WASHINGTON STATE UNIVERSITY
EXTENSION

Plant Population Evaluations of Processing Sweet Corn in the Columbia Basin

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Introduction: This trial was conducted to provide information about the effects of plant population density on three sweet corn hybrids grown in the Columbia Basin.

Methods: The trial was located at Watts Brothers 100 Circles Farm, west of Paterson, WA. The experimental design was a split-plot arrangement with completely randomized subplots replicated five times. Main plots were planted to one of three sweet corn hybrids, including 610Y (Abbott and Cobb), 1365 (Seminis), and Basin (Seminis). The main plots were divided into subplots, which were assigned to one of four plant populations (17,500, 23,200, 29,000, and 35,000 plants per acre). Each subplot was 4 rows wide (30-in rows) and 30 feet long. Seeds were sown on 14 May 2012 using a 4-row Monosem vacuum planter. The seeding rate was 35,000 plants per acre. Seedlings were hand-thinned on 4 June to establish the desired plant population in each plot; they were thinned to an in-row plant spacing of 11.9-in, 9.0-in, 7.2-in, and 6.0-in for populations of 17,500, 23,200, 29,000, and 35,000 plants per acre respectively. The trial was grown under center pivot irrigation on a Burbank loamy fine sand, using standard agronomic practices for fertility and pest control. Ear height was measured on 7 Aug. Ears in each subplot were harvested, counted, and weighed from two entire rows on 22 Aug. Only the terminal ear on each plant was harvested. A subsample of five ears from each subplot was retained to make processing quality assessments, including ear length and diameter, kernel depth, brix, and pericarp firmness. Another subsample of ears from each cultivar was submitted to a commercial laboratory for moisture analysis, which returned moisture levels of 79% for 610Y, 80% for 1365, and 73% for Basin. The data were analyzed using the SAS® GLM Procedure for analysis of variance, with orthogonal contrasts to compare populations. Pairwise comparison of cultivar and population treatment means was by the Duncan's multiple range test (P=0.05).

Results: Sweet corn ear characteristics and yield as affected by cultivar and plant population are presented in Table 1. Population and cultivar both had significant effects on yield in tons per acre. On average, yields by weight were significantly greater at the 35,000 and 29,000 plants per acre populations than at the 17,500 plants per acre population. Yields tended to increase linearly as plant populations increased. There was no interactive effect of cultivar and population on yield, i.e. the three cultivars had a similar response to plant population. Population also had a significant effect on the number of ears harvested, with the 35,000 plants per acre population resulting in significantly more ears per acre compared to the 23,000 and 17,000 plants per acre populations. There was a positive linear relationship between ear number and plant population, and there was no interaction between cultivar and population. The greatest effect of plant populations on ear characteristics was a tendency for decreased ear length with increasing populations. This relationship, however, was not strictly linear. Plant populations did not have a significant effect on any of the other ear characteristics measured in this study.

TABLE 1. Sweet corn ear characteristics and yield as affected by cultivar and plant population, Paterson, WA, 2012.

Treatment	Ear characteristics						Yield/acre	
	Height (in)	Length (in)	Diameter (in)	Kernel depth (in)	Brix (%)	Pericarp (kg)	No. Ears (1000)	Weight (tons)
Cultivar (Cv)								
610Y	26.2 a	8.85 b	2.22 a	0.538 b	14.4 a	0.817 a	21.4	12.34 a
1365	26.7 a	7.93 c	2.22 a	0.554 a	12.3 b	0.691 c	21.1	10.17 b
Basin	24.2 b	9.33 a	1.94 b	0.517 c	15.1 a	0.735 b	22.1	10.81 b
P>F	*0.016*	*0.001*	*0.0001*	*0.001*	*0.0001*	*0.023*	*0.435*	*0.0004*
Population (Pop)								
17,500	25.7	8.81 ab	2.18	0.534	13.6	0.769	17.5 c	9.88 b
23,200	25.1	8.84 a	2.13	0.532	13.5	0.757	19.6 b	10.93 ab
29,000	25.9	8.54 c	2.08	0.531	14.5	0.729	24.3 a	11.74 a
35,000	26.1	8.61 bc	2.11	0.547	13.9	0.736	24.9 a	11.87 a
P>F	*0.824*	*0.011*	*0.103*	*0.232*	*0.211*	*0.862*	*0.0001*	*0.006*
Contrasts	*P>F*							
Pop-*Linear*	*0.548*	*0.008*	*0.054*	*0.176*	*0.227*	*0.448*	*0.0001*	*0.001*
Pop-*Quadratic*	*0.638*	*0.682*	*0.143*	*0.138*	*0.476*	*0.781*	*0.095*	*0.252*
Pop-*Cubic*	*0.578*	*0.035*	*0.523*	*0.610*	*0.109*	*0.775*	*0.041*	*0.856*
Interactions								
Cv x Pop	*0.776*	*0.160*	*0.277*	*0.669*	*0.388*	*0.972*	*0.086*	*0.569*

Data analyzed with SAS® GLM Procedure, with orthogonal contrasts to compare populations.
Means followed by different letters significantly different at P=0.05 (Duncan's multiple range test).

Summary: In a recent study, Williams explored the effects of plant population density on several processing sweet corn cultivars in Illinois. He found that increasing plant populations linearly decreased filled ear length and kernel recovery, important traits in processing sweet corn. However, he also found that optimum plant populations for yield and recovery varied for different cultivars. This study was conducted to provide information about the effects of plant population density on three cultivars grown in the Columbia Basin, because growing conditions in the Columbia Basin are quite different from those in Illinois, yields are significantly higher, and cultivars vary. In the first year of this study, ear number and yield in tons per acre tended to increase linearly as plant population increased. However, ear length tended to decrease as population density increased. These responses were similar for all three cultivars. These are preliminary results of a study that will be continued in 2013.

Reference: Williams, M.M.II. 2012. Agronomics and Economics of Plant Population Density on Processing Sweet Corn. Field Crops Research 128:55-61.

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