TITLE OF PROJECT: Influence of early season plant stands on yield and sugar content of sugarbeets.

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METHODS: Plots were established to study the influence of various early season plant populations on sugarbeet yields and sugar production. Plots were seeded on a Brookston clay loam sand spot phase soil on the Ridgetown College research farm on 30 April, 2001 using a 4-row Monosem air seeder with 30" (76 cm) row spacings. Fertilizer was applied pre-plant incorporated at a rate of 85 kg/ha N and 50 kg/ha phosphate and potash. Weed control included an application of Pyramin on 07 May, and Betamix on 28 May. The plots were cultivated on 22 May, and 04 July and weed escapes were controlled by hand hoeing. Senator, Dithane and Kocide were applied in August for disease control.

Plots were harvested with a single row plot harvester on October 29. One row was used to collect samples for sugar analysis and the entire plot (2 rows) were used in yield calculations.

The cultivars E17 and C648 were used since they are the most widely grown cultivars in Ontario. Plots were seeded at 3 times the highest plant population, hand thinned on 30 May, and checked and rethinned if necessary on 18 June. Treatments included:

Treatment	Beets/100 feet of row	Distance between beets (inches)
1	80	15
2	130	9.2
3	180	6.6
4	230	5.2

At harvest, yields were not adjusted for gaps in the row; however, overall there were few.

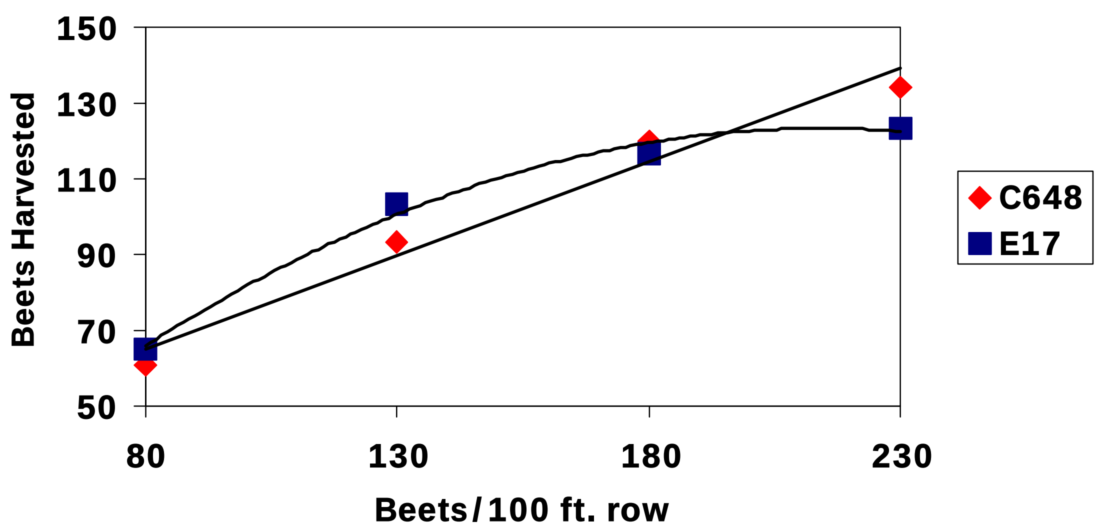
EXPERIMENTAL DESIGN AND DATA ANALYSIS: The experiment was established as a split plot in a randomized complete block design with 6 replications. Main plots were plant population and sub-plots were cultivar. A sub-plot plot consisted of 2 rows, 26" (8.0 m) in length. Data were statistically analyzed using analysis of variance to determine if there were interactions between cultivars and the variables evaluated. If interactions were not present, cultivar data was pooled. Regression analysis were performed using plant population as the regression variable.

DISCUSSION

After good spring rains, the summer of 2001 was relatively dry at Ridgetown. Beet emergence was good, but beet vigour was low; this was evident by the canopy not yet filling in by early August and the yields, which were low. Leaf spot pressure was low.

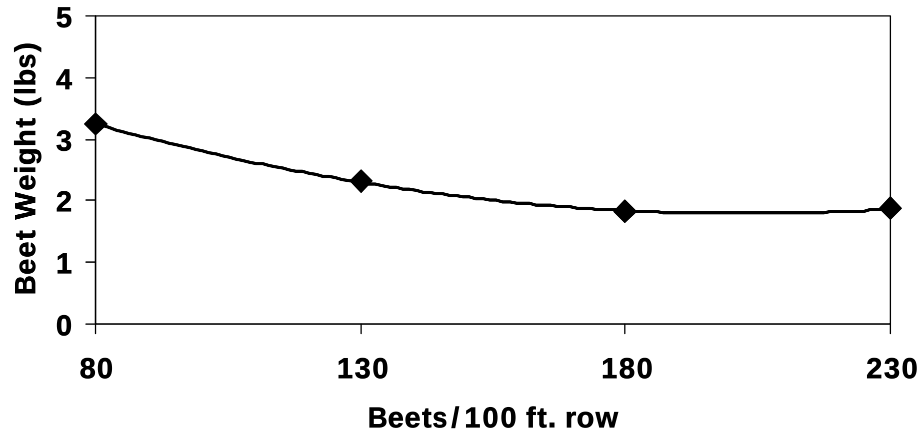
The number of beets harvested increased as initial populations increased, but tended to level off as the higher populations were reached (Figure 1). The cultivars responded differently in respect to the number of harvested beets, with E17 demonstrating a more curved response with little difference between the 2 highest populations, while the response of C648 was linear. Overall, the number of beets harvested as a percentage of the initial population decreased as populations increased. For example, when averaged across both cultivars, 78% of the initial 80 beets per 100 ft of row were harvested, while 75%, 66%, and 56% of the initial 130, 180, 230 beets per 100 ft. of row were harvested. Reduced numbers harvested at the highest population is assumed to be due in part to small beets not being picked up by the harvester.

Figure 1: Beets harvested in response to early season populations.



As expected, individual beet weights decreased as populations increased (Figure 2). Both cultivars responded similarly, so an overall response is shown. Average beet weights of the 230 and 180 beets/100 ft. of row populations were similar, while the weights of the 130 and 80 beets/100 ft of row populations were 26 and 77% heavier respectively.

Figure 2: Average individual beet weights in response to early season populations.



The influence of early season plant population on the percent sugar content, and raw white sugar per ton (RWST) of beets followed a similar pattern, but differed between cultivars (Figure 3, 4). The sugar content and RWST of C648 was relatively unresponsive to increased plant populations and statistically had a slope of 0, while the sugar content and RWST of E17 tended to increase as populations increased.

Figure 3: Percent sugar content of E17 and C648 sugarbeet in response to early season plant population

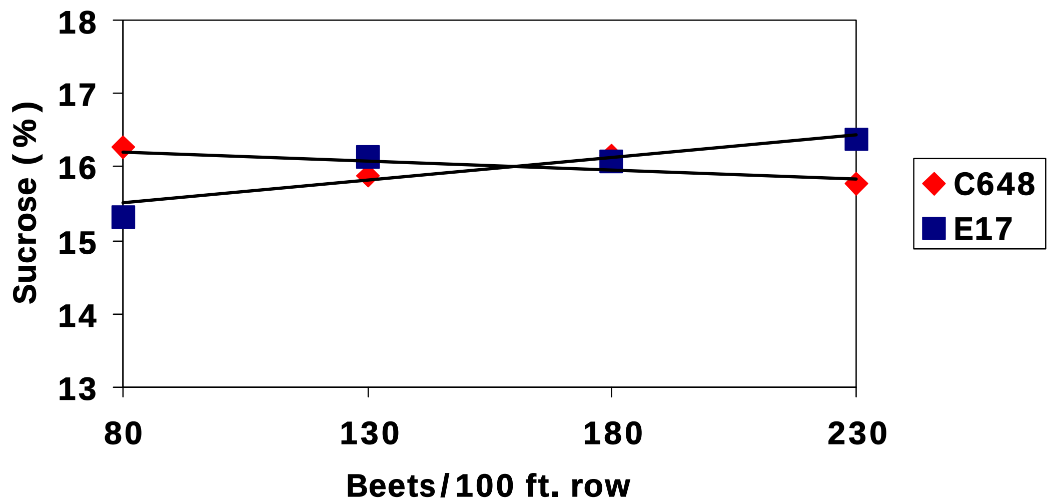
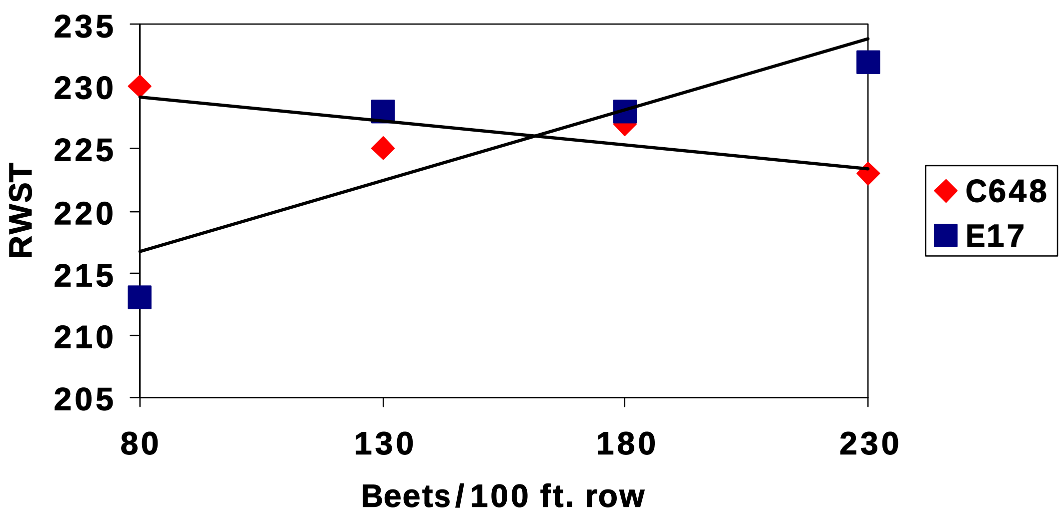
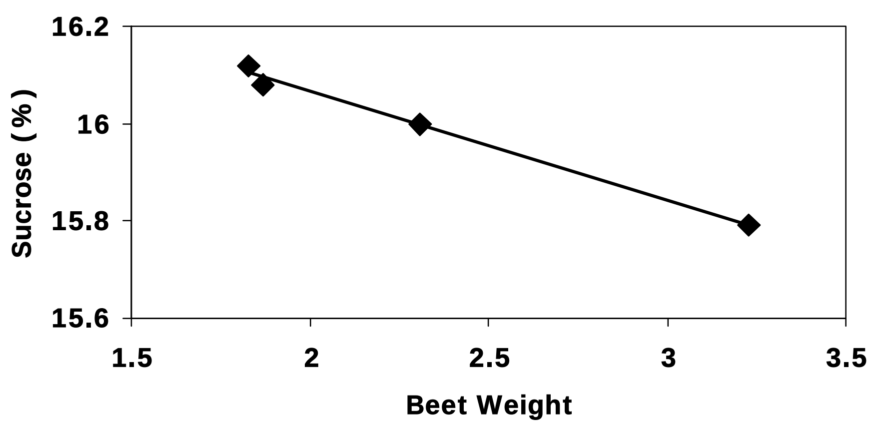


Figure 4: Raw white sugar per ton of E17 and C648 sugarbeet in response to early season plant population



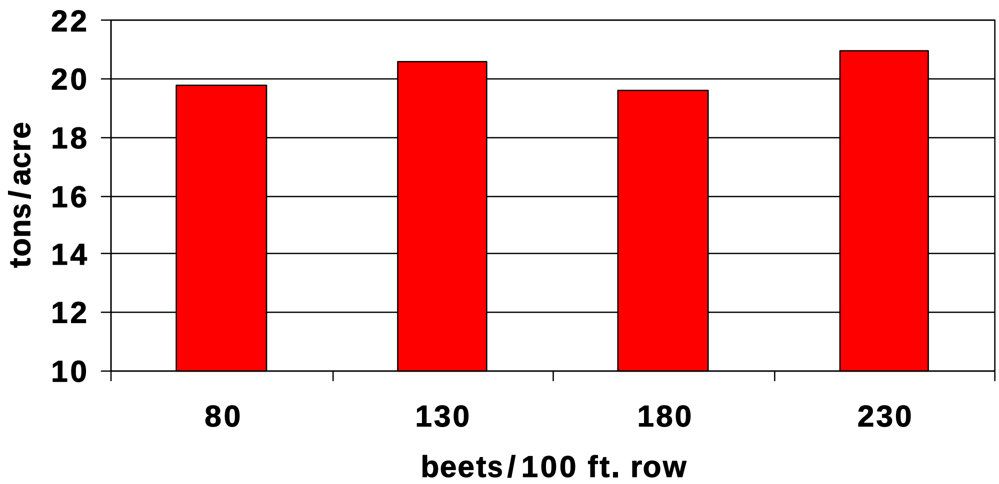
A relationship between beet size and sugar content has previously established, indicating that smaller beets have a greater sugar content. When average beet weight per population was averaged across the 2 cultivars and plotted against average sugar content, this relationship was evident (Figure 5).

Figure 5. Relationship between average beet weight and sugar content (averaged across both cultivars)



Overall, yields did not differ as early season plant populations decreased from 230 to 80 beets per 100 ft. of row (Figure 6), and both cultivars responded similarly. Larger beets in the lower populations and a smaller percentage of the initial stand being harvested at the higher population contributed to this response. The overall response of raw white sugar per acre (RWSA) was similar (Figure 7)

Figure 6: Yield of sugarbeet in response to early season plant populations.



These results support the fact that sugarbeets have a considerable capacity to compensate for low plant populations or gaps in the row. Yields did not differ when initial spacings ranged from 15" down to 5.2" in the row. We have assumed in previous trials that a beet can compensate for 1 ft gap on either side of it in the row, which is still greater than the spacings reported here. However, keep in mind that the results reported here are from a single growing season on a single site under less than ideal growing conditions.

Figure 7: Raw white sugar per ton of sugarbeet in response to early season plant populations