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EFFECT OF ROOT PRUNING ON XYLEM EXUDATION OF SEEDLING AND GRAFT SUCCESS OF WALNUT (Juglans regia L.)

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ABSTRACT: *In this preliminary study, the effect of root pruning on graft survival percentage and xylem exudation of walnut seedlings was studied for 2 dates (March 15 and April 15) under field conditions. The scions of Yalova-1 walnut cultivars were grafted by tongue grafting method on 1 and 2-year-old walnut (J. regia L.) seedlings. The root pruning did not have any significant effect on either the amount of xylem exudates or the graft survival percentage at the earlier grafing date (March 15). On the other hand, root pruning decreased the xylem exudation and increased the graft survival percentage of 2 year-old rootstocks in the later period (April 15). The graft survival percentage of 2-year-old rootstocks on April 15 was increased by 25 % through root pruning. Xylem sap exudate, regarded as one of the negative factors for graft success in walnuts, was decreased as 1.7 ml by root pruning on 2 year-old rootstocks grafted on April 15.*

Keywords: *Walnut,* ***Juglans regia*** *L., grafting, root pruning, xylem exudates.*

CEVİZDE (Juglans regia L.) KÖK BUDAMASININ ÇÖĞÜR KANAMASI VE AŞI BAŞARISI ÜZERİNE ETKİLERİ

ÖZ: *Bu ön çalışmada, ceviz aşılarında başarı oranını olumsuz yönde etkileyen çöğür kanamasını azaltarak aşı başarısını artırmak amaçlanmıştır. Bu amaçla aşılamadan 1 hafta önce çöğürlerde kök budaması yapılmıştır. Aşılar dış ortamda, 15 Mart ve 15 Nisan olarak iki farklı tarihte yapılmış ve aşılamadan sonra aşı yerleri toprakla kapatılmıştır. Anaç olarak bir ve iki yaşındaki J. regia L. çöğürleri kullanılmıştır. Kanamanın daha az olduğu 15 Mart'ta aşı başarısı da düşük olmuştur. Yine aynı şekilde 1 yaşlı çöğürlerde kanama daha az olmasına rağmen aşı başarısı da düşük olmuştur. 15 Mart'ta yapılan kök budaması kanama miktarı üzerinde önemli bir etki yapmamıştır. Kanamanın daha fazla olduğu 15 Nisan'da yapılan kök budamasının ise, özellikle 2 yaşlı çöğürlerde kanama miktarını ve aşı başarısı üzerine belirgin bir etkisinin olduğu saptanmıştır. Bu dönemde iki yaşlı çöğürlerde yapılmayan kök budaması kanama miktarında 1,7 ml'lik bir azalış meydana getirirken, aşı başarısını % 25 oranında artırmıştır.*

Anahtar Sözcükler: *Ceviz,* ***Juglans regia*** *L., aşılama, kök budaması, kanama.*

INTRODUCTION

Walnut (*J. regia* L.) is one of the nut crops increasingly gaining importance in the world. Grafting is still the most common vegetative propagation method of walnut. However, in walnut grafting, there are some problems that hinder the advancement of good varieties.

Today, the graft survival percentage of walnut is still low and unstable. Some researchers consider that one of the main factors affecting grafting success is xylem exudation (Lagerstedt and Roberts, 1972; Lagerstedt, 1979; Knuyuki and Forde, 1985; Tekintaş et al. 1988; Eriş and Barut, 1989). According to Prataviera et al. (1983), the existence of juglone (5-hydroxyl-1 4-naphthoquinone) in xylary sap exudates blocks callus formation at the grafting juncture. Contrarily, Rongting and Pinghai (1990) reported that there was a trace amount of juglone in xylem exudates and negative effect of xylem exudates on callus formation was not due to juglone. They stated that anaerobic respiration occurring in xylary sap at the grafting union region affected callus initiation and differentiation

The aim of the present study was to examine the effect of root pruning on the amount of xylary sap exudes in walnut and the graft survival percentage.

MATERIALS AND METHODS

The study was conducted over two periods (March 15 and April 15) in 1999 under field conditions. Scions of "Yalova-1" walnut cultivars were grafted on 1 and 2-year-old walnut (*J. regia* L.) seedlings. The root pruning was made on half of the rootstocks one week before grafting and other seedling rootstocks were kept intact. The experiment was conducted with four replications and 100 grafts were made for each treatment. After grafting, cylindrical plastic pipes were fitted around the graft area and filled with soil in order to protect the grafting area from cold or moisture loss. To determine the amount of xylary sap exudate, some of the seedlings were topped and bent down. Plastic bags were placed on cut tops and the xylem exudates collected in the bags were measured. Survival percentage of grafts was recorded six months after grafting.

The statistical analysis was carried out by analysis of variance. Different levels among the data (means) indicate significant differences for $p= 0.05$ with Duncan test.

RESULTS AND DISCUSSION

As seen in Table 1, the graft survival percentage of walnut on March 15 was lower than that of April 15. The amount of xylary sap exudates was also less than April 15. The reason for the small amount of xylem exudate on March 15 might be due to the lower activity of roots during this period. Likewise, many researchers (Lagerstedt and Roberts, 1972; Lagerstedt, 1979; Knuyuki and Forde, 1985; Tekintaş et al. 1988; Eriş and Barut, 1989) reported that the xylem exudation resulted from root pressure and was increased by root activity. On March 15, neither the root pruning nor the age of seedlings affected the xylem exudation and the graft survival percentage significantly. The xylem exudation was between 0.40 ml (1-year-old seedlings with roots pruned) and 0.60 ml (in 2-year-old seedlings with or without root pruning), and graft survival percentage was between 25% (1-year-old seedlings without root pruning) and 35 % (2-year-old seedlings with root pruning) during in this period. On April 15, 1-year-old seedlings produced a lower volume of xylem exudate than the 2-year-old seedlings did. However, the graft survival percentage of 1-year-old rootstocks was still lower than that of 2-year-old rootstocks. Root pruning had no significant effect on xylem exudation or the graft survival percentage of 1-year-old rootstocks. On the other hand, it was clearly observed that the root pruning increased the grafting success and decreased the xylem exudation on 2-year-old seedlings significantly (Table 1 and Figure 1). The root pruning of 2-year-old rootstocks increased the graft survival percentage by 25% and lowered xylem exudation by 1.7 ml.

Table.1 Amount of xylem exudates and success of graft on seedlings with or without root pruning.

Date of grafting	Seedling age	Amount of xylem ex. (ml)		Graft survivat (%)	
		With root-pruning	Without root-pruning	With root-pruning	Without root-pruning
March 15th	1	0.40 d	0.50 d	28 cd	25 d
	2	0.60 cd	0.60 cd	35 cd	30 cd
April 15th	1	0.80 c	1.20 b	35 cd	40 c
	2	1.30 b	3.00 a	80 a	55 b

The differences between the means indicated by different letters are significant at 0.05 level

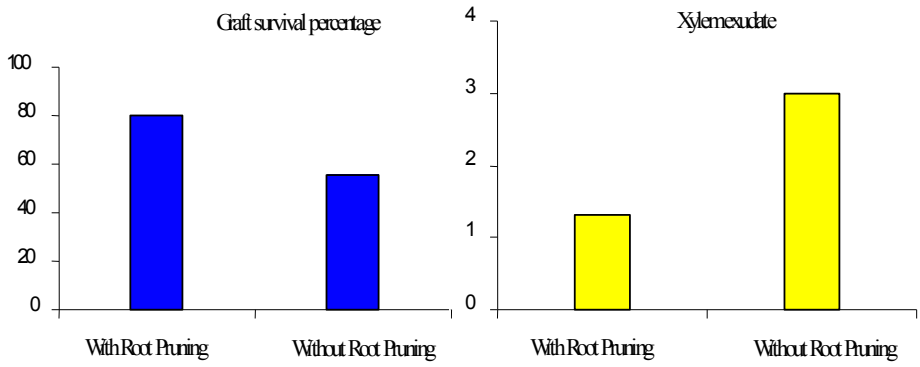

Figure 1. On April 15th, graft survival percentage and xylem exudates of two-years old seedlings.

It was seen that the graft survival percentage in earlier period was low even with a small amount of xylem exudates. Other factors such as average temperature might be responsible for this situation. In fact, the average temperature on March 15 and April 15 were 3 °C and 8 °C, respectively. The xylem exudation of 2-year-old seedlings was very high on April 15; however, the root pruning caused a significant decrease in the amount of xylem exudation and increase in graft survival percentage. As indicated by some researchers (Prataviera et al., 1983; Knuyuki and Forde, 1985; Rongting and Pinghai, 1990), the xylem exudation was found as an important factor that affect the grafting success of walnut because root pruning of 2-year-old seedlings increased the graft survival percentage by decreasing the xylem exudation.

Our study has shown that the amount of the xylem exudation and the graft survival percentage of walnut are affected by the time of grafting and the age of rootstock. The earlier date (March 15), the amount of xylem exudation was found to be low; however, the graft survival percentage is also low. Likewise, both the xylem exudation and the graft survival percentage of 1-year-old rootstocks are lower than that of 2-year-old rootstocks. At the later date (April 15), the amount of the xylem exudation appears to be an important factor affecting the graft survival percentage of 2-year-old rootstocks. According to the result of the study, we can conclude that if the roots of walnut seedlings are pruned before grafting during the period of excessive xylem exudation, xylem exudation could be decreased and graft survival percentage might be increased.

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