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Effect of various treatments on the production of first grade grafts of Thompson Seedless grapevine on Vitis solonis × V. riparia 1616 rootstock

by

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Einfluß verschiedener Behandlungsverfahren auf die Erzeugung pflanzfähiger Pfropfreben aus Thompson Seedless auf der Unterlage Vitis solonis × Vitis riparia 1616

Zusammenfassung. — Durch 24stündiges Eintauchen des Unterlagenschnittholzes von *Vitis solonis* × *V. riparia* 1616 in 50 ppm NES vor der Veredlung mit Thompson Seedless wurde der höchste Prozentsatz pflanzfähiger Pfropfreben erzielt. Kältestratifikation des Schnittholzes erbrachte bessere Ergebnisse als die anderen Behandlungen. IES, IBS, GS, Thiamin und Saccharose verringerten die Anwuchsprozente. Wurden die Unterlagen mit dem basalen Ende in 14—16 °C warmes Wasser eingetaucht, und zwar kalt gelagertes Schnittholz 6 oder 12 Stunden, frisch geschnittenes Holz 12 Stunden lang, so war der Pfropferfolg beträchtlich verbessert. Bei vorgekühltem Unterlagenschnittholz waren auch 24stündiges Quellen des basalen Endes mit anschließendem Entfernen der unteren 3 cm oder 24stündiges Eintauchen des oberen Endes von Vorteil. Überziehen der Pfropfstelle mit Paraffin erhöhte die Anwuchsrate nur im Falle des unmittelbar vor der Pfropfung geernteten Holzes.

Introduction

Thompson Seedless is the leading grapevine cultivar in Egypt. Previous trials by Stino *et al.* (1976) proved its high compatibility with Solonis × Riparia 1616 rootstock. This stock is tolerant to many species of nematodes which are found in vineyards in Egypt (Riad 1974). The experiment is confined to different treatments affecting the union of Thompson Seedless cultivar on 1616 rootstock. Previous investigations considered the effect of NAA (Eifert 1966, Schenk 1969 and Stepanova 1969), IAA (Eifert 1966, Liuni and Costacurta 1969), IBA (Sarkisova 1964, Eifert 1966), GA_3 (Weaver 1959 and Julliard 1970), ascorbic acid (Stepanova 1969), thiamin (Tizio 1967) and sucrose (Schenk 1969) on the graftage success of vines. Moreover, steeping the basal or apical portion of rootstock vine cuttings was recorded to increase the grafting success (Almela Pons *et al.* 1963, Nacvlisvili 1969, Sulikeri and Nalawadi 1971, Liuni 1972 b and c). Also, removal of the base portion of some rootstock cultivars increased the rooting percentage (Calo and Liuni 1966). Waxing treatment was recommended to improve the success of graftage (Eifert 1966, Antognozzi *et al.* 1968 and Maltabar *et al.* 1968).

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Material and methods

Graftage materials of Thompson Seedless scions and Solonis × Riparia 1616 rootstock cuttings were collected in 1975 from the vineyard of the Department of Horticulture, College of Agriculture, Cairo University, in Giza. Median hardwood cuttings of rootstock were prepared with 4 nodes (SINGH and SINGH 1968) and basal cut close to a node (MAMAROV 1973). The scions contained 2 nodes (HARMON and WEINBERGER 1967). The best taking dates were previously determined to be 10 January for cuttings stored before grafting at 4 °C for one month (pre-stored cuttings) and 30 January for directly grafted cuttings (MIKHAIL 1976). Both types of rootstock cuttings were treated one of the following treatments just before grafting:

1. Soaking the basal end for 24 hours in the dark in one of the following solutions: IAA at 100 ppm, IBA at 100 ppm, NAA at 50 ppm, GA_3 at 100 ppm, vitamin C at 250 ppm, vitamin B_1 at 200 ppm and sucrose at 3%.

2. Steeping the basal 3 cm of cuttings in volumed water (250 ml per 60 cuttings) at 14—16 °C for 6, 12, 24 or 48 hours. Another trial was steeping the upper end in volumed water for 24 hours.

3. Covering graftage zone with paraffin wax (M.P. 40 °C).

For each treatment 60 cuttings of both rootstock and scion were prepared and divided into three equal replicates. Scion cuttings were bench-grafted using the common whip technique and the grafting union was tightly wrapped with polythene tapes. Grafts were kept at 15—20 °C for one month until their planting in nursery rows. Stratification either cold or hot was carried out by keeping cuttings or grafts upside-down (LIUNI 1972 a) in sealed polythene bags (GARTNER 1971) filled with wetted sawdust.

Graftage success was mesaured by the percentage of plants showing a good union between stock and scion and developing a good shoot and root system after one year of graftage.

Results and discussion

The best auxin treatment (Table 1) for graftage success was soaking the basal end of either cold-stored or freshly prepared rootstock cuttings in 50 ppm NAA for 24 hours. Similarly, NAA was mentioned to be the best auxin for rooting of certain vines and grafts (SCHENK 1969); however, it stimulated union formation at 60 ppm (STEPANOVA 1969). On the other hand, 100 ppm IAA gave statistically equal effects as NAA for precooled cuttings, while it decreased the success of freshly prepared ones. This difference in the effect of IAA was possibly due to the variation of the physiological state of the two types of cuttings as previously shown by LIUNI and COSTACURTA (1969). However, IAA at 100 ppm was the optimum concentration which has been reported for grafting success of vines (STEPANOVA 1969). On the other side, IBA treatment gave the poorest results with both cold-stored and freshly prepared stock cuttings.

Although low concentration of GA_3 was reported to stimulate callus formation on vine grafts (JULLIARD 1970), in this study GA_3 treatment failed to encourage grafting success. Furthermore, this treatment ultimately depleted the directly prepared cuttings. This retarding effect of GA_3 could be attributed to the high concentration used (100 ppm). However, WEAVER (1959) found that treating vine cuttings with GA_3 prolonged the dormancy of their buds, especially at high concentrations.

Table 1

Effect of different exogenous growth regulators and of storage on the definite success of graftage

Einfluß verschiedener exogener Wachstumsregulatoren sowie der Lagerungsbedingungen auf den Pfropferfolg

Treatment	Condition of grafting material	Avg. percentage of success	Avg. of angle
NAA	Cold-stored	53.7	47.15 a[1])
IAA	Cold-stored	50.0	45.00 ab
NAA	Freshly prepared	46.8	43.12 b
Untreated	Cold-stored	45.2	42.22 b
IBA	Cold-stored	37.4	37.69 c
Control	Freshly prepared	29.2	32.66 d
IAA	Freshly prepared	18.4	25.36 e
IBA	Freshly prepared	14.8	22.48 e
GA_3	Cold-stored	3.7	4.01 f
GA_3	Freshly prepared	0	0 f

[1]) Within last column, means followed by the same letter do not differ at the 5% level of probability according to Duncan's Multiple Range test.

The discussed results revealed that there is no need to use ascorbic acid or thiamin, since untreated cool-stored rootstock cuttings gave superior results than those treated with each of these vitamins (Table 2). However, vitamin C treatment stimulated the success of freshly prepared cuttings, while vitamin B_1 had no effect at all. These results substantiated the previous findings of TIZIO (1967) and STEPANOVA (1969).

As for the effect of soaking stock cuttings in sucrose solution before grafting and stratification, the obtained results (Table 3) showed that this treatment did not give any appreciable effect. This was true for either cold-stored or freshly prepared cuttings. It is worth mentioning that storing grafting material at 4 °C for one month had always higher success rate than those directly prepared, regardless of sucrose application. Yet, the combination of glucose with IAA did not greatly increase the stimulatory effect of the auxin on callusing and root development on vine grafts (SCHENK 1969).

Table 2

Effect of soaking in ascorbic acid and thiamin solutions and of storage on the definite success of graftage

Einfluß von Ascorbinsäure- und Thiaminlösung sowie der Lagerungsbedingungen auf den Pfropferfolg

Treatment	Condition of grafting material	Avg. percentage of success	Avg. of angle
Untreated	Cold-stored	45.2	42.22 a
Vit. C	Freshly prepared	37.0	37.45 b
Vit. B_1	Cold-stored	35.1	36.35 bc
Vit. C	Cold-stored	33.3	35.30 bcd
Control	Freshly prepared	29.2	32.65 cd
Vit. B_1	Freshly prepared	26.8	31.11 d

As to statistical significance, cf. footnote Table 1.

Table 3

Effect of soaking in 3 percent sucrose solution and of storage on the definite succress of graftage

Einfluß 3%iger Saccharoselösung sowie der Lagerungsbedingungen auf den Pfropferfolg

Treatment	Condition of grafting material	Avg. percentage of success	Avg. of angle
Untreated	Cold-stored	45.2	42.22 a
Sucrose	Cold-stored	45.2	42.22 a
Control	Freshly prepared	29.2	32.65 b
Sucrose	Freshly prepared	23.6	29.00 b

As to statistical significance, cf. footnote Table 1.

The advantage of steeping the basal portion of rootstock cuttings in water at 14—16 °C was recognized in this study (Table 4). However, the adequate period of soaking which significantly improved the graftage success varied according to the physiological state of cuttings. Thus, 6 or 12 hours' steeping was most favourable for pre-stored cuttings at 4 °C. However, with freshly prepared cuttings, only 12 hours of steeping had a beneficial effect, while 6 hours' treatment had a deleterious one. Increasing steeping period up to 24 hours did not improve the success in either of the two types of cuttings. The favourable effect of soaking in water for the success of vine graftage has been proved by several investigators including NATSVLISVILI (1969) and LIUNI (1972 b). Best period for soaking was found to vary with different varieties (ALMELA PONS *et al.* 1963, SULIKERI and NALAWADI 1971). On the other hand, by a more prolonged steeping period (48 hours), the success rates of cold-stored and directly prepared stock cuttings were diminished significantly. SULIKERI and NALAWADI (1971) had demonstrated that prolonged soaking of Thompson Seedless up to 72 hours had an adverse effect.

Though soaking of cold-stored 1616 rootstock cuttings in water for 24 hours did not improve the graftage success, this treatment gave the best result when it was

Table 4

Effect fo soaking the basal portion of rootstock cuttings for different periods and of storage on the definite success of graftage

Einfluß unterschiedlich langer Wasserbehandlung des basalen Endes der Unterlage sowie der Lagerungsbedingungen auf den Pfropferfolg

Treatment	Condition of grafting material	Avg. percentage of success	Avg. of angle
6 hours	Cold-stored	66.7	54.76 a
12 hours	Cold-stored	66.7	54.76 a
24 hours	Cold-stored	50.7	45.12 b
Untreated	Cold-stored	45.2	42.22 bc
12 hours	Freshly prepared	43.6	41.29 c
24 hours	Freshly prepared	32.9	34.79 d
Control	Freshly prepared	29.2	32.65 d
48 hours	Cold-stored	26.7	30.99 d
48 hours	Freshly prepared	17.8	24.71 e
6 hours	Freshly prepared	0	0 f

As to statistical significance, cf. footnote Table 1.

Table 5

Effect of soaking the upper portion of rootstock cuttings, removal of the pre-soaked cuttings' base and of storage on the definite success of graftage

Einfluß der Wasserbehandlung des oberen Endes der Unterlage, der Entfernung des unteren Endes von den vorgequollenen Unterlagen sowie der Lagerungsbedingungen auf den Pfropferfolg

Treatment	Condition of grafting material	Avg. percentage of success	Avg. of angle
24 hours removal	Cold-stored	60.0	50.80 a
24 hours reversal	Cold-stored	53.3	46.92 b
24 hours	Cold-stored	50.4	45.21 b
24 hours	Freshly prepared	32.9	34.92 c
24 hours reversal	Freshly prepared	29.3	32.67 c
24 hours removal	Freshly prepared	19.0	25.87 d

As to statistical significance, cf. footnote Table 1.

followed by taking off the basal 3 cm of the cutting including the basal node (Table 5). However, when this combined treatment was done on freshly prepared cuttings, an adverse effect was obtained. In this respect, Calo and Liuni (1966) found that removal of this portion from the lower end of Kober 5 BB, Teleki 8, Selection Cosmo 2 rootstock cuttings after stratification increased slightly the rooting percentage. However, keeping the old surface of 420 A resulted in a significant reduction of the number of roots per cutting.

Concerning the direction of soaking (Table 5), 24 hours' soaking of either pre-cooled or freshly prepared cuttings in an upside-down direction showed similar effect as those soaked in the right way. Nevertheless, Liuni (1972 b) obtained best results when the apical ends of Kober 5 BB rootstock cuttings were soaked in water for 12 hours. However, this treatment depressed the length of root produced on Merlot vine cuttings (Liuni 1972 c).

The results of waxing treatment (Table 6), differed according to the state of graftage materials. With the cuttings directly grafted after preparation, coating grafting union with paraffin wax before stratification enhanced greatly union

Table 6

Effect of waxing the grafting zone and of storage on the definite success of graftage

Einfluß der Paraffinumhüllung der Pfropfstelle sowie der Lagerungsbedingungen auf den Pfropferfolg

Treatment	Condition of grafting material	Avg. percentage of success	Avg. of angle
Wax	Freshly prepared	48.61	44.16 a
Untreated	Cold-stored	45.18	42.20 a
Control	Freshly prepared	29.17	32.65 b
Wax	Cold-stored	26.67	31.07 b

As to statistical significance, cf. footnote Table 1.

formation and subsequent success of graftage process. On the contrary, covering the grafting zone of previously cooled materials with wax inhibited union development and so reduced the percentage of success. This converse role of waxing might be due to the different physiological state of grafting material of both treatments. However, waxing treatment was recommended to improve success of vine graftage (ANTOGNOZZI *et al.* 1968). Moreover, this practice reduced scion rooting (ANTOGNOZZI *et al.* 1968) and prevented drying out of grafts (MALTABAR *et al.* 1968).

Summary

Soaking Solonis × Riparia 1616 vine rootstock cuttings in 50 ppm NAA for 24 hours before grafting gave the highest rate of Thompson Seedless graftage success. Cold stratification of cuttings gave superior results than other treatments. However, IAA, IBA, GA, thiamin and sucrose reduced the percentage of success. Steeping the basal portion of rootstock cuttings in water at 14—16 °C for 6 or 12, and 12 hours for cold-stored and freshly prepared cuttings respectively improved the grafting success. Basal soaking for 24 hours and then removing the lower 3 cm or 24 hours' soaking upside-down were advantageous for precooled rootstock cuttings. Yet, waxing the grafting zone increased only the success rate of directly grafted cuttings.

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