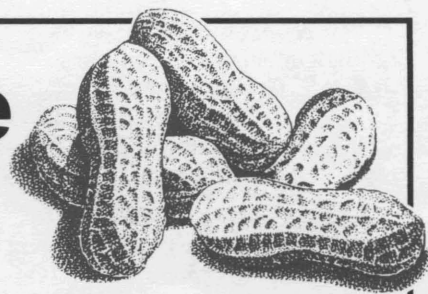




# Spotted Wilt Disease of Peanut



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Spotted wilt was first identified in Texas peanuts in 1971. The disease caused yield reductions in the mid-1980's in the South Texas counties of Atascosa, Bexar, Frio, La-Salle, Medina and Wilson. This bulletin discusses symptoms, the pathogen and its carriers, disease control, and estimating disease risk.

The disease is caused by tomato spotted wilt virus (TSWV). Originally found in Australia in 1919, TSWV has now been reported all over the world. The more than 200 susceptible plant species include several crops, ornamentals, and broadleaf weeds. Thrips insects carry the virus from plant to plant.

Susceptible crops include peanut, tobacco, spinach, potato, pineapple, lettuce, tomato, and pepper. Affected ornamentals include chrysanthemum, dahlia, gloxinia, zebra plant, and impatiens. Greenhouse ornamental growers worldwide have suffered severe losses from spotted wilt.

## Symptoms

Several symptoms occur on peanut plants infected with TSWV (Fig. 1). Strains of the virus, age of plants, and changes in temperatures during the season probably contribute to this variation.

The first symptoms appear on new leaves in one or more terminals. New leaves may have light

green and yellow mottling, light green to yellow ringspots and streaks, or dark brown rings and line patterns. A peculiar symptom oftentimes is one leaf on an infected terminal with a twisted petiole and brown blotches on the undersides of leaflets.

Terminal buds on some plants die, but older leaves often remain green. Plants infected early in the season are severely stunted or killed.

Older plants that become infected may suddenly turn yellow, wilt, and die without developing distinct leaf symptoms. A close look at yellowed plants usually reveals faint ringspots, streaks, or a mosaic in one or more terminals.

Only a few small pods are formed when plants are infected early in the growing season.

Some kernels produced on infected plants have discolored seed skins. Kernels may be partly or completely red instead of being the usual pink color of healthy seed. The discoloration may also be combinations of brown, tan, or white.

## Carriers

Tomato spotted wilt virus cannot exist unless it is inside a plant or a thrips. Six thrips species have been reported as carriers of TSWV, but the major thrips vector in Texas epidemics is probably the western flower thrips (*Frankliniella occidentalis*). Tobacco thrips (*F. fusca*) may also be involved in this peanut disease.

Thrips feed in flowers and growing points (buds) of plants. Many of the plant species with high numbers of thrips can also be infected with TSWV. However, weeds and wild flowers infected with TSWV often do not have recognizable symptoms.

An adult thrips can transmit TSWV only if it previously fed on an infected plant when the thrips was immature (larval growth stage). The virus is carried inside the body of the thrips larvae but the thrips is not able to put TSWV into healthy plants until it grows into an adult.

Within the species known to be carriers, a low percent of individual thrips carry TSWV. Non-carriers may have developed from eggs laid in grasses and other plants that are immune to the virus. Or, the thrips may have developed on healthy plants that escaped TSWV infection. Or, they may have fed on an infected plant containing so few TSWV particles that they did not acquire it. Peanut leaves, therefore, can show severe thrips damage yet remain free of the spotted wilt disease.

## Virus Sources

An epidemic on peanuts occurs when large numbers of a certain kinds of thrips leave their habitat among broadleaf weeds infected with TSWV. Some of those thrips ride the winds into peanut fields as well as vegetable fields, home gardens, and greenhouses.

Perennial broadleaf weeds in South Texas that are infected with

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TSWV probably carry the virus through long periods including droughts. Examples of perennial hosts include cotton morningglory, silverleaf nightshade, and American black nightshade.

Faster growing annual broadleaves, on the other hand, apparently contribute to epidemics by producing large quantities of virus in shorter periods of time when weather favors rapid plant growth.

The South Texas peanut growing area is sometimes called the "Brush Country" because of the thorny plants that invade neglected fields along with broadleaf plants. Only 30 percent of the 2.5 million acres of sandy soils in the South Texas growing area are cultivated farm land, improved pastures, roads, and urban areas.

The total number and volume of broadleaf weeds and wild flowers susceptible to TSWV on the remaining 1.75 million acres varies, depending on highly erratic rainfall. The months with the highest average rainfall are September and May. The total annual rainfall varies from about 12 to 50 inches a year.

Soil moisture is usually adequate long after heavy fall rains because of cool winter temperatures and short days in South Texas. However, high temperatures, high winds, and the long days of summer quickly deplete soil moisture after a wet spring.

Seeds of many wildflowers and broadleaf weeds in South Texas lie dormant in the soil for years until abundant rains and alternating temperatures occur in the fall. These plants apparently developed the ability to germinate in the fall because chances for producing seeds are better in cool months than in the hot dry summers of South Texas. Spectacular spring wildflower shows are preceded by wet falls.

This greening of the landscape during a wet fall includes many plant species that are excellent hosts for both TSWV and thrips. The timing is sometimes just right for these seedlings to receive adult thrips, possibly carrying TSWV, as they leave warm weather plants such as peanuts, summer vegetables and weeds. These winter weeds and wildflowers apparently serve as a "living bridge", not only to carry TSWV through the mild South Texas winter, but also to produce a lot of virus particles as these plants grow.

### High Risk Conditions

There is evidence that two weather conditions must occur before severe, region-wide spotted wilt occurs in peanuts and home gardens. When rainfall accumulates above the long term average in September and October, the risk of spotted wilt for the next summer increases. However, spring weather must include dry periods which are long enough to dry out broadleaf weeds and wild flowers and start thrips flights into peanuts.

Local risks include planting late peanuts downwind from early planted fields, thereby allowing short distance migrations of virus-carrying thrips. Thrips flights, even from a field with low levels of disease, could start a severe epidemic in adjacent late planted peanuts. Other crops susceptible to TSWV include potatoes, spinach, and lettuce, but the crops most likely to overlap with the peanut season are tomatoes and peppers.

Peanut fields with a high population of yellowtops weed (*Verbesina encelioides*, also known as golden crownbeard) sometimes have many more plants infected with spotted wilt than fields with successful weed control.

Southern and southeastern portions of peanut fields are at slightly greater risk from spotted wilt infec-

tions than northern or northwestern portions during years with moderate disease pressure. This is apparently due to prevailing southeasterly winds in warm months.

Growers should consider these risk factors when making decisions about managing spotted wilt prior to planting and early in the season (Table 1). The estimated importance of these factors was based upon numerous field observations and comparisons of weather and disease pressure from 1984-89.

### Control

There is no single control measure or combination of measures that will totally eliminate all loss from spotted wilt when disease pressure is high. Several control efforts, each providing a small benefit, should be used in South Texas during growing seasons when risk is high.

1. Reduce sources of TSWV with broadleaf weed control near and in peanut fields, especially yellowtops (*V. encelioides*). Do not plant next to and downwind from infected warm season crops such as early peanuts, tomatoes and peppers.
2. Use high seeding rates when risk is high.
3. Consider thrips management suggestions by Extension entomologists. If the decision is made to apply insecticide in years with low or moderate risk, it may be best to treat the southern and southeastern portions of large fields where risk is slightly higher.
4. Use a resistant variety. Southern Runner has partial resistance to spotted wilt as well as rust and leafspots. There is some evidence that GK-7 also has partial TSWV resistance. Southern Runner is adapted in Texas only south of San Antonio.





(a)



(b)



(f)



(c)



(e)



(d)

**Figure 1. Symptoms of tomato spotted wilt virus infection in peanut include, starting clockwise at the upper left, (a) ringspots; (b) mottling; (c) twisted petiole with mottled leaflets; (d) bud death and subsequent multiple bud growth; (e) whole plant wilting, yellowing, and death; and (f) discolored seed coats (seeds on left were from healthy plants).**



**Table 1.** A method for predicting potential spotted wilt disease risk in South Texas peanuts before planting and during the early season.

| SEASON   | WEATHER   | RATING         |
|--|---|----------------|
| 1. Previous summer   | High incidence of spotted wilt in late planted peanuts (+1)<br>Low incidence of spotted wilt in late planted peanuts (0)  | _____          |
| 2. Previous fall   | Sept.-Oct. rainfall 50% less than the long term average (-2)<br>Sept.-Oct. rainfall near average (0)<br>Sept.-Oct. rainfall 50% above average (+2)<br>Sept.-Oct. rainfall 100% above average (+4)           | _____          |
| 3. Previous winter   | Nov.-March rainfall below average (0)<br>Nov.-March rainfall average or above average (+1)  | _____          |
| 4. Current spring  | Rains very frequent for several weeks after planting (-2)<br>Rains infrequent after planting (0)<br>No rain for several weeks after planting (+1)   | _____          |
| Region risk (add your ratings for items 1 through 4) . . . . . |   | _____          |
|  |   | (go to item 5) |
| PRACTICE   | FIELD SITUATION   | RATING         |
| 5. Variety   | Florunner or Tamrun 88 (0)<br>Southern Runner or GK-7 (-1)  | _____          |
| 6. Weed control  | Severe infestation of yellowtops ( <i>Verbesina encelioides</i> ) (+1)<br>Good broadleaf weed control (0)   | _____          |
| 7. Field selection   | Planting downwind from crops resistant to TSWV<br>such as wheat, oats, sorghum, or corn (0)<br>Planting downwind from weedy fields or susceptible crops<br>such as early peanuts tomatoes, and peppers (+1) | _____          |
| Local risk (add ratings for items 5 through 7) . . . . .       |   | _____          |
| Total <sup>a</sup> (add ratings for items 1-7) . . . . .       |   | _____          |

<sup>a</sup>A total of 0 or less indicates that low risk from spotted wilt is expected, 1-3 indicates moderate risk, and 4 or more indicates high risk.

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