Genotype By Seeding Rate Interaction in Wheat

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Introduction

The interaction between genotype and seeding rate can play a critical role in understanding wheat yield potential.

Objective

- Evaluate early season uniformity of plants;
- Quantify wheat yield response to seeding rates with contrasting genotype strategies.

Materials and Methods

The study was conducted at two sites in Kansas, Ashland Bottoms (dryland) and Topeka (irrigation). Soybean was the previous crop.

Table 1. Experimental factors (genotype and seeding rate) evaluated and each treatment combination is presented. Planting time was during the first two weeks of October in both sites (Ashland and Topeka, KS).

Factors	Treatments							
	1	2	3	4	5	6	7	8
Genotype	Cedar	Cedar	Cedar	Cedar	4458	4458	4458	4458
Seeding rate (Kg/ha^{-1})	45	90	135	180	45	90	135	180

Measurements consisted of stand count, percent of canopy coverage estimated via digital imagery, within-row gap length (missing plants), leaf area index (LAI), light interception, plant biomass and imagery collected via small-unmanned aerial vehicle systems (sUAVS).

Results

Emergence

Early growth emergence showed an expected progression, without portraying significant differences between treatments (Fig. 1).

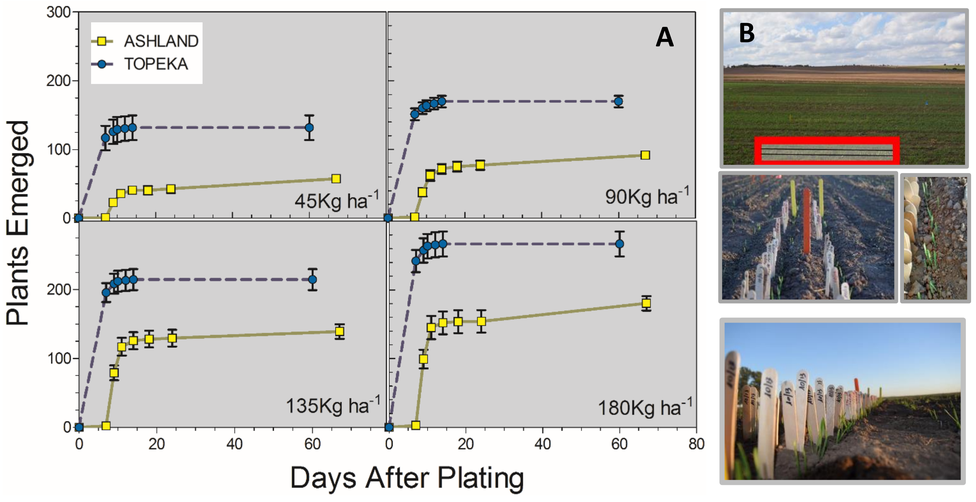


Figure 1. Plant emergence dynamics. (A) Graph showing progression of emergence. Description of the area analyzed (B).

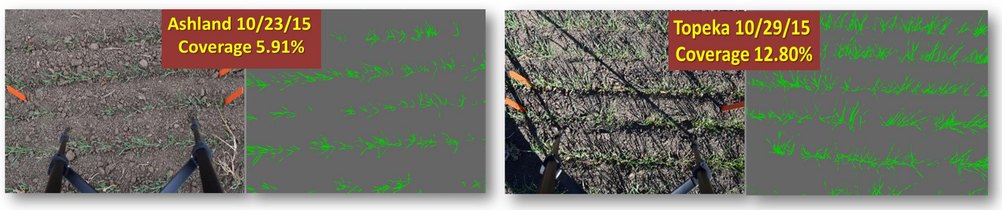
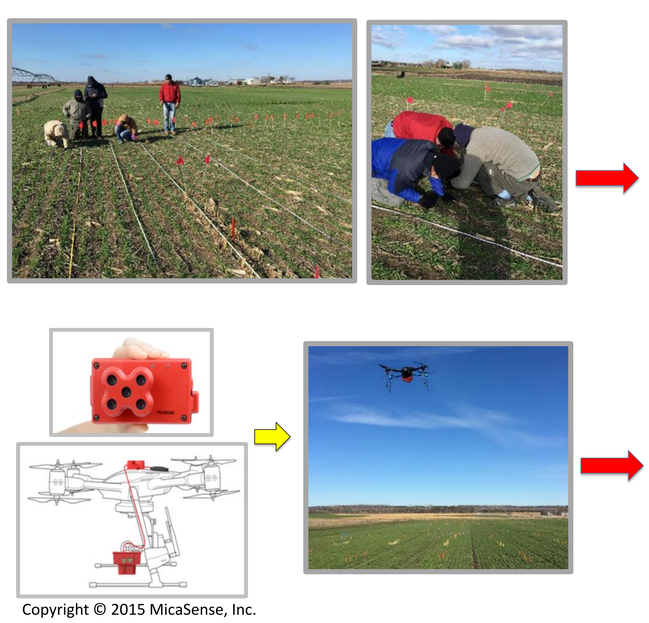


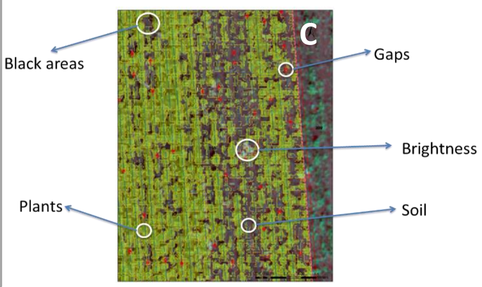
Figure 2. Wheat canopy cover at early growth stage. Image analyzed using SISCOB software.

Results (continued)

Gap Analysis



Calibration of Imagery



Gap analysis helps to:

- Relate the pattern of gaps in imagery with the use machinery and environmental issues.
- Calibrate imagery method.

Figure 3. Gap analysis, comparison ground truth (A) and imagery (B). Calibration of imagery (C).

Biomass

- Plant dry weight at four stages did not showed critical differences between evaluated treatments.
- Plant dry mass was obtained from a 2.5 linear meter.
- Larger variability was observed at the Ashland site.

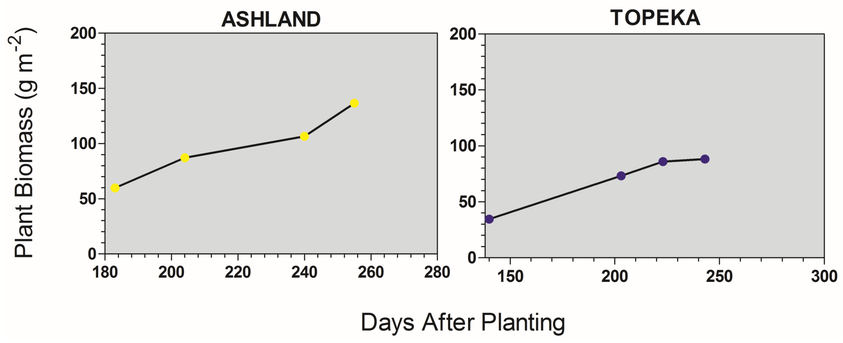


Figure 4 . Plant biomass in g m^{-2} at varying stages, in both locations.

Grain Yield at Harvest Time

- Final grain yield for Ashland (5.3 Mg ha $^{-1}$) was greater than Topeka (3.4 Mg ha $^{-1}$) site.
- Neither significant differences were reported for genotype and seeding rate nor interactions between factors at Topeka site.
- For Ashland site, smaller grain yield differences were observed for the seeding rate factor.
- Even though Ashland site presented superior yields and a clear trend between treatments, variability was also reported in this location.

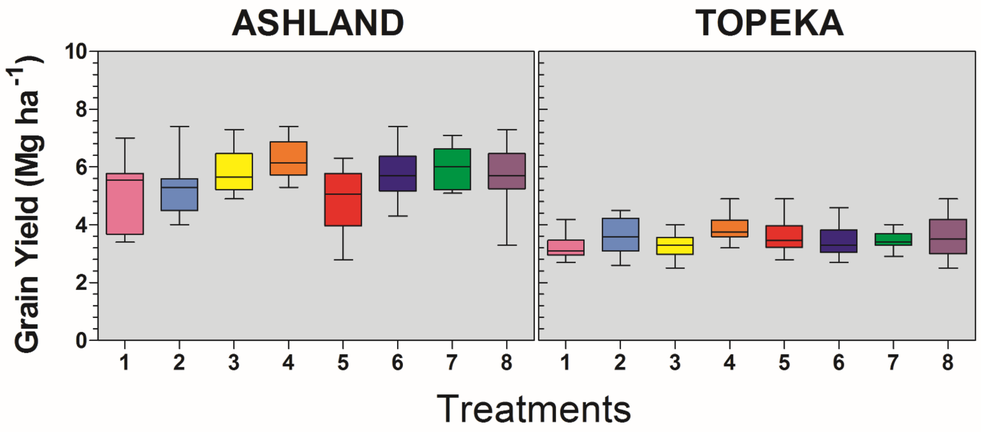


Figure 5. Grain yield, 13.5% moisture, for all systems evaluated at harvest time at Ashland and Topeka sites, KS (2015-16 growing season).

Conclusions

- Topeka presented better stand of plants but lower yields when compared to Ashland site. That might be explained in part because of low temperature damage occurred at this location.
- No differences between seeding rates may be explained by the ability of wheat plants to compensate.