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# Effects of different pruning intensities on growth and fruit quality in Sarılop fig varieties

## Sarılop incir çeşidinde farklı budama yoğunluklarının gelişim ve meyve kalitesi üzerine etkileri

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## ABSTRACT

**Objective:** The objective of this study was to reveal the effect of pruning intensity in terms of yield and quality in dried fig cultivation in winter pruning, one of the important techniques in fruit production.

**Material and Methods:** Winter pruning ($B_3$=3 buds/shoot, $B_5$=5 buds/shoot, $B_7$=7 buds/shoots) and two separate control applications ($B_k$ (no pruning) and $B_0$ (no tip taking application)) were performed at five different bud intensities in Sarılop fig varieties.

**Results:** When dried fig fruit was examined as scrap, cracked and normal fruit, normal dried figs were found to be 74.49% for the $B_7$ application. Total dried fruit yield was 11.34 kg/tree with highest $B_7$ application and lowest 6.91 kg/tree with $B_3$ application. According to the quality classification of the normal fruit, $B_7$ has an Extra Grade product of 60.95%, followed by $B_5$ with 55.58%, and the lowest was in $B_k$ with 16.49%.

**Conclusion:** Pruning trees at 7 buds/shoot stage came into prominence in terms of yield and quality. Likwise, all of the other pruning applications were successful in terms of quality as compared to control applications.

**Keywords:** Dried fig, *Ficus carica*, pruning density, winter pruning

## ÖZ

**Amaç:** Temel meyvecilik yetiştirme tekniklerinde önemli bir yere sahip olan kış budamasında, budama yoğunluğunun kurutmalık incir yetiştiriciliğinde verim ve kalite açısından etkisini ortaya koymaktır.

**Materyal ve Yöntem:** Sarılop incir çeşidinde kış budama uygulaması ($B_3$=3 göz/sürgün, $B_5$=5 göz/sürgün, $B_7$=7 göz/sürgün) üç farklı yoğunlukta ve iki farklı kontrol uygulaması ($B_k$ (hiç budama yapılmayan) ile $B_0$ (uç alma yapılmayan uygulama)) olmak üzere beş farklı budama yoğunluğu gerçekleştirilmiştir.

**Araştırma Bulguları:** Kuru incir meyvesi hurda çatlak ve normal meyve olarak incelendiğinde arası kuru normal(sağlam) meyve oranı en yüksek $B_7$ uygulaması için% 74,49 bulunmuştur. Toplam kuru meyve verimi 11,34 kg/ağaç ile en yüksek $B_7$ uygulamasında en düşük 6,91 kg/ağaç ile $B_3$ uygulamasında gerçekleşmiştir. Normal meyvede kalite sınıflandırmasına göre $B_7$'de %60,95 Ekstra Sınıf ürün elde edilmiş, $B_7$'yi %55,58 ile B5 takip etmiş olup, en düşük %16,49 ile $B_k$'da gerçekleşmiştir.

**Sonuç:** 7 göz/sürgün budaması verim ve kalite açısından ön plana çıkmıştır. Aynı şekilde diğer tüm budama uygulamaları da kalite açısından control uygulamalarına gore daha başarılı olmuştur.

**Anahtar sözcükler:** Kuru incir, *Ficus carica*, budama yoğunluğu, kış budaması

## INTRODUCTION

Fig is a species belonging to the Ficus genus of the Moraceae family of the Urticales order. There are many wild and cultural subspecies of fig. *Ficus carica* L., known as “Anotolian fig” is the most important in terms of fruit growing. Türkiye, one of the most important gene centers of figs, ranks first in The World production of fresh and dried figs. The main five fresh fig production countries in the world are Türkiye, Egypt, Morocco, Algeria and Iran. According to 2019 data, World fresh fig production is 1.315.588 tons while Türkiye produced, 310.000 tons (FAOSTAT, 2019).

Türkiye is the World leader in dried fig production as well as in fresh fig production. Türkiye is the leader in the sector with 84.923 tons of dried fig production, and the prominent countries in the World dried fig production are Türkiye, Iran, USA, Greece, Spain and Italy, respectively (FAOSTAT, 2019).

Almost all of Türkiye’s dried fig production is concentrated in the Kücük and Büyük Meander basins in the Aegean Region. Marmara Region is at the forefront in terms of commercial fresh fig production. Althogh fig trees are encountered in almost all of Türkiye, the reason why production with commercial value is intense in these two regions is the sensitivity of fig fruit quality to ecological conditions. The most preferred among the varieties produced is the Sarılop fig variety, which stands out with its many features and it is grown in the other varieties such as Bursa Siyahi, Göklop, Yesilgüz, Morgüz and Bardacik (Anonymous, 2018).

Smyrna-type cultivar do not produce breba (first crop). main crop (summer crop) form and ripen only if pollinated (Zare, 2021).

In the production of fresh and dried figs, many applications are needed to increase yield and quality. In the garden facilities created, pruning of young and old trees that have reached the age of yield carried out with the methods from the old ancestors.

Pruning is such a technique that influence the shape, growth and even yield of tree by cutting its branches. It can also be defined as a king of training process for fruit trees. The fig tree produces shoots every year depending on the soil conditions with the continuation of the apical bud. The lateral buds on one year old branches either do not last at all or very little. When left to grow naturally, the main branches grow continuously lengthwise. This causes the lower parts of the trees to be bare. The main branches, which grow continuously with out strong development, eventually cannot carry the pruduct load and leaf weight and hang down (Özen et al., 2007).

In fig production, open vase system (goble) pruning is generally done. In the open vase system, there are usually four or five structural main branches in the tree (Flaisman et al., 2008). This system supports the natural growth of the fig tree with a wide crown.

Cutting back or removing all annual shots promotes the main crop production in fig trees, because the main crop (summer crop) consists of one year old shoots.

In general, winter pruning based studies were carried out for fresh fig varieties.

Although the researches of winter pruning and training systems on yield and quality in figs are generally made on fresh fig varieties, there are also some studies on dried fig varieties (Gonzalez et al., 2010; Dalastra et al., 2018; Micheloud et al., 2018; Galvan et al., 2021; Zare, 2021).

However, the winter pruning studies on the Sarilop, which is the leading variety in the production of dried figs are limited. Hence, this study aimed to investigate severe pruning intensity on Sarilop dried fig cultivar on quality and production.

## MATERIAL and METHODS

This study was carried out in Aydın Fig Research Institute Central Enterprise and alaysis were carried out in the institute laboratories. The trees of Sarılop fig variety, which were established in 6m x 4m intervals in 2015, constitute the material of the research (Figure 1).


**Figure 1.** Application site; winter pruning and full foliation.

***Şekil 1.*** *Uygulama sahası; kış budaması ve tam yapraklanma.*

## Method

According to the randomized blocks experimental design, each application was designed with 3 replications and 3 trees in each replication, and a total of 45 trees were used. Three different severity of winter pruning and two control applications took place in the experiment A total of 5 different bud pruning applications were carried out in annual shoots (no pruning was done) $B_{k,}$ shoot tip not removed $B_0$, $B_3$= 3 buds/shoot, $B_5$= 5 buds/shoot, $B_7$= 7 buds/shoot. In all applications, except for he $B_k$ control application, the shoots corresponding to 2/3 of the shoots formed a year ago were left and the shoot removal process was carried out so that 25 healthy shoots/trees were left (Table 1). The remaining annual shoots were completely cut off. Pruning was done on the annual shoots on the basis of different bud/shoot density on January 23, and the necessary measurements and analyzes were carried out during the vegetation period.

**Table 1.** Number of different bud density winter pruning by applications

***Çizelge 1.*** *Uygulamalara göre farklı göz yoğunluğu kış budama uygulama sayısı*

| Aplication | Annual Shoot Number (number/tree) | Number of Buds After Pruning on Annual Shoot (buds/shoot) | Number of Buds After Pruning (buds/tree) |
|---|---|---|---|
| **$B_k$** | No pruning, tip removal or branch removal control application | | |
| **$B_0$** | 25 | Control application in which branches are removed but the shoot tip is not removed | |
| **$B_3$** | 25 | 3 | 75 |
| **$B_5$** | 25 | 5 | 125 |
| **$B_7$** | 25 | 7 | 175 |

During the shoot thinning process, the branches damaged by diseases and pests, deformity and intertwined branches that prevent aeration were cut and removed.

**Values of the application field**

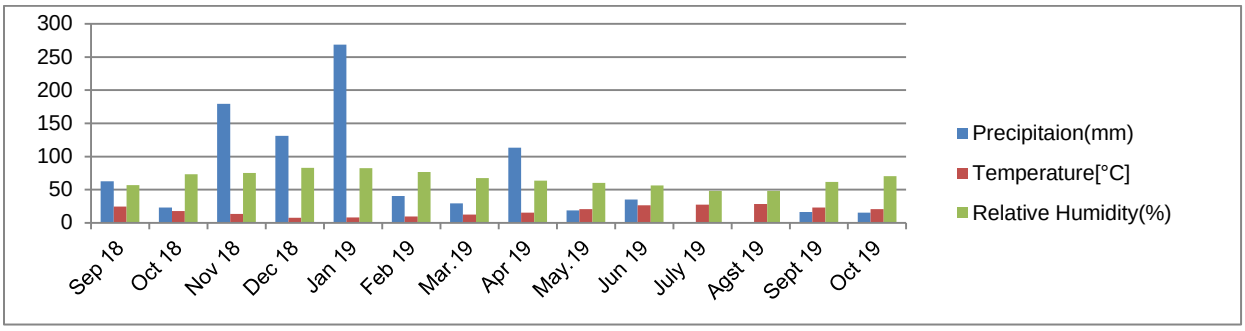


**Figure 2.** Climatic data of the trial site for the application year

***Şekil 2.*** *Uygulama yılına ait deneme sahası iklim verileri*

In the orchard where the experiments were conducted, irrigation was carried out in the summer season with the help of the drip irrigation system for 3 years from its establishment, and no irrigation was carried out in 2019 when the application took place.

**Measurements**

The effects of winter pruning applications on yield and quality were examined in three different groups as morphological measurements, phenological observations and analyzes on yield and fruit quality.

Within the scope of the project, phenological observations were made according to the observation principles on Eroğlu (1982) and Aksoy (1981).

Analysis of yield and fruit quality; observation and analyzes were carried out on fruit quality in fruit formed in July, August and September. Observation and analyzes were carried out on the fruit quality of randomly harvested fig fruits, one each from eight branches determined from four different directions on each tree. Flaisman et al. (2008) principles was taken into account.

Scrap, cracked, normal fruit ration in dried fruit; the semi-dry fig fruit, which fell to the bottom of the trees in each application, were collected during the harvest period and dried on the boards under the sun until they are reached a humidity of 22-24%. Scrap, cracked and normal (sound) fruit ratios were determined in dried fruit. 1 kg samples were taken from the total dry normal fruit obtained during the harvest period from each application in the replications, and they were subjected to quality classification in three groups as Extra, $1^{st}$ and $2^{nd}$ class in accordance with Anonymous (2007). Standards and the percentages of the total dry normal fruit were determined on the basis of applications. 1 kg of normal dried fig fruits with 22-24% humidity obtained from the trees in the replications were taken randomly and ground in a meat grinder. The samples that weigh 25 g of the fruits were taken from the meat grinder and 100 g with pure water was completed. The samples, kept in pure water for 1 day (24 hours), were mashed with the help of a mixer, and the juice was extracted by passing through a coarse filter. The data obtained by placing the obtained pure watery fruit juice into the measurement chamber of the digital refractometer was calculated and the TSS was obtained in% in dried fig fruit. The samples, were kept in pure water for 1 day (24 hours), were mashed with the help of a mixer, homogenized 10 g pure water juice was completed to 50 ml, titrated with 0.1 N NaOH until the pH was 8.2, and the total acidity(TA) of citric acid type was%. was obtained (TAN et al., 2018).

**Statistical analysis**

For statistical analyzes and LSD test, JUMP package program was used.

## RESULTS

### Phenological observations

As seen in Table 2, bud burst was observed on 10 March at the earliest in $B_k$ control application. This practice was followed by $B_0$ and occured no later than 22 March in $B_3$. Failure to perform crown bud removal in $B_0$ and $B_k$ control applications caused the control applications to wake up earlier than $B_3$, $B_5$ and $B_7$ with tip removal. This situation continued in the same way in all phenological observations. Foliation was observed at the latest in $B_3$, and full foliation was achieved in 60 days on average in all treatments. Full foliation was observed earliest on 19 May in $B_k$ and $B_0$.

Breba crop (first crop) fruiting was observed only in $B_k$ and $B_0$ without top bud removal, but did not ocur in $B_3$, $B_5$ and $B_7$ applications with tip pruning.

**Table 2.** Phenological observations

***Çizelge 2.*** *Fenolojik gözlemler*

| Application | Bud Burst | Foliation Beginnig | Full Foliation | Date of Fruit Birth | Fruit Ripening Date | Harvesting Period(days) |
|---|---|---|---|---|---|---|
| **$B_3$** | 22.Mar ±1 | 27.Mar ±2 | 28.May ±1 | 28.May ±1 | 29.Tem ±1 | 56 ±2 |
| **$B_5$** | 21.Mar ±1 | 25.Mar ±1 | 24.May ±2 | 24.May ±1 | 29.Tem ±2 | 55 ±1 |
| **$B_7$** | 19.Mar ±1 | 23.Mar ±1 | 23.May ±1 | 23.May ±1 | 27.Tem ±2 | 55 ±1 |
| **$B_0$** | 11.Mar ±1 | 17.Mar ±1 | 19.May ±1 | 19.May ±1 | 24.Tem ±2 | 50 ±2 |
| **$B_k$** | 10.Mar ±3 | 17.Mar ±3 | 19.May ±1 | 19.May ±1 | 23.Tem ±2 | 48 ±1 |

± number of days

Fruit: Main crop (summer crop)

**Figure 3.** Main crop (summer crop) birthing process.

Şekil 3. İyilop mey*vesi (ana ürün, yaz meyvesi) doğuş süreci.*

The time when the birth of the main crop began to appear different between applications. It first occured in $B_k$ on 19 May and was observed in $B_3$ on 28 May at the latest, 8 days after $B_k$. Fertilization time is directly related to the birth of summer fruits. Summer fruits are the main pruduct of the Sarılop dried fig variety. Fruits formed in other perionds are shed because the fertilization process dos not take place. The date the fruits reach a diameter of about 10 mm is the time to be fertilized.

Although ripening in summer frutis varies between applications, it was determined on 23 July in $B_k$, where bud swell was observed the earliest. Bk was followed by $B_0$ application, and the latest fruit maturation was in $B_3$ and $B_5$. The longest harvest period was in $B_3$ with 56 days and the shortest in $B_k$ with 48 days.

Morphological measurements were carried out on two different dates, 60 days after bud burst and before winter rest from the end of harvest, n order to reveal the developmental course of winter pruning

with different bud density. In this context, the first measurement was carried out on 30 May and the second on 15 October. Two branches from each direction were determined from the trees on which the application was made, and morphological measurements were carried out on these branches.

As seen from Table 3, in the morphological measurments performed 60 days after the bud burst date there were differences between the control aplications ($B_k$, $B_0$) and the pruning applications ($B_3$,$B_7$, $B_7$) in general. In the measurements made on this date, while the highest number of shoots occured in $B_k$ with 3.81, it was determined in $B_3$ with at least 2.04. When evaluated in terms of shoot length, the highest shoot length was observed in $B_3$ with 62.97 cm, $B_3$ was followed by $B_7$ with 61.33 cm and $B_5$ with 59.17 cm. In proportion to shoot length, the highest number of nodes occured in $B_3$ with 14.68, and at least 11.87 in $B_k$.

**Table 3.** Morphological measurments (30 May)

***Çizelge 3**. Morfolojik özellikler (30 Mayıs)*

| Application | Number of Shoots (number/branch) | Shoot Lenght (cm) | Shoot Diameter (mm) | Peduncle Lenght (mm) | Number of Leaves (pcs) | Number of Nodes (pcs) |
|---|---|---|---|---|---|---|
| **$B_3$** | 2.04$^{d}$ | **62.97$^{a}$** | 11.71 | **69.34$^{a}$** | **14.44$^{a}$** | **14.68$^{a}$** |
| **$B_5$** | 2.42$^{cd}$ | 59.27$^{a}$ | 11.36 | 63.85$^{ab}$ | 13.80$^{a}$ | 13.89$^{a}$ |
| **$B_7$** | 2.56$^{c}$ | 61.33$^{a}$ | **12.56** | 60.89$^{b}$ | 14.23$^{a}$ | 14.38$^{a}$ |
| **$B_0$** | 3.08$^{b}$ | 38.93$^{b}$ | 12.43 | 42.12$^{c}$ | 12.46$^{b}$ | 12.60$^{b}$ |
| **$B_k$** | **3.81$^{a}$** | 33.41$^{b}$ | 12.37 | 36.65$^{c}$ | 11.58$^{c}$ | 11.87$^{b}$ |
| Std error | 0.127 | 2.054 | 0.285 | 2.452 | 0.246 | 0.284 |
| P | <0.0001 | <0.0001 | 0.0552 | <0.0001 | <0.0001 | 0.0001 |

(LSD < 0.05) The differences between the means with different letters in each row are%95 significant according to the LSD multiple comparison test.

In fig, main crops are formed in leaf axils on the knuckle in annual shoots. Two weeks after the pollinating, on July 1, fruit counting was carried out on two shoots determined from all directions. As can be seen Table 7, the highest number of fruits was detected in $B_7$ with 14.63, the lowest number of fruits in $B_0$ with 9.55 and $B_k$ control application with 9.85.

According to Table 5, although the vegetative development increased in all applications from the first measurement (Table 5) date to winter rest, it contained the most in $B_3$, $B_5$ and $B_7$. In the morphological measurements obtained before winter rest, the maximum number of shoots was 3.65 in $B_k$, as in the measurement dates 30 May. The least number of shoots occurred in $B_3$ with 2.08 and $B_5$ with 2.24. In the measurements made on this date, the maximum shoot length was 86.09 cm in $B_3$, followed by $B_5$ and $B_7$. Between the two measurement periods, shoot length increased the most in $B_5$, followed by $B_3$ application. The least shoot length variation between both periods occured in control applications $B_k$ and $B_0$. Annual shoot length is an important parameter that determines fruit number and yield (Kuşaksız, 1999).

**Table 4.** Morphological measurments (15 October)

***Çizelge 4.** Morfolojik özellikler (15 Ekim)*

| Application | Number of Shoots (number/branch) | Shoot Lenght (cm) | Shoot Diameter (mm) | Peduncle Lenght (mm) | Number of Leaves (pcs) |
|---|---|---|---|---|---|
| **$B_3$** | 2.08$^{b}$ | **86.04$^{a}$** | **14.40** | **64.31$^{a}$** | **20.62** |
| **$B_5$** | 2.24$^{b}$ | 84.07$^{a}$ | 13.89 | 63.82$^{a}$ | 19.93 |
| **$B_7$** | 2.78$^{ab}$ | 83.46$^{a}$ | 13.82 | 56.59$^{b}$ | 20.37 |
| **$B_0$** | 2.99$^{ab}$ | 44.28$^{b}$ | 13.13 | 43.04$^{c}$ | 14.79 |
| **$B_k$** | **3.65$^{a}$** | 46.61$^{b}$ | 13.08 | 36.42$^{c}$ | 15.50 |
| Std error | 0.312 | 5.350 | 0.376 | 2.245 | 1.072 |
| P | 0.0327 | 0.0002 | 0.1446 | <0.0001 | 0.0057 |

(LSD < 0.05) The differences between the means with different letters in each row are%95 significant according to the LSD multiple comparison test.

**Table 5.** The number of main crop in annual shoot after pollination.

***Çizelge 5.*** *İlekleme sonrası yıllık sürgündeki ana ürün (iyilop) meyve sayısı.*

| Application | $B_3$ | $B_5$ | $B_7$ | $B_0$ | $B_k$ |
|---|---|---|---|---|---|
| **Number of Fruits** | 12.84[a] | 13.26[a] | **14.63[a]** | 9.55[b] | 9.85[b] |
| Std error | 0.621 | | | | |
| P | 0.0006 | | | | |

(LSD < 0.05) The differences between the means with different letters in each row are%95 significant according to the LSD multiple comparison test.

Shoot diameter development increased for all applications, and the highest increase between the two measurement dates was in the $B_3$ appication. While the shoot diameter was maximum in the $B_7$ application in the measurement dates 30 May, it was measured in the $B_3$ application dated 15 October. In the measurement made on this date, the number of nodes has increased since the measurements dates May 30, and the highest increase in the number of nodes between the two measurement times occured in $B_5$ with 6.04, while the lowest increase was in the $B_0$ control application with 2.19. The highest number of leeves occured in $B_3$ with 20.62, while the lowest was in the $B_0$ control appication with 14.79.

As tabulated in Table 6, it is seen that pruning application does not make any difference between the applications in terms of fruit width. When evaluated in terms of fruit size, the lowest fruit size was observed in $B_k$, an there was no statical difference in other control applications $B_0$ and pruning applications $B_3$, $B_5$ and $B_7$.

**Table 6.** Fresh fruit pomology measurements

***Çizelge 6.*** *Taze meyve pomolojik ölçümler*

| Application | $B_3$ | $B_5$ | $B_7$ | $B_0$ | $B_k$ |
|---|---|---|---|---|---|
| **Fruit Width(mm)** | 54.39 | 53.29 | **55.88** | 55.87 | 53.62 |
| **Std error** | 1.3466691 | | | | |
| **P** | 0.5388 | | | | |
| **Fruti Length (mm)** | **41.41[a]** | 40.02[a] | 41.19[a] | 39.80[a] | 37.76[b] |
| **Std error** | 0.55388727 | | | | |
| **P** | 0.0062 | | | | |
| **Ostiole Width(mm)** | 7.38 | 7.38 | 6.85 | 6.84 | **6.30** |
| **Std error** | 0.39551092 | | | | |
| **P** | 0.3282 | | | | |
| **Fresh Fruit Weight (g/fruit)** | 73.72[a] | 72.45[a] | **76.41[a]** | 73.80[a] | 62.27[b] |
| Std error | 1.3576196 | | | | |
| P | 0.0002 | | | | |

(LSD < 0.05) The differences between the means with different letters in each row are%95 significant according to the LSD multiple comparison test.

According to Table 6, there was no statistical difference between the applications of ostiol width in fresh fruit. In the $B_k$ control application, the smallest ostiole width was obtained with 6.30 mm, while the largest ostiole width was formed with 7.38 mm in $B_3$. Although the difference in fruit width, length and ostiole width of winter pruning applications with different bud density was small, t was not found to be statistically significant.

Considering the fresh fruit weight among the treatments, the lowest fruit weight was 62.27 g/piece in $B_k$ control application, and the highest fruit weight occurred in $B_7$ with 76.41 g/piece. When statistically evaluated, applcations other than $B_k$ were inclded in the same grouping (Table 6).

Dried fig fruits collected during the whole harvest were grouped in three classes as scrap, cracked and normal fruit, and their percentage in total yield was determined (Anonymous, 2006). Sunburn was determined in the normal fruit obtained, and the rate of sunburn in dried figs was determined (Aksoy et al., 1987).

**Table 7.** Normal, cracked, scrap and sunburn fruit ratio in dried figs

***Çizelge 7.*** *Kuru incirde sağlam, çatlak ve güneş yanığı meyvelerin oranı*

| Application | Normal (%) | Cracked (%) | Scrap (%) | Sunburn (%) |
|---|---|---|---|---|
| **$B_3$** | 69.91[a] | **12.81** | 17.28[c] | 1.21[c] |
| **$B_5$** | 70.09[a] | 10.97 | 18.94[c] | 1.24[c] |
| **$B_7$** | **74.49[a]** | 6.06 | 18.90[c] | 0.45[c] |
| **$B_0$** | 49.68[b] | 7.21 | 43.11[b] | 3.27[b] |
| **$B_k$** | 41.09[c] | 6.38 | **52.53[a]** | **6.36[a]** |
| Std error | 0.02579 | 0.07749 | 0.02703 | 0.04270 |
| P | < 0.0001 | 0.1210 | < 0.0001 | 0.0007 |

(LSD < 0.05) The differences between the means with different letters in each row are%95 significant according to the LSD multiple comparison test.


**Figure 4.** Normal (b), cracked (c), scrap (d) fruit in dried fig fruits. Collecting dried figs from the ground and drying them in the drying tunnel (a, e)

***Şekil 4.*** *Kuru incirde* sağlam *(b), çatlak (c), hurda (d) meyveler. Kuru incirlerin toprak yüzeyinden toplanıp kurutma tünelinde kurutulması (a, e)*

When dried fig fruits were grouped as normal, cracked and scrap, $B_7$ had the highest normal rate with 74.49%, while $B_7$ was followed by $B_5$ and $B_3$. The lowest normal fruit was 41.09% in $B_k$ control application (Table 9).

Accoarding to Table 7, cracked fruit occured in B3 with 12.81% in dried fig fruits, while the lowest was in $B_7$ appication with 6.06%. Among the applications, $B_k$ control applications, $B_k$ control application was followed by the other control application $B_0$ with 43.11%. The lowest scrap rates were in $B_3$, $B_5$ and $B_7$ applications, respectively.

Sunburn was evaluated according to 1/3, 2/3 and 3/3 ratio of sunbunr in dried normal fruits, only 1/3 of sunburn was observed in dried fig fruits in all applications, in this context 1/3 sunburn evaluated statistically. The highest rate of sunburn occurred in the $B_k$ control application with 6.36%, and the lowest in the $B_7$ application with 0.45%.

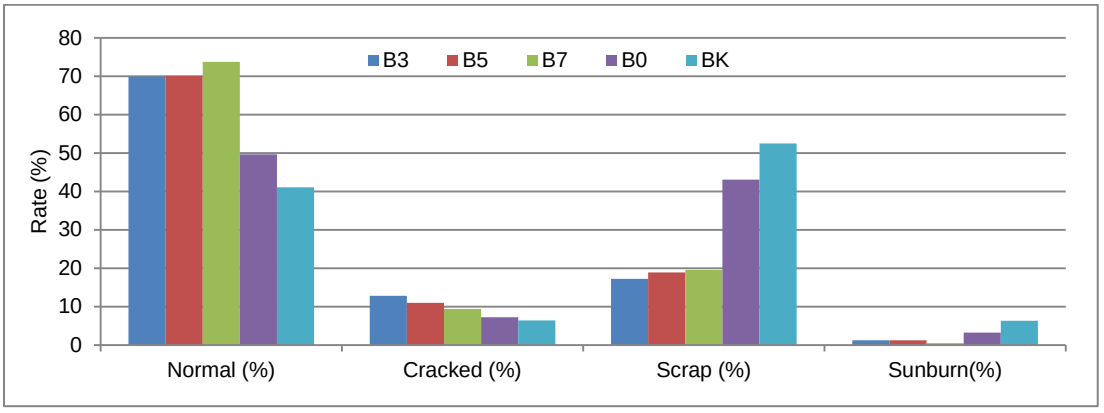


**Figure 5.** Normal, cracked, scrap and sunburn fruit rate (dried figs)

***Şekil 5.*** *Sağlam, çatlak, hurda ve güneş yanığı meyve oranı (kuru incirlerde)*

**Table 8.** Quality class ratios in dried figs (normal fruits)

***Çizelge 8.*** *Kuru incirlerde kalite sınıf oranları (sağlam incirlerde)*

| Application | Extra (%) | 1. Class (%) | 2. Class (%) |
|---|---|---|---|
| **$B_3$** | 55.63[a] | 30.76 | 13.61[c] |
| **$B_5$** | 55.58[a] | 30.84 | 13.58[c] |
| **$B_7$** | **60.95[a]** | 27.61 | 11.44[c] |
| **$B_0$** | 29.16[b] | **44.06** | 26.78[b] |
| **$B_k$** | 16.49[c] | 42.67 | **40.84[a]** |
| **Std error** | 0.09444 | 0.13577 | 0.11575 |
| **P** | <0.0001 | 0.0718 | 0.0003 |

(LSD < 0.05) The differences between the means with different letters in each row are%95 significant according to the LSD multiple comparison test.

**Table 9.** Dried fig weight (normal fruits)

***Çizelge 9.*** *Kuru incir ağırlıkları (sağlam incirlerde)*

| Application | $B_3$ | $B_5$ | $B_7$ | $B_0$ | $B_k$ |
|---|---|---|---|---|---|
| **Drid Normal Fig Weight (g/pc)** | 19.07[bc] | 19.82[ab] | **20.72[a]** | 18.68[c] | 17.00[d] |
| **Std error** | 0.34174064 | | | | |
| **P** | 0.0002 | | | | |

(LSD < 0.05) The differences between the means with different letters in each row are%95 significant according to the LSD multiple comparison test.

In dried normal figs, Extra Class was realized in $B_7$ with 60.95%, $B_7$ was followed by $B_3$ with 55.63% and $B_5$ 55.58%. Class 1 was the highest in $B_0$ with 44.06% and $B_k$ with 42.67%, while the lowest was in $B_7$ with 27.61%. $B_k$ was measured as the second class with 40.84%, followed by $B_0$ with 26.78%. In the 2. Class dried fruit classification, there was no statistical difference in $B_3$, $B_5$ and $B_7$ applications, the lowest was in $B_7$ with 11.44%.

As seen from Table 9, there were statistical differences between the dried fig normal fruit ratio and applications. The best dried normal fruit ratio was obtained in $B_7$ with 20.72 g/piece while,it was followed by $B_5$ with 19.82 g/piece. The lowest values occurred in $B_0$ and $B_k$ control applications. In terms of fresh fruit weight, although there was no difference except for $B_k$, there were differences in terms of dried normal fig fruit weight. This situation is associated with scrap, cracked and dried normal fruit ratios in applications.

Although there was no statistical difference between the applications, the highest yield per tree was realized in $B_7$ with 11.34 kg, $B_7$ was followed by the control application $B_k$ with 8.51 kg, and the lowest yield occurred in the $B_3$ application with 6.91 kg.

Yield per hectare was obtained in $B_7$ with 4762.90 kg, and the lowest in $B_3$ with 2904.10 kg. The highest yield per trunk cross-sectional area was measured in $B_7$ with 115,51 g/cm$^2$, while followed $B_7$ with 87.36 g/cm$^2$ (Table 10).

**Table 10.** Dried fig fruit yield.

***Çizelge 10****. Kuru incir verimi.*

| Application | Yield Per Tree (kg/tree) | Yield Per Hectare (kg/ha) | Yield Per Tree Trunk Cross Section (g/cm$^2$) |
|---|---|---|---|
| **$B_3$** | 6.91 | 2904.10 | 66.86 |
| **$B_5$** | 7.91 | 3324.50 | 68.88 |
| **$B_7$** | **11.34** | **4762.90** | **115.51** |
| **$B_0$** | 8.14 | 3422.40 | 64.85 |
| **$B_k$** | 8.51 | 3575.30 | 87.36 |
| **Std error** | 1.228 | 51.636 | 17.347 |
| **P** | 0.2003 | 0.2010 | 0.2670 |

(LSD < 0.05) The differences between the means with different letters in each row are%95 significant according to the LSD multiple comparison test.

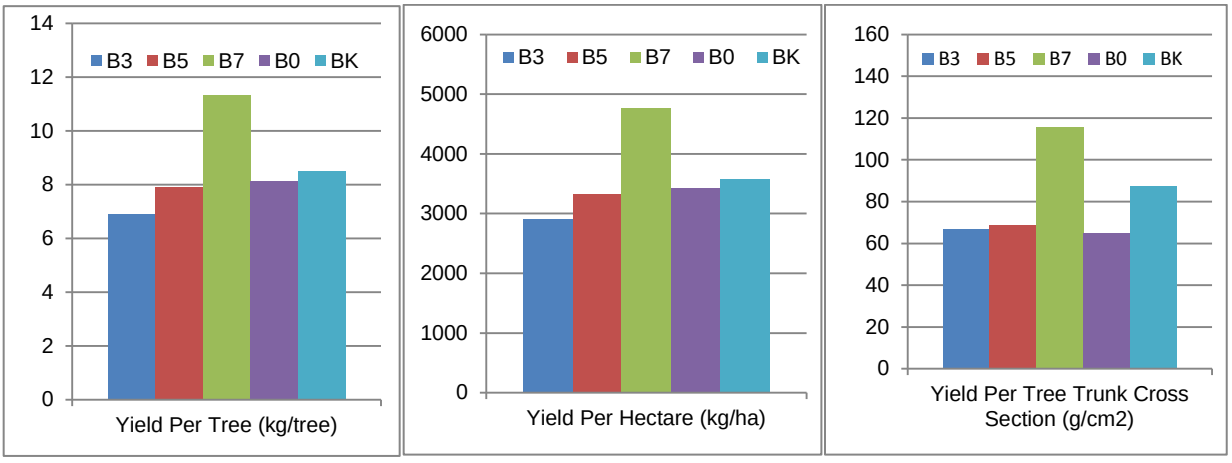


**Figure 5.** Dried fig fruit yield

***Şekil 5.*** *Kuru incir verimi*

Figure 6 shows the amount of scrap, cracked and normal fruit in the total dried fig yield per tree. In the $B_7$ application where the highest yield was determined, the normal fruit amount was determined as 8,45 kg/tree. In $B_k$ control application, which has the highest dried fruit yield after $B_7$ application, the normal fruit amount is the lowest with 3,50 kg/tree. After $B_7$ application, the highest normal fruit yield was realized in $B_5$ application. $B_k$ and $B_0$ control applications, which stand out compared to $B_5$ and $B_3$ in terms of efficiency, where unsuccessful in terms of quality. $B_7$ application was determined as the most successful application in terms of efficiency and quality.

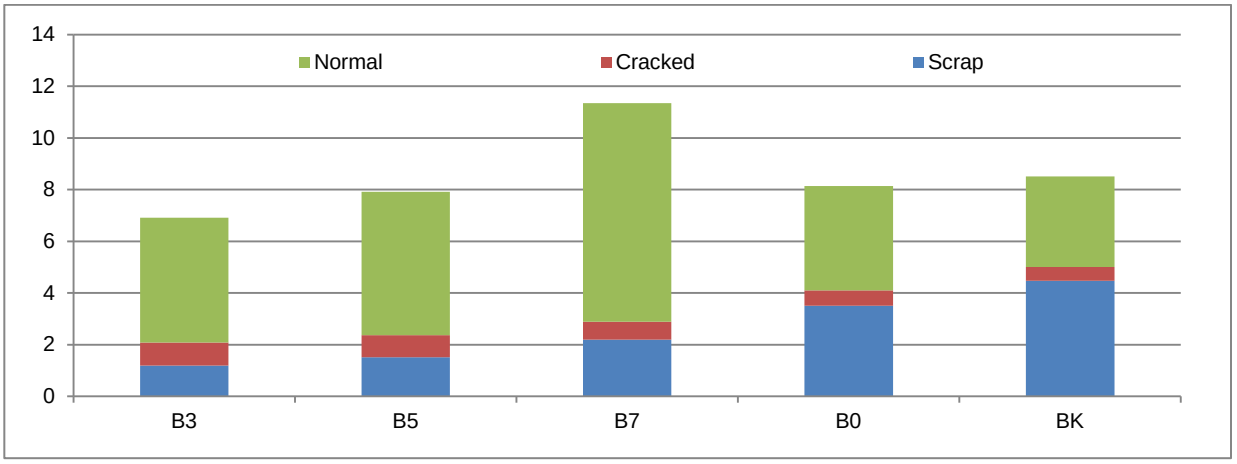


**Figure 6.** Scrap, cracked, normal fruit content in dried fig yield per tree

***Şekil 6.*** *Her bir ağaç için kuru incirde hurda, çatak ve sağlam meyve miktarı*

As seen from Table 11, there was no statistical difference between the applications in terms of TSS and TA. The highest TSS content in fresh and dried fruit was in $B_7$, and it was 21.66% in fresh fruit and 76.75% in dried fruit. TA content was lowest in $B_5$ in fresh and dried fruit, and it was determined as 0.107% in fresh fruit and 0.719% in dried fruit. The effect of pruning on TSS and TA content was statistically insignificant.

**Table 11.** Biochemical properties

***Çizelge 11.*** *Biyokimyasal özellikler*

| Application | TSS content (%) (Fresh Fruit) | TSS content (%) (Dried Fruit) | TA content (%) (Fresh Fruit) | TA content (%) (Dried Fruit) |
|---|---|---|---|---|
| **$B_3$** | 21.35 | 75.46 | 0.115 | 0.722 |
| **$B_5$** | 21.46 | 75.64 | 0.107 | 0.719 |
| **$B_7$** | 21.66 | 76.75 | 0.115 | 0.853 |
| **$B_0$** | 21.38 | 74.75 | 0.117 | 0.831 |
| **$B_k$** | 21.32 | 75.95 | 0.123 | 0.838 |
| **Std error** | 0.37794767 | 1.1023208 | 0.0076623 | 0.0447800 |
| **P** | 0.9695 | 0.7790 | 0.6628 | 0.1411 |

(LSD < 0.05) The differences between the means with different letters in each row are%95 significant according to the LSD multiple comparison test.

## DISCUSSION

Sarılop fig variety is one of the genetic resources of Türkiye's and it is the leader in the World with its fruit drying characteristics. In this study, in terms of drying quality and increasing yield, the effects of pruning application on plant growth, yield and quality on different bud density on Sarılop variety fig trees, which have reached the yielding age, were examined, and bud management was applied to the tapestry pruning system currently applied by producers.

The earliest bud bursting date was observed in $B_k$ and $B_0$ control applications, which did not undergo tip removal. The latest bud burst date was determined in $B_3$ application with the least bud density 3 buds/shoot. Reducing or increasing the number of buds left had different phenological results in fig trees. Bud burst occurred in $B_7$, $B_5$ and $B_3$ applications, respectively. This situation occurred in the same way at the start of leafing, fruit birth, full leafing and fruit ripening dates. In regions where the fig is likely to

be affected by early spring frosts at the time of bud burst, pruning can be done over 3 buds to encourage late awakening. In fresh fig pruduction, where earliness controbutes economically, in fruit trees, excess shoots are completely removed in accordance with tree development, leaving the buds on the shoot partially of completely, not taking the tip can provide earliness in fresh fruit production.

Gölcü (2019) conducted a study to determine the phytochemical properties of some fig cultivar and genotypes grown in Kahramanmaras (Türkiye) conditions, determined the burst date fort he Sarılop fig cuntivar as 25 March for 2017 and 16 March at 2018. Syonia crop was born on May 29 for 2017 and 16 March at 2018. Çatmadım (2014), in his study in Aydin, stated that the earliest leafing in Sarilop fig cultivar occurred on 30 March.

In a study conducted in Incirliova Districh İn Incirliova District of Aydın Province, Ayar (2018) determined that the first foliation date for 2015 among the Clones of Sarılop Fig Variety differs between clones, but between 1-3 April and 21-28 March for 2016. Main crop birth was observed between 25-31 May in 2015 and and between 10-19 May in 2016. In this study, although the date of birth of main crops differs on the basis applications, it was determined between 19 and 28 May. In the $B_3$ applications, it was determined between 19 and 28 May. In the $B_3$ application, which left the least bud density, the date of birth of main crops occurred on May 28.

While Ayar (2018) stated that the harvest period varied between 35-47 days in 2015 and between 38-48 days in 2016, in this study, the harvest period was 48-56 days, and pruning extended the harvest period. This is an indication that the interaction between pruning density and harvest periol has a direct effect on phenology.

Phenology follow up is important in fig trees in terms of determining the time of pollinating. The date of pollinating may change with pruning practices. In the $B_3$ application, in which the latest main crop birth was observed, unfertilized fruit drop was observed in the late period after harvesting, and this directly affected the yield. In this direction, it is necessary to determine pollinating time based on the severity of pruning by following the phenology.

In the measurement of morphological development, shoot length, shoot diameter, internode length and number of nodes were better in $B_3$,$B_5$ and $B_7$ applications compared to $B_k$ without pruning and $B_0$ without tip removal. In a study on the dried Sabz fig variety, it was stated that the effect of pruning on the tree growth were equivalent to the growth and number of shoots. In a study on dried Sabz fig variety, it was stated that the efffect of pruning on tree growth were eauivalent to the growth and number of shoots (Zare, 2021). Gonzalez et al. (2010) investigated the effects of intensive pruning on yield in fig production in De a Libra fresh fig variety. In 9 years old fig trees; They removed 30%, 45% and 60% of the entire tree structure in the branches with winter pruning. The lowest pruning density, 30%, was found to be sufficient agronomic technique. Equivalent to these studies, our study; pruning and tip removal had a positive effect on shoot length and fruit setting, although they differed on the basis of applications. In the measurements made before winter rest, it was determined that pruning over 3 buds was the best prcatice in terms of shoot length, shoot diameter and number of nodes. In the process of creating the desired crown structure, hard pruning such as pruning over 3 buds will give positive results in fig trees where vegetative development is encouraged.

Different bud density pruning practices created significant differences on the quality of fresh and dried figs. The increase in the length on the internodes showed increases in terms of quality on the basis of applications. In all $B_3$, $B_5$ and $B_7$ applications, there was an increase in quality compared to $B_0$ and $B_k$ control applications. Main crop fruits of Smyrna-type fig varieties ocur in leaf axils above the knuckle on annual shoots. It has been observed that the shortness of the internodes causes the fruit growing in contact with each other during ripening, resulting in a decrease in air flow, rotting and flowing of the fruit. Drying quality an performance were higher in trees with good ventilation and long internodes.

Climate is one of the most important external factors for dried gig cultivation. Insufficient winter precipitation will affect plant growth negatively, as well as the relative humidity increase in July, August and September, when the harvest period is carried out, and precipitation negatively affects yield and quality. In the harvest period of 2019, when the application was carried out, the amount of precipitation and relative humidity were close to the optimum climatic values of the Sarılop fig variety, which positively affected the yield and quality. Fig cultiation is strongly affected by climatic conditions. For this reason, 70% of the world's fig production is concentrated in countries on the Mediterranean coast (Arpaci, 2017). Thinning out along with heading back winter pruning treatment was the best strategy for reducing drought damages in fig orchard under rainfed conditions due to superiority in vegetative characteristics, less negative leaf water potential, reduced leaf temperature, and main crops drop, increased main crop number in the shoot, increase in solyble solids, fruit color, and weight quality (Zare, 2021).

In this study, in which the effects of winter pruning applications at different bud density on fig trees established on open vase system in Sarılop fig cultivar were investigated, the highest results in terms of yield and quality were obtained in $B_7$ application. Dried fig quality was found to be higher in all applications than in control applications. It ıs stated that in Deanna fresh fig variety, the best yield is obtained in winter pruning of 4 buds/shoot in winter pruning applications at different bud density on 3-4 years old trees (Kumar et al., 2015). Equivalent to our study, winter pruning intensity was directly related to yield and quality.

At the end of this study, when the dried fig fruit was examined as scrap crack and normal fruit, the difference between blocks was found to be 74.49% for the highest $B_7$ application, followed by $B_5$ application. The highest scrap rate in the $B_k$ control application was 52.53% and the lowest was 17.28% in $B_3$ application. Total dry fruit yield was 11.34 kg/tree with highest $B_7$ application and lowest 6.91 kg/tree with $B_3$ application. The highest yield per decare was 476.29 kg in $B_7$ application. According to the quality classification of the normal fruit, $B_7$ has an Extra Grade product of 60.95%, followed by $B_5$ with 55.58%, and the lowest was in $B_k$ with 16.49%. Dried fig size is the majör factor in marketing especially for direct consumption (İrget et al., 2008). Some severe pruning treatments on figs increased fruit weight compared to control, which was consistent with the results of apple pruning intensities (Choudhary & Dhakare, 2018).

Dried figs are subject to different evaluations in terms of quality. The first class fig was identied by fruit brighter color, bringing about better marketing (Sedaghat & Rahemi, 2018). In our study the best dried normal fruit ratio was realized in $B_7$ with 20.72 g/piece, and $B_7$ application was followed by $B_5$ with 19.82 g/piece. Calabatica dried fig variety was ranged in a study from 7.88 g to 10.64 g (Galvan et al., 2021), Kadota dried fig variety was reported average weight from 15-18 g (Genna et al., 2008) and Sabz variety in different study was measured from 3.9 g to 6.44 g (Rahemi & Jafari,2008; Zare, 2021).

## CONCLUSIONS

Quality is very important in terms of market value in dried fig. It is obvious that there is a need for cultivation techniques to minimize losses.

In this study, in which the effects of winter pruning applications at different bud density on fig trees planted on an open vase system in Sarılop fig variety were investigated, different results were obtained in terms of yield and quality. For the first time, the effect of pruning intensity on fruit quality in terms of marketing was examined in detail in Sarılop, which is the world's leading dried fig variety in terms of production amount. In the study, positive outputs were obtained in tree growth and fruit yield/quality amount depending on the pruning severity. Especially 7 buds/shoot pruning came into prominence in terms of yield and quality. Likewise, all of the other pruning applications were found to be successful in terms of quality as compared to control applications.

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