PUBLICATIONS

1991

HORTICULTURAL RESEARCH, 1991 - OVERTON

RESEARCH CENTER TECHNICAL REPORT 91-1

Texas A&M University Agricultural Research & Extension Center
at Overton

Texas Agricultural Experiment Station
Texas Agricultural Extension Service

Overton, Texas

June 20, 1991

SCION BUD SURVIVAL ON WATER STRESSED ROSE ROOTSTOCK PLANTS

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INTRODUCTION

East Texas is a major center for garden rose plant production in the United States. During a two-year production cycle, losses of up to 50% can occur through problems encountered with the T-bud grafting operation during the spring of the first year of production. This operation accounts for more than 25% of the total cost of production. Currently, no irrigation is used for field production of rose plants in Texas as local rainfall normally exceeds 40 inches per year. However, poor rainfall distribution often exposes rootstock plants to drought stress during the budding season. To determine the effect of rootstock water stress on scion bud survival, plants of *Rosa multiflora* were established in a glasshouse under three levels of water stress as defined by morphological and physiological measurements. These plants were then T-bud grafted and assayed for scion bud survival.

MATERIALS AND METHODS

Rooted cuttings of *Rosa multiflora* 'Brooks 56' were established in 1 gallon pots in a media of 80% pine bark/20% sand (v/v). Non-stress, intermediate stress, and stressed watering regimens were then established gravimetrically. Stress levels were confirmed with Ψ_w (water potential) measurements. Twenty-one days after imposing the stress treatments, plants were T-bud grafted with buds of *Rosa* cvs. Tiffany and Mister Lincoln. Fourteen days after grafting, the rootstock tops were partially cut and bent away from the bud (crippled) in order to force the buds to grow as an assay of survival. Later in the experiment, the tops were completely removed and the scions allowed to grow. Twenty one days after crippling, plants were harvested and growth measurements of the scions were made. Another set of plants was grown for 35 days after establishing the water stress treatments. At that time, the new growth was harvested and measured. Experiments were performed twice.

RESULTS

The water stress treatments had a significant effect on the growth of *Rosa multiflora*. Plants fully stressed for 35 days exhibited a 50% reduction in area of the

first fully expanded leaf (Table 1). Total leaf area and total leaf number were also reduced 53 and 43% for plants in the intermediate stress treatment while 73 and 68% in the stressed treatment, respectively. Internode length was reduced by 16% for the intermediate stress and 19% for the stressed treatment when compared to non-stress control plants. Plants in the intermediate stress treatment produced 44% less dry weight than the controls while those in the stressed treatment produced 61% less.

At the time that the rootstock plants were T-bud grafted, Ψ_w averaged -2.1 MPa for the stressed treatment and -1.2 MPa for the non-stress treatment. However, adequate bark slippage was found for rootstock plants in all treatments. Scion bud survival was lower for both cultivars when budded onto stressed rootstock plants compared to non-stressed controls (Table 2). In addition, surviving scion shoot length was greater on non-stressed plants than stressed plants regardless of cultivar (Table 3). Mr. Lincoln performed better than Tiffany overall.

CONCLUSIONS

The results show the effect of rootstock water stress on scion bud survival. The plant stress established in this experiment was less than can be observed under field conditions where periods of drought can result in a total stoppage of rootstock plant growth associated with a lack of bark slippage. That T-budding cannot be accomplished without adequate bark slippage is known. However, these data illustrate that the levels of rootstock water stress that affect scion bud survival can occur even though adequate bark slippage is present. This set of conditions would be difficult to assess by field observation and emphasizes the need for supplemental irrigation when periods of drought occur during the budding season.

Table 1. Mean growth measurements on *Rosa multiflora* 'Brooks 56' plants after exposure to three water regimens for 35 days under glasshouse conditions.

Treatment	Leaf area first fully expanded leaf (in^2)	Leaf number	Total plant leaf area (in^2)	Internode length (in)	Shoot dry wt (oz)
Non-stress	7.1 a[z]	189 a	681 a	1.4 a	1.0 a
Intermediate stress	4.5 b	107 b	320 b	1.1 b	0.6 b
Stressed	3.6 c	62 c	202 c	1.1 b	0.4 c

[z]Mean separation within columns using Fisher's protected LSD 5% level. Means followed by the same letter are not significantly different.

Table 2. Bud survival for two cultivars T-bud grafted onto *Rosa multiflora* 'Brooks 56'.

Treatment	% Dead Buds
Tiffany	
Non-stress	24 ± 5.4[z]
Intermediate stress	63 ± 6.0
Stressed	100 ± 0.0
Mister Lincoln	
Non-stress	0 ± 0.0
Intermediate stress	13 ± 4.1
Stressed	50 ± 6.2

[z]Mean ± standard error.

Table 3. Growth of surviving scions T-bud grafted onto *Rosa multiflora*.

Treatment	Scion Shoot Length (in)
Non-stress	2.7 a[z]
Intermediate stress	1.8 ab
Stressed	0.6 b
Cultivar	
Mister Lincoln	2.5 a
Tiffany	0.5 b

[z]Mean separation within factor using Fisher's protected LSD 5% level. Means followed by the same letter are not significantly different.