited symptoms of virus infection. In the first field I visited near Oostburg, WI, over a third of the plants exhibited virus-like symptoms that included plant stunting, mosaic patterns on the foliage and discolored pods. Symptoms were uniformly distributed across the field instead of just along the perimeter. Subsequent samples from the eastern shore area of WI and from the Cambria area indicated a fairly wide distribution of virus-infected plants in several fields. These plants also exhibited a wide range of symptoms typical of virus infection. During 2001 the geographical area of processing beans affected by virus problems increased substantially. In addition to the eastern areas of WI along Lake Michigan and fields in the Cambria area, symptoms were observed in southern WI and into the Central Sands area. There were also reports of virus problems on processing beans grown in southern MI, southern Ontario and western NY. Samples of snap beans sent to us from fields near Buffalo, NY exhibited symptoms similar to the symptoms observed in WI.

Virus-incited diseases on processing beans have cost the WI industry in excess of $10 million during the past two years. These losses are related to plant stunting and loss of plant vigor, blossom abortion, pod drop prior to maturity, misshapen bean pods, brown to black pod sutures and interior and exterior discoloration of pods. Several fields were rejected prior to harvest and disked. In other fields there was a significant reduction in yield. In one field, the processor anticipated a 5-ton yield per acre based on the past performance of a popular variety in their production area. On the day of harvest, delayed by a full week to allow for additional pod growth, the company harvested 700 pounds of pods. There have been many similar stories documented by processor field personnel over the past two years, particularly for fields maturing in mid August to mid September.

Some of the earliest symptoms of virus infection resemble a wide range of plant stress and other plant pest symptoms. Yellow mottled foliage could easily resemble mite damage or inadequate fertility. Plant stunting could mimic soil compaction, lack of water

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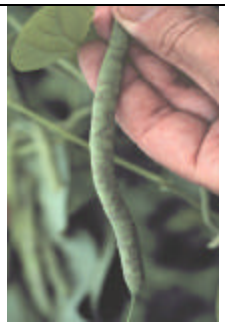
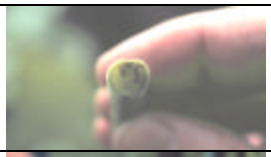
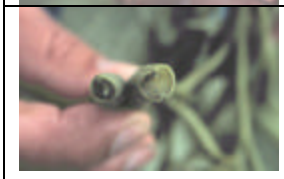
or herbicide damage. Downward curling of leaves, roughened and misshapen leaves and curled pods are often symptoms of exposure to volatile herbicides. Since we normally think of virus infected plants as occurring singly in fields and usually along the edges of fields, the appearance of these type of symptoms on a field-wide basis may be mistaken for environmental or cultural problems rather than virus-incited diseases.

We have developed a photographic database of many of the key symptoms observed on snap beans during the past two years. In addition to symptoms in commercial fields, we were also able to capture symptoms on multiple cultivars in field trials at the West Madison Agricultural Field Station and in a field trial near DeForest. Symptoms observed on plants during the past two years include the following:

Leaf blisters – Dark green erumpent blisters on the surface of affected leaves		
Leaf chlorosis – Pale yellow to dark yellow discoloration on interveinal leaf tissues		
Leaf chlorotic spotting – Distinct yellow spotting of leaf tissue		
Leaf malformation and downward leaf curl – Leaves are distorted and curled downward		

Leaf - mild to severe mosaic – Faint to distinct patterns of dark green and light green leaf tissue		
Leaf rugosity – Surface of affected leaves are severely roughened		
Plant stunting – Depending on the time of plant infection, internodes may be severely shortened.		
Pod - darkened pod suture – External pod suture may become dark brown to black		
Pods - external pod necrosis – Brown lesions of varying dimensions appear on the surface of affected pods		

Pods - internal pod discoloration – Internal tissues of pod turn dark brown to purple, discoloration may affect a portion or most of the pod		 
Pod malformation – Pods may be twisted, bent, swollen in some areas while constricted in others.		
Pod mosaic – Faint dark green and light green patterns on pods		
Symptoms on weeds - Chlorotic spotting of lambsquarters – Distinct yellow patterns on the leaf surface of lambsquarters		
Symptoms on weeds - Mild mosaic on velvetleaf – Mosaic symptoms include a faint to more distinct light green to dark green pattern on the leaf surface		

These photographs along with dozens of additional photographs in color are available in CD-ROM format for those with a need to use this material in worker training or in-field diagnosis.

Identification of potential virus problems is the first step to management. Since the majority of viruses isolated from symptomatic plants are stylet-borne and aphid transmitted, it is also important to observe aphid populations throughout the season. Once plants are inoculated by aphid feeding, the first symptoms generally appear in about 2-3 weeks. Any aphid control practices would thus have to be initiated prior to plant feeding to have any chance of reducing losses to these viruses.