Virginia Tech
VIRGINIA POLYTECHNIC INSTITUTE
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**Tidewater Agricultural Research and Extension Center**

College of Agriculture and Life Sciences
6321 Holland Road, Suffolk, Virginia 23437
(757) 657-6450 ext. 123 Fax: (757) 657-9333
www.vaes.vt.edu/tidewater/soybean

# Virginia Soybean Update

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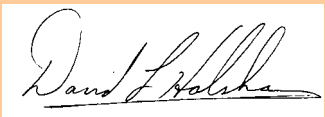
Dear Reader,

Asian soybean rust (ASR) just doesn't do well under hot or dry conditions, and will nearly disappear if both conditions are present. That's what happened this year in the southeast. But, with recent rains, the disease is reemerging. At the present, ASR has only been found on soybean in seven different counties in four states. A total of 27 counties have reported ASR, but the other findings were in kudzu. .

In Virginia, we continue to scout 40 commercial fields and 10 sentinel plots on a weekly basis. We have found no ASR and just a couple of aphids. Our weather conditions have been conducive for soybean rust and we did find some look-alike rust spores in our spore traps in Suffolk and Orange. But, the extreme heat that we've had would likely inhibit development, even if ASR spores did blow in. So, it looks as if most of our full-season crop will avoid the disease. Still, things could change rapidly.

This month, I've devoted this issue to troubleshooting. Many problems tend to show their face in August. There usually isn't much we can do about it this year. But, now is the time to make plans to correct the problem in the future.



**Extension Soybean Specialist**

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## Troubleshooting the Soybean Crop

Many problems with the soybean crop will reveal themselves in August. Actions taken or not taken will sometimes stick out like a sore thumb. Unexpected problems arise, fertility deficiencies become evident, pests move in, etc. Therefore a review of field diagnostics is in order.

You can sometimes diagnose problems via a review of the field history, practices implemented this year, or by plant symptoms. In other cases, soil and/or plant samples may need to be sent to a laboratory for analysis. Diagnosing field problems can be a challenge. Visual aids can be of great value. Probably most important are the questions asked. Signs and symptoms don't always follow the textbook. Patterns don't always exist. But, by following some general guidelines, one can be quite successful at diagnosing problems. Below are some guidelines that I use.

Preliminary Fact Finding. Obtain information on each of the following:

- *Cropping History (for at least the two previous growing seasons).* What crops were planted? What is the typical rotation? Is this the first year that soybeans were grown in this field? Tillage used? Fertilizer, lime, and chemical applications? Any past problems with this or other crops in this field?
- *Soil Information.* Find out soil texture and classification. A soil map would be handy. Soil test results (Soil pH and levels for P, K, Ca, and Mg) are valuable. Plant tissue test results (major plus most secondary and minor nutrients) may be needed. What were the fertilizer and liming practices (time, rate, and method of application) for this season?
- *Weather.* Rainfall amounts, temperature, relative humidity during growing season are valuable. If chemical injury is suspected, then identify rainfall patterns (amounts, dates, light vs. heavy, etc.) and temperatures of soil and air before, during, and after application. What was wind speed and prevailing direction during and after the chemical application?
- *Pest Management Information.* This includes all herbicide, insecticide, fungicide applications and rates for this and the previous crop(s). Other valuable information includes past soil nematode assay results (species and population levels) and major weed or insect problems.
- *Tillage and Other Cultural Practices.* What were the planting procedures and equipment used? What was the soybean variety? Is the seed tag available? Was the seed saved from last year? What was the germination?

Continued on p. 2.

**Diagnosing Soybean Problems (cont')**

The Field Visit. After obtaining as much information as possible before going to the field, follow the general guidelines listed below:

- *Materials and Equipment Needed.*
  - * Notebook, paper, pencil, complaint or diagnostic forms
  - * Mobile phone
  - * Camera and accessories. Digital cameras are best because images can be quickly emailed to specialists.
  - * Shovel or spade, pocket knife, trowel, other digging tools
  - * Soil probe, plastic mixing pail, soil sample boxes or bags
  - * Plastic bags for plant samples that need preserving, paper bags for plant nutrient analysis samples
  - * Reference books, product labels, other visual aids
  - * Penetrometer or other soil compaction measurement device (soil probe, pocket knife, metal surveying flag
  - * Pocket ruler, yard stick
  - * Magnifying glass, hand lens
- *Windshield / Whole Field Investigation.* Before looking at plants in the field, try to get a feel for the problem over the entire field. Are there any patterns or trends to the injury? Check neighbor's fields or other soybean fields on the farm.
- *Above-Ground Inspection.* Identify the soybean growth stage. Know the types of problems that can be experienced at this stage. Did the problem occur in the past or is it ongoing? All affected plant parts should be identified and noted. Compare symptoms with those found in a trouble-shooting guide. Note the occurrence of, identification, and growth of weeds present.
- *Below-Ground Inspection.* Check the soil texture, condition, moisture, hardness, etc. Inspect the root system. Dig; never pull the plant to inspect the roots. Pulling will dislodge roots and nodules. Is plant well nodulated? Are roots malformed or injured? Check for compaction.
- *Take the Appropriate Plant or Soil Samples.* In many if not most cases, you will not be able to fully diagnose the problem. Take plant and soil samples from the affected and unaffected area. Follow directions on diagnostic forms (see below). Remember, if taking a plant sample, dig up the plant (never just pull the plant from the soil). If you can hand deliver the sample, include the soil around the roots.
- *Documentation.* Record information in writing. This doesn't have to be written up as you are diagnosing the problem, but document the evidence before leaving the site. Use a prepared form (University, industry, or self-developed). Fill it out completely. This may be the only opportunity to gather the evidence, so get all of it on paper.
- *Equipment Check.* If you suspect that the problem may be related to a piece of equipment such as a planter or sprayer, then it would be wise to look at it. Check the general mechanical condition, settings, and spacing.
- *Interaction with the Producer (for agents, consultants, crop advisor, company representatives, etc.)* Be courteous and respectful. Approach the situation as a service opportunity to solve a problem. Be positive, but careful in your assessment. Know when you are over your head. Get help when you need it. "I don't know" is response that can gain respect.

Analysis of Data.

- *Patterns.* Look at any patterns that may be present (i.e., streaks, patterns of emergence, tire tracks, cultivation depth, planting depths, soil types, etc.)
- *Look-Alike Symptoms.* Many symptoms of nutrient deficiency, nematode damage, and herbicide injury look alike. One may be able to infer from field history information what the symptom can be attributed to. But, in many cases, further laboratory analysis will be needed.
- *Interacting Factors / More Than One Problem.* In most cases, the problem cannot be attributed to a single factor. Herbicide activity closely follows weather conditions. Nematodes can be more or less severe depending on the weather, soil fertility, or cultural practices. The general soil condition (organic matter, structure, etc.) will affect many other things. Compacted soils will enhance any other problem. Certain soybean varieties are sensitive to particular chemicals or combinations of chemicals.

Drawing a Conclusion. Review the facts and data. Evaluate the data regarding what is normal and abnormal. Eliminate unlikely causes. Validate the likely causes (for instance, streaks in the field are related to spraying, tillage, or planting equipment). Remember, a conclusion may not be able to be drawn in the field, especially if laboratory analysis is needed to confirm your suspicions. However, be prompt with you diagnosis. Solve the problem as soon as possible, so remedial actions can be taken.

Follow Up. If the problem was identified, did corrective actions resolve the problem? Re-visit the field. Gather and read any relevant information such as Extension publications, labels, journal reprints, etc. Forward relevant material to the producer or others involved.

On the following pages are a diagnostic outline for vegetative and reproductive-stage soybean. Although I do not include photos in this newsletter, I would suggest that you obtain a good pictorial companion to be used in conjunction with my outline.

# Vegetative Soybean Diagnostic Outline

The guide below offers some possible causes of the injury symptoms described. However, one should not assume that the causes listed are the one that is being experiences unless clear proof is available via pest identification or laboratory analysis.

## Vegetative Stages (V5-R1)

**Plants are wilted or dead**

- PLANT BROKEN OFF AT GROUND LEVEL
  - Three-cornered alfalfa leaf hopper
  - Surface applied dinitroaniline herbicide (i.e., Prowl)
  - Lesser cornstalk borer
- DISCOLORED OR WILTED LEAVES
  - Silver to light brown areas along the major veins or over the whole leaf - thrips
  - Yellowing followed by browning and necrosis of leaf margins - triazine herbicide (atrazine, Princep, Bladex, Sencor)
  - Leaves are yellow, may wilt; some plant death
    - Phytopthora rot
    - Nematodes
    - Lesser cornstalk borer
    - Grubs, wireworms, other soil larvae
  - Leaves wilted, dead, or dropped
    - Lesser cornstalk borer
    - Grubs, wireworms, or other soil larvae
    - Lightning
  - Leaves yellow speckled; plant stunted; webbing and/or mites present on underside of leaflets - Spider mites
- STEMS DISCOLORED OR SHOWING FRUITING STRUCTURES
  - Discolored stem, reddish fruiting bodies present - Red crown rot (Cylindrocladium black rot)
  - Lower stem discolored
    - Phytopthora rot
    - *Rhizoctonia solani*
    - *Fusarium spp.*

**Plants have damage to leaves or stems**

- LEAVES
  - Leaves are torn: hail
  - Show signs of insect feeding
    - Circular holes: bean leaf beetle
    - Irregular holes: green cloverworm, Mexican bean beetle, grasshoppers, other defoliators
  - Show signs of animal feeding (tops of plants are missing; two stems arising from an older single stem)
    - deer, groundhogs
- STEMS
  - Stem girdled or dark ring at soil line with possible adventitious root development
    - Three-cornered alfalfa hopper
    - Surface-applied dinitroaniline herbicides
    - Hail
  - Stem fed on at or below soil line
    - Cutworms
    - Wireworms
    - Lesser cornstalk borer
  - Stem tunneled into at or below soil line - Lesser cornstalk borer
  - Stem snaps off at base when plant is bent or blown over
    - Three-cornered alfalfa hopper
    - Lesser cornstalk borer
    - Surface-applied dinitroaniline herbicide
    - Hail
  - Small sand-covered tube attached to stem at soil line - Lesser cornstalk borer

**Plants have spots, discoloration of leaves and/or abnormal stem growth; roots may also show stunted or abnormal growth**

- LEAVES SHOWING SPOTS, STREAKS, MOTTLING, OR NECROTIC AREAS
  - Dead spots with pustules (raised areas) on underside of leaf, usually on upper leaves – bacterial pustule
  - Leaf spots with light-colored centers and dark margins – frogeye leaf spot
  - Brown spots and/or yellowing on lower leaves – brown spot
  - Brown spots on upper leaf surface & gray tufts of fungal growth on underside of leaves – downy mildew
  - Angular reddish brown to black spots, usually with yellow halos, on mid to upper leaves – bacterial blight
  - Leaves are speckled or burned; new growth is not affected
    - Membrane-disrupting herbicides
    - Sunburn
    - Air pollution / ozone
- LEAVES YELLOWING
  - Yellowing along leaf margins, followed by browning and necrosis
    - Potassium deficiency
    - Triazine herbicides
  - Narrow yellowing along leaf margins and leaf cupping
    - potato leafhopper (symptoms are more pronounced with varieties with little leaf pubescence)
    - glyphosate herbicide (on RR soybeans)
  - Interveinal yellowing of young leaves
    - Manganese deficiency
    - Sulfonylurea herbicides
    - Brown stem rot
    - Sudden death syndrome
  - Yellowing of old and young leaves
    - Nitrogen deficiency
    - Sulfur deficiency
    - Molybdenum deficiency
    - $O_2$ deficiency (waterlogged soils)
    - Zinc deficiency
    - Nematodes
    - Magnesium deficiency (interveinal)

- Scorching of leaves along margins
  - Chlorine toxicity
  - Boron toxicity

- LEAVES CRINKLED OR DISFIGURED
  - Leaves crinkled or disfigured, but not stunted – various viruses, including soybean mosaic, bean pod mottle, & peanut mottle virus
  - Leaves crinkled and/or distorted with possible stunting
    - phenoxy herbicides (i.e., 2,4-D, etc.)
    - glyphosate herbicide
    - Manganese or boron toxicity
  - Leaves cupped up
    - benzoic acid herbicides (i.e., Banvel, Clarity)
    - Potato leafhopper
    - Glyphosate herbicide (on RR soybeans)

- STUNTED OR ABNORMAL ROOTS
  - Little or no nodule development
    - Nitrogen deficiency
    - Greater than 25-30 lbs of nitrogen applied pre-plant to soil
    - Nematodes
    - Low soil pH
    - Molybdenum deficiency
    - Soil compaction
  - Little or no secondary root development - nematodes
  - Secondary or lateral roots swollen – dinitroaniline herbicides (i.e., Treflan, Prowl)
  - Proliferation of secondary roots
    - Root-knot nematodes
    - Phenoxy herbicides (2,4-D, etc.)
  - Root galls formed – root-knot nematode
  - Small, yellow, lemon-shaped cysts present – soybean cyst nematode
  - Secondary roots show bottle-brush appearance
    - Imidazolinone herbicide (i.e., Scepter, Pursuit, Cadre, Lightning)
    - Root-knot nematodes
  - Irregular or L-shaped roots - compaction
  - Evidence of insect feeding – wireworms, white grub

# Reproductive-Stage Soybean Diagnostic Outline

### Pods are damaged or lost

- Pods are showing evidence of insect damage.
  - Pods with evidence of feeding into seed cavity
    - Corn earworm
    - Grasshoppers
  - Pods with superficial feeding, rarely reaching the seed cavity
    - Bean leaf beetle
    - Velvetbean caterpillar
    - Mexican bean beetle
- Pods are stunted, shriveled, or discolored
  - Fruiting bodies present on the pod
    - Pod and stem blight
    - Anthracnose
  - Pods are not cut off, but have fallen from the plant
    - Drought
    - Boron deficiency
  - Pods are shriveled with one or more aborted seed
    - Stink bug
    - Pod and stem blight
    - Anthracnose
  - Pods are abnormal, distorted, small, are missing one or more seed. Seed may seem to be vacuum-sealed inside of pod.
    - Bud blight virus
    - Phenoxy (2,4-D, etc.) or benzoic acid (i.e., Banvel, Clarity) herbicide

### Leaves and/or stems are physically damaged

- Leaves skeletonized or lacy in appearance
  - Mexican bean beetle
  - Japanese beetle
- Holes eaten in leaves
  - Bean leaf beetle (circular holes)
  - Green cloverworm
  - Soybean looper
- Leaves showing yellow mottling. Leaves may appear scorched
  - Spider mites
- Leaf tips and upper margins yellow. Leaves may be cupped upward
  - Potato leafhopper (more pronounced on varieties with little leaf pubescence)

### Leaves and/or stems discolored and/or stunted

- Interveinal yellowing of young leaves
  - Manganese deficiency
- Upper leaves have interveinal chlorosis and neucrosis
  - Red crown rot (Cylindrocladium black rot)
  - Stem canker
  - Brown stem rot
  - Phytopthora rot
  - Sudden death syndrome
- Stems blighted with fruiting bodies present
  - Pod and stem blight
  - Antracnose
  - Red crown rot (Cylindrocladium black rot)
  - Southern blight
- Cankers from the lower to mid section of the main stem, mostly near the axils of branches
  - Stem canker
- Leaves showing spots or necrotic areas
  - Dead spots with pustules (raised areas) on underside of leaf, usually on upper leaves – bacterial pustule
  - Leaf spots with light-colored centers and dark margins – frogeye leaf spot
  - Brown spots and/or yellowing on lower leaves – brown spot
  - Brown spots on upper leaf surface & gray tufts of fungal growth on underside of leaves – downy mildew

  - Angular reddish brown to black spots, usually with yellow halos, on mid to upper leaves – bacterial blight
  - Yellow spots with no tufts of fungal growth on underside of leaves, changing to small gray to tan lesions beginning on the oldest main-stem leaves. Older lesions will contain small pustules (raised "volcanoes") with masses of tan spores – Asian Soybean Rust
- Leaves are speckled or burned; new growth is not affected
  - Membrane-disrupting herbicides
  - Sunburn
  - Air pollution / ozone
- Premature leaf yellowing with a gray discoloration under the bark on the roots and stem just above the soil line
  - Charcoal rot

**Plants stunted with possible abnormal growth**

- Leaves crinkled, mottled, distorted, or appearing to be blistered - virus
- Leaves yellow; roots contain galls, cysts, root proliferation, or stubbiness - nematodes

**Plants in spots of the field remaining green past maturity of the rest of the field**

- Few pods are present, but plant is otherwise healthy and green
  - Stink bugs
- Few pods are present; most are 1-bean pods appearing in clusters; leaves may be crinkled
  - Bud blight virus
  - Other viruses
  - Phenoxy (2,4-D, etc.) or benzoic acid (Banvel, Clarity) herbicide injury
- Normal pods with mature color, but stems and petioles remain green after maturity
  - "Green-stem condition"
  - Excess foliage for the number of pods present due to drought during pod formation, stinkbugs, and/or virus

**Plants are wilted or dead**

- Plants are dead; not evidence of disease or nematode damage
  - Plants are broken off at ground level; callus tissue and adventitious roots present
    - Three-cornered alfalfa hopper
    - Lesser cornstalk borer
    - Surface-applied dinitroanaline (Prowl) herbicide
    - Hail damage
  - Scorched-looking, dead areas in the field
    - Spider mites
  - Circular pattern of dead plants
    - lightning
- Plants are dead and showing evidence of disease or nematodes on stems or roots
  - White fungal growth and mustard see-like structures on the lower stem
    - Southern blight
  - Charcoal-appearing discoloration on the roots that generally extends to just above the soil line. Reddish-brown stains in the wood along with black streaks.
    - Charcoal rot
  - Discolored stem with reddish fruiting structures present
    - Red crown rot (Cylindrocladium black rot)
  - Discolored stem without fruiting structures, but with cankers present near stem nodes
    - Stem canker
  - Roots with galls, cysts, root proliferation, or stubbiness
    - Soybean cyst nematode
    - Root-knot nematode
    - Sting nematode

## The 2006 Virginia Ag Expo is August 10, 2006.

This year the Virginia Ag Expo will be held at Brandy Station in Culpeper County. The location is Beauregard Farms managed by our host, James Bowen. The theme is very appropriate for today's agriculture, "Growing Food, Fuel and Forage". The Ag Expo is the largest field day event held annually in the Commonwealth of Virginia and is an educational, marketing and social event that farmers look forward to every year.

Companies with agribusiness interest will be exhibiting their products, services and equipment. There will be a field tour of corn and soybean exhibit plots along with exhibit plots of corn weed control, soybean seeding rates and biosolids applications. Culpeper Soil and Water District along with VA DCR will sponsor a no till corn plot, to promote the new no till and cover crop BMP. Virginia Cooperative Extension will have a booth for livestock producers to sign up for the PREMISE REGISTRATION, the national livestock identification program. A bale wrapping demo is also planned.

A traditional Bar-B-Que lunch will be served with all the trimmings and beverages. Lunch tickets are $8.00 in advance with a limited number available on the day of the Ag Expo for $10.00. Look for registration information in the mail coming soon or contact your local Virginia Cooperative Extension Office.

The Virginia Ag Expo is a joint project of the Virginia Corn Growers Association, the Virginia Soybean Association and the Virginia Cooperative Extension Service.