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Variable Emergence Due to Variable Seedbed Moisture

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One of several requirements for uniformly quick germination in corn (Nielsen, 2007a) is uniformly adequate soil moisture in the seed zone. When seedbed soil moisture is variable (too dry vs. just right or too wet vs. just right), germination and emergence will also be variable.

Corn planted during the past couple of weeks in parts of Indiana has occurred in soils that have dried quickly in response to a string of warm, sunny days with strong winds and low humidity levels. Tilled seedbeds in particular have dried very quickly at the surface and sometimes unevenly.

Coupled with shallow compacted tillage layers that sometimes prevent planter row units from placing seed as deeply as the depth setting targets, kernels within inches of each other in the seed furrow can experience significantly different soil moisture levels. In other situations, growers may have neglected to change planter depth settings in response to the depth at which soil moisture was more uniform.

Last Friday I came across an example of fairly dramatic uneven emergence caused by variable soil moisture in a conventionally tilled field (corn following soybean) that was planted May 7. I estimated 75 to 80% of the field was comprised of "normal" emergers that were at the late V1 leaf stage (one leaf with a visible collar). Some late emergers were barely breaking through the surface, while others were yet in the process of elongating towards the soil surface.

Still other kernels showed no visible signs of germination (Nielsen, 2007b), suggesting they had not imbibed enough moisture to initiate the germination process. The non-germinated kernels were otherwise healthy with no evidence of disease or insect injury.

Given that the initial emergers were at late V1, if the non-germinated kernels eventually germinate and emerge they will likely be out-competed and not contribute to yield. Even the late emergers that were barely visible on May 18 will likely experience enough competition with their neighbors that are almost two leaves farther advanced that they will not contribute 100% to grain yield.

Seed spacing among the normal emergers suggested an initial seeding rate of 33000 seeds per acre. I estimated the percent of delayed emergers or non-germinated kernels to be no less than 20% of the stand. Yield loss due to such delayed emergence is roughly similar to that due to low population. Based on the initial seeding rate and the plant population

yield response tabular data published in Purdue's ID-179, Corn & Soybean Field Guide, the estimated yield loss in this field would thankfully only be 1 to 2 percent (33000 vs . If the initial seeding rate had been closer to the lower end of the optimum range, say closer to 28000 seeds per acre, the predicted yield loss due to 20% fewer contributing plants would have somewhat higher at about 5 percent.

Expected Grain Yield Due to Various Planting Dates and Final Plant Populations

Planting date	Plant population (final) per acre													
	10,000	12,000	14,000	16,000	18,000	20,000	22,000	24,000	26,000	28,000	30,000	32,000	34,000	36,000
	Percent of optimum yield													
10-Apr	62	68	73	78	82	85	88	91	92	93	94	94	93	91
15-Apr	65	71	76	81	85	88	91	94	95	96	97	96	96	94
20-Apr	67	73	78	83	87	90	93	96	97	98	99	98	98	96
25-Apr	68	74	79	84	88	92	94	97	98	99	100	100	99	97
30-Apr	68	74	79	84	88	92	95	97	99	100	100	100	99	97
5-May	67	73	79	83	87	91	94	96	98	99	99	99	98	97
10-May	65	71	77	82	86	89	92	94	96	97	97	97	96	95
15-May	63	69	74	79	83	87	89	92	93	94	95	95	94	92
20-May	59	65	71	75	80	83	86	88	90	91	91	91	90	89
25-May	55	61	66	71	75	79	81	84	85	86	87	87	86	84
30-May	49	55	61	65	70	73	76	78	80	81	81	81	80	79
4-Jun	43	49	54	59	63	67	70	72	74	75	75	75	74	73
9-Jun	36	42	47	52	56	60	62	65	66	67	68	68	67	65

Source: Nafziger. 1994. J. Prod. Ag 7:59-62. Yield response to planting date extrapolated beyond May 25 with concurrence of author.

Note: The highlighted area represents the optimum ranges (98 to100% yield) of plant populations and planting dates for productivity levels greater than about 125 bushels per acre. Optimum plant populations for soils with historical yields less than about 100 bushels per acre will likely not respond to final plant populations greater than about 24,000 plants per acre. (RLNielsen, Purdue Agronomy)

(Table source: Purdue ID-179, Corn & Soybean Field Guide, 2007 ed., p. 11)

Related References

Carter, Paul, Emerson Nafziger, and Joe Lauer. Uneven Emergence in Corn. North Central Regional Extension Pub. No. 344. [On-Line]. Available at http://learningstore.uwex.edu/pdf%5CNCR344.pdf. (URL verified 4/23/07).

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Nielsen, R.L. (Bob). 2007b. Visible Indicators of Germination in Corn. Corny News Network, Purdue Univ. [On-Line]. Available at http://www.kingcorn.org/news/timeless/GerminationGallery.html. (URL verified 5/20/07).

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