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THE EFFECTS OF BETWEEN AND WITHIN ROW SPACING ON FINAL PLANT GRADE OF FIELD PRODUCED ROSE PLANTS

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Traditionally, rose plant producers in east Texas have used 132 cm (52 inch) between row and 15 cm (6 inch) within row spacings for field production. The between row spacings has been dictated by the prevalent use of single row offset tractor equipment while the within row spacing has varied from 7.5 to 20 cm (3-8 inches) depending upon market demand, the closer spacings producing more smaller plants.

In recent years, two row tractor equipment has been increasingly used to enhance efficiency of field operations. This equipment requires a more narrow between row spacing than that traditionally used, 112 cm (44 inch) with 15 cm (6 inch) within row spacing being the most common. The objective of this experiment was to study the effect of various between and within row spacings on final rose plant grade and yield.

MATERIALS AND METHODS

In December 1982, disbudded hardwood cuttings of Rosa multiflora 'Brooks 56' were planted 7.5, 15.0, or 22.5 cm (3, 6, or 9 inches) apart in rows 102 or 132 cm (40 or 52 inches) apart. Plots were 3 rows wide by 183 cm (6 ft) long arranged in a randomized complete block design with 8 replications and a split plot restriction using between row spacing as main plots. The following June 1983, plants were T-bud grafted with buds of 'Mister Lincoln'. The following March 1984, rootstock tops were removed to force the scion bud. Applications of 12-12-12 homogeneous granular fertilizer at 224 and 560 kg/ha (200 and 500 lbs/acre) were made in March and June 1984, respectively.

Weed control was achieved by applications of 2.25 kg active ingredient (ai)/ha (2 lbs ai/acre) oryzalin plus 1.7 kg ai/ha (1.5 lbs ai/acre) simazine and 3.4 kg ai/ha (3 lbs ai/acre) metolachlor plus 1.7 kg ai/ha (1.5 lbs ai/acre) simazine made in July 1983 and March 1984, respectively. Plants were harvested from the center plot rows in January 1985, counted and graded into four grades as determined by Texas Department of Agriculture standards. The grade designations

used were 1, 1 1/2, 2, and cull. Grades 1 and 1 1/2 designate the largest and most desirable plants, grade 2 designates small, somewhat inferior plants, and grade cull designates plants which cannot be sold from the field. Percent yield and percent of harvested plants in each grade was determined for each plot. Analysis of variance was used to analyze the data. Orthogonal polynomials was used to test the differences between treatment means.

RESULTS AND DISCUSSION

There were no differences in percent yield for plants in any of the spacing treatments with an overall mean yield of 69%. There was also no difference in final plant grade when plants were grown using between row spacings of 102 or 132 cm (40 or 52 inches). However, both % grade 1 and % grade 1 1/2 exhibited a quadratic relationship with within row plant spacing (see Table 1). The 15 and 22.5 cm (6 and 9 inch) spacing resulted in the highest % grade 1 while the 7.5 and 22.5 cm (3 and 9 inch) spacing resulted in the highest % grade 1 1/2 per plot. When the data for % grades 1 and 1 1/2 were combined, the response to within row spacing was linear with % grade 1 + 1 1/2 increasing with within row spacing. Percent grade cull also exhibited a linear response, but was inversely related to within row spacing. There were no differences in % grade 2 among the treatments with an overall mean of 18%.

However, when number of plants per acre of a particular grade was calculated (number of plants/acre with each within row spacing in a 52 inch row x 0.69% yield x % of plants in a particular grade from Table 1), the results are interpreted differently (see Table 2). Even though % grade 1 and 1 1/2 was lowest for the 7.5 cm (3 inch) within row spacing, this treatment resulted in the highest number of plants in these grades per acre. Currently, costs of production for the various spacings is being considered as spacing systems with fewer plants per acre could also result in a higher cost per plant due to fixed costs of operation.

As stated above, plants of grade 1 and 1 1/2 are the largest and most desirable. The increase in the number of plants in grades 1 and 1 1/2 as within row spacing decreases indicates that the minimum within row spacing for production of high grade plants was less than

anticipated. In addition, a between row spacing more narrow than 102 cm (40 inches) might be used without affecting final plant grade as no differences were found between 102 and 132 cm (40 and 52 inch) treatments. Indeed, a two row bed system like that used in Israel for field plant production may prove effective. There, plants are spaced 11 cm (4") in rows that are 45 cm (18") apart on beds 165 cm (65") apart on center. Costs of production will have to be considered before recommendations for plant spacings can be made or studied further. Also, optimization of irrigation and fertilization regimens could allow more narrow spacing systems to be used effectively.

Table 1. Effect of within row plant spacing on final grade of field grown 'Mr. Lincoln' rose plants

Within Row Plant Spacing (cm)	% Grade 1	% Grade 1 1/2	% Grades 1 and 1 1/2	% Cull
7.5 (3 inch)	27	32	59	22
15.0 (6 inch)	47	24	71	12
22.5 (9 inch)	39	41	79	05
ANOVA				
Row Spacing	NS[z]	NS	NS	NS
Plant Spacing	*	*	*	*
Linear	*	NS	*	*
Quadratic	*	*	NS	NS
Row x Plant Spacing	NS	NS	NS	NS

[z]NS=non-significant *=significant at the 5% level.

Table 2. Effect of within row plant spacing on the number of plants of a particular final grade per acre.

Within Row Plant Spacing (cm)	Number of plants per acre			
	Grade 1	Grade 1 1/2	Grade 1 and 1 1/2	Cull
7.5 (3 inch)	7491	8878	16369	6104
15.0 (6 inch)	6520	3329	9849	1665
22.5 (9 inch)	3607	3792	7306	462