EFFECT OF ROOTED AND UNROOTED ROOTSTOCK CUTTINGS ON SUCCESS OF GRAFTED VINE PRODUCTION

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ÖZET

Aşılı Köklü Asma Fidanı Üretiminde Köklü Amerikan Asma Fidanlarının Anaçlık Çelik Olarak Kullanılma Olanakları Üzerinde Araştırmalar

Bu araştırma ile, aşılı köklü asma fidanı üretiminde genellikle iyi sonuç alınamayan 41 B ve 99 R'nin köksüz çelikleri yerine, köklü fidanlarının çelik olarak kullanılmasıyla fidan veriminin arttırılması amaçlanmıştır. Her iki anacın köklü çelikleri, Hamburg misketi üzüm çeşidinden alınan kalemlerle aşılanmışlardır.

Araştırmadan elde edilen bulgular aşağıda özetlenmiştir:

1. Tüm aşılı çelikler, aşı yerlerine % 100.0 oranında çepeçevre kallus oluşturmuşlardır.

2. 99 R'nin köksüz çelikleri (% 100.0), 41 B'den (% 55,7) bazalda önemli derecede yüksek oranda çepeçevre kallus oluşturmuşlardır.

3. Farklı anaçlık çelik tipleri, kalemlerin çimlendirme sırasındaki sürme oranlarını her iki anaçta da önemli oranda etkilememişlerdir.

4. Çimlendirme sırasında köklenme (%) ve aşılı çelik başına kök sayısı yönünden, 99 R'de görülen birbirine çok yakın köklenme oranları dışında, köklü fidanlar sürekli olarak daha yüksek değerler sağlamışlardır.

5. Her iki anaç için de anaçlık çeliklerin yerine köklü fidanlar kullanıldığında, fidan veriminin önemli oranlarda arttığı saptanmıştır. Özellikle 99 R'nin anaçlık çelikleri yalnızca % 18,6'lık bir randıman sağlarken, bu değer köklü çelik kullanıldığında % 62,9'a ulaşmıştır.

6. I. sınıf fidan oranı ve aşılı köklü fidan başına ana kök sayısı yönünden, 41 B'de anaçlık çelik tipleri arasında bir farklılık gözlenmezken, 99 R'de köklü çelikler istatistiki olarak yüksek değer oluşturmuşlardır.

7. Yukardaki bulguların ışığında, özellikle 99 R için, aşılı köklü asma fidanı üretiminde anaçlık çeliklerin yerine köklü çeliklerin kullanılması, ekonomik olarak önerilebilir. Bunun yanısıra, 41 B için uygun özellikler taşıyan anaçlık çelik bulunmasında güçlük çekildiğinde, bu anaç için de aynı öneri geçerli olacaktır.

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SUMMARY

This experiment was carried out to compare the performances of rooted (rooting) and unrooted stock cuttings of 41 B and 99 R on which Muscat of Hamburg was grafted to decrease the nursery losses in grafted vine production.

As a result of this present experiment, rootings (rooted stock cuttings) increased the take in both rootstocks significantly. The increase in 99 R was more than 3-fold. The take in unrooted cuttings of 99 R was found extremely lower (18.6 %) than in rootings (62.9 %).

Machine bench grafting using rootings can be recommended particularly for 99 R. If it is difficult to find the stock material in good condition, rootings can also be used successfully for 41 B. At the same time, these grafts on rootings may be planted directly in the vineyard.

INTRODUCTION

Today, phylloxera is effective in most of the vine growing areas of Turkey. As a result of this circumstance, we must realize a rapid progress to re-establish the vineyards destroyed by phylloxera. Selection of suitable phylloxera resistant rootstocks to soils of different characteristics and standard varieties which are susceptible to phylloxera of vine growing areas was the first step of this renovation programme. Although some additional studies should be conducted on the adaptation and affinity abilities of vine rootstocks, according to the results of some previous works, certain rootstocks were recommendent to popular grape varieties which were grown in different areas.

It was reported that total grafted or rooted vine requirements of Turkey's viticulture were about 55 millions/year and 55-65 % of this amount were necessary for phylloxera infested areas. But, annual production of vine planting materials were only about 8 millions that was 20 % of amount required in the last years (Anonymous, 1977).

Ağaoğlu and Çelik (1976) reported that one of the important reasons for this insufficient production was lower takes in the nurseries. On the other hand, although we achieved some progresses on machine grafting in recent years, but our grafted vine production is still very limited. For this reason, the most common method of field grafting grapevines in Turkey is now cleft grafting. Since cleft grafting requires considerable skill, more effort and causes at least one-year postponement for fruiting (Allex 1964), we should increase the grafted vine production to a level required as soon as possible using the progressive techniques proposed by previous workers (Tikhvinskii and Kaisyn 1975, Schenk 1976, Becker and Hiller 1977, Goussard 1977, Romberger et al. 1979, Çelik and Ağaoğlu 1980).

It is a clear evidence that although most of the grafts formed nearly perfect callus at union during callusing period, much lower takes could usually be obtained in the nurseries with common bench grafting using unrooted stock cuttings (Çelik and Ağaoğlu 1980).

This experiment was done to compare the performances of rooted (rooting) and unrooted stock cuttings of 41 B and 99 R on which Muscat of Hamburg was grafted to decrease the nursery losses in grafted vine production.

MATERIALS and METHODS

This experiment was carried out at the Department of Horticulture Faculty of Agriculture, University of Ankara, in 1978 and 1979.

Plant Material: Muscat of Hamburg (*Vitis vinifera L.*) and two Berlandieri hybrid rootstocks (41 B and 99 R) which those hardwood cuttings are relatively difficult-to-root were used.

Scion wood and unrooted stock cuttings were taken from the central parts of canes (between 4. and 10. internodes) just before pruning (early March), then graded to 8-9 mm in diameter and 35 cm (stock cuttings) and 50 cm (scion cuttings) in length, stock cuttings were disbudded with a sharp knife, placed in polyethylene bags and stored at + 1°C until grafting period.

Rootings of the rootstocks were taken from the place in which heeled in, washed, graded to 8-9 mm at the top where the grafts is to be made, then shortened to 35 cm long and the roots were cut back to short stubs (2-3 cm).

Before grafting, all materials were soaked in running water for 24 h (scion wood and rootings) and 48 h (unrooted stock cuttings), then immersed in 0.5 % chinosol solution for 15 h against *Botrytis cinerea* Pers. (Becker and Hiller 1977), then singlebud scions were prepared in 5.0-7.5 cm. in length. Grafting was done with Automatic-II omega grafting machine in early April.

Grafted cuttings were stratified in moist sawdust; perlite (3:1) in wooden callusing boxes in a callusing room with a temperature regime at + 30°C (10 days), + 26°C (5 days), + 22°C (10 days) respectively and 80-85 % R.H.

The callusing period lasted 25 days. Grafted cuttings in boxes were hardened off in an unheated room for 5 days. Afterward, the grafted cuttings were planted in the nursery 30 cm deep, spaced at 10 cm within the furrows and 80 cm between furrows. After planting, the graft unions and scions were hilled with soil to prevent moisture loss. In early July and August, graft unions and scions were uncovered and roots from the scions were removed.

Completed callus-ring formation was calculated using the procedure of Goussard (1977). Transplants were considered firs grade grafted vines if they had live canes and healed graft unions.

A randomized complete block design with 4 replications was used. Results were statistically analyzed using F-test.

Data were calculated in to percentages except the number of roots (n_1 and n_2) and all data in percentages were transformed by inverse sine transformation, arcsin $\sqrt{x}$ (Düzgüneş 1963). For presented purposes, however, these means were changed back to the original data.

RESULTS

All data are presented in Table 1.

Table: 1
The Effect of Rooted and Unrooted Rootstock Cuttings on Success in Grafted Vine Production in The Graft Combinations of Muscat of Hamburg With 41 B and 99 R

Rootstock	Type of stock cutting	Completed callus-ring formation at the union (%)	Completed callus-ring formation at the base* (%)	Bud-burst during callusing (%)	Rooting during callusing (%)	Number of Roots per grafted cutting formed during callusing (n1)	Percentage take (final output) (%)	First Grade Grafted Vines (%)	Number of Main Roots Per Grafted vine (n2)
41 B	rooted	100.0 a**	—	24.3 a	99.3 b2***	8.7 b1	58.6 b1	34.3 a	5.8 a
	unrooted	100.0 a	55.7 a2	39.3 a	51.4 a2	5.0 a1	41.5 a1	28.6 a	6.3 a
99 R	rooted	100.0 a	—	7.2 a	94.3 a	13.9 b2	62.9 b2	40.0 b2	8.8 b1
	unrooted	100.0 a	100.0 b2	12.9 a	90.0 a	6.1 a2	18.6 a2	12.8 a2	6.6 a1

* Only the differences in grafted cuttings of 41 B and 99 R with unrooted stock cuttings were analyzed statistically.
** a and b indicate the significant difference
*** 1 and 2 indicate the significant difference at 5 % (1) and 1 % (2) levels.

All grafts of both rootstocks formed perfect (100.0 %) completed callus-ring at the union.

We did not consider the completed callus-ring formation at the base of grafted rootings because of their 2-3 cm long one-year-old roots. Completed callus-ring formation at the base of unrooted grafts of 99 R (100.0 %) were significantly higher than in 41 B (55.7 %).

Results in Table 1 indicate no significant difference in bud-burst (%) at the end of callusing period between grafted rootings (rooted) and cuttings of both rootstocks, but rootings of both rootstocks delayed bud-burst, arithmetically. Furthermore, bud-burst in the grafts of 41 B (31.8 %) were found significantly higher than in the grafts of 99 R (10.1 %) as an average of grafted rootings and cuttings.

While rooting ratios at the end of callusing period of both types of stock cuttings in 99 R were very similar, rootings of this rootstock showed 2-fold higher number of roots during callusing. Although nearly all grafted rootings of 41 B (99.3 %) rooted during callusing, rooting ratio of grafted cuttings was 51.4 % that was considerably lower than in rootings. Number of roots per grafted rooting (8.7)was also statistically higher than in grafted cuttings (5.0).

Data in Table 1 indicated that rootings increased the take significantly in both rootstocks, even the increase in 99 R was more than 3-fold. The take in unrooted cuttings of 99 R were found extremely lower (18.6 %) than in rootings (62.9 %).

There were no considerable differences in first grade grafted vines (%) and number of main roots per grafted vine (n_2) in the combinations of 41 B, but, rootings of 99 R gave significantly higher results on these parameters.

DISCUSSION

It is known that certain good rootstocks-particularly some of the Berlandieri hybrids-were somewhat difficult-to-root and grafts of their unrooted stock cuttings always give very low takes in the nurseries (Winkler et al. 1974). It was reported that unrooted stock cuttings of 99 R generally give lower yields in grafted vine production (Morton 1979). Present data on unrooted cuttings of 99 R bench grafted with Muscat of Hamburg are in agreement with these results.

Furthermore, the second rootstock (41 B) used is known a difficult-to-root "vinifera x berlandieri" hybrid that its lower rooting ability reduces the success of bench grafting (Morton 1979). But, unrooted stock cuttings of 41 B gave a satisfactory yield (41.5 %) in this experiment. These results agree with those of Çelik and Ağaoğlu (1980). This may be a result of using only the stock cuttings in good condition. It is a clear evidence that significantly higher takes were obtained with rootings in grafted vine production for both rootstocks. These data are also in agreement with the results of Chanana and Singh (1974) and Kısmalı (1980).

As a result of this experiment, machine bench grafting using rootings can be recommended particularly for 99 R. If it is difficult to find the stock materials in good condition, machine bench grafting can also be used successfully for 41 B. At the some time, these grafts on rootings may be planted directly in the vineyard.

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