SOYBEAN DISEASE AND NEMATODE CONTROL - *(Kemerait)*

Disease and Nematode Outlook for 2009

In 2009, growers will need to remain vigilant with regards to management of Asian soybean rust. However, effective management of rust may also lead to better control of other diseases such as frogeye leaf spot and anthracnose.

Southern blight ("white mold") caused by *Sclerotium rolfsii* was particularly troublesome to some growers in Georgia last year. This was likely due to very warm soil temperatures early in the season which fueled early outbreaks of this disease. If similar conditions occur in 2009 and southern blight is again an issue, growers may consider applying appropriate fungicides for control of the disease.

As the acreage of soybeans continues to increase in Georgia, the time between soybean crops in a field will likely decrease (i.e. shorter rotation) and also peanuts and soybeans are more likely to be planted in shorter rotations with each other. Should shorter rotations occur, growers can expect greater problems with Cylindrocladium black rot (CBR)/Red crown rot, as this disease affects both peanuts and soybeans, and possibly the peanut root-knot nematode. Increased plantings of soybeans may also increase problems with southern root-knot nematodes, reniform nematodes, and Columbia lance nematodes on future cotton crops.

Asian Soybean Rust

Asian soybean rust remains of important concern to soybean producers across Georgia. It is believed that the majority of the soybean acreage planted in the Coastal Plain was sprayed with fungicide at least once in 2008. Some growers may question the value of spraying for Asian soybean rust, especially in a year like 2008, where soybean rust developed slowly in some areas. However, there are at least three important reasons why growers should apply fungicides, should rust threaten.

First, Asian soybean rust can develop quickly under the right environmental conditions and can be difficult to detect in the earliest stages. A timely fungicide application will protect the crop.

Second, timely fungicide applications by a number of growers in a region can help to keep inoculum levels (the number of rust spores released to the environment) low, thus potentially protecting not only the local crop, but also delaying the spread of rust to other areas as well.

Finally, timely applications of fungicides to control Asian soybean rust will also help to control other diseases as well, e.g. frogeye leaf spot, Cercospora blight, Phomopsis pod and stem blight, and anthracnose. While the University of Georgia Cooperative Extension had not typically recommended spraying soybeans with fungicides prior to the arrival of

Bottom-line comments for managing Asian soybean rust in Georgia:

1. Asian soybean rust can (and does) limit yields in some soybean fields in Georgia each year.

2. Asian soybean rust will very likely occur in every county in the state at some time between May and December each year. Soybean rust is most likely to be found on soybeans and kudzu.
3. Soybean producers are advised to protect their crop with a fungicide IF a) the crop has reached reproductive growth, b) Asian soybean rust has been detected locally or is likely to be found locally, c) environmental conditions are favorable for development and spread of rust, e.g. adequate rainfall or storms, and d) the grower's crop has the potential to make a satisfactory crop.
4. Asian soybean rust is less likely to be a problem in a field with poor growth and plants stunted by drought or other factor than in a field with good growth, heavy foliage, and a closed canopy of foliage.
5. Some growers plan to apply fungicides to their soybean crop automatically as the crop reaches the R3/pod formation growth stage. They reason that since they will already be applying Dimilin and boron during this time period and because the crop is susceptible to rust, it just makes sense to tank-mix the fungicide for good timing and to save a trip across the field later. This is a good strategy; however if soybean rust does not develop until much later, the R3 fungicide application may not have been needed.
6. In some studies, a single, well-timed application of an effective fungicide may be all that is needed to adequately protect a grower's crop from soybean rust. However, depending upon the timing of arrival of the soybean rust pathogen (earlier versus later) and the impact of weather, e.g. tropical storms, it may be necessary (an profitable) to make a second fungicide application 2-4 weeks after the first application.
7. To determine where soybean rust is known to be present in Georgia, growers should consult there county agent (University of Georgia Cooperative Extension) or consult the USDA-CREES website at **www.sbrusa.net**.

Lessons from 2008: As of 1 December 2008, Asian soybean rust had been confirmed in 77 counties in Georgia, though it was likely present in every county in the state where soybeans and/or kudzu grew. In 2008, Asian soybean rust was found often found on soybeans and kudzu and less frequently on Florida beggarweed and iron clay peas.

Asian soybean rust was found to survive the 2007-2008 winter in extreme southern Georgia on kudzu at several locations until hard freezes in February killed all known kudzu remaining in the state.

Although the disease was found at a private research farm in Brooks County in mid-July 2008, it appeared that the important spread of the disease did not occur until late August and into September. The delayed spread of soybean rust in 2008 coupled with timely fungicide applications allowed most producers in the state to escape considerable losses to the disease. It is very likely that the spread of Asian soybean rust in 2008 was slowed considerably by large-scale fungicide sprays that kept inoculum from building up and by the dry weather conditions that existed for much of the season. Some spread of rust was likely fueled by Tropical Storm Fay as it moved across southern Georgia.

It is believed that nearly all of the soybean acreage in southern Georgia was protected with fungicides. However, some fields were not sprayed and it was estimated that up to 25% of the yield potential was lost in some fields in Grady and Lowndes County to soybean rust.

Spread of Asian Soybean Rust

Soybean rust is spread from infected plants to non-infected plants by spores. Spores germinate in approximately 6-7 hours with suitable leaf wetness and temperatures between 59 and 86ºF. Pustules form in 5-10 days and new spores are formed in 10-21 days. Spores are spread by wind-blown rain and can be carried great distances in upper air currents.

Resistant Soybean Varieties

Currently, we have no varieties that are resistant to the soybean rust.

Alternative Hosts

Phakopsora pachyrhizi (the fungus that causes Asian soybean rust) infects other plants in addition to soybean. These include kudzu, snap beans, lima beans, cowpeas, and more than 90 other species of legumes (the bean family). In 2008 Asian soybean rust was confirmed on kudzu, Florida beggarweed, and iron clay pea in Georgia . **NOTE: peanut is NOT a host for the Asian soybean rust.** Alternative hosts are important because they allow the disease to survive and spread even in the absence of soybean. Thus, the disease may spread into regions where soybean does not occur and survive when soybean is not planted.

Survival of the Asiatic Soybean Rust

Survival of the rust pathogen is an important component in determining the threat of soybean rust in the coming season. The soybean rust pathogen does not survive for long without a living host. As most kudzu freezes back in Georgia each winter, it is very unlikely that soybean rust will survive in Georgia or in northern Florida to any appreciable amount during the winter. However, the rust pathogen will survive in central and southern Florida, provided that alternative hosts are present. The disease can then be reintroduced into Georgia as it is spread up the peninsula.

Detection of Asiatic Soybean Rust

Early detection of symptoms of the soybean rust is an important tool in the management of this disease. The initial symptoms begin on the under surface of the leaves and as gray lesions that change to red or tan. These early symptoms can be quite difficult to detect because they are fairly non-descript; however, it is essential to find the disease as early as possible in order to most effectively treat it. Lesions can spread from the foliage to the petioles, stems, and pods. Spores are produced in the mature lesions on the undersides of the leaves. Once these spores are visible, it is very likely that many other infections also exist which have yet to form lesions.

Lessons from the field: It is very difficult to identify the very early infections of soybean rust in a field and early detection can be likened to “finding a needle in a haystack.” Based upon our efforts since 2004, effective detection of the earliest infections will require patience and use of a dissecting microscope. It is highly doubtful that growers, consultants, or county agents will find the earliest introductions of soybean rust in a field. **Therefore, soybean rust sentinel plots**

(funded by the Georgia Soybean Commission and the USDA) will be carefully monitored again in 2009 to provide advanced warning to growers.

In 2009, growers, consultants, and agents should continue to monitor the soybean crop and kudzu carefully. Suspicious samples should be submitted to the Plant Disease Diagnostic Clinic in Tifton. Any finds of soybean rust in 2009 by researchers at the University of Georgia will be immediately passed along to the County Agents and also reported on the national USDA website at www.sbrusa.net.

Management of Asian Soybean Rust with Fungicides

There are currently a number of fungicides that are labeled (either Section 3 or Section 18) for the management of Asian soybean rust. Those fungicides that have Section 3 labels are likely effective in the management of other diseases of soybean as well. Fungicides labeled for the management of Asian soybean rust are presented in Table 1.

Strobilurins versus Triazoles

The most important classes of chemistries that growers will use to manage soybean rust are the strobilurins (azoxystrobin, pyraclostrobin, and trifloxystrobin) and the triazoles (tebuconazole, tetraconazole, flutriafol, flusilazole, metconazole, myclobutanil, propiconazole and cyproconazole). Here are some notes on these fungicides:

1. Strobilurin fungicides, unless tank-mixed with a triazole, are for use as protectants only and must be applied before rust infection occurs.

2. Strobilurin fungicides are reported to remain active in the field longer than triazole fungicides after application (3 weeks versus 2 weeks), though we do not have clear data on this.

3. Triazole fungicides have both protectant and limited curative properties. “Curative properties” refers to their ability to eliminate or reduce some infections that have happened in the very recent past.

4. Propiconazole (i.e. Tilt, PropiMax, and Bumper) is a weaker fungicide against rust than are other triazoles such as tebuconazole (Folicur et al.), myclobutanil (Laredo), tetraconazole (Domark) cyproconazole (Alto), flutriafol (Topguard), metconazole (Caramba) and flusilazole (Punch).

Lessons from the field: Based upon fungicide trials conducted in Georgia since 2005, we have learned the following lessons:

1. Asian soybean rust can be effectively managed with the fungicides currently available to soybean growers in Georgia.

2. Producers who protect their crop with timely applications of fungicides do not need to worry about spores coming to their fields from kudzu or a neighbor’s field where fungicides were not applied. In field trials, rows of soybeans that were treated with

fungicides remained nearly disease-free for extended periods of time despite devastated, unsprayed, plots next to them.

3. In UGA fungicide trials, chlorothalonil products were less effective than were other fungicides for the control of rust. Although chlorothalonil is labeled for the control of soybean rust, the University of Georgia's Cooperative Extension advises growers that the optimum timing for application of this fungicide to control rust is unclear and to use the product cautiously. Chlorothalonil remains an effective tool against diseases such as frogeye leaf spot.

4. Although we have not had a single trial where we were able to evaluate each fungicide under a severe rust epidemic, we expect excellent control of rust with the use of Folicur 3.6F, Headline SBR (Headline + Folicur), and Domark 230ME, Topguard.

5. Used preventatively (that is before rust appears in a field), Headline, Quadris + crop oil, Quilt + crop oil, and Stratego should provide satisfactory results to the grower From field, it seems that Quilt is not as affective as Folicur, Domark, or Headline SBR.

6. Laredo 25EC is a triazole fungicide and performed satisfactorily in trials in 2005 and 2006, though not quite as well as Domark, Folicur, or Headline SBR.

7. **NOTE: Headline, Headline SBR (Headline + Folicur), and likely Quadris and Quilt produced what we refer to as a "greening" effect. Foliage in plots sprayed with these fungicides remained greener longer and than in plots sprayed with other fungicides and took considerably longer to defoliate. This did not seem to affect the % moisture of the soybeans at harvest; however the delay in defoliation did make harvest more difficult. In 2008, some growers used harvest-aides such as paraquat to defoliate the crop and hasten harvest.**

8. Where Folicur 3.6F and other tebuconazole products were applied in our studies, we sometimes observed striking foliar symptoms described as "interveinal chlorosis". This effect was more severe in 2005 than in 2006, 2007, or 2008. The foliage on these plants looked like plants that have been affected by nematodes or by sudden death syndrome. NOTE: We did not find any yield reductions associated with these symptoms; tebuconazole provides excellent control of Asian soybean rust.

Application Timing

The timing for application of fungicides to manage soybean rust is **critical**. It is unlikely that growers in Georgia can afford to spray fungicides on soybean without the imminent threat of Asian soybean rust or some other disease such as frogeye leaf spot. However, we have learned that soybean rust can be a very unforgiving disease if fungicide applications are delayed too long once it threatens. Where applications were delayed in our fungicide trials, significant reductions in yields often occurred.

Based on field studies conducted in Georgia, it appears that early reproductive growth (for example early bloom (R1-R2) through early pod (R3) stages) is an important time for rust management. To date, we have never detected rust in plots or fields prior to early bloom and typically began to find rust as the soybean crop reached early pod set and beyond. However, based upon a variety trial in the fall of 2005, **we know that soybean rust can infect soybeans prior to bloom!**

Lessons from the field: Listed below thoughts about the timing of fungicides applications for management of soybean rust.

1. Timing fungicide applications ahead of introduction of Asian soybean rust into a field is critical in the successful management of the disease.

2. From field observations, it appears that early reproductive growth is a critical period in the management of soybean rust. From both seasons, it appears that a well-time fungicide application with an appropriate fungicide during this period is CRITICAL for maximum rust control IF the disease is threatening.

3. **If rust has not been detected in the local region (as assessed with sentinel plots and careful scouting)**, it is recommended that soybean growers delay application of a fungicide for control of soybean rust until the threat from the disease is more imminent, UNLESS the grower is protecting against some other disease, such as frogeye leaf spot.

4. **If rust has been detected in the local area, or is thought to be likely,** growers are advised to initiate fungicide applications once the crop reaches first bloom.

5. **A second fungicide application should be considered within 2-4 weeks after the first application UNLESS the crop has reached harvest maturity or weather has been unfavorable for disease spread.**

6. From field studies, it is clear that the **FIRST** fungicide application is more important than the second. In 2006, a single, well-timed application of our best fungicides was at times as effective as two fungicide applications, and sometimes better than two applications of a lesser effective fungicide. Growers should not miss the opportunity to achieve excellent control of rust by using a less effective product in the first application, if rust threatens.

"Plant Health Benefits" of Fungicides

Many soybean growers in Georgia are aware that at least one fungicide, Headline, is noted not only for its fungicidal qualities, but also for its reported "plant health" benefits. There is no question that applications of Headline on soybeans keep the leaves greener longer and delays natural defoliation. However, it is not clear that this "greening" effect actually improves yields consistently enough, in the absence of disease, to justify the expense. In Georgia we have not seen an increase in yield where Headline was used in the absence of disease. Growers who wish to apply Headline with anticipation of improved yields simply from better "plant health" should do so with caution.

Steps to manage Soybean Rust in 2009

1. Early detection is critical. Agents, consultants, and growers will be trained in the winter of 2008-2009 to recognize early symptoms of the disease. Once a grower or consultant finds a sample that could be Asian soybean rust, they should take it to their local county Extension agent. The agent will send it immediately to Mr. Jason Brock at the Disease Diagnostic Lab at 4604 Research Way, Tifton, GA, 31793. The phone number at the Diagnostic Lab is 229-386-7495.

2. Sentinel crops. Sentinel soybean plots will be planted in April and monitored around the state to provide a means for early detection and warnings of the disease to the growers. Kudzu sentinel plots will also be monitored.

3. Fungicide programs to effectively manage rust will be developed and disseminated through the Cooperative Extension Service to the growers.

4. In using a fungicide program, growers must recognize that improper use of fungicides will increase the risk for the development of fungicide resistance by the pathogen.

Table 1. Fungicides currently labeled in Georgia for Management of Asian Soybean Rust[a]

Trade Name	Active Ingredient	Chemical Group	Manufacturer	Rate/A	Basic Information
Bravo[b] WeatherStik*	chlorothalonil	chloronitrile	Syngenta Crop Protection, Inc.	1-2.5 pts	max 6.0 pts/season
Echo 720[b*]	chlorothalonil	chloronitrile	Sipcam Agro Inc.	1-2.5 pts	max 6.0 pts/season
Equus 720[b*]	chlorothalonil	chloronitrile	FarmSaver.com	1.37-2.25 pts	max 6.0 pts/season
Quadris[c*]	azoxystrobin	strobilurin	Syngenta Crop Protection, Inc.	6.2-15.4 oz	max 2 sprays
Headline[c*]	pyraclostrobin	strobilurin	BASF	6-12 oz	max 24 oz/season
Tilt 3.6EC*	propiconazole	Triazole	Syngenta Crop Protection, Inc.	4-8 oz	max 12 oz/season
PropiMax 3.6EC*	propiconazole	Triazole	Dow AgroSciences	4-8 oz	max 12 oz/season
Bumper 41.8EC*	propiconazole	Triazole	MANA	4-8 oz	max 12 oz/season
Folicur 3.6F*	tebuconazole	Triazole	Bayer CropScience	3-4 oz	max 12 oz/season
Orius 3.6F*	tebuconazole	Triazole	MANA	3-4 oz	max 12 oz/season
Uppercut	tebuconazole	Triazole	DuPont Crop Protection	3-4 oz	max 8 oz/season
Laredo 25EC*	myclobutanil	Triazole	Dow AgroSciences	4-8 oz	max 16 oz/season
Laredo 25EW*	myclobutanil	Triazole	Dow AgroSciences	4.8-9.6 oz	max 16 oz/season
Domark* 230ME[d]	tetraconazole	Triazole	Valent Biosciences	4-6 oz	1 app. per season[d]
Headline SBR[e]	Pyraclostrobin + tebuconazole	strobilurin + triazole	BASF	7.8 oz	max 2 apps per season
Quilt*	Azoxystrobin + propiconazole	strobilurin + triazole	Syngenta Crop Protection, Inc.	14-20.5 oz	max 40 oz/season
Stratego*	Trifloxystrobin + propiconazole	strobilurin + triazole	Bayer CropScience	5.5-10 oz	max 2 apps per season
Topguard	flutriafol	Triazole	Cheminova	7.0 oz	
Alto*	cyproconazole	triazole	Syngenta Crop	4 oz	

			Protection, Inc.		
Caramba	metaconazole	triazole	BASF	8.2-9.6	

NOTE: Follow label directions for applications, waiting periods, pre-harvest intervals, and safety information.
[bc]Chloronitriles and strobilurins are used as protectants; triazoles will have protectant and some curative benefits.
[d]The label for Domark should be modified in 2007 to allow for 2 applications per season.
[e]Headline SBR is no longer available commercially. A similar product can be prepared by tank-mixing 4.7 fl oz/A Headline + 3.1 fl oz/A Folicur.

Seedling Diseases and Seed Treatments

Over the years, seedling diseases have reduced soybean yields 0.5 to 1%. *Rhizoctonia* or *Pythium* are usually the pathogens responsible, but *Rhizoctonia* damage is far more common than *Pythium* damage in soybean fields. Non-uniform stands and/or death of plants soon after emergence are the problems caused by these diseases. Typical symptoms are reddish to dark brown lesions at the base of the stem or on the roots.

Seedling diseases are usually associated with poor quality seed and cool, wet soils. Seed rots and seedling diseases are rarely a problem if high quality seed are planted in well drained, warm soils. However, the increased incidence of seed-borne diseases such as anthracnose shows a need for general fungicide treatment of soybean seed. Commercial treatment of seed is the most effective, but on-farm treatment is acceptable. Rotation should be used in combination with seed treatment for control of these diseases.

Soybean Seed Treatment

Common Names (Compounds)	Remarks and Precautions
Captan Thiram Thiabendazole Molybdenum Carboxin PCNB Metalaxyl *Bacillus subtilis*	Use according to label recommendations.

A good stand is essential to ensure maximum production. Seedling emergence is best when soil temperatures are 80-90°F and there is adequate soil moisture. Seed germination decreases if soil temperatures exceed 100°F. Excessively cool soil temperatures also decrease germination. The following table will give producers an idea of what constitutes a good stand.

Suggested Stands for Soybean (Number of Plants per Row Foot)

Row Spacing (Inches)[1]	Number Plants / Row Ft
30-40	5-8
20-30	4-6

10-20	2-4

[1] Source: Southern Soybean Diagnostic Guide. J. H. Palmer and J. M. Woodruff.

Fusarium Wilt

Symptoms: Fusarium wilt occurs in midseason during hot weather. The disease is rarely found in seedlings and is more common in sandy soils. Initial aboveground symptoms include a general wilting. The disease may progress rapidly with leaves becoming chlorotic (yellow) then withering. Unlike many soybean diseases, Fusarium wilt can kill plants. Fusarium wilt can be identified in the field by cutting into the stem just above the soil line to observe the condition of the vascular tissue: Fusarium wilt causes tan or brown discoloration in the vascular tissue whereas healthy tissue is white. Fusarium wilt is often exacerbated by root-knot nematode or soybean cyst nematode damage though the presence of the nematodes is not necessary for Fusarium wilt to occur. Drought can enhance disease development.

Control: In fields with a history of Fusarium wilt, crop rotation may help reduce disease pressure. If soybean cyst or root-knot nematodes are present, varieties resistant to those nematodes should be grown. Genetic resistance to Fusarium wilt has been documented, but varieties are not routinely screened and Fusarium wilt resistance information is rarely reported. If a variety is reported to have Fusarium wilt resistance, it should be grown in fields with a history of Fusarium wilt.

Stem Canker

Symptoms: Symptoms of stem canker are first evident when the soybean plant is in the early reproductive stage. Symptoms appear as small, reddish brown lesions at the base of a petiole on the lower stem. If conditions favor disease development, these lesions elongate laterally along the stem and may, or may not, girdle the stem. Generally, there is a distinct border between the lesion and healthy stem tissue. Foliar symptoms (similar to red crown rot and/or sudden death syndrome) can appear as the season progresses and are expressed as an interveinal chlorosis (yellowing) which becomes necrotic (brown with dead tissue). This disease can cause premature death of plants which significantly reduces yields.

Control: Use crop rotation, resistant varieties, and destruction (plowing under) of infected crop residue to reduce stem canker incidence and severity. Even in fields where stem canker has never occurred, resistant varieties should be grown. All Georgia recommended varieties have fair to good resistance to stem canker. Do not plant susceptible varieties (refer to the variety table in previous section). Some weeds can serve as hosts for the stem canker fungus, so when incorporating fallow into a rotation, it should be as "weed free" as possible.

Pod and Stem Blight

Symptoms: The fungal pathogen of pod and stem blight remains latent in the plant throughout most of the growing season, and symptoms are usually not evident until near harvest. There may be evidence of small black dots along the stems and pods as plants reach maturity. The dots are pycnidia (a fungal reproductive structure) of *Diaporthe phaseolorum* var. *sojae*, the causal agent of pod and stem blight. These pycnidia are more abundant during periods of wet weather.

Control: Rotate with corn and plow down residues. Plant high quality, treated seed. Plant late or during a time that allows maturation during a dry period. Plant resistant varieties if available. Do not delay harvesting. Maintain adequate potash to minimize moldy seed.

Anthracnose
Symptoms: The plant is susceptible to the fungus at all growth stages, but initial symptoms usually appear during the early reproductive stages. Symptoms are predominantly on the stems and pods in the form of brown to black blotches. As the disease progresses the lesions (blotches) contain black fruiting structures of the fungus. These structures (acervuli) produce minute spines that are easily seen with a hand lens and are very good diagnostic characteristics of this disease. Foliar symptoms are rare, but occur after prolonged periods of high humidity. They include necrosis (browning) of the laminar veins, leaf rolling, petiole cankering, and premature defoliation.

Control: Use disease-free seed and a fungicidal seed treatment. Plow under infected crop residue and rotate the field to something other than soybean.

Red Crown Rot
Symptoms: Symptoms of red crown rot usually appear during the early reproductive stage. The symptoms are expressed as an interveinal chlorosis in the foliage. Prior to harvest, a close examination of the base of the stem may reveal the presence of brick red perithecia, which are fungal fruiting structures that look like clusters of small, red balls. These structures allow the fungus to survive and spread.

Control: Red crown rot is caused by the same fungal pathogen responsible for Cylindrocladium black rot (CBR) in peanut. Therefore, DO NOT rotate soybean with peanut in fields that have problems with red crown rot. This disease is favored by moderate soil temperatures (70 to 85°F) and wet (field capacity) soil. Disease severity is often greater in heavy soils. Management practices reducing red crown rot are as follows: 1) rotate (3-5 years) with any crop except peanut (peanut is highly susceptible), and 2) delay planting. After working in fields infested with this fungus, remove soil from equipment before moving to another field.

Foliar Diseases other than Asian Soybean Rust
Foliar diseases are usually not a problem in Georgia soybean production, though several different fungal leaf diseases are common. If possible, choose a variety with resistance to Frogeye leaf spot, which is caused by the fungus *Cercospora*. Fungicide sprays are usually not economical.

Grower complaints for Frogeye leaf spot and downy mildew are common in some years. Many growers who felt they had a good soybean crop were concerned about losses that could be associated with the foliar diseases and called the Extension Service for recommendations on fungicides for the control of this disease. Our recommendations are as follows:

1. In most situations, control of Frogeye leaf spot with a fungicide will not be economically justified. Growers should focus on using a resistant variety.
2. Currently, it is not economically justified to control downy mildew with fungicides.

3. Growers who want to use a fungicide for managing the disease should use the fungicide on irrigated land and only when they expect exceptional yields, typically 45 bu/A or greater.
4. Fungicide spays should begin when the symptoms first start to appear or in the range of the R3 (1/4 inch pod) to the R5 (1/8 inch seed) growth stages.
5. If a growers waits too long to begin spraying (i.e. the diseases is rampant in the field), the fungicides will not help him.
6. In addition to many of the fungicides that are labeled (Section 3) for the control of Asian soybean rust, Topsin-M (thiophanate methyl) is labeled for control of foliar diseases such as frogeye leaf spot.

Nematodes
Take soil samples prior to harvest (typically August or September) to determine if economically damaging nematodes are present. Nematode populations decline following harvest, so do not delay sampling or you may fail to identify nematode problems. Do not sample overly dry soil and protect samples to keep them from getting too hot or dry. Several species of nematode can damage soybean, but root-knot nematodes and soybean cyst nematode are the most common problems in Georgia. In some parts of Georgia, reniform and Columbia lance nematodes are common and cause significant damage to soybean. Sting nematodes are not common and are limited to very sandy sites, but they can be extremely damaging where they occur.

For some nematode species, damage can be determined by examining soybean roots prior to harvest. Root-knot nematode damage can be identified by the presence of root galls. Root galls differ from nitrogen nodules by the fact that galls are caused by swelling of the root tissue and cannot be removed from the root, but nodules are located on the side of the root and can easily be broken off. If roots are gently washed free of soil, soybean cyst nematodes can be seen as small white specks on the roots (they are much smaller than nodules). As cysts age, they get darker and may appear golden, tan, or brown.

Root-knot nematode is the most commonly occurring nematode problem in soybean in Georgia, and three different species (Southern, Peanut and Javanese root-knot) cause damage here. Many fields in the Coastal Plain region of Georgia are infested with one or more species of these nematodes, and heavy infestations can cause severe damage and, in extreme cases, even plant death. The most common and widespread is the Southern root-knot nematode, which is found in all counties where soybean is grown. For predictive purposes, assume that root-knot nematodes detected in cotton or corn fields are southern root-knot. Peanut root-knot is common in areas with significant peanut production. Javanese root-knot is found less commonly in some areas of south Georgia. Many soybean varieties have genetic resistance to one or more of these root-knot species. The level of resistance to these three species is given in variety recommendations. It is critical to select varieties with resistance to the root-knot species present in your field. Anyone using the early soybean production system should be aware that few varieties in early maturity groups have root-knot nematode resistance. An example of a soybean variety with resistance to the southern root-knot nematode is ‘Prichard RR’.

Soybean cyst nematode is present in almost all counties where soybean is grown in Georgia. In the midwestern US, soybean cyst can cause significant yield losses with no above-ground symptoms. It seems unlikely here, but Georgia soils typically have much lower fertility and organic matter; however, it may be possible. Sixteen different races of soybean cyst nematode are theoretically possible, but there are only three races of significance currently widespread in Georgia. Race 3 is the most widespread race of soybean cyst nematode in Georgia. Much less commonly, race 9 or 14 is identified. In Georgia, populations often shift readily between races 9 and 14. University of Georgia variety recommendations include a rating of the level of resistance to the species of root-knot and the races of soybean cyst nematode common in Georgia.

In older literature, different soybean cyst nematode race designations were used. The races we now call 9 and 14 previously were lumped together in race 4. This will ONLY be relevant if you are reading reports published prior to 1988. **In all current literature, the new race designations are used**.

While many varieties do have resistance to the races of cyst found in Georgia, continuous planting of resistant varieties in the same field year after year is not the best way to control cyst nematodes because it can lead to the emergence of new races. Since soybean is the only agronomic crop that is a host of this nematode, a combination of resistant varieties and crop rotation is highly effective in managing soybean cyst nematode. The use of different varieties and non-host crops in a three or four-year rotation is the most effective approach to control. The best is a four-year rotation as follows:

YEAR 1 - Non-host crop (corn, peanuts, cotton, etc.)
YEAR 2 - Soybean cyst nematode resistant variety
YEAR 3 - Non-host crop
YEAR 4 - Soybean cyst nematode susceptible variety
YEAR 5 - Repeat 4 year program

A somewhat less effective program with a shorter rotation is as follows.

YEAR 1 - Non-host crop
YEAR 2 - Soybean cyst nematode resistant variety
YEAR 3 - Soybean cyst nematode susceptible variety
YEAR 4 - Repeat 3 year program

Even if you do not have a soybean cyst nematode infestation, rotation with crops other than soybean is extremely helpful in reducing losses from other diseases.

Columbia lance, reniform, and sting nematodes cause economic damage in some counties. Nematicides can provide good control, but they are expensive. Rotation with peanut is an excellent control for these nematodes, but peanuts are susceptible to many of the same soilborne fungal disease problems.

The reniform nematode is a growing problem in Georgia and can cause significant yield loss in soybean and cotton. Corn and peanut are non-hosts for the reniform nematode. Most soybean varieties are very susceptible to the reniform nematode, but some soybean varieties have extremely effective reniform nematode resistance and others have moderate resistance. If reniform nematodes are present, a highly resistant variety should be chosen to minimize soybean losses and to reduce reniform levels in the field. A highly resistant soybean variety can reduce reniform populations as effectively as a non-host crop such as corn. An example of soybean varieties with reported resistance to reniform nematodes include ‘Santee’, ‘Motte’, ‘DP 5806 RR’, ‘DP 5644 RR’, and ‘Delsoy 5710'. Reniform nematodes are not believed to have races, but a population may be able to overcome reniform resistance in soybean if resistant soybeans are grown for several consecutive years. Crop rotation can be used to minimize this possibility.

Both fumigant and non-fumigant nematicides are registered for use on soybeans and either type can provide effective nematode control. Resistant varieties are available for root-knot, soybean cyst, and reniform nematodes, and those varieties should be grown if these nematodes are present. Nematicides may be necessary if sting or Columbia lance nematodes are present, though it is probably better economically to avoid such fields. Root-knot resistant soybean still suffers some yield loss in heavily infested fields, and research shows that yields of root-knot resistant varieties may be increased by nematicides.

Historically, nematicides have not been economically feasible in most situations, but they may be an option in high profit potential situations such as production of foundation or certified seed. Given better prices for soybeans in the recent past, more growers may consider use of nematicides to manage nematodes and to increase yields. Nematicides are not recommended as a general soybean production practice unless production potential is excellent and the price for soybeans makes this added expense worthwhile.

SOYBEAN NEMATODE CONTROL

Chemical and Formulation	Rate/Acre (36" Row Basis) Amount of Formulation	Rate/Acre (36" Row Basis) Pounds Active Ingredient	Ounces/1000 Feet of Row Any Row Spacing	Remarks and Precautions
Preplant Injected				
Telone II	3 to 5 gals		30 to 50 fl ozs	Inject 8 inches deep beneath future row. Wait seven days between application and planting when using Telone II.
Preplant or At Planting				
Temik 15G	5 to 20 lbs	1.5 to 3	12 to 18 ozs	Apply in-furrow at planting.