Number 236
March 19, 2010

1. Velvetleaf: Growth habits and characteristics ______ 1
2. Velvetleaf control in corn, grain sorghum, and soybeans ______ 4
3. Soybean planting date/variety maturity research in south central Kansas ______ 5
4. Expected increase in efficiency using an RTK guidance system over a WAAS system ______ 7

1. Velvetleaf: Growth habits and characteristics

Velvetleaf (*Abutilon theophrasti* Medik.), sometimes called elephant ear or buttonweed, is a member of the mallow family, the same family as cotton. It is one of the most common summer annual broadleaf weeds in row crops in the eastern half of Kansas, and is also becoming more common in the western half of the state. It is classified as a large-seeded broadleaf weed.

It is a tall plant, that reaches 3 to 8 feet tall or more, easily growing above the canopy of soybeans and cotton, and sometimes taller than sorghum and corn. It has a sturdy main stem, which is covered in soft hairs. Plants are only sparingly branched. The leaves are velvety and soft, covered with short, fine hairs.

The large heart-shaped leaves are usually 2 to 6 inches long and wide, but they can be as large as 10 to 12 inches across. Each leaf is pointed at the tip. The leaves are hairy on both the upper and lower surfaces. A slender petiole supports each leaf. The flowers are yellow to yellow-orange. The cup shaped seed pod is 1 inch in diameter, and it is composed of 5 to 15 hairy beaked carpels arranged in a disc.

Velvetleaf seedling. Photos by Dallas Peterson, K-State Research and Extension.

Velvetleaf in grain sorghum.

Velvetleaf is an annual, and reproduces by seeds that germinate throughout the growing season. It grows quickly during the hot summer months. The seedling develops a tap root immediately after emergence, and lateral roots develop 1 or 2 days later. The fastest growth occurs 6 to 8 weeks after seedling emergence. Flowers and seeds are produced from July through October, depending on the area. As a late-flowering summer annual, velvetleaf grows well when partially shaded, and can produce seed and infest a corn field while growing under the dense canopy. Velvetleaf is not frost tolerant, and dies with the first hard frost.

Mature seed is present about 3 weeks after flowering. The seed capsule has 13 to 16 carpels, each containing 2 to 3 seeds. A velvetleaf growing full season in a soybean field produces 30 to 50 capsules; a plant without competition produces two to four times more. Velvetleaf seeds exhibit considerable dormancy which can enable them to survive over 50 years in the soil. Scarification of the hard seed coat by microbial action, soil action, or tillage permits water entry and germination. Maximum germination occurs in the top 2 to 3 inches of soil, but ceases below 6 inches.

If seed germinates on the soil surface, it dies. Therefore, leaving seed lying on the soil surface reduces survival. Velvetleaf becomes less of a problem in no-till systems because of this. Velvetleaf dormancy is greater deeper in the soil profile and can remain viable for 40 years. Seeds can remain viable after passing through the digestive tracts of animals. Seeds will ripen on the plant after the plant is pulled so it is important to remove a pulled plant from the field.

The root growth rate of velvetleaf exceeds that of redroot pigweed, green foxtail, and several other weeds. Although soybeans and corn will outgrow velvetleaf initially, velvetleaf will catch up and often exceed the height of these crops by mid-season. Because velvetleaf produces sugars at a relatively efficient rate in low sunlight, it grows well even when partially shaded. This attribute enables late emergers to produce seed under a crop canopy.

At a density of one plant per foot of row, velvetleaf will reduce soybean yields by 10 to 30 percent over a full season. Losses are probably similar in other crops. Removing velvetleaf by the fourth week after emergence normally prevents crop competition losses. In a Kansas study velvetleaf that emerged more than 20 days after soybeans did not affect crop yield. Such weeds, however, do produce seeds and can interfere with harvest. Problems with velvetleaf arise from its seed dormancy, robust seedling vigor, variable emergence time, and its ability to produce seed under competition.

Velvetleaf grows the best in rich soils of cattle yards and feed lots. Along with growing in croplands throughout most of the U.S., it is common in waste areas, roadsides, vacant lots, fence rows and around farmsteads where it is found in barnyards, cultivated fields and gardens. Seeds are eaten by mourning doves and quail.

Velvetleaf is native to China, and introduced to the U.S. from India sometime before 1700. Early U.S. colonists cultivated velvetleaf fiber for needed rope and cloth. Velvetleaf was probably introduced to the U.S. before 1700, as it was widespread on the east coast in the early-1700's. The economic gains did not materialize, but farmers continued to cultivate it for 100 years. Velvetleaf is spreading, worldwide. This species is common in the Mediterranean countries, where it reduces crop yields.

Parts of this article are reproduced or adapted from the following valuable resources:

* University of Nebraska NebGuide:
http://digitalcommons.unl.edu/cgi/viewcontent.cgi?article=2495&context=extensionhist

* The state of Washington's Noxious Weed Control Board:
http://www.nwcb.wa.gov/weed_info/Written_findings/Abutilon_theophrasti.html

* USDA's Forest Service:
http://na.fs.fed.us/fhp/invasive_plants/weeds/velvetleaf.pdf

* Virginia Tech Weed Identification Guide:
http://www.ppws.vt.edu/scott/weed_id/abuth.htm

* Michigan State University's Weed Science:
http://www.msuweeds.com/michigans_worst_weeds/velvetleaf

* University of Tennessee Extension:
http://www.utextension.utk.edu/publications/wfiles/W167.pdf

-- Dallas Peterson, Weed Management Specialist
dpeterso@ksu.edu

-- Curtis Thompson, Weed Management Specialist
cthompso@ksu.edu

2. Velvetleaf control in corn, grain sorghum, and soybeans

Velvetleaf has a higher level of tolerance to glyphosate than many other common weeds. As a result, control with glyphosate is often inconsistent.

Controlling velvetleaf is a long-term effort. It must begin by preventing seed production. Crop rotation aids crop production and prevents favorable conditions for velvetleaf.

Corn

In corn, it is recommended to use a preplant or preemergence herbicide followed by a postemergence herbicide if needed. Among the most effective preplant and preemergence herbicides for velvetleaf control in corn are Balance Flexx, Corvus, Prequel, Lexar/Lumax, Radius, Hornet, and Surestart. Herbicides containing atrazine and a chloracetamide (ie. Bicep II Magnum, Degree Xtra, Guardsman, etc.) have activity on velvetleaf, but performance will be enhanced if they are applied with products such as Sharpen or Callisto.

For postemergence control of velvetleaf in corn, the most effective options are Aim, atrazine or products containing atrazine, Cadet, Callisto, Capreno, Halex GT (on Roundup Ready corn only), Hornet, Impact, Laudis, Priority, Resource, Spirit, and Status. Treating velvetleaf when it is small, 6 inches or less, will increase the level of success.

Grain Sorghum

In grain sorghum, a preemergence application of either Lumax or Lexar is normally very effective in controlling velvetleaf. Lexar contains 2X more atrazine than Lumax, and is used more often in the eastern half of Kansas. Lumax is used more often where the desired atrazine content is lower. The addition of Sharpen to a chloracetamide/atrazine prepack mix will help control velvetleaf.

If postemergence treatments are needed, producers can get best control with products containing atrazine, or with Aim, Ally+2,4-D, or Peak. Ally+2,4-D must be applied to grain sorghum that is 3-10 inches in height. It can also be applied with drop nozzles to sorghum up to 15 inches tall, but prior to the boot stage. Treatments containing atrazine should be applied to sorghum up to 12 inches tall. Postemergence herbicides will most effectively control velevetleaf 6 inches tall or less, and will generally provide very little residual control of late-emerging velvetleaf plants.

Soybeans

For preemergence residual applications in soybeans, the FirstRate-, Classic-, and Valor-based herbicides offer some of the best control. This includes Authority First/Sonic, Gangster, Enlite, Envive, Canopy, and Valor XLT. The Kixor-based products Optill and Sharpen also give excellent velvetleaf control.

For postemergence control, glyphosate can provide good control at times in Roundup Ready soybeans, but can be inconsistent. The addition of ammonium sulfate to glyphosate applications is very important for velvetleaf control because velvetleaf actually accumulates calcium on the leaf surface. Tank-mixing Resource, Cadet, FirstRate, or Synchrony XP with glyphosate also may help improve velvetleaf control compared to glyhphosate alone. Extreme or Tackle, which are premixes of Pursuit and glyphosate, can also give excellent control of velvetleaf.

Tillage

Tillage can control velvetleaf, but must be done be before any plants have formed seeds. If the plants have already formed seed, tillage will only incorporate those seeds into the soil and result in future problems.

-- Dallas Peterson, Weed Management Specialist
dpeterso@ksu.edu

-- Curtis Thompson, Weed Management Specialist
cthompso@ksu.edu

3. Soybean planting date/variety maturity research in south central Kansas

The planting window for soybeans in south central Kansas is quite wide. If growing conditions are favorable, early planting (late April to early May) of an early maturing (group II or III) soybean variety can produce yields that exceed those of late-planted beans regardless of maturity group.

Thus, selection of the appropriate maturity group by planting date can allow for considerable flexibility in the schedule for spring planting of various crops. Several factors influence the selection of maturity group and variety, including soil type and moisture, potential rainfall, and the possibility of a killing freeze in the fall before the crop is mature.

Experiments were conducted at the South Central Experiment Field-Hutchinson and in Sumner county on the Wellington Area Test Farm in 1999 and on land belonging to private farmers south of Argonia in 2000 through 2002. Varieties planted were Midland 8280 (II), Macon (III), Midland 8410 (IV), and Pioneer 95B33 (V). The varieties were planted at a seeding rate of 160,000 seeds per acre in 30-inch rows. At seeding plots received 16 lb/acre N and 40 lb/a P_2O_5 in a 2x2 placement.

Results

Results are presented in the tables below. Some explanation is needed for some of the low yields and missing data. At Argonia in 2000 the soybeans planted on June 8 and July 5 did not mature before fall rains set in. Rains continued until such time that the beans for these two planting dates were frozen and shattered to the point that a meaningful harvest was unattainable. The July 6, 2001 planting at Hutchinson did not survive the extreme heat and dry weather of July. This same heat hit the Argonia location, but that location received approximately 5.25 inches of rainfall during the same period. At the Argonia location in 2001 the rainfall and heat caused a reversal of the yields observed the previous years. As a result, the late-planted beans had higher yields, as did the late maturity groups. At Hutchinson in 2002, the results for the first two planting dates reflect hail damage and delayed maturity. The 2002 plots at Argonia were lost to wet conditions that resulted in poor weed control.

Soybean Yields by Date of Planting and Maturity Group: 1999									
	Hutchinson					Wellington			
	Yield (bu/acre)								
Planting date	Group II	Group III	Group IV	Group V	Planting date	Group II	Group III	Group IV	Group V
May 4	41	39	33	22	May 7	19	20	21	8
May 26	22	12	18	11	June 7	19	19	19	17
July 6	21	23	24	15	July 7	17	18	17	15
LSD(0.05)	6	6	6	6		4	4	4	4

Soybean Yields by Date of Planting and Maturity Group: 2000									
	Hutchinson					Argonia			
	Yield (bu/acre)								
Planting date	Group II	Group III	Group IV	Group V	Planting date	Group II	Group III	Group IV	Group V
April 25	35	44	35	12	April 29	26	26	24	8
May 16	33	30	26	7	May 17	25	21	20	5
June 6	14	8	10	4	June 8	--	--	--	--
June 19	7	6	8	3	July 5	--	--	--	--
LSD(0.05)	5	5	5	5		NS	NS	NS	NS

Soybean Yields by Date of Planting and Maturity Group: 2001									
	Hutchinson					Argonia			
	Yield (bu/acre)								
Planting date	Group II	Group III	Group IV	Group V	Planting date	Group II	Group III	Group IV	Group V
April 20	4	3	4	5	April 23	8	6	7	7
May 9	2	1	2	2	May 11	6	7	8	9
June 11	2	4	3	4	June 13	7	7	7	10
July 6	--	--	--	--	July 5	11	15	22	22
LSD(0.05)	NS	NS	NS	NS		3	3	3	3

Soybean Yields by Date of Planting and Maturity Group: 2002									
	Hutchinson					Argonia			
	Yield (bu/acre)								
Planting date	Group II	Group III	Group IV	Group V	Planting date	Group II	Group III	Group IV	Group V
April 29	12	14	10	12	April 25	--	--	--	--
May 20	15	10	12	14	June 3	--	--	--	--
June 11	23	18	18	16	July 2	--	--	--	--
June 29	14	16	13	15					
LSD(0.05)	5.3	5.3	5.3	NS					

Varieties: Midland 8280 (II), Macon (III), Midland 8410 (IV), and Pioneer 95B33 (V).

Summary

Averaged over maturity groups, the yields were highest for the group II and III varieties for the late April and early May planting date in 1999 and 2000. The extreme temperatures of July in 2001 came at a time when soybeans planted at the early planting dates were setting seed and thus, the July 5 planting date had higher yields than the early planting dates. In 2002, the results from Hutchinson were affected by hail damage on the beans planted at the two earliest planting dates.

Producers can look at the weather patterns for their particular area and use the data present here to make timely variety and planting date decisions.

-- Bill Heer, Agronomist-In-Charge, South Central Experiment Field
bheer@ksu.edu

4. Expected increase in efficiency using an RTK guidance system over a WAAS system

In the past I have recommended WAAS (Wide Area Augmentation System) guidance systems to most producers as a good starting system. Still, I frequently get questions on whether it will pay to upgrade to an RTK system from a WAAS unit, with the increased accuracy of RTK systems.

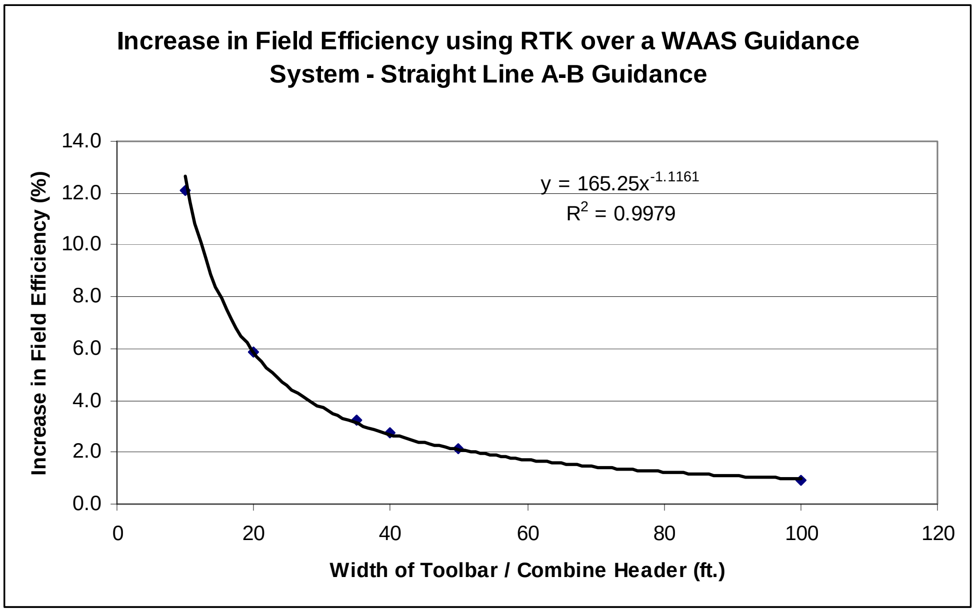
The answer is not an easy one. When purchasing an RTK system, the price of the system itself is only part of the cost. Purchasers will have to buy extra items, such as a radio, antenna equipment, and a yearly subscription to a base tower (approximately $1500 per year). Still, many people like the increased accuracy of an RTK system, and the extra benefits they get from increased precision.

If you want a complete cost analysis comparing the two types of guidance systems, visit the K-State Agricultural Economics Ag Managers website and work through the guidance system spreadsheet. The address is:
http://www.agmanager.info/farmmgt/machinery/default.asp#Decision-Making%20Tools

On the other hand, if you want a quick answer or just an idea of the savings, this article may help you.

Consider guidance systems choices in terms of field efficiency. Typically during straight line guidance, a WAAS unit can maintain an overlap setting of 12 to 15 inches while an RTK unit can maintain an overlap setting of 3 to 4 inches. This is the setting that each system operates at below full header or implement width to cause no skips or misses in coverage.

We can plot the data and compare the field efficiency of the two types of systems. The graphic below shows the general increase in field efficiency you can expect transitioning from a WAAS unit to an RTK unit. (Note: This does not include turn around or headland losses in the field when the machine is not working). The field efficiency increase with an RTK system can be quite substantial (≥3%) for implements or header widths less than 30 feet, but not as substantial (≤1% increase) for sprayer boom or toolbars greater than 90 feet. For this reason, smaller header and tillage bar widths (combine, tillage) benefit more from a more accurate guidance system than a larger boom width (such as a sprayer), although results can vary depending upon the actual cost of the operation.



Expected increase in field efficiency using a RTK guidance system over a WAAS unit.

For instance, the actual savings can be calculated by multiplying the increase in field efficiency for that toolbar or header width (divided by 100) by the total cost of that operation per year. For instance, assume a wheat producer runs a combine with a 30-foot header that costs $25,000 per year to operate. The savings from switching to an RTK system from a WAAS system will be $800 ($25,000 x 0.032 from the graph below for a 30-foot header width). Although this doesn't seem like much, if that same producer uses the RTK system instead of WAAS unit to apply anhydrous ammonia fertilizer at a cost of $50,000 over a 30000-acre farm, using with a 40 foot sweep, his average field efficiency will increase by 2.8% (from graph). This will add another $1,400 in savings. Together, these increases can slowly pay for the increased cost of the RTK system, and definitely the tower cost. Individual results will vary based on the size of farm, cost of the operation, number of field trips per season, type of crops grown, and the width of the implements.

-- Randy Price, Biological and Agricultural Engineering
rrprice@ksu.edu

These e-Updates are a regular weekly item from K-State Extension Agronomy and Steve Watson, Agronomy e-Update Editor. All of the Research and Extension faculty in Agronomy will be involved as sources from time to time. If you have any questions or suggestions for topics you'd like to have us address in this weekly update, contact Steve Watson, 785-532-7105 swatson@ksu.edu, or Jim Shroyer, Research and Extension Crop Production Specialist and State Extension Agronomy Leader 785-532-0397 jshroyer@ksu.edu