

Grafted Watermelon Stand Survival After Transplant in a High-Wind Area

Angela R. Davis

USDA, ARS, South Central Agriculture Research Laboratory, P.O. Box 159, Lane, OK 74555
U.S.A.

Stephen R. King

Vegetable & Fruit Improvement Center, Department of Horticultural Sciences, Texas A & M
University, College Station, TX 77843-2133 U.S.A.

Grafting of watermelon (*Citrullus lanatus* (Thunb.) Matsum. and Nakai) to disease resistant rootstocks is a common practice in many parts of the world but despite the reported advantages, such as resistance to soil-borne diseases and increased water use efficiency, the practice is not common in the U.S. The use of rootstocks has been shown to enhance the vigor of the scion through avoidance of soil pathogens, tolerance of low soil temperatures and/or salinity, and increased scavenging of soil nutrients (2). The type of rootstock has been shown to affect watermelon plant growth and yields (3). Yetisir et.al. (4) demonstrated that the survival rate of grafted plants was inversely correlated with the difference in diameters of scion and rootstock, and that the number of vascular bundles positively affected the growth rate of the grafted watermelon plants. Edelstein, M. et.al. (1) showed that stem diameter and number of vascular bundles of the rootstock did not correlate with scion plant fresh weight for *C. melo* scions and 22 *Cucurbita* spp. rootstocks.

Increases in soil born pathogens accompanied by the loss of effective pesticides such as methyl bromide may necessitate the use of alternative forms of disease control, such as the use of disease resistant rootstocks, in the U.S. One disadvantage that has been observed by growers in the U.S. is a high mortality of grafted watermelon plants. Despite the potential benefits of using grafted watermelon, little research has been done in the U.S. The purpose of this research was to

investigate the feasibility of using grafted watermelon plants in high-wind areas.

Materials and Methods: *Plant material.* Watermelon scions included 'Royal Sweet' (diploid) and 'Sugar Time' (triploid), and the rootstock was 'Strongtosa' (an interspecific hybrid between *Cucurbita maxima* and *C. moschata*). Seeds were sown into 3.8 cm square x 6.3 cm deep Speedling flats (#F128A, Speedling, Inc., Sun City, FL) containing Redi-earth growth media (SunGro, Vancouver, BC). The watermelon cultivars were sown 5 d prior to sowing the rootstock. Watermelon plants were 10 to 12 days old at time of grafting.

Grafting. Scions were grafted using a modified tongue and groove method with or without the aid of a wooden pin. The tongue and groove method involved cutting a slit in the rootstock and cutting the scion to fit the groove made in the rootstock. The scion was then attached either with parafilm to hold the two together since clamps were unavailable, or with a toothpick (wooden-pin) inserted into both the scion and rootstock to align the two. This method was also held together with parafilm (Figure 1). Grafted plants were placed in flats in a warm environment for 48 hours. Temperatures ranged from 23°C to 28°C but the environment was not sufficiently humid and there was a high loss of plants shortly after grafting. Seedlings were planted in a Lane, Okla. field 3 weeks later in a randomized complete block design with four replications in a serpentine arrangement. The field had Bernow fine-loamy, siliceous, thermic,

glossic palendalf soil. There were no wind breaks in the field. Survival counts were taken prior to transplanting in the field, and at 3 d and 10 d after transplanting.

Statistics. Means were calculated for grafting frequency by dividing the number of graft attempts by successful grafts (prior to transplanting) for each variety and method. Three and ten day survival frequencies were calculated by dividing number of transplants surviving after 3 d or 10 d by the number of transplants for each treatment. Analysis of variance was performed using Proc GLM with mean separation by Duncan's multiple range test (SAS statistical software, Cary, NC).

Results and Discussion: The wooden-pin modification of the tongue and groove method did speed the grafting process compared to the non-modified method because the toothpick provided sufficient support. Survival of the tongue and groove and wooden-pin modified tongue and groove method were similar, ranging from 33 to 40% success (Table 1), which indicates that the wooden-pin modification did not hinder the healing process.

Both methods were similar for transplant survival after 3 days with a range from 70 to 83%. However, Sugar Time had a lower survival rate (24 to 37%) at day 10 than Royal Sweet (67 to 69%). This may be due to smaller seedling size at time of grafting compared to Strongtosa reducing graft acceptance. Survival of the grafted plants was significantly reduced when compared to the respective survival of non-grafted plants. The primary cause of transplant loss appeared to be tissue breakage at the graft union. Wind conditions in Lane following transplanting had gusts up to 32 mph (Table 2). Very few plants were lost after the 10 day stand count

The goals of any grafting modifications should be to reduce input costs and increase survivability in the field. The methods used

here did not show significantly different changes in survivability, but the wooden-pin method did decrease the amount of time required to perform the grafts, which will result in lower costs. However, it appears the added support afforded by the wooden-pin modified method will not result in increased survival of grafted watermelon plants under high wind conditions. Further study is needed with multiple rootstock/scion combinations and grafting techniques to determine optimal survival rates of grafted plants under high-wind conditions.

Literature Cited:

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Table 1. Comparison of grafting frequency and transplant survival frequency for the different cultivars and different grafting methods.

Variety	Method	% Graft survival*	Number of transplants	% 3d Survival**	% 10d Survival**
Royal Sweet	Parafilm	26	26	83b	69b
Royal Sweet	Toothpick	33	33	83b	67b
Royal Sweet	Non-grafted	NA	33	100a	91a
Sugar Time	Parafilm	30	30	70b	37b
Sugar Time	Toothpick	29	29	73b	24b
Sugar Time	Non-grafted	NA	33	98a	98a

*% Graft survival = (successful grafts/attempted grafts) x 100. One hundred graft attempts were made for each treatment. There were no significant differences at the P_{0.05} level of probability.

**Percentage of plants surviving 3 and 10 days after transplanting. Means followed by the same letter are not significantly different at the P_{0.05} level of probability.

Table 2. Wind speed weather data for 10 days following transplanting.

Days after transplant	Average (mph)	Gust (mph)
0	5	18
1	8	27
2	5	32
3	9	22
4	8	19
5	9	20
6	8	21
7	7	24
8	6	20
9	8	20
10	6	16



Figure 1. The toothpick modified tongue and groove graft procedure. A groove is made in the rootstock and a tongue is made in the scion to fit the groove. For the modification a toothpick is inserted into the rootstock and the scion is inserted onto the toothpick and pressed down to make contact with the rootstock. Parafilm was used to hold the graft in place.