Tidewater Agricultural Research & Extension Center
Virginia Agricultural Experiment Station

Virginia Soybean Update

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Index

- Drought and Management Strategies for Soybean
- Soybean Thrips Showing up Again in 1999
- Plant Tissue Testing
- Upcoming Events and Field Days

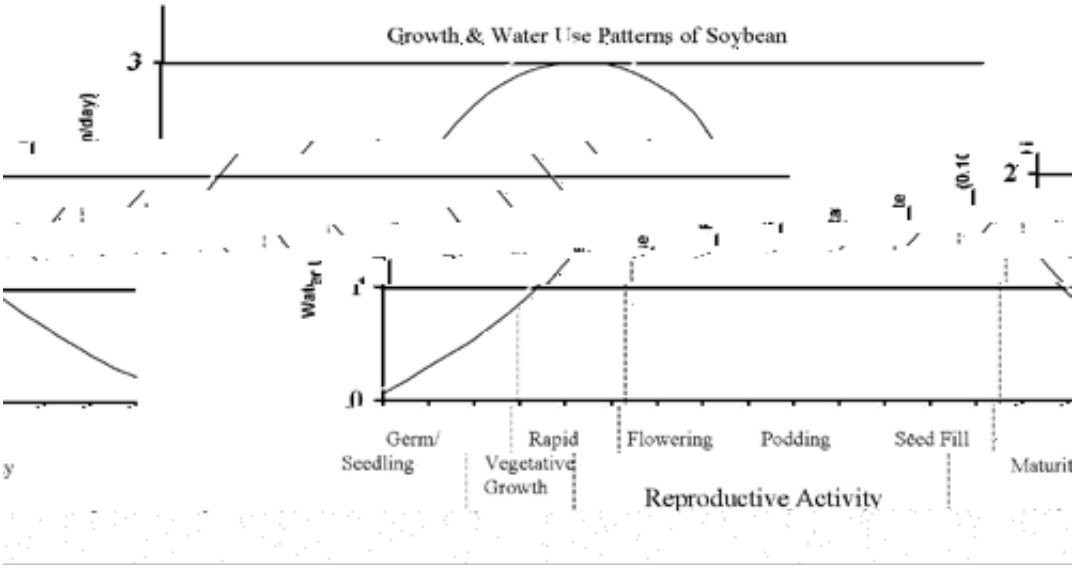
Drought and Management Strategies for Soybean

Lack of soil moisture is the single most important factor affecting soybean yields in Virginia. With the exception of the southeastern and Eastern Shore portion of the state, soil moisture reserves may be low following our small grain crop. Therefore, we may be completely dependent on in-season rainfall for good yields. There are little soil moisture reserves and drought may be of greater likelihood in 1999 due to this. Below is a review of the critical stages in which soil moisture is most critical for yield and management strategies to overcome a drought-stressed crop.

The two periods that soil moisture is critical for soybean are 1) germination and emergence, and 2) bloom through seed fill. The time from stand establishment through bloom is less important. Although I have stressed the need for the soybean crop to develop adequate leaf area index (LAI), I have seen 40+ bu/A double-crop soybean yields when LAI was low (<3.0 sq. feet of leaves per sq. foot of ground area) if rains came at the right time. On the other hand, I believe these 40 bu/A yields could have been increased to 60 bu/a with adequate canopy development (LAI >4.0). Therefore, irrigation (if available) to double-crop soybean during the vegetative stages during drought conditions can be justified. On the following page is the estimated crop water use for soybean with respect to development stage. As one can decipher from this chart, the soybean crop will use between 1 to 2 inches of water per week during the reproductive stages. I have heard time and time again that the crop needs 1 inch of rainfall per week to make maximum potential yields. This can be true in an "average" year since we generally have to soil moisture reserves to make up any deficit when the crop is using 1.5 to 2.0 inches per week. However, in 1999, we may not have those reserves.

Management Strategies: Many of the management strategies listed below are not necessarily applicable at this

time of the year but can serve as a reference for future use. Others can be implemented after stand establishment.



Soil Fertility. Drought stress will show up first in fields in which nutrients are low and pH is not optimal. A pH of less than 5.5 will show drought stress early due to the high concentration of aluminum, which is toxic to the plant. Low pH results in poor root growth that further restricts exploration to stored soil moisture. On the other hand, high pH (>6.5) will also show stress early largely due to micronutrient deficiencies, mainly manganese (Mn). The micronutrient deficiency basically is an additive effect to the drought stress. Low levels of other nutrients will also restrict growth.

Tillage/Planting. Tillage during the spring and summer months can increase compaction and soil moisture loss. Soil surface residues will help reduce evaporation. No-tillage should be the rule during drought periods in order to conserve soil moisture. I recommend only planting into moist seedbeds to insure emergence and prevent the seed from "baking" in the hot, dry soils; therefore wait for rain before planting. With this said, do not no-till into soils that are too wet or sidewall compaction may occur. Sidewall compaction takes place when the disk openers smear the soil around the seed and the closing wheel(s) further compact the soil around the seed zone. This generally happens only when the soil is too wet. No-till land can be driven on before conventional tillage land, but that doesn't mean that the soil is ready to plant. A general rule of thumb is to wait 1/2 to 1 day after the time you believe you can no-till the field. Deep tillage with a minimum-tillage subsoiler (Paratill, DMI Ecolotill, Worksaver Terra-Max, others) may be necessary on soils with a tillage or naturally forming hardpan. Be sure you have a pan before subsoiling however.

Variety Selection. Planting soybean varieties of two or three different maturity groups (MG) can spread the risk of drought. The most critical stages of a MG V variety will be approximately 5 to 10 days later than a MG IV variety. By planting both, one may spread the critical period of development over a longer period.

Row Spacing/Plant Population. Narrow row spacing will tolerate drought better due to more rapid canopy formation, preventing evaporation losses, and a more uniform removal of soil moisture. Plant population has less

of an effect. It is true that higher populations will deplete soil moisture faster, but the soybean crop will compensate by adjusting its pod load per plant to an optimal level. For double-crop soybean, a final plant population of 180,000 to 220,000 plants per acre is needed for maximum potential yields. Begin with 180,000 plants/A in mid-June and increase to 220,000 plants/A by July.

Pest Management. Weed competition can be most severe in times of drought. Do not let weeds utilize limited soil moisture. Apply herbicides before weeds reach the maximum-labeled stage for control. Use adequate rates to get complete control. Be aware that postemergence herbicides will not work as well during times of drought; therefore, do not cut rates. Preemergence herbicides need rain for activation. In no-till fields, apply a non-selective herbicide immediately after planting to kill existing weeds. If drought conditions make stand establishment uncertain, a postemergence program may be the most risk-free.

Insect and nematode problems will enhance drought effects. Drought stress will likely show up early in nematode infested fields. Defoliating insects generally have less effect on soybean in the vegetative stages, but can be rather destructive in the reproductive stages. Spider mites, thrips, and leafhoppers may be more problematic in drought-stressed soybean.

As stated several times above, drought stress can be used as an excellent diagnostic tool for nematodes, soil compaction, low pH, and pest management strategies. Take advantage of this opportunity to correct future problems. Another site for additional soybean drought stress information can be found at the North Carolina State Web Site listed below: http://www.ces.ncsu.edu/disaster/drought/dro-24.html.

Return to Index

Soybean Thrips Showing up Again in 1999
D. Ames Herbert, Jr., Extension Entomologist

Soybeans are being attacked by thrips in many fields. Thrips are very small, slender insects that are not easily seen. Immatures are usually yellow and adults are black, banded black and white,or straw colored, depending on the species. They are commonly found on many weeds and flowers. They feed by rasping off the outer layer of leaves and sucking out the juices. Thrips populations have been especially large this year, in part because of the dry weather. Populations build up on many weed and grain crop hosts in the spring and move to new hosts, such as soybean, peanut and cotton seedlings, as old hosts dry down. When conditions are dry, weed and grain hosts dry down quickly which drives adults in large numbers to new hosts. Adults fly into fields, feed, mate, and lay eggs that hatch into larvae. This large larval population does the most damage to seedlings. Several species can be involved, but all do about the same amount of damage. This early season damage is normally not a problem, however, during dry weather when populations are high, thrips damage, along with drought effects, can severely stunt plant growth or occasionally kill plants.

On seedling plants thrips may be found on the upper and lower leaf surfaces as well as in unfolded leaves. Thrips problems are always accompanied by crinkled, deformed leaves which often have a silvery appearance. If populations are high and damage is severe, leaf drop is common.

Scouting Procedure -- Sample only if damage is readily noticeable. At each sample site randomly pick 10 leaves (a leaf consists of 3 leaflets) and examine them for thrips damage (substantial silvery scaring and/or deformed leaves). Record the number of leaves damaged. Sample a minimum of three sites (small fields) or maximum of 10 sites (large fields). After sampling the field calculate the percentage of leaves damaged. If the

plants are stressed for any reason (e.g. chemical injury or drought) take special notice of thrips activity since thrips damage and other plant stress factors are additive. Thrips numbers can be checked by careful leaf examination or by picking leaves and slapping them over a horizontally held white card.

Action Threshold -- Thrips rarely require treatment; however, early season injury to drought-stressed plants may occasionally reduce yields. Treatment can be considered if 75% of the leaflets are damaged, the plants are under stress, and numerous thrips are present (more than 8 per leaflet). **All three conditions should be met before treatment is applied.** If the plants are growing vigorously, it is likely they will outgrow the damage. Most states refer to data indicating no effects on yield unless thrips damage is combined with drought stress.

Last year the cool, dry weather early in the season and continued drought stress did allow for some possible yield losses and maturity delays. This year conditions are quite different. Moisture is adequate and temperatures are warming so we should not expect problems even though some thrips are present in fields.

Return to Index

Plant Tissue Testing

Diagnosis of nutrient deficiencies can be aided by the use of plant tissue analysis. Samples taken prior to or at initial flowering from good and bad portions of the field in conjunction with soil test results from each area can provide more information and permit accurate nutrient diagnosis. Approximately 25 soybean leaves (trifoliate leaf sets composed of 3 leaflets with petiole removed) per field should be taken and air-dried for shipment to a private laboratory offering plant tissue analysis services. For samples collected at initial bloom, adequate nutritional status is usually indicated when leaf concentrations are within the following sufficiency ranges:

	N	P	K	Ca	Mg	S	Mn	Fe	B	Cu	Zn
	%						ppm				
Low	4.25	0.30	1.75	0.50	0.25	0.20	20	50	25	6	20
High	5.00	0.50	2.50	1.50	0.80	0.60	200	300	60	30	50

Return to Index

Upcoming Events and Field Days

North Carolina Precision Farming Field Day	Vernon James Research & Extension Center Plymouth, NC	July 15-16
Agroecology Field Day	Pee Dee Research & Extension Center Florence, SC	July 15
Global Soy Forum '99, includes: World Soybean Research Conference Midwest Soybean Conference	Chicago, IL	August 4-7
1999 Virginia Ag Expo	Rapidan River Plantation Orange County, VA	August 12
Tidewater Agricultural Research & Extension		

Center Annual Field Day	TAREC Research Farm Suffolk, VA	August 26
Virginia Corn & Soybean Conference	Williamsburg, VA	Jan. 31 -- Feb. 2
Southern Soybean Conference	Memphis, TN	Feb. 6-8

Return to Index

Return to David Holshouser