Southern Stem Rot of Peanuts

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Southern stem rot of peanuts, also called southern blight, is caused by the fungus (*Sclerotium rolfsii*). It is capable of causing significant yield loss. The relationship between peanut yield and southern stem rot incidence, measured in "hits", (defined later) is a linear one, but the degree of loss (the slope) varies with environment and cultural practices, especially fungicides. Losses are apparently greater when the year is hotter than normal. A 1995 southern stem rot study in Alabama grown peanuts showed that fungicide use decreased southern stem rot "hits" by about 52.6% and increased yield by an average of 10.6%. Losses were greater in two years when the temperatures were hotter.

The *Sclerotium rolfsii* fungus overwinters as both mycelia in the previous years infected crop residue, and as a hard, environmentally resistant structure the size of a small BB, called a sclerotia. The fungus usually starts off as a unobtrusive white mold on dead, decaying matter (Figures 1-2) and in the current seasons (Figure 3) fallen leaves, stems, and debris in the shadowed and sheltered moist soil around the base of plants. It then attacks any plant part in contact with the soil or just beneath the soil surface, including roots, stems, leaves, or fruit (Figure 4 -5).

The growing mycleia has thick, ropey-like hyphae (like thick spider webbing) which spread out in fairly large "V" shaped patterns near or on the soil surface in search for a new host (Figure 6). There is another fungus whose hyphae look like *Sclerotium rolfsii* (Figure 7), except the base of the "V" usually has a orange/brown coloration. Another way to distinguish southern stem blight from the non-pathogenic look-alike (with the orange base, Figure 2), is that when it grows onto a plant part or fallen leaf, it will not rapidly decay the plant material, but the plant parts will stay green until lack of light and high humidity start to rot it (Figure ADD IMAGE).

Although *Sclerotium rolfsii* grows in temperatures from ca. 50° F to 105° F, it grows best at temperatures between about 80° F to 95° F. High soil moisture and humidity are needed, and the fungus is commonly first seen about 7-10 days after a soaking rain. The fungus produces sclerotia about 7-10) days after germinating, when food, moisture, humidity and temperatures of around 86° F occur. Soil pH below 7.0 and well drained, light textured, well aerated soil also favor sclerotia production. Sclerotia are produced inside the white mat formed by the fungal mycelia (Figure 8). Some of the mycelia clump to form small ball-like areas (Figure 8 and 9). These balls will grow to be the size of slightly small BB's or largish brown mustard seeds. The fully sized sclerotia will first be pale, turn yellow, tan, and brown (Figure 9 and ADD). The sclerotia will persist in the upper 2-3 inches of the soil for numerous years. The sclerotia will die if buried 6" deep for about 45 days, otherwise they may survive for years until fluctuating water levels and host exudates stimulate germination.

Once southern stem rot reaches a host, it produces substances (oxalic acid, pectinolytic, cellulolytic and other enzymes) that digest the plant surface before the fungus penetrates into the plant. These chemicals cause the stem tissue of the plant to look wet and somewhat slimy (Figure 9). Once the chemicals eat away the protective layer of the plant, they sever the water conducting tissues, thus the first plant symptoms we see are usually a yellowing and wilting of the top part of the plant. Affected plants usually die within a few days after symptom expression because of the lack of water in the high heat.

The fungus then spreads on the soil to nearby plants and produces tens of sclerotia. Because of this mode of spread, the disease causes a vaguely circular patch of dead and dying plants in densely planted crops, whereas in row crops like peanut, it will spread along the row. "Hits" or disease loci, are areas of 1-foot of row or less in length, that have been "hit" by the disease. If two lineal feet of row have been damaged, then that is two "hits"... The extent of a "hit" is usually determined when the peanut crop is inverted, prior to combining. Hits determined before inversion (while the plants are still growing) will probably underestimate the length/severity of the infection.

If the weather is warm and dry, a dark brown lesion or rotten area will be seen at or just below the soil line (Figure 10 and 11). A brownish vascular discoloration inside the stem may extend several inches above the soil line. The outside of the lower stem usually sloughs off easily. The white fungal growth may not be seen but sclerotia may be present if they have had time to form before drying out.

Beside peanut, southern blight affects about 643 different plants, including beans, carrots, cabbage, cantaloupe, cucumber, eggplant, lettuce, okra, onion, peas, pepper, potato, squash, strawberry, sugar beet, sweet potato, tomato, turnip, watermelon, and a wide range of ornamental plants. This wide host range makes escape from this disease using crop rotation difficult. Rotation to monocots, especially pasture grasses, corn, and sorghum are usually recommended. Not because these crops are non-hosts, but because they are poor hosts. Additionally, in the case of peanut, rotation with cotton seems to decrease white mold infections.

Because Sclerotium rolfsii sclerotia do not survive burial for more than 45 days, mold-board plowing has sometimes been recommended as a management tool.

Both the triazole and strobilurin fungicides (those fungicides whose active ingredients end with "azole" or "strobin", respectively) are labeled for use on white mold. The older product, PCNB (PentaChloro-NitroBenzene) is available as is the newly labeled Fontelis, which should be more available next year. The active ingredients in Convoy and Artisan have worked well for me in ornamental trials. Which ever fungicide you decide to use, please apply it in as much water as you can stand (at least 20 gallons water/Acre or what ever is specified by the label). Also, according to University of Georgia data, application during the very early morning or evening, when the leaflets are folded up, seems to improve significantly improve efficacy.

The Mississippi Peanut Promotion Board has funded me look at several aspects of southern stem rot management this year (and I hope for several more years). One portion of the work addresses "early" applications for white mold suppression. Early because the typical Georgia recommendation is to apply a white mold fungicide at 60 days, whereas a early application would be prior to this time. The most advertised early application is a banded application of Proline at 100% emergence. Application of other products might be later, but prior to 60 days. I still have room for at least one more such trial if you know of a young field (30-45 days) that has a history of white mold. If so, please contact me.

The Mississippi Peanut Promotion Board has also funded me look at residual activity of some of these fungicide products this year – i.e. how long the fungicide lasts.

Note. The images used in this and previous notes were taken last year as part of a Mississippi Peanut Promotion Board funded study to examine the types and prevalence of peanut diseases in the state so that their money could be more effectively targeted towards real problems. The images are available in a narrated CD. It is an rough draft alpha version, but if you are interested, please let me know.

Figure 1, <u>Sclerotium</u> <u>rolfsii</u> (southern stem blight or white mold) beginning to grow out of a corn stalk (1a) and the same corn stalk about 5 days later after incubation in humid chamber (1b).

Figure 2. Southern blight growing from cotton (2a) and wheat (2b) crop residues.

Figure 3. Southern stem blight spreading to the current seasons crop, including peanut stems and nut shells harvested by a mouse.

Figure 4. Southern stem rot attacking the peanut "fruit" or nuts.

Figure 5. Southern stem rot has attacked the tap root of this peanut plant and the pods, causing a pod rot. The weather has subsequently turned dry, and the tap root and pods have browned.

Figure 6. Actively growing white mold (Sclerotium rolfsii) on soil, just beginning to infect a peanut limb. Note that the base of the large "V" shape is white.

Figure 7. A fungus that looks like Sclerotium rolfsii, but is not pathogenic. Note the orange/brown coloration at the base of the large "V" pattern (7a), this and the lack of rot of plant parts under the hyphae (7b) distinguish it from white mold.

Figure 8. Southern stem blight forming sclerotia. Sclerotial formation proceeds from stage 1 to stage 5. Not shown are some of the more mature color phases that may go to a light "mustard seed yellow" to a dark yellow.

Figure 9. Active decay of peanut plant parts caused by southern stem rot when moisture and humidity are favorable. You will not see this decay with the southern stem rot (white mold) look-alike that has the orange near the base of the "V". Note the sclerotia on the decayed leaves and forming, on the stem.

Figure 10. Southern stem rot that is starting to dry out due to lack of moisture. Note the dark browning of the stem and the prolific numbers of sclerotia.

Figure 11. A southern stem rot infection which has nearly dried up. They fungus is still present on the inside of the stem, either as mycelia or as sclerotia. A rain may activate the foci again.