TEMPERATURE AND SOYBEAN EMERGENCE

Results from MSPB-funded Project 75-2014 from Dr. Raja Reddy at Miss. State Univ. provide some interesting estimates about how air temperature affects soybean germination and emergence.

Experiments were conducted under optimum soil moisture and oxygen conditions. Seed of two early MG V varieties, one determinate and one indeterminate, were placed 0.75 inches deep in the soil.   Germination was recorded as the time when the radicle was half or more the length of the seed. Emergence was recorded when the cotyledons were above the soil surface and opened.

In one of the studies, seed germination was about 83% when temperatures ranged from 50 to 93° F., and declined significantly at higher temperatures. Thus, soybean seed will germinate under a wide range of temperature conditions.

A second study was designed to determine how temperature will affect seedling emergence following germination, which is a more important variable for producers who plant early. Results from this experiment are shown in the following table. Notice in the table title I used "maximum days to emergence" since it is assumed that average daily temperatures will increase between planting and emergence, which should result in a slightly shorter time to emergence than the values shown in the table for each planting date.

Effect of average air temperature* on maximum days to soybean emergence** based on planting date at two Mississippi locations.					
	Stoneville			Tunica	
Planting Date	Avg. air temperature	Days to emergence		Avg. air temperature	Days to emergence
Mar. 20	55.0	13.0		53.5	14.0
Mar. 30	58.0	12.0		56.0	12.5
Apr. 10	62.0	10.5		60.0	11.0
Apr. 20	65.5	9.0		63.5	10.0
Apr. 30	67.0	9.0		65.0	9.5
May 10	70.0	8.0		68.5	8.5
May 20	73.0	7.0		71.5	7.5

*Average air temperature (max. + min./2) for each location obtained from DREC website.
**Using the equation Y (days to emergence) = $53.763 - 1.0504x + 0.0056398x^2$, where x equals average air temperature. Rounded to nearest half number.

Several points are worth noting based on the results shown in the table.

● Since no individual year will have average temperatures that mimic the above long-term averages, times to emergence in a given year will likely be slightly different from those

shown above. However, the differences should be no more than 1 to 2 days more or less than the tabled values.

● The nearly 2° latitude difference between Stoneville and Tunica made little difference in time to emergence even though average air temperatures varied by 1.5 to 2° F. between the two locations.

● The longer times between planting date and emergence in early plantings provide a wider window for applying pre-emergence herbicides. Delaying these applications until closer to emergence rather than immediately following planting can provide valuable additional time for effective residual weed control following soybean emergence, especially since up to 2 weeks can pass between planting and emergence in early plantings.

● The longer time between planting and emergence in early plantings provides additional impetus to use effective fungicide seed treatments since seed and seedlings will be in the soil longer, and thus subject to infestations by soil-borne pathogens for a longer period.

In the above studies, average air temperatures were used instead of soil temperatures because air temperature data are likely more available to producers. Click here for a publication that provides details about this research.

Producers are encouraged to use these results in conjunction with the estimated average date of last frost at a given location to determine a safe planting date for soybeans at Midsouth locations.

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