



Specialty Cut Sunflowers Response to Planting Density

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INTRODUCTION

The specialty cut flower industry has been growing rapidly in the past few years, producing new and rediscovered species. There was a continuous decrease in domestic cut flower production within the United States of America in the 1970's and 1980's due to increased imports from other countries (Bonarriva, 2003). Industry reports suggested that the United States of America has a diverse market of cut flowers with imported cut flowers from around the world. Plant spacing is one of the main production factors for any crop to ensure optimum plant density and to minimize the losses that occur as a result of overcrowding. The plant population affects the cost of planting. Sunflowers are grown both as an agronomic crop and specialty cut flower crop. Specialty cut flower growers are more interested in stems and flower sizes whereas for agronomic purposes growers are interested in seeds for the production of oil. For the production of cut flowers, growers are striving to pick a spacing that will produce marketable flowers by utilizing the available space. Sunflower growers should decide upon the optimum spacing after considering the local market demand for the grade of stems and flowers. The purpose of this experiment was to evaluate the influence of plant spacing on sunflower stem length, stem diameter, flower diameter, disk diameter, days to harvest and marketable stems.

MATERIALS & METHODS

Raised beds of dimensions 365 × 121 × 61 cm were used for this experiment. Treatments consisted of four different spacing 30 × 30 cm, 23 × 23 cm, 15 × 15 cm and 8 × 15 cm (Figure 1). Seeds were directly sown in the raised beds on April 23, 2018 for the first experiment and June 29, 2018 for the second experiment. Two seeds at each location were sown and thinned to 1 plant (Figure 2). The cultivars that were sown in the raised beds were 'Superior Gold', 'Pro Cut Gold', and 'Sunrich Lemon'. Each bed had all the four spacing treatments. The number of plants per row was 4, 5, 7 and 13 for the 30 × 30, 23 × 23, 15 × 15, and 8 × 15 cm spacing, respectively (n=64, n=80, n=112 and n=208). Sunflowers were harvested when the sunflower heads were fully developed and open. The measurements taken for each stem harvested were stem length measured from the base of the ground, stem diameter approximately 2.5 cm below the flower, flower diameter, disk diameter and harvest date were recorded. In this experiment, the minimum standard for cut flowers used was a stem length of ≥ 60 cm, stem diameter of ≥ 5 mm, flower diameter of ≥ 8 cm and disk diameter of ≥ 4 cm (Wien 2016, 2017; Sloan and Harkness, 2010).

RESULTS

The 'Superior Gold' cultivar resulted in significant difference in stem length. However, all three cultivars produced marketable stem lengths for all the four spacing treatments in both expt. I and II (Figures 5 and 6). There was a significant trend with stem diameter increasing as spacing increased. However, only 'Superior Gold' and 'Pro Cut Gold' resulted in significant differences in stem diameter producing marketable stems in both expt. I and II. The 'Sunrich Lemon' the least vigorous cultivar still produced marketable stem diameter at all four spacings (Figures 7 and 8). All three cultivars showed a similar trend for flower diameter, with flower diameter increasing as spacing increased for all three cultivars in both expt. I and II (Figures 9 and 10). 'Superior Gold' in expt I had marketable flowers at the 15 x 15, 23 x 23 and 30 x 30 spacing and all four spacings in expt. II. 'Pro Cut Gold' produced marketable flower diameters at the 30 x 30 spacing in expt. I and 23 x 23 and 30 x 30 in expt. II. 'Sunrich Lemon' the least vigorous cultivar failed to produce marketable flower diameter at all four spacing in both expt. I and II. Disk diameter increased with increasing vigor of the sunflowers with 'Superior Gold' producing the largest disk diameter followed by 'Pro Cut Gold' and 'Sunrich Lemon'. All three cultivars produced marketable flowers based on disk diameter at all four spacings for both expts. I and II. Spacing had minimal effects on day-to-harvest, but there was a significant difference in cultivars days-to-harvest which would be attributed to genetic difference between cultivars (Figures 13 and 14). Although there was a decline in the number of marketable flowers for the higher spacings, these spacings would have produced more marketable flowers due to the increased number of plants per unit area for both expts. 1 and II (Figures 15 and 16).



Figure. 1



Figure. 2



Figure. 3



Figure. 4

CONCLUSIONS

The initial results of these experiments indicate that marketable sunflowers can be produced at all four spacings using the more vigorous cultivars. When evaluated based on flower diameter of ≥ 8 cm the 'Sunrich Lemon' cultivar and 'Procut Gold' failed to produce marketable flowers at most spacing, however, when using the disk diameter of ≥ 4 cm all spacing and cultivars resulted in marketable sunflowers. Further research is planned to conduct an economic analysis of which treatment combinations results in the greatest returns per unit area. This will provide growers the information to determine the cultivar and spacing to maximize profit.

References

- Bonarriva, J. 2003. Cut Flowers, Industry and Trade Summary. Washington: USITC Publication, 3580.
 Sloan, R. C., and S. S. Harkness. 2010. Planting date and pinch treatments affect the growth of field-grown, cut-flower sunflower cultivars. Annu. Res. Rep. of the North Miss. Res. & Ext. Ctr. Miss. AFES Info. Bull. 1180.
 Wien, H. C. 2016. Pinching Sunflower Produces More Stems-What about Profits? The Cut Flower Quarterly, 14-15.
 Wien, H.C., 2017. Response of Branching and Nonbranching Cut Flower Cultivars of Sunflower to Pinching and Planting Density. Hort Technology, 27(2):257-262.

Experiment 1

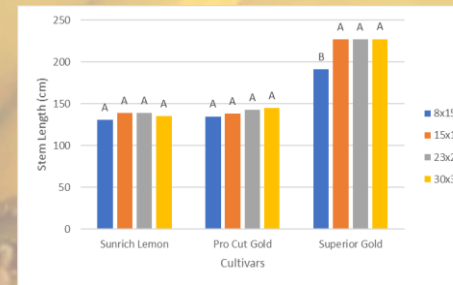


Figure 5: Effect of spacing on stem length, expt 1

Experiment 2

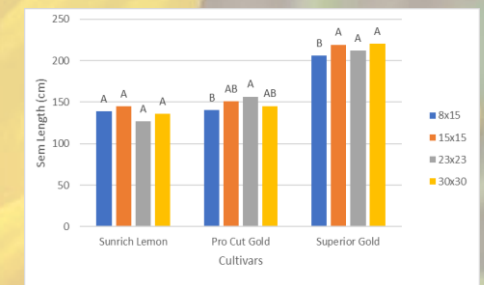


Figure 6: Effect of spacing on stem length, expt 2

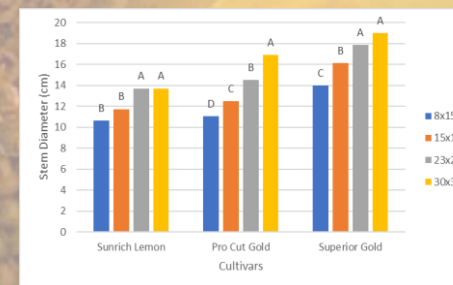


Figure 7: Effect of spacing on stem diameter, expt 1

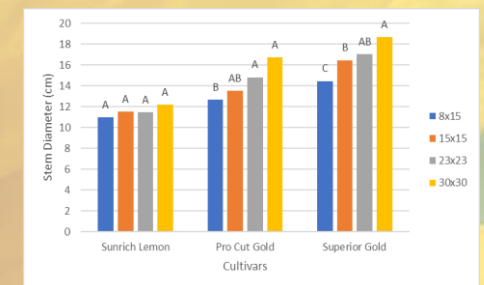


Figure 8: Effect of spacing on stem diameter, expt 2

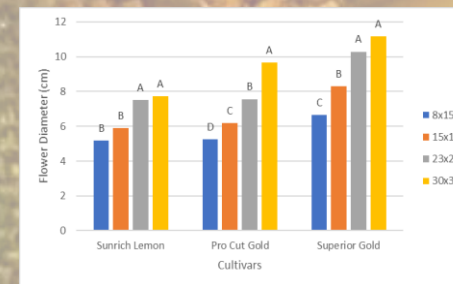


Figure 9: Effect of spacing on flower diameter, expt 1

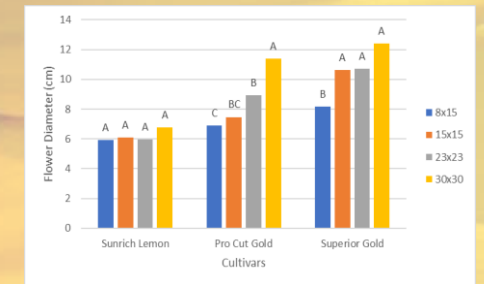


Figure 10: Effect of spacing on flower diameter, expt 2

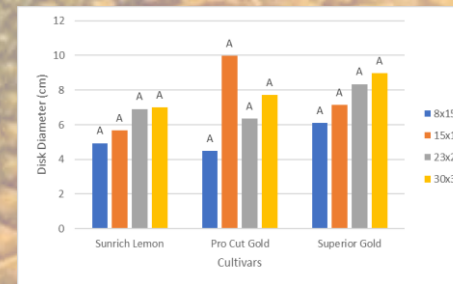


Figure 11: Effect of spacing on disk diameter, expt 1

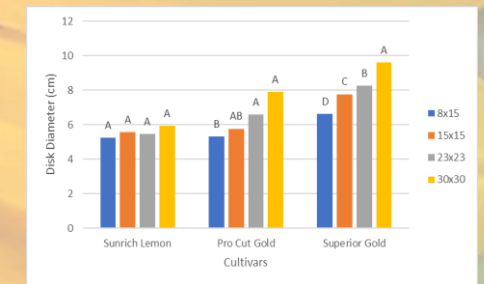


Figure 12: Effect of spacing on disk diameter, expt 2

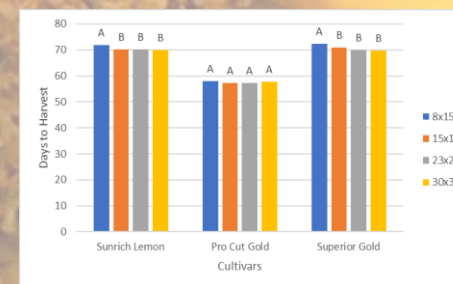


Figure 13: Effect of spacing on days-to-harvest, expt 1

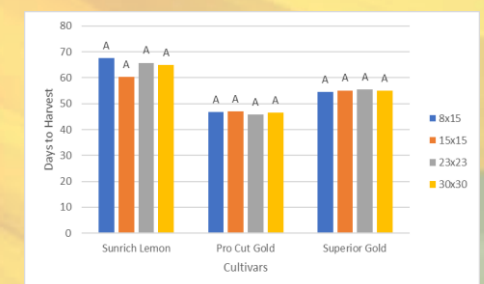


Figure 14: Effect of spacing on days-to-harvest, expt 2

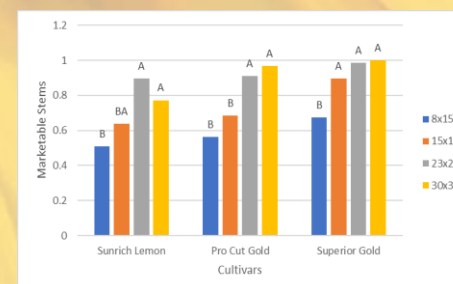


Figure 15: Effect of spacing on the number of marketable stems, expt 1

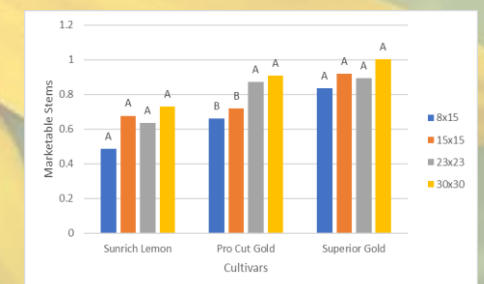


Figure 16: Effect of spacing on the number of marketable stems, expt 2