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Determination of yield and some quality traits of Pistachio cv. 'Siirt' trained different systems

S. Aktug Tahtaci¹, H. Gozel^{1,*}, A. Yilmaz¹ and B.E. Ak²

¹Pistachio Research Institute, Gaziantep (Turkey)

²University of Harran, Faculty of Agriculture, Department of Horticulture, Sanliurfa (Turkey)

*e-mail: gozel27@yahoo.com

Abstract. Pistachio trees grow under sunny and hot areas, for preventing those damages and circulation, it is needed good shaped tree crown. This just can be done after planting with each year regular pruning. There is not much more studies on this matter. It is unknown how to effect training systems to yield and quality. Via a good training system and pruning that is made for physiological base of tree, yield can be separated in each year production. This study was started in 1995 to determine the best training system to get high yield and having more quality. Three (The Open-Center System, Open center system closed with lateral branches and Modified Central Leader system) training systems were applied to the experimental trees. Yield and quality in cultivar 'Siirt' was recorded.

Keywords. Pistachio – Training– Pruning – Yield – Quality.

Détermination du rendement et de certains caractères de qualité selon différents systèmes de conduite architecturale chez le pistachier cv. 'Siirt'

Résumé. Les pistachiers poussent en zones ensoleillées et chaudes, et pour prévenir les dommages et favoriser la circulation, la couronne de l'arbre doit avoir une bonne forme. Ceci peut être fait simplement après la plantation par une taille régulière à chaque année. Il n'y a pas beaucoup d'études sur cette question. On ne connaît pas bien comment les systèmes de conduite architecturale affectent le rendement et la qualité. Par un bon système de conduite architecturale et de taille en fonction de la base physiologique de l'arbre, le rendement peut être séparé pour la production de chaque année. Cette étude a été entamée en 1995 pour déterminer le meilleur système de conduite architecturale afin d'obtenir plus de rendement et de qualité. Trois systèmes d'architecture (Système ouvert au centre, système ouvert au centre et fermé par branches latérales, et système leader central modifié) ont été appliqués aux arbres expérimentaux. Le rendement et la qualité ont été enregistrés chez le cultivar 'Siirt'.

Mots-clés. Pistachier – Conduite architecturale de l'arbre – Taille – Rendement – Qualité.

I – Introduction

Turkey has big pistachio production potential, and third pistachio producer country after Iran and USA in the world. Pistachio has mainly cultivated in Southeast Anatolian part of Turkey (95% of total production). These areas are arid and hot climated, and no rain from June to October during the year. Kernel of pistachio fruits have been developed during the summer and matured in September in Turkey. For this reason, the pruning and training systems are very important to save the water balance in the tree canopy. Crane and Maranto, (1988) reported that, pistachio young tree should be trained during the first 3 years with 3 main branches and 1 leader branch.

Arpaci *et al.* (2001) reported that, open center training system mainly used at pistachio orchards in Southeast Anatolia, and there was some sunburn problems on the main branches. The pruning studies were neglected for pistachio trees in Turkey. We know that, pruning affects the yield 15-17% in pistachio. This is the first training experiment in pistachio orchard of Turkey.

Pruning is a general term which refers to selective removal of plant parts to obtain a desired growth or developmental response. However, for fruit trees, pruning usually refers to mature, bearing trees and is done primarily to increase production of high quality fruit and limit tree height and spread. Pruning is necessary to maintain tree health, vigor and productivity throughout its life cycle. Proper pruning and training of fruit trees is necessary to obtain maximum yields of high quality fruit.

Proper tree training also opens up the tree canopy to optimize light penetration. For most deciduous tree fruit, flower buds for the current season's crop are formed the previous summer. Light penetration is essential for strong flower bud development and optimal fruit set, flavor, and quality. Although a mature tree may be growing in full sun, a very dense canopy may not allow adequate light inside the canopy. Opening the tree canopy also permits air movement through the tree, which promotes rapid drying to minimize disease infection and allows thorough spray penetration. Additionally, a well-shaped fruit tree is aesthetically pleasing, whether in a landscaped yard, garden, or commercial orchard (Parker, 2010).

Pruning is the removal of a portion of a tree and is used to correct or maintain tree structure. Training is a practice that allows tree growth to be directed into a desired shape and form. Training young fruit trees is essential for proper tree development. It is more efficient to direct tree growth with training than to correct it with pruning (Parker, 2010).

This study is carried out in order to determine the effects of different training systems on yield and quality of pistachio cv Siirt.

II – Materials and methods

This work is carrying out at Pistachio Research Station in Gaziantep-Turkey. The orchard was established in 1995 with 'Siirt' cultivar, 4 m by 7 m intervals, with randomized parcel design (5 tree per treatment). *Pistacia khinjuk* is used as rootstock.

Three training systems were practiced after plantation. These are: the Open-center system, Open center system closed with lateral branches and Modified Central Leader system.

Yield and some pomological traits were evaluated in the experiment. Yield per ha (kg), 100 nut weight (g), shelling percentage (%) and split nuts percentage (%). Data were evaluated by analysis of variance When the F- test was significant, means were separated by the least significant (LSD) test at a 5% level.

III – Results and discussion

Yield averages per tree are given in Table 1. The results were not statistically important. However the highest average yield (1021 kg/ha) was obtained from Open center system closed with lateral branches (Table 2).

The data about the one hundred nut weight are given in Table 3. As it was seen Table 3, The 100 nut weight of Siirt cultivar effected by training systems statistically. According to average value the highest 100 nut weight was obtained from Open center system closed with lateral branches.

The harvested fruits were analysed to observe the effect of training systems on Shelling percentage. The data are given in Table 4. According to Table 4, there is no effect of training systems on shelling percentage in dehulled fruits.

The effect of training systems on splitting rate is given in Table 5. There is no effect as statistically. But according to average modified central Leader was affected the splitting rate.

Table 1. Effect of training systems on yield per tree (kg)

Training system	Years			Average
	2011	2012	2014	
Open center system	1,42	1,69	2,84	1,98
Open center system closed with lateral branches	2,09	2,66	4,00	2,92
Modified central leader	1,72	2,61	2,87	2,40
LSD ≤ 5%	ns	ns	ns	ns

Table 2. Effect of training systems on yield per ha (kg)

Training system	Years			Average
	2011	2012	2014	
Open center system	497	592	994	694
Open center system closed with lateral branches	732	931	1400	1021
Modified central leader	602	914	1005	840

Table 3. Effect of training systems on 100 nut weight (g)

Training system	Years			Average
	2011	2012	2014	
Open center system	116 b	116 b	131 a	121
Open center system closed with lateral branches	117 ab	123 a	125 b	122
Modified central leader	124 a	109 b	121 b	118
LSD ≤ 5%	5.8	7.0	5.9	ns

Table 4. Effect of training systems on shelling percentage (%)

Training system	Years			Average
	2011	2012	2014	
Open center system	51.5	50.4	51.1	51.0
Open center system closed with lateral branches	51.6	51.7	50.4	51.2
Modified central leader	48.4	50.7	49.8	49.6
LSD ≤ 5%	ns	ns	ns	ns

Table 5. Effect of training systems on split nuts (%)

Training system	Years			Average
	2011	2012	2014	
Open center system	93	96	97	95.4
Open center system closed with lateral branches	96	94	97	95.8
Modified central leader	95	98	99	97.2
LSD ≤ 5%	ns	ns	ns	ns

IV – Conclusions

Pruning of mature deciduous trees has several objectives. One is to confine the tree to its allotted space. This, for reasons already described, is of major importance in pistachio. Secondly, pruning is performed to renew fruitwood and distribute light throughout the canopy. The invigoration effect from pruning also helps maintain tree health and longevity. Pruning can improve nut removal at harvest and equipment damage from low branches. Finally, pruning can also be used to mitigate strong alternate bearing (Ferguson *et al.*, 1991). A seven-year trial involving severe mechanical hedging and topping combined with normal pruning showed that cumulative split nut yield for the severely pruned trees was not different from the handpruned control. Further, severe hedging and topping, followed by normal hand-pruning in subsequent years strongly and persistently mitigated alternate bearing (Beed and Ferguson, 2005).

Pruning on pistachio tree that grown under dry and poor soil conditions should be done carefully. Otherwise tree can be damaged seriously. The pruning application in Turkey and Syria in two stages, after harvest and before flowering time. First stage after harvest dried shoots must be cutted out. Second stage, normally pruning the tree general situation. In all pistachio producer countries pruning is done by hand using labor. But in U.S.A pruning is done mechanically due to very good vegetative growth by irrigation (Ak, 2015).

The shape of tree canopy is more important for the arid areas. Yield and quality characteristics of pistachio cv Siirt affected by training systems. It is concluded that, Open center system closed with lateral branches is suitable for pistachio trees in arid areas. Main Pistachio growing areas have high sunshine and dry climate conditions. Because of this ecological system very high hot temperature in summer time. The tree shape or pruning system is very important. The branches and fruits should be protected from direct exposure of sun. In this point training or pruning system prevents the tree. But we need to have high yielding and quality. The trunk system for all kind of fruit trees are important as well as pistachio tree. In this study training system were investigated. According to obtained results, quality is not effected but yielding. The yield was found higher in closed center system. But such experiment should be going on. In these conditions the plant are very young. The next years the results may be changed year after year.

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