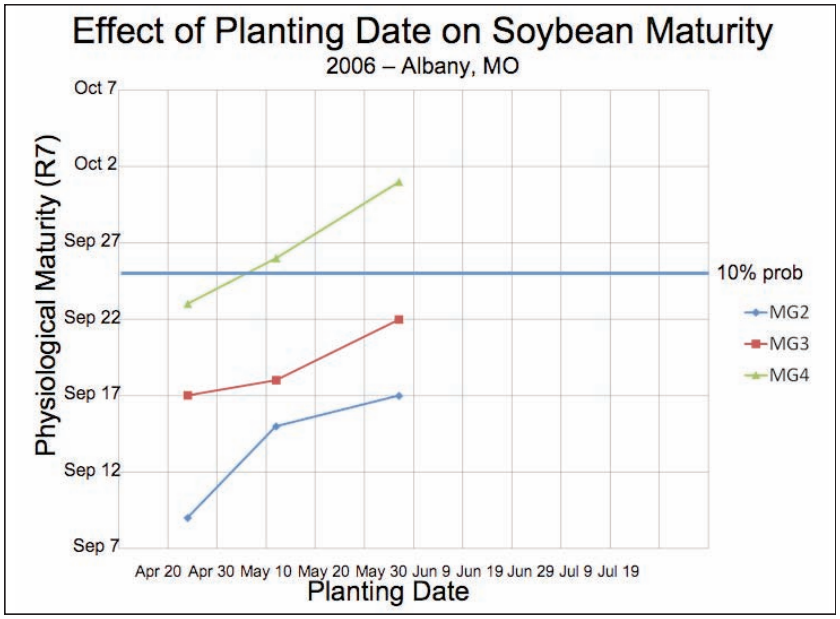
Plant Protection Programs University of Missouri

Integrated Pest & Crop Management

Ultra Late Planted Soybean

By Bill Wiebold

The year 2008 is one for the record books. Frequent rains delayed corn planting in Missouri and are continuing to affect soybean planting. Numerous streams and rivers have flooded and water levels remain above flood stage in parts of Missouri. This means that some soybean fields have yet to be planted or were planted and severely damaged by floods. In the past these fields would have been abandoned and no crop planted. However, with soybean prices at near record highs, it may make sense to plant soybean on dates as late as the end of July.



Our planting date studies have never included this late date, but we may be able to make some estimates about yield potential and maturity. One of the reasons that delayed planting reduces soybean yield is that the critical stage of development (podding, R3 and R4) is delayed into August – a month with less than optimal rain. Less rain means more pod abortion and less yield. The good news for very late planted soybean is that September often experiences higher rainfall than August. Two other reasons for reduced yield from delayed planting is shortened seed-filling period (photoperiod controlled) and less light available for photosynthesis (shorter days and lower sun angle). These problems will be very much in play with very late planted soybean.

In 2005 and 2006 we conducted a project funded by the Missouri Soybean Merchandising Council. The primary purpose of the project was to evaluate soybean management strategies related to soybean rust.

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Rescue Nitrogen Applications on Corn Can Still be Profitable

By John A. Lory and Peter Scharf

Wet weather has left many corn fields short of nitrogen, either because applied fertilizer was lost from wet soils or because wet soils prevented application. Our experience implies that rescue nitrogen applications to corn fields deficient in nitrogen typically more than pay for themselves.

In the last issue of the IPM newsletter Peter Scharf documented fields that have lost 40 to 180 lbs N/acre due to wet conditions. Many of these fields would benefit from supplemental nitrogen if you have a way to get it applied.

Quite a bit of research has been done on delayed N applications for corn in Missouri, by us, Bill Wiebold, Kelly Nelson, and Gene Stevens. Application timing has been as late as silking in a few cases. In many of these fields the corn plants were severely nitrogen deficient when we applied nitrogen. In those experiments we found that:

If you can get the needed N to the corn by growth stage V11, you have a good chance to make full yield, especially if some fertilizer N was previously applied. This conclusion is based on 37 N timing experiments. Most of these experiments were conducted in producer fields. Corn is typically over 60 percent of its final height with 11 leaves fully emerged at V11.

We've had about half a dozen experiments in which the first nitrogen application was delayed until the V12 to V16 range. They averaged only 3 percent reduction in yield potential.

In 3 experiments where the first nitrogen application was delayed until silking the average reduction in yield potential was 15 percent. Yield increase due to nitrogen still exceeded 35 bushels per acre in all three experiments where nitrogen application was delayed until silking.

Any type of nitrogen fertilizer, broadcast at rates that can correct N deficiency, will cause some leaf burn. Thus the ideal way to apply late rescue nitrogen is between the rows below the canopy using high-clearance applicators.

In many cases broadcast applications are all that is available for late fertilizer applications. Data from eight Missouri experiments indicated that urea was the safest N source to broadcast on tall corn (3- and 4-foot corn heights were the latest timings included in these experiments) and gave the best yields. Broadcast ammonium nitrate gave more leaf burn and lower yields than urea when corn was 3 feet or taller, but gave better yields than urea when corn was 2 feet or shorter. This was probably due to volatile N loss from urea in the shorter corn. When urea was applied to corn 2 feet tall or shorter, coating the urea with Agrotain volatilization inhibitor gave a profitable yield response by preventing N loss.

In summary, rescue applications of nitrogen are recommended late into the growing season, certainly through silking. Profitability of a rescue application depends much more on deficiency level than on timing. In significantly N-deficient corn, rescue applications are likely to be profitable up to two weeks after silking. Apply the fertilizer between the rows below the canopy if possible. If broadcast applications are necessary, use urea if corn is taller than 3 feet. If corn is 2 feet or shorter, use ammonium nitrate or urea coated with Agrotain. Do not broadcast UAN solution on corn.

Any source of nitrogen is safe for rescue nitrogen applications on corn when it is applied as part of a fertigation program through irrigation equipment.

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"Corn Diseases" and "Soybean Diseases" Manuals Have Been Updated

By Bill Wiebold

The MU IPM Program has sponsored development and printing costs for a series of publications related to pest and crop management. This publication portfolio contains 29 manuals and Agricultural Guides of which 18 are printed in full color. A complete listing of the MU IPM portfolio can be found at: http://ppp.missouri.edu/ipm/pubs.htm.

Two of the most popular manuals have recently been updated and reprinted. *Corn Diseases* contains more than 50 color photos. This publication is designed to help in the identification of common diseases of corn and to present management strategies. *Soybean Diseases* provides similar information for common soybean diseases.

Please visit our Web site, ppp.missouri.edu, to find information about these publications and other services provided by the MU IPM Program. You may also order these manuals by contacting your local extension office or visiting the extension publications web site: http://extension.missouri.edu/explore/agguides/.

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Soybean Rust Developing Slowly in the United States

By Allen Wrather

The current threat of soybean rust in Missouri is extremely low. Soybean rust has only been found on a few soybean leaves at two locations in Florida and nowhere else in the US. Soybean rust has been found on kudzu in several locations in FL and one location each in AL, LA, and TX, but it has developed slowly in these areas. The slow development and spread of rust in the south and southeast parts of the US is due to the drought in these areas. I expect rust to develop slowly in these areas until this weather pattern changes. We recently examined some soybean and kudzu leaves from fields in Missouri and did not find rust. I will present information about the spread of rust on soybean in Missouri and the US on a hotline, 1-866-587-1206, throughout 2008 with new updates daily as rust gets closer to Missouri. More information about the spread of rust in Missouri and the US is available on the Web at http://agebb.missouri.edu/mgt/soyrust/. You may contact me, wratherj@missouri.edu, for more information about this.

University of Missouri Extension has activated its statewide early-warning network of soybean rust sentinel plots/fields during 2008. Each sentinel plot/field will be monitored weekly from June to October. University of Missouri Extension regional agronomists in 20 locations will collect 100-leaf samples from each sentinel plot/field and ship to the pathology laboratory at the MU Delta Center for examination. The objective is to detect soybean rust when it first starts to develop in Missouri soybean fields so farmers can be warned to take action. Once the disease is detected, an all-out alert will be issued using radio and other media.

Missouri farmers and crop consultants may have soybean leaves examined for rust by pathologists at the University of Missouri Plant Diagnostic Clinic. Soybean leaves and a moist paper towel should be sealed in a plastic bag, and these should be sent immediately by express mail to the clinic along with a completed information form. The information form and more instructions about collecting and mailing samples to the clinic are posted at http://soilplantlab.missouri.edu/plant/index.htm. You may also call, 573-882-0623, or email, plantclinic@missouri.edu, the clinic about this and other services they provide. The clinic can also provide diagnosis and management information for other soybean problems including diseases, insects, and weeds. There is a $15 fee for examination of samples submitted to the diagnostic clinic.

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Stewart's Bacterial Wilt of Corn

By Laura Sweets

The variations in weather conditions this spring have put stress on young corn plants. In some fields seedlings have been showing yellowing and/or stunting from cool, wet soils immediately after planting and saturated soils since planting. However, with the more recent warm weather, corn in many parts of the state has really taken off and is now 12 to 18 inches tall. So symptoms of Stewart's bacterial wilt are beginning to develop on these rapidly growing young corn plants.

On young corn plants the symptoms of Stewart's bacterial wilt include linear, pale green to yellow streaks that tend to follow the veins of leaves and originate from feeding marks of the corn flea beetle. Lesions may extend the length of the leaf. Plants may appear stunted or somewhat distorted. If the bacteria become systemic within the plant, the entire plant wilts and may die prematurely. Cavities of a brown, soft rot can develop in the stalk pith.

On field corn the disease tends to be limited to the leaf blight phase of the disease in which foliage symptoms develop but the pathogen does not become systemic within the plant. With the leaf blight phase of Stewart's bacterial wilt, the linear, pale green to yellow lesions develop on the leaves. These lesions tend to parallel the leaf veins and to have wavy, irregular margins. These streaks soon become dry and brown.

The bacterium which causes Stewart's bacterial wilt overwinters in the guts of some species of adult corn flea beetles. Adult beetles feeding on corn seedlings in late spring and early summer can contaminate the feeding wounds with the causal bacterium. Flea beetles can continue to spread the bacterium throughout the season by feeding on infected plants and then healthy plants. The potential for Stewart's bacterial wilt to develop on young corn plants is greater after mild winters when higher levels of the corn flea beetle may be present.

Most field corn hybrids have enough resistance to Stewart's bacterial wilt that additional management is not necessary.

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Early Season Soybean Diseases

By Laura Sweets

This could be an interesting year for early season soybean diseases in Missouri. Because of the erratic weather patterns, soybean planting is well behind average. However, the unusual fluctuations in both soil moisture and soil temperatures could increase the potential for Pythium seed decay and seedling blight as well as Phytophthora in beans that were planted early. The early season soybean diseases include those that cause seed decay, seedling blights and root rots of soybean. Most of these early season soybean diseases are caused by fungi in the soil that are found wherever soybeans are grown. *Pythium, Phytophthora, Rhizoctonia* and *Fusarium* are the most common of these early season pathogens, although *Macrophomina* (charcoal rot fungus) may also cause early season seedling problems.

Soybean seedling blights have the potential to cause losses in Missouri soybean fields every year. The specific seedling blights that occur and their severity vary with the environmental conditions each season. With the changes in weather patterns this spring and soybean planting delayed in much of the state because of wet soil conditions, it is difficult to predict which, if any, seedling blights may occur or may cause significant problems this season.

Pythium and *Phytophthora* are favored by wet conditions and are more likely to be serious problems when wet conditions exist at or just after planting. *Rhizoctonia* and *Fusarium* are not as restricted by soil moistures and soil temperatures but still need some moisture to initiate infection. *Macrophomina phaseolina* grows best at temperatures between 82-95°F. Infection of seedlings with *Macrophomina* is most likely to occur if conditions of high soil temperatures and low soil moisture exist during the first two to three weeks after planting.

Symptoms of *Pythium damping-off* range from seed rot or preemergence damping-off to early postemergence damping-off. Affected tissue develops a soft, watery brown rot. Pythium damping-off is most likely to occur in cool (50-55 degrees Fahrenheit), wet soils.

Phytophthora can cause seed rot, preemergence damping-off and early postemergence damping-off. Initially affected tissue develops a soft, watery brown rot. Within several days the affected plant parts may dry out and shrivel up becoming dark, dry and brittle. This early stage Phytophthora is difficult to distinguish from Pythium damping-off; it may be necessary to submit a sample to the Plant Disease Clinic for an accurate diagnosis Phytophthora can also cause a seedling blight in which established seedlings turn yellow, wilt and die. Generally the entire seedling is affected and roots may be poorly developed and rotted. Phytophthora root rot is more likely to occur in heavy, wet soils, low areas or compacted areas, but it may occur in light soils or better drained areas if heavy rains occur after planting.

Rhizoctonia can cause seedling blight and root rot of soybean. Affected stands may have an uneven appearance and seedlings appear pale green in color and stunted in growth. The identifying feature of this disease is a small, reddish lesion on one side of the stem at or just below the soil line. This lesion develops into a sunken, cankered area a the point of infection. Sometimes the lesion will expand to completely girdle the stem. On severely infected seedlings, the entire hypocotyl may be discolored and shriveled into a dry, stringy or wiry stem.

Fusarium can also cause root rot of soybean. Infection is usually confined to roots and lower stems. The lower part of the taproot and the lateral root system may be discolored, deteriorated or completely destroyed. General roots show a nondescript brown discoloration and a dry, shrunken rot. Above ground portions of plants may appear off-color and stunted. Plants with severe Fusarium root rot may die prematurely.

Charcoal rot, caused by *Macrophomina phaseolina*, may be more commonly recognized as a mid to late season disease on maturing soybean plants, but it can also occur early in the season on seedlings. Infected seedlings tend to show a reddish brown discoloration from the soil line up the stem. The discolored area changes from reddish brown to dark brown to black. Foliage may appear off color or begin to dry out and turn brown. If the growing point is killed, a twin stem plant may develop. Under hot, dry conditions, infected seedlings may die. Under cooler, wetter conditions, infected seedlings may survive but carry a latent infection. Then symptoms may reappear later in the season with hot, dry weather.

Once the crop has been planted, there is little that can be done to reduce incidence or severity of soybean seedling diseases. Additional stress from poor growing conditions, herbicide injury or other factors may compound problems with soybean seedling diseases. Prior to planting it is important to consider variety selection (especially in fields with a history of Phytophthora), fungicide seed treatment, crop rotation, seedbed preparation and conditions at planting.

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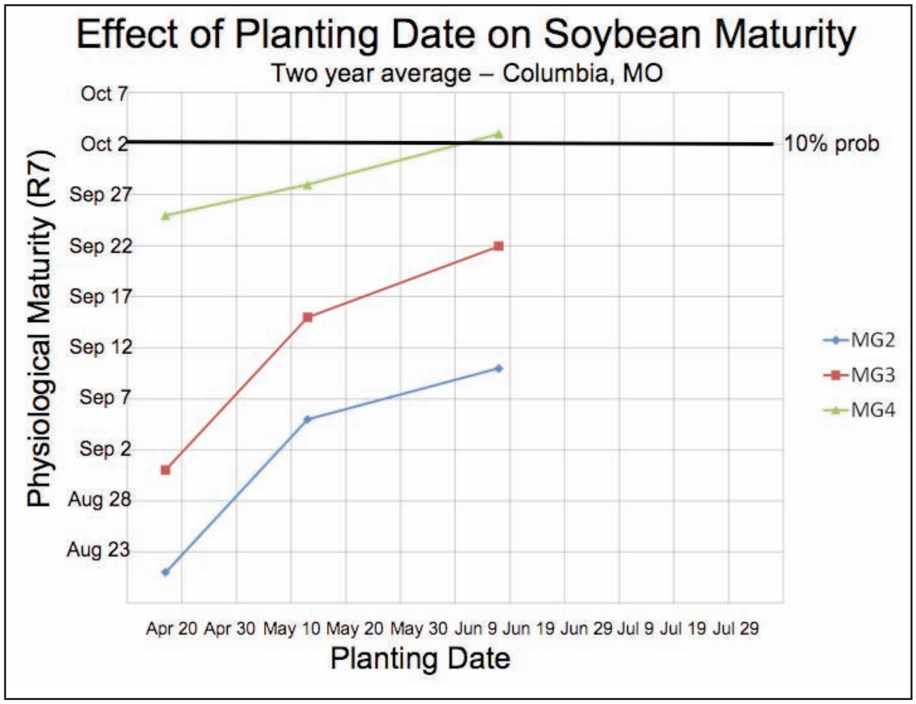

Planting dates and Maturity Groups were two factors studied in the project. We planted three varieties from each Maturity Group 1, 2, 3 and 4. These varieties were planted on three dates at Albany (NW MO) and Columbia (Central MO). Among the data collected were stages of development dates. Although the latest planting date was June 16, we can use this study to try to predict maturity dates and the potential need for switching varieties for ultra late planted soybean.

Planting varieties that mature before frost is an important consideration. Soybean plants killed before maturity will result in green seeds that are often heavily docked. These seeds do not lose their green color during storage. Freeze probabilities do not follow straight lines across Missouri so it is best to use a database that includes individual communities like the one provided by NOAA at http://cdo.ncdc.noaa.gov/climatenormals/clim20supp1/states/MO.pdf. Many datasets include probability percentages, i.e., 10 percent or 50 percent and a temperature, i.e., 28 or 32 degrees Fahrenheit. For spring freeze damage we often use 28 degrees Fahrenheit for four hours to represent a killing frost. For soybean in the fall, I think 32 degrees Fahrenheit is a more realistic temperature. The difference between 10 percent and 50 percent probability of a freeze is about 10 days to two weeks. I believe that a 50 percent chance of damaging temperatures is too risky so I chose 10 percent probability as an appropriate target date for completing soybean maturity.

Figure 1 illustrates the effect of planting date on dates for physiological maturity for soybean planted near Albany in 2006. Physiological maturity is when soybean leaves and pods begin to turn yellow and the plant has reached the end of its life cycle. Yield cannot be reduced by frost or other stresses after this date, but the grain moisture may be as high as 60 percent. Cautious interpretation is in order because this is one-year data. For Maturity Groups 2 and 3, a 50 day delay in planting resulted in a 5 to 8 day delay in maturity. Soybean maturity is strongly regulated by day length, but this delay in maturity is less than expected and may be related local conditions. Physiological maturity occurred about 5 days earlier for Maturity Group 2 varieties than Maturity Group 3 varieties. Normally, the difference between Maturity Groups averages about 10 days.

In north Missouri where flooding has yet to end, soil may not be fit to plant until late July. The 10 percent chance of an air temperature of 32 degrees is September 25 for several communities in north Missouri. Although difficult to estimate from our limited data set, I believe that north of Highway 36 farmers may want to consider using a Maturity Group 2 variety if planting after July 19. This switch in maturity would help ensure mature soybeans if frost occurs earlier than normal this autumn.

Figure 2 illustrates the effect of planting date on dates for physiological maturity for soybean planted near Columbia in 2005 and 2006. Because this dataset represents two years and the two years were nearly identical for response, we have greater confidence in interpretation. For Maturity Groups 2 and 3, a 60 day delay in planting resulted in a 20 day delay in maturity. At Columbia, physiological maturity occurred about 10 days earlier for Maturity Group 2 varieties than Maturity Group 3 varieties.

The 10 percent chance of an air temperature of 32F is October 2 for several communities in central Missouri. Unfortunately, freeze probability lines do not extend in straight line west to east. So, some areas may experience frost earlier than in other areas even if the two areas are relatively close in distance. Also, night temperatures in fields are often colder than temperatures where agencies monitor temperatures. Given these caveats, if soybean is planted in late July in central Missouri, it appears that Maturity Group 3 varieties should mature before frost.

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Weather Data for the Week Ending July 8, 2008

By Pat Guinan

		Weekly Temperature (degrees Fahrenheit)						Monthly Precipitation (in.)		Growing Degree Days‡	
Station	County	Avg. Max.	Avg. Min.	Extreme High	Extreme Low	Mean	Departure from long term avg.	Jul 1-8-Jul	Departure from long term avg.	Accumulated Since Apr. 1	Departure from long term avg.
Corning	Atchison	86	67	94	58	77	1	0.18	-1.27	1440	74
St. Joseph	Buchanan	83	66	91	60	75	-2	1.36	-0.06	1374	-17
Brunswick	Chariton	*	*	*	*	*	*	*	*	*	*
Albany	Gentry	85	66	93	57	75	-2	0.44	-1.03	1324	-45
Auxvasse	Audrain	83	64	92	56	73	-4	3.19	2.21	1389	-37
Columbia	Boone	83	65	92	56	74	-4	0.64	-0.52	1417	-74
Sanborn Field	Boone	85	66	94	56	75	-3	0.68	-0.56	1504	-31
Williamsburg	Callaway	84	64	91	56	74	-2	1.62	0.22	1393	7
Novelty	Knox	83	63	91	54	73	-3	1.01	-0.11	1259	-127
Linneus	Linn	83	64	90	55	73	-3	2.54	1.25	1312	-28
Monroe City	Monroe	82	64	92	55	73	-4	4.86	3.93	1333	-95
Versailles	Morgan	85	67	92	59	75	-2	2.11	1.1	1512	-15
Green Ridge	Pettis	84	66	91	59	75	-1	1.67	0.51	1450	19
Lamar	Barton	88	69	94	65	78	0	0.32	-1.2	1559	-31
Cook Station	Crawford	86	63	91	55	74	-3	1.2	0.42	1444	-114
Alley Spring	Shannon	*	*	*	*	*	*	*	*	*	*
Round Spring	Shannon	87	64	94	59	74	-2	0.87	-0.12	1446	-23
Mountain Grove	Wright	85	65	89	60	75	-1	0.76	-0.38	1392	-44
Delta	Cape Girardeau	87	66	94	63	76	-3	0.47	-0.38	1661	-116
Cardwell	Dunklin	90	69	93	63	79	-2	0.32	-0.4	1927	-29
Clarkton	Dunklin	90	68	96	62	79	-2	0.28	-0.31	1838	-89
Glennonville	Dunklin	90	70	93	66	80	-1	0	-0.64	1849	-69
Charleston	Mississippi	88	69	94	65	78	-1	0.62	-0.61	1777	22
Portageville-Delta Center	Pemiscot	91	71	97	68	81	0	0.01	-0.74	1932	6
Portageville-Lee Farm	Pemiscot	91	71	96	68	81	0	0	-0.76	1939	30
Steele	Pemiscot	91	71	95	65	81	0	0.05	-0.65	2012	82

* Complete data not available for report

‡Growing degree days are calculated by subtracting a 50 degree (Fahrenheit) base temperature from the average daily temperature. Thus, if the average temperature for the day is 75 degrees, then 25 growing degree days will have been accumulated.

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