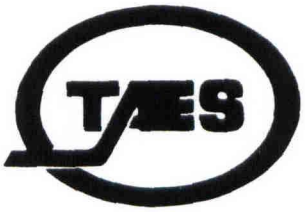

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THE TEXAS AGRICULTURAL EXPERIMENT STATION / Neville P. Clarke, Director / The Texas A&M University System / College Station, Texas

THE CORRELATION BETWEEN CARBOHYDRATE/NITROGEN RATIO AND ROOTING ABILITY IN ROSA MULTIFLORA STEM CUTTINGS

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The Texas field rose bush industry depends upon Rosa multiflora 'Brooks 56' as its primary understock. Hardwood cuttings are generally taken from November through January after the plants have gone dormant. The cuttings are rooted in the field in raised beds without irrigation. Frequently, poor stands in the field are a major problem in the industry. A greater understanding of optimum physiological conditions for selecting cuttings could improve industry productivity.

Seasonal fluctuations of carbohydrates and nitrogen have been studied in several varieties of plants. Depending on species, carbohydrates can enhance or inhibit rooting. The same is true with nitrogen. For this reason, research has been initiated to determine if rooting responses of Rosa multiflora cuttings relate to endogenous levels of soluble carbohydrates, starch, and nitrogen.

Objectives of this research are to 1) determine rooting responses of basal, medial, and apical cuttings on a seasonal basis, 2) to correlate seasonal changes in the carbohydrate/nitrogen ratios with the rooting of hardwood cuttings, and 3) to establish morphological and/or chemical tests for determining optimum commercial rooting periods.

PROCEDURES

Cuttings and sample material were taken on October 30, November 15 and 30, and December 15 and 30, 1983. In 1984, sample dates were January 15, February 15, and March 15. Cuttings were placed both in the greenhouse and the field. Three different experiments were carried out. Experiment 1 consisted of placing 40 each of basal, medial, and apical cuttings, under distilled water intermittent mist in the greenhouse. This was done on each sampling date. The cuttings were propagated in a sand media to facilitate root removal. Each week, for a period of six weeks, cuttings were evaluated for rooting percentage and root number. Experiment 2 was also in the greenhouse. Basal, medial, and apical cuttings were again placed in a sand media

under a distilled water intermittent mist. The cuttings were left undisturbed for a period of six weeks and then evaluated for rooting percentage, root number, and root dry weight. Experiment 3 consisted of placing basal, medial, and apical cuttings in the field at the Texas A&M Horticulture Research Farm. The cuttings were placed in the field, on the dates of November 30, December 15 and 30, January 15, and February 15. On the other sample dates the temperature was too high for the cuttings to survive in the field. The cuttings were placed in a randomized block design. After a period of ten weeks, the cuttings were evaluated for rooting percentage, root number, and root dry weight.

For laboratory analysis, sample material was washed with 0.01 N HCl and rinsed with double distilled water. The material was then dried for a 24 hour period in a forced air oven at 70°C and ground through a number 20 mesh screen in a Willey mill. The ground material was stored in sealed containers until time for analysis. The soluble carbohydrate analysis consisted of taking a 1 gram sample and treating it for three 24 hour periods with 80% ethanol. The residue was frozen for later starch analysis. The extract solution was treated with sulfuric acid and anthrone (a color reagent) and tested spectrophotometrically for soluble carbohydrate content. The residue was boiled in double distilled water for 15 minutes. Amyloglucosidase was added and the resulting extract was analyzed in the same manner as for soluble carbohydrate to ascertain the starch content. For nitrogen analysis, a 0.25 g sample was digested with sulfuric acid and hydrogen perioxide using a block digester. The residue was tested spectrophotometrically with an autoanalyzer.

RESULTS

In Experiment 1, basal cuttings rooted with a higher percentage and a faster rate than either medial or apical cuttings (data not shown). In Experiment 2, basal cuttings rooted significantly better than medial and apical cuttings on the dates of October 30, December 30, and January 15 (Table 1). Over the entire experiment, basal cuttings had significantly higher rooting and root dry weight than apical cuttings (Table 2). Basal was higher than medial but not at a significant level. In Experiment 3, there was no significant

difference between basal, medial, and apical cuttings in overall rooting (Table 3). Medial cuttings had a higher root dry weight than basal ones. The best rooting period was January 15 followed by December 30. Low rooting percentages for the earlier planting dates were most likely due to an unusual period of severely cold weather from December 20, 1983 to January 3, 1984. There was a trend of nitrogen being lower in basal than in apical cuttings from November 15 to January 15 (Table 4). This same trend did not prove similar for carbohydrate data (Table 5). These data corresponded to better rooting of basal over apical cuttings during this period.

Table 1. Percent Rooting of Greenhouse Propagated Cuttings Based on Planting Date from Exp. #2. Cuttings were evaluated six weeks after each planting date.

	Planting Date					
Cutting Location	Oct. 30	Nov. 15	Nov. 30	Dec. 15	Dec. 30	Jan. 15
Apical	30.0±12.4	50.0	72.5	70.0	62.5±11.0	22.5±9.6
Medial	53.3±12.3	62.5	62.5	80.0	75.0± 9.8	22.5±7.0
Basal	96.7± 3.3	65.0	75.0	72.5	95.0± 3.3	57.5±5.9

Table 2. First year rooting data of greenhouse propagated cuttings from Exp. #2.

	Apical	Medial	Basal
% Rooting	39.4±10.3	46.1±9.5	57.4±6.8
Dry Weight (mg)	15.4± 4.5	19.0±9.5	35.6±11.0

Table 3. Percent Rooting of Field Propagated Cutting Based on planting date from Exp. #3. Cuttings were evaluated ten weeks after each planting date.

Cutting Location	Planting Date			
	Nov. 30	Dec. 15	Dec. 30	Jan. 15
Apical	25.0±10.5	7.5±3.7	35.0±7.3	72.5±3.7
Medial	7.5± 3.7	10.0±5.3	37.5±5.9	90.0±5.3
Basal	15.0± 5.0	32.5±6.5	30.0±6.5	90.0±3.8

Table 4. Percent nitrogen of cutting dry weight at each planting date for Exp. #3.

Cutting Location	Planting Date					
	Oct. 30	Nov. 15	Nov. 30	Dec. 15	Dec. 30	Jan. 15
Apical	1.09	0.92	1.22	1.19	1.07	1.09
Medial	1.04	0.85	1.21	1.09	0.89	1.11
Basal	1.09	0.85	1.07	0.95	0.96	0.96

Table 5. Percent soluble carbohydrates and starch of cutting dry weight at each planting date for Exp. #3.

Cutting Location	Planting Date					
	Oct. 30	Nov. 15	Nov. 30	Dec. 15	Dec. 30	Jan. 15
Soluble CHO						
Apical	6.31	2.60	3.54	3.05	3.82	4.81
Medial	4.52	2.11	2.05	2.79	3.23	3.51
Basal	3.18	1.53	3.23	2.11	2.58	3.14
Starch						
Apical		2.84	8.01	4.91	5.03	4.28
Medial		2.93	8.29	5.56	4.89	4.49
Basal		4.61	10.56	8.05	8.77	3.96