PROPAGATION AND PRODUCTION OF TEXAS FIELD-GROWN ROSE BUSHES

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Abstract. Texas is the second largest U.S. producer of field rose bushes, having a 20 million dollar industry New techniques are needed to reduce the 2-year production cycle and increase the yield of Texas field rose bushes There are advantages in simultaneously bench chip budding and rooting. Chip budding was successful using both manual techniques and a Liliput grafting tool, while parafilm strips were the most effective graft wrapping material. To establish the optimum time for rose propagation, leafless hardwood cuttings were harvested from field-grown stock plants and propagated in raised field soil beds at intervals of 2 to 4 weeks from November to February Cutting position had no effect on percent rooting, however basal cuttings had the lowest root number. Starch content was positively correlated and nitrogen negatively correlated to rooting. Maximum rooting of cuttings for field propagation was from 15 November to 15 December, which also corresponded to a low N and higher starch content in propagules harvested from stock plants.

Under present practices, often less than 65% of hardwood cuttings initially planted are harvested as marketable No. 1 rose bushes. New techniques are needed to more effectively produce field roses that are individually handled 20 to 25 times during their 2-year production cycle (Table 1). Objectives of these outlined studies were: (1) to investigate simultaneous bench chip budding and rooting as a more efficient system for producing field roses, and (2) to analyze basal, medial, and apical cuttings for seasonal rooting, and to correlate seasonal rooting changes with carbohydrate-nitrogen ratios.

Table 1. Two year field rose production cycle, East Texas, USA Grading, storage and packaging processes have been omitted

Nov., 1990-Jan., 1991	*R. multiflora* hardwood cuttings placed in field for rooting
March-July, 1991	T-budding of *R multiflora* understock with budwood collected and stored from late fall, 1990
Oct -Dec , 1991	Breaks from *R multiflora* understock used as hardwood cuttings
Jan -Feb , 1992	Scion budwood, which was forced during previous season, is cut back to prevent scion damage before *R multiflora* understock is cut back by machine
Feb -March, 1992	Budded *R. multiflora* understock cut back by machine to encourage scion bud break
Oct -Dec , 1992	Rose bushes pruned for budwood and later dug and processed for storage and shipping

RESULTS AND DISCUSSION

Chip Budding and Rooting. There are advantages of simultaneously bench chip budding and rooting which would eliminate production steps since cutting switches, de-eying cuttings (removing lower axillary buds to prevent suckering), and budding can be done at the same time indoors during the ''downtime'' of winter, reducing time and discomfort to the worker who would bud on a bench vs. conventional T-budding in the field. Other advantages of bench chip budding are budding onto dormant understock vs. field seasonal rainfall dependence on T-budding to maintain active understock cambium; with chip budding the production cycle may be reduced since a 3 to 6 month advantage may be gained in the development of the scion.

Successful bud unions occurred with both the Liliput budding tool and manual budding techniques (Table 2). Poorer responses occurred with manual chip budding of 'Blaze' budwood on the indexed understock which may have been attributable to smaller bud pieces used; it has been our observation that 2 to 3 cm bud pieces are more effective in chip budding of dormant rose understock. Parafilm was more effective than traditional budding rubbers used by growers, by acting as a protective barrier and possibly reducing desiccation.

Table 2. Effect of bench chip budding by manual technique and by Liliput budding tool using Parafilm strips and budding rubbers when budding 'Blaze' and 'Climbing White American Beauty' to the rootstocks *Rosa multiflora* 'Brooks 56' and a disease-indexed *R. multiflora* free of spring dwarf and mosaic virus. (2)

Treatment		Bud union (%)			
		'Blaze' scion		'Climbing White American' 'Beauty' scion	
		Rootstock		Rootstock	
Budding method	Wrapping material	'Brooks 56'	*R. multiflora*	'Brooks 56'	*R. multiflora*
Manual	Parafilm	87a[1]	53b[1]	93a[1]	80a[1]
	Budding rubber	67b	27c	67b	73a
Tool	Parafilm	93a	93a	87a	87a
	Budding rubber	80a	87a	67b	80a

[1] Values followed by the same letter are not significant at the 5% level.

Simultaneously bench chip budding and field rooting has the potential for improving production efficiency of field rose bushes in Texas. There are obvious labor advantages in utilizing a Liliput tool for chip budding with nonskilled laborers. Parafilm wrapped 2 to 3 times around the graft is more effective than conventional budding rubbers since some girdling and tissue necrosis occurred with budding rubbers; grafts were buried under the soil and budding rubbers were not subjected to ultraviolet light breakdown, which normally happens in the above ground T-budding process.

Seasonal Rooting Response. There was a significant relationship between percent rooting, root number, and propagation date. The highest percent rooting and root number occurred from 15 November to 15 December (Table 3). Cuttings taken during cooler periods (30 December to 15 January) had decreased rooting (42%), while low rooting in February (37%) was attributed to the competing sink of axillary bud growth which had begun on stock plants by this time (axillary bud growth was observed, but not quantified). Root number was highest on cuttings propagated from 15 November to 15 December, which may also be attributable to a more moderate temperature and sufficient precipitation levels for non-irrigated field propagation.

Cutting Position. There was no difference in cutting position for percent rooting of field-propagated *R. multiflora;* however, basal cuttings had the lowest root number (Table 3). This agrees with unpublished rooting studies with *Rosa indica* (M. Raviv, personal communication, 1989).

Table 3. Seasonal rooting and starch.N ratio and total carbohydrate·N ratio of field-propagated *R multiflora* 'Brooks 56' hardwood cuttings.

	Percent rooting	No. of roots per cutting	Starch·N ratio	Total C:N ratio
Propagation date				
Nov 15	72.5	7.9	11.1	13 1
Nov. 30	85 8	7 1	11·1	15.1
Dec. 15	80.8	5 6	8·1	12.1
Dec 30	39.2	1 8	5 1	8.1
Jan. 15	44.2	2 3	6 1	8:1
Feb. 15	37.5	2 2	5.1	7.1
Cutting position				
Apical	58 3a	4.5ab	—	—
Medical	65 8a	5 4a	—	—
Basal	55 8a	3.5b	—	—
Significance				
Month (date)	**	**	—	—
Position	NS	**	—	—
Month x position	NS	NS	—	—

Chemical Composition, C/N Levels and Rooting. Starch levels decreased and N levels increased in propagules harvested from stock plants toward the end of the propagation season, which corresponded with poorer rooting capacity (Table 3). In addition, high starch content was positively correlated and high N negatively correlated with rooting. Brandon (1), using nonquantitative KI histological staining techniques, was unable to find a correlation between the starch content and ease of adventitious root formation of selected *Rosa* species. This contrasts with the positive correlation of high starch accumulation and rooting of our research, and may explain why KI histological observation has not been a widely used test for the commercial determination of cutting fitness to root. Stored forms of carbohydrates, such as starch, are needed for the rooting of hardwood cuttings that are leafless and unable to photosynthesize (3). During highest field rooting (15 November to 15 December), all three cuttings types average 0.85% N, and during low rooting (30 December to 15 February) N increased to a combined average of 1.03%. Optimum and supraoptimum levels of N have been reported to play a role in the rooting of *Vitis* (5).

CONCLUSIONS AND RECOMMENDATIONS

Mid-November through mid-December is the optimum period for propagating *R. multiflora* 'Brooks 56' hardwood cuttings. This roughly corresponds to the time of planting presently used by many Texas rose producers, even though growers will plant as early as 30 October and as late as 15 February to use available labor. Successful early propagation dates will most likely depend on the prevailing climatic conditions, with adequate rainfall and cool temperatures being advantageous. Planting after 30 December in Texas would not be advisable based upon these data and another seasonal study (4). Collection of cuttings and field planting is advisable at temperatures $\geq 5°$ C, as cuttings in this and another study (unpublished data) planted under colder conditions failed to give satisfactory results. The apical and medial sections of the *R. multiflora* canes were generally the best position to take cuttings for propagation.

C/N ratios appear to be important for optimum periods to harvest propagules from stock plants. An 11-8:1 starch:N, and 15-12:1 total carbohydrates:N, were desirable levels for optimum rooting, and as C/N decreased below these levels, so did rooting. N levels also appeared to be an important predictor of rooting potential. When all three cutting types averaged 0 to 0.85% N, high rooting occurred vs. 1.03% N when rooting was low. The importance of N in rooting underscores the potential for stock plant manipulation through fertilization practices, since low to moderate N fertility will help increase starch levels, C/N ratios, and rooting success. Currently, rootstock plants of *R. multiflora* are not fertilized during the first year of commercial production, after which cuttings are taken for the next crop rotation. Future research implementing simplified screening tests for starch and N in determining C/N ratios could improve industry propagation efficiency for field rose production.

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