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Trouble with Doubles, Gaps and Peepers

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Growing Season Update

The 2008 production year has been one of the coolest on record. Growing degree unit accumulation is tracking about 300 GDUs behind schedule. Temperature drives the vegetative (V) developmental stages of the corn life cycle, but has less influence during the reproductive (R) developmental stages (Table 1). The number of days from silking (R1) to maturity (R6) ranges from 55 to 60 days. A farmer benchmark to gauge the season is "To be dented by Labor Day." About 26-28 days remain for the crop to mature.

Table 1. Relationship between corn kernel growth stage and development.

		Growing Degree Units (GDUs) to Maturity		Percent of Maximum Yield		Moisture Content (%)	
Stage	Calendar Days to Maturity	Southern Wisconsin	Northern Wisconsin	Grain	Whole Plant	Grain	Whole Plant
R1- Silk	55-60	1100-1200	950-1050	0	50-55	---	80-85
R2 - Blister	45-50	875-975	800-900	0-10	55-60	85-95	80-85
R3 - Milk	37-42	750-850	700-800	15-25	60-65	75-85	77-82
R4 - Dough	31-36	600-700	550-650	30-50	65-75	60-80	75-80
R5 - Dent	26-28	425-525	400-500	60-75	75-85	50-55	70-75
R5.5 - 50% Kernel milk	10-15	200-300	175-275	90-95	100	35-40	65-70
R6 - Maturity	0	0	0	100	95-100	25-35	55-65

Assessing Corn Plant Stands

Understanding plant interactions in a community of plants is key to understanding grain yield and how plants compensate for inevitable stresses. An early management decision faced by farmers is stand assessment and its effect on yield potential. Both temporal and spatial plant variation can affect yield potential.

Three key factors must be evaluated quickly when assessing a stand: 1) stand population, 2) evenness of spacing and development, and 3) plant health. Then comparisons are made between the yield potential of an existing stand and yield potential of a later-planted stand to determine whether replanting should be pursued.

Most farmers and agronomists agree that uniform stand establishment is ideal and can only be achieved by a well-calibrated planter and sound agronomic practices. Key planting factors influencing corn stand establishment include spacing of seed, uniform seed depth, seed quality, planter speed, insects, diseases, desired seed density, and optimum soil environment for rapid germination and uniform emergence (including soil water and temperature). No single factor is responsible for differences among fields for stand establishment; rather, fields with uneven plant spacing have unique problems and often a combination of factors during the planting operation leads to inconsistent stands.

Plant Variability

Longitudinal surveys tracking plant development during the growing season are inconclusive for grain yield. Plant spatial variability masks differences among plants, but specific contradictory cases are observed. Plant spatial variability trends are more easily measured. In general once a plant gets behind relative to its neighbors, it never catches up resulting in a smaller lower yielding plant. Plants emerging up to one week later than their neighbors tend to silk four days later, produce one less leaf, two fewer kernel rows, four fewer kernels per row, and 25% lighter kernels.

Spatial Variation

Previous research is mixed for the impact of plant **spatial** variability, but generally yield is decreased up to 10%. We have found a "threshold" whereby grain yield is not affected up to 4.7 inches standard deviation, but then

decreases 2.4% for every inch of standard deviation greater than 4.7 inches (Figure 1).

Tuning Planters

Do planters need to be tuned? Agronomists should never recommend not going through and tuning a planter because it provides "peace of mind" and planter problems can be corrected before the planting season begins. However, the corn plant can compensate dramatically to plant spacing variability as long as plant density is adequate in the field. What might be more important is temporal variation for time of plant emergence.

Temporal Variation

Plant response to **temporal** variability is more consistent with yield decreases up to 22%. But, usually treatments include later planting dates so that emergence is substantially later (2-3 weeks) than the earlier planted stand which is not typical in a field situation. Plants emerging 2-3 weeks late are often called "peepers."

Two types of **gaps** exist. First, gaps caused by planter skip increase spatial variation and can lead directly to a reduction in plant density. The yield response to these skip gaps is a plant density response.

A second type of gap exists where a plant is "set back," but not killed. Depending upon the stage when these gaps develop in the field, yield can be decreased 16% with a tendency for larger gaps (8-plant patterns) to compensate more when they occur at V4 and V6 (Figure 2).

Current Research

The objective of this research is to help producers assess both temporal variation and "plant health" using simulated field situations growers encounter when planted on the same date. Clipping treatments of 0, 25, 50, 75 and 100% of the plants in a plot are applied at V1, V2, V3 and V4.

Grain yield has not been measured yet, but visual estimates of plant growth indicate substantial effect on plant growth and development which will likely be reflected in grain yield.

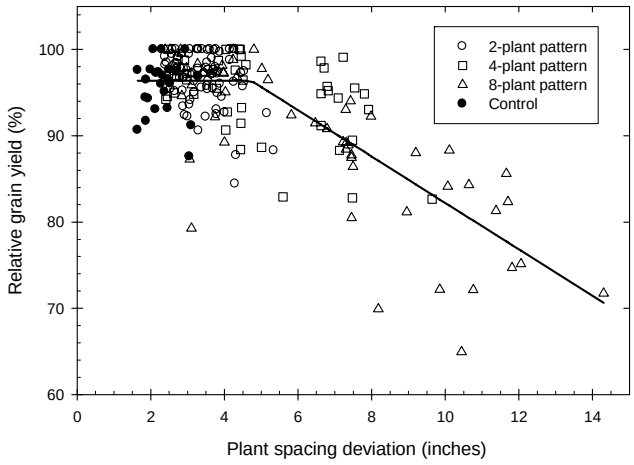

Figure 1. Relationship between relative grain yield and plant spacing standard deviation for 2-, 4-, and 8-plant patterns at 30,000 plants/A (Y = 96.4, if X < 4.7 and Y = 109.1 - 2.4 X, if X > 4.7; R2 = 0.57).

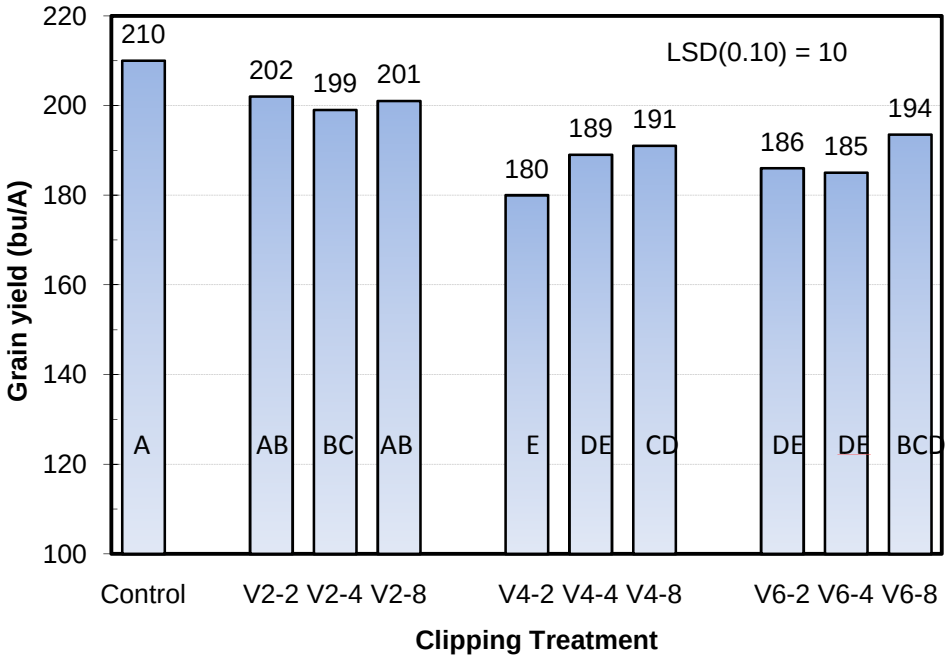

Figure 2. Impact of defoliation at V2, V4 and V6 for 2-, 4-, and 8-plant patterns (gaps) at Arlington during 2000-2005.