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# An investigation on the determination of transplanting success and growth in some *Pistacia* spp. seedlings transplanted in field conditions

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**SUMMARY** – This study was carried out at the Pistachio Research Institute between 1995-1997. Three different types of *P. vera* (1 year potted, 2 and 3 yearly seedlings), *P. khinjuk* (4 month potted, and 1 and 3 yearly seedling), *P. mutica* (1 yearly seedling), and budded plants (Siirt) were used in this experiment. These seedlings and budded plants were planted in autumn, early spring and at the end of May. The percentage of transplant and growing value and budding success in orchard were determined on seedling and budded plants. There were no significant differences for percentages of transplanting on seedlings and budded plant types. The most successful percentage of transplant and budding was obtained on one year potted seedlings. High value of stem diameter and of potted seedlings were obtained by autumn planting. The most suitable planting time was determined as autumn. Young and potted plants showed more success in transplanting. The seedlings and budded plants which were planted in autumn showed 10% more success than spring and May planting. One year potted of *P. vera* was planted in autumn. They gave 100% transplant success. Unlike three year old *P. vera* seedlings which were planted at the same time and which gave 80% transplant success. These differences were because: (i) the potted seedlings had more capillary roots; (ii) during planting the roots were not greatly cut; and (iii) these potted plants were planted with their soil. Also in other *Pistacia* species, young and potted plants were more successful than old and non-potted plants. The autumn planting showed the highest percentage of budding on orchard, because of seedling stem growing. Also the same results were obtained on potted and budded plants.

**Key words:** *Pistacia* seedling, planting, transplant success, growing.

**RESUME** – "Recherches pour déterminer les conditions de réussite de la transplantation et croissance chez quelques espèces de plants de *Pistacia* replantés au champ". Cette étude a été menée à l'Institut de Recherches sur le Pistachier entre 1995-1997. Trois types différents de *P. vera* (1 année en pot, plants de 2 et 3 ans), *P. khinjuk* (4 mois en pot, et plants de 1 et 3 ans), *P. mutica* (plants de 1 an), et des plants bourgeonnés (Siirt) ont été utilisés dans cette expérimentation. Ces plants et plants bourgeonnés ont été plantés en automne, au début du printemps et à la fin mai. Le pourcentage de transplantation et la valeur de croissance, ainsi que la réussite du bourgeonnement en verger ont été déterminés sur les types plants et plants bourgeonnés. Il n'y a pas eu de différences significatives pour le pourcentage de transplantation sur les types plants et plants bourgeonnés. Le pourcentage le plus performant de transplantation et de bourgeonnement a été obtenu sur les plants d'une année avec mise en pot, par rapport aux autres. Les meilleures valeurs de diamètre de la tige et de hauteur des plants en pot ont été obtenues avec la plantation d'automne. D'après le pourcentage de réussite de transplantation par rapport à la valeur des différents temps de plantation des plants et plants bourgeonnés, la période de plantation adéquate a été déterminée comme étant l'automne, et les jeunes plants en pot avaient montré plus de réussite à la transplantation. Les plants et plants bourgeonnés qui furent plantés en automne s'avéraient 10% plus performants que les plantations au printemps ou en mai. Pour les plants de *P. vera* de 1 an, avec mise en pot et plantés en automne, on obtenait 100% de réussite au replantage. Par contre les plants de *P. vera* de 3 ans qui avaient été plantés à la même date donnaient 80% de réussite au replantage. Ces différences proviennent de : (i) les plants en pot avaient davantage de racines capillaires ; (ii) durant la plantation, les racines n'ont pas été fortement coupées ; et (iii) ces plants en pot ont été plantés avec leur terre. Pour d'autres espèces de *Pistacia* également, les plants jeunes et en pot ont été plus performants que les plants plus âgés et sans mise en pot. La plantation d'automne a montré le plus grand pourcentage de bourgeonnement en verger, en raison de la croissance de la tige des plants. Les mêmes résultats ont également été obtenus sur les plants en pot et bourgeonnés.

**Mots-clés** : Plants de *Pistacia*, plantation, réussite à la transplantation, croissance.

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## Introduction

In Turkey pistachios are grown usually on produced field condition seedlings rootstocks. This seedlings grow very slowly on dry conditions. That seedlings are grafted 5-7 years after

transplanting (Arpacı *et al.*, 1997). Pistachio culture is carried out under arid condition without in Turkey. This situation causes considerably low yield and quality and thus decreases Turkey's market competition among other pistachio production countries (Kaska, 1990; Arpacı and Atli, 1994; Tekin *et al.*, 1995; Nikpeyma *et al.*, 1997). Increases in yield and quality can be obtained with the selection of good cultivars and proper orchard management techniques. The pistachio culture in Turkey is irrigated slowly using water provided by the Southeast Anatolia Project.

California pistachio rootstocks are planted budded or not from potting containers directly into the orchard (Holtz *et al.*, 1995). Commercial pistachio nursery production requires fast growing rootstocks to allow early budding and transplanting. In addition vigour is a desirable character in pistachio rootstocks, due to its effect on the time needed by the scion to form a large canopy and no the adaptation of the tree to adverse growing conditions in which the crop is placed (Vargas *et al.*, 1997).

Potted seedlings have strong root system, that grow quickly and adapt easily to orchard soil. After planting, budding is applied in autumn that years or the next spring and fruit production begins after 4-5 years (Arpacı *et al.*, 1997).

Budding begins in early July providing stock diameter is 1 cm. Pistachio can be successfully budded until late September when the bark begins to tighten. Maintaining excess late season growth also predisposes both the rootstock and cultivar to chilling injury should night temperatures drop suddenly. For this reason rootstock budded after August are nut headed encouraged to grow (Beede and Ferguson, 1995).

## Material and methods

This study was carried out at centre station investigation parcels of Pistachio Research Institute from 1995 to 1997. The results were supported from three planting periods by budded plant, *P. khinjuk* and *P. vera* seedlings which were sold by Pistachio Research Institute and private nurseries as different potted and field conditions.

Three types seedlings one yearly potted, two and three yearly of *P. vera*, one and three yearly potted seedling of *P. khinjuk*, one yearly potted seedling of *P. mutica* as six different seedlings types, at the end of October were planted. Three types seedlings, one and three yearly potted seedlings of *P. khinjuk*, three types seedlings, one yearly potted, two and three yearly of *P. vera*, and budded plant as six types of seedlings at February, fourth month potted seedling *P. khinjuk* at May were planted.

For each application and per block five plants were used. Three blocks were designed in orchard. The stem diameter and plant high were measured on June 1996, October 1996 and June 1997 periods. Also all of seedlings were budded 14th June 1997. After planting the percentage of budded success, and transplant percentage were determined at June. According to these the best suitable planting time and orchard management for seedlings properties were pointed out. These data which was obtained as in followed.

## Results

### Transplanting success (Tables 1 and 2; Fig. 1)

The percent successful for transplant on value of different planting time of seedlings and budded plant, the suitable planting time was determined as autumn, young and potted plants had showed more successful about transplanting. The seedlings and budded plants which were planted at autumn showed 10% more successful than spring and May planting.

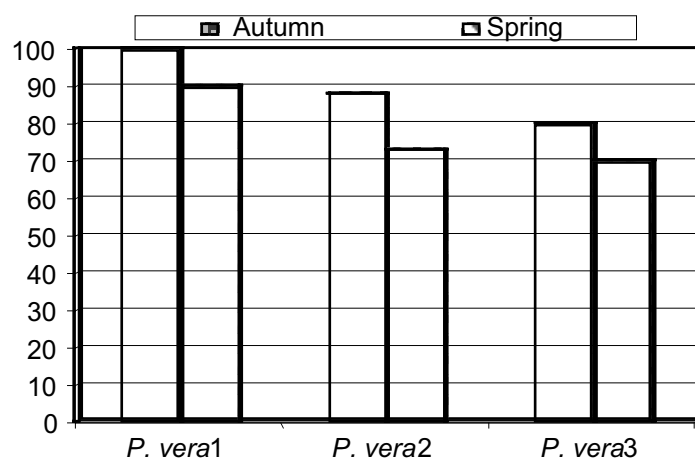
One yearly potted of *P. vera* which was planted at autumn. They gave 100% transplant successful. Unlike three years old *P. vera* seedlings which was planted at the same time gave 80% transplant successful. These differences come from: (i) the potted seedlings had more capillary roots; (ii) during planting the roots were not cut large amount; and (iii) these potted plants were planted whit their soil. Also for others *Pistacia* species young and potted plants which were more successful than old and whit out potted plants.

Table 1. The autumn planted and different years old seedlings transplanted successful percentage and plant growing and bud take success on field

Seedlings types	Transplant success (%)		Plant growing		Bud take success (%)	
	Angels numbers	Natural numbers	Trunk diameter (mm)	Plant height (cm)	Angels numbers	Natural numbers
<i>P. vera</i> 1	90.00 a	100.00	11.70 a	82.00 a	83.85 a	96.67
<i>P. vera</i> 2	66.08 ab	83.33	8.79 bc	54.00 ab	73.85 a	88.33
<i>P. vera</i> 3	63.07 b	80.00	9.98 b	63.28 bc	56.22 a	69.00
<i>P. khinjuk</i> 1	83.85 ab	96.67	9.10 bc	64.22 bc	61.96 a	88.33
<i>P. khinjuk</i> 2	78.85 ab	86.67	8.27 c	75.22 ab	61.96 a	77.00
<i>P. mutica</i>	66.15 ab	83.33	9.61 bc	57.18 bc	65.82 a	80.33
LSD (%5)	23.43	–	1.41	17.08	NS	–

Table 2. The spring planted and different years old seedlings transplanted successful percentage and plant growing and bud take success on field

Seedlings types	Transplant success (%)		Plant growing		Bud take success (%)	
	Angels numbers	Natural numbers	Trunk diameter (mm)	Plant height (cm)	Angels numbers	Natural numbers
<i>P. vera</i> 1	75.00 a	90.00	10.50 ab	73.22 a	67.71 a	85.00
<i>P. vera</i> 2	55.83 c	73.33	8.84 bc	51.17 bc	58.11 a	72.33
<i>P. vera</i> 3	54.79 c	70.00	9.65 ab	59.44 bc	51.22 a	60.00
<i>P. khinjuk</i> 1	66.15 abc	83.30	8.75 bc	66.28 ab	61.96 a	77.00
<i>P. khinjuk</i> 2	61.22 bc	76.67	8.40 bc	62.44 ab	61.96 a	77.00
Budded plant	63.93 abc	80.00	11.15 a	60.00 abc		
<i>P. khinjuk</i> 3	68.85 ab	86.67	7.98 c	40.22 d	58.11 a	72.33
LSD (%5)	12.05	–	1.68	17.08	NS	–



*P. vera*1: 1 years old potted seedling.  
*P. vera*2: 2 years old and produced on field condition seedling.  
*P. vera*3: 3 years old and produced on field condition seedling.

Fig. 1. Different time planted *P. vera* seedlings transplanted successful percentage on field.

## Plant growth (Tables 1 and 2; Fig. 2)

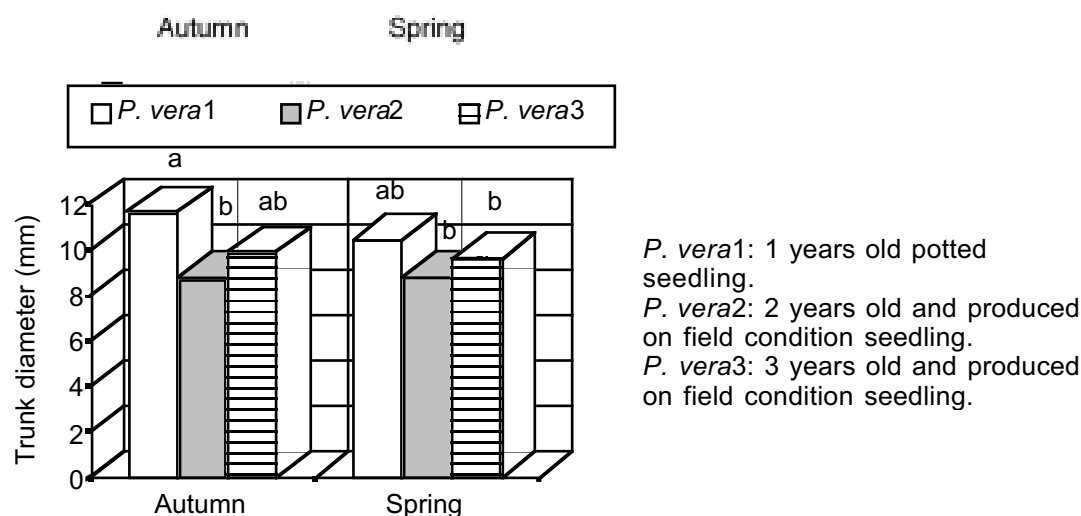


Fig. 2. Different time planted *P. vera* seedlings trunk growing at budding time.

The diameter of planted seedlings and budded plant were measured 3 different times, the high of plants were measured 2 times. According to these measurement the effect of planting time and plant types on growing of plant were occurred on October in 1996 and June in 1997. One yearly *P. vera* seedlings which were planted on autumn had showed 11.70 mm as diameter which were the best growing diameter. On the other hand the plants which were planted at spring had 10.50 mm diameter.

During planting time the seedlings which had high diameter as three years *P. vera* and *P. khinjuk* had not reach the diameter stem growing one yearly potted seedlings. According to the plant growing (diameter and high) measurement potted and one yearly seedling had showed more development in the same species. The best growing on *P. khinjuk* seedlings had showed 8.75 mm diameter as one yearly potted planted seedlings. 8.40 mm diameter was obtained from three yearly potted seedling which had large diameter during planting time.

However for 4 month *P. khinjuk* seedlings showed good result, according to the transplanting successful, because of the temperature of weather and low relative humidity the plant diameter and high did not show good growing rate of May planting.

## Bud take success (Tables 1 and 2; Fig. 3)

More differences occurred from transplanting and seedlings types for budded successful at second year (June 1997). As the best result 96.67% budded success was obtained from one yearly potted *P. vera* which was planted at autumn. For the same seedlings which were planted, during spring time showed 85.00% budded success. The least budded success was obtained from three yearly *P. khinjuk* seedlings which was planted during spring as 60%. According to these results rootstocks did not effect on budded success but, types of seedlings effected.

Among the *P. khinjuk* seedlings the highest budded success were obtained from one yearly and potted plants as 88.38% and 77.00% was obtained three yearly seedlings, 72.00% was obtained from 4 month seedlings. 80.33% bud success was obtained from 1 yearly potted *P. mutica* as planted on autumn.

## Acknowledgements

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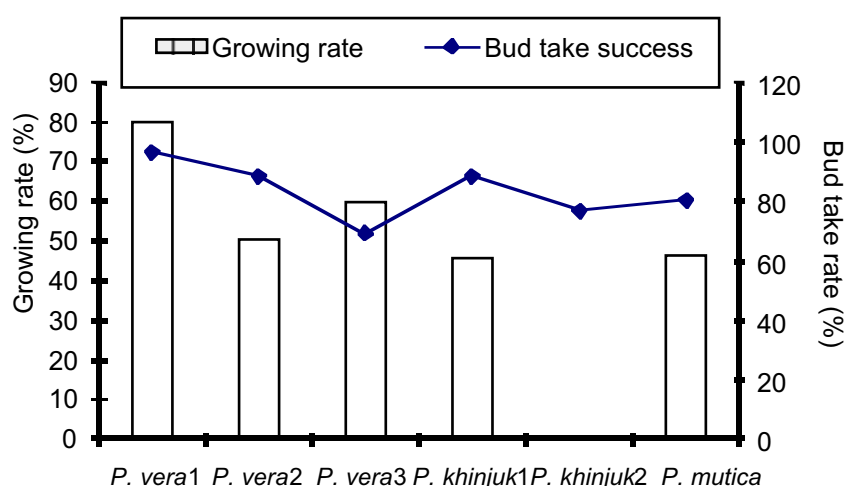


Fig. 3. Plant growing rate and bud take rate relations.

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