



Figure 2. Symptoms of BYD in wheat. Reddening or yellowing starts at the tip of the leaf. Infected leaves are usually twisted.

can easily be mistaken for nutrient deficiency, cold injury, herbicide damage, drought, or other viral infections. Furthermore, YDV symptom expression is highly variable and dependent on factors such as the crop species and variety, virus strain, weather conditions, soil fertility, soil compaction, and stage of the plant at the time of infection. In wheat, early infections usually result in stunting and red-purple to yellow flag leaves in the spring; whereas, spring infections tend to result in discolored, usually yellowish, erect flag leaves without plant stunting. Early spring BYD infections could easily be mistaken for wheat streak mosaic virus or wheat spindle streak virus.



Figure 3. As the virus infection progresses, entire leaves are discolored and may die prematurely.

A reduction in root growth is a less obvious but important symptom of YDV infection. A poorly developed root system cannot provide the aboveground plant parts with sufficient water and nutrients to sustain proper growth. In the Southeast, water may become scarce toward the end of the grain-filling period; consequently, infected plants with poorly developed root systems often die before reaching physiological maturity. Ample water and nutrients will help offset the negative effect of reduced root growth. Under drought stress, field areas with soil compaction have more obvious symptoms than areas without soil compaction.

On a field scale, the formation of numerous, bowl-shaped depressions about 3 to 8 feet in diameter are another symptom of YDV infection (Figures 4 and 5). This "field signature" is especially visible at flowering (Feekes scale 10.5). Infected plants in the center of depressions are stunted and tend to have severe leaf discoloration. Plants toward the perimeter of the patches show less stunting and leaf discoloration. Research in Virginia has shown that these stunted areas yield about 30 percent less grain than nonstunted areas.



Figure 4. A wheat field with many BYD-diseased plants.



Figure 5. The bowl-shaped depression is a typical field signature of YDV.

Several laboratory-based procedures can be used to detect YDV in infected tissues. The procedures vary in technical complexity. Commercial products are available that allow detection of YDV using procedures such as an Enzyme Linked Immunosorbent Assay (ELISA).

Vectors of Yellow Dwarf Viruses

Healthy plants can become infected only after being fed upon by aphids carrying YDV. The viruses cannot be transmitted in seed and are not spread mechanically. Aphids pick up the viruses as they feed on the sap of infected plants, a process that takes from 1 to 48 hours. Before the viruses can be transmitted by an aphid to other plants, they have to travel through the aphid's body to the salivary accessory gland, a process that can take