



The effect of green pruning times on some physiological and morphological characteristics of peach redtop cultivar in Moghan region

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ABSTRACT

In order to evaluate the effect of green pruning times on some physiological and morphological characteristics of peach Redtop cultivar in Moghan region, a factorial experiment was arranged based on randomized complete block design with three replications. First factor (the pruning severity) included 3 treatments ($\frac{1}{3}$ pruning, $\frac{1}{2}$ pruning, complete pruning and non pruning as control) and second factor (pruning time) included 4 treatments (31 May, 15 June and 1 June). Morphological characteristics such as length of seasonal branches, fruit size, physiologic characteristics; total soluble solids (TSS), acidity, rate of sugar and yield were measured, and evaluated. Results showed that green pruning times had significant effect on length of seasonal branches, yield, fruit size, total soluble solids, acidity and rate of sugar. The superior treatment was ($\frac{1}{2}$ pruning at 15 June) that had the highest rate of sugar, biggest fruit, highest yield, high total soluble solids and lower amount of total acidity. Finally, it was concluded that among the seven studied characteristics, the treatment (June 25, $\frac{1}{2}$ pruning severity) had the most significant effects in comparison with other treatments.

INTRODUCTION

Winter and summer pruning are widely applied processes in all fruit trees, including in peach orchard management. The summer pruning (SP) increases the average fruit weight and soluble solids contents (SSC) more than winter pruning (WP).

Nowadays, in order to enhance the value of products through the production of the fruit with the proper size, shape and color, high quality of new horticulture techniques such as green pruning is used. For increasing the economic lifetime of fruiting, peach need to severe pruning every year that it cause to more light penetrate into the tree canopy (Szklarz and Radajewska 2009; Ikinci

2014). Summer pruning has long been used as a management method for fruit trees and was shown to be a valuable method of controlling tree growth (Ikinci 1999; Bayazit et al. 2012; Ikinci 2014), increasing flowering (Day et al. 1989; Kumar et al. 2010), increasing fruit color (Ikinci 1999; Hossain and Mizutani 2008; Bayazit et al. 2012) increasing soluble solids concentration (SSC) (Mizutani et al. 2000; Demirtas et al. 2010; Kumar et al. 2011) and decreasing titratable acid content (TA) (Hossain and Mizutani 2008; Hossain et al. 2006). Disadvantage of summer pruning include reduced cold hardiness of flower buds (Marini 1986), delayed defoliation (Marini 1986; Ikinci 1999), decreases carbohydrate levels in the tree (Marini 1986; Myers 1993; Ikinci 2014), fruit yield, fruit quality (Kumar et al. 2011; Ikinci 2014). The significant loss of leaf area on summer-pruned trees may lead to a reduction in the carbohydrate and nutrient element concentrations in remaining tissues and thus limit the growth of trees. Similarly, summer pruning decreased carbohydrate concentration in stems and roots of mulberry and reduced the leaf carbohydrate and significantly affected carbohydrate accumulation in shoot (Ikinci 2014). The aim of this study was to evaluate green pruning times on some physiologic and morphologic characteristics of peach redtop cultivar.

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MATERIALS AND METHODS

The field experiment was conducted during 2013-2015 on Redtop peach variety in Moghan region. The experiment was based on randomized complete block design (RCB) with 2 factors in 3 replications and 12 treatments. The yearly average temperature is approximately 20-30 degree centigrade, while annual precipitation rate varied between 280-300 mm. The rate of relative moisture in experiment field was 40% -80%. The soil in the studied orchard was loamy clay-with pH=7 and 1ml/mos EC. The First factor (A=the pruning severity) included 3 treatments ($\frac{1}{3}$ pruning, $\frac{1}{2}$ pruning, complete pruning and Non pruning as control) and second factor (B=pruning time) included 4 treatments (31 May, 15 June and 1 July). In this goal, thirty trees (12-year-old) of Redtop variety that were grafted on misery rootstocks were chosen. Studied characteristics were yield, fruit length, the rate of sugar, total soluble solid (TSS), the rate of fruit acidity and the ratio of fruit length to fruit diameter. As well, the length of the branches grown in present year was among the studied characteristics at the end of the growth season. Yields per tree were recorded. Finally, yield efficiency was obtained using formula below

Efficiency of yield = tree yield \times the number of tree

Total Solid Materials (TSS) was measured with refractometer. In term of Total fruits acidity, Malic Acid which is dominate Acid in peach was measured by titrating fruit juice against 0.1 NaOH at pH 8.1 and was expressed as percent malic acid. Ten fruits per tree were randomly selected and used to determine mean fruit Sugar. The weight of fruit calculates at ripping stage with digital scale (0.0001 accuracy). The length and diameter of fruits measured with coulis. Additionally, at the end of the growing season, 105 current seasonal branches were selected for growth measurements and their average length was calculated after measuring. Finally, data were analyzed using MSTAT-C softwar and Duncan test was used to detect significant differences between treatments means (1 %).

RESULTS AND DISCUSSION

Analysis of variance for the length of seasonal branches, fruits acid, yield, the length of fruit, sugar content and TSS were significant ($p \leq 0.01$). Pruning time, pruning severity and their interaction effect of them were also significant (Table 1). The comparison of data means shows that between pruning date and severity significant there was a significant difference (Table 2, Fig. 1).

Length of branch

The highest length was seen at 31 May while 1 July treatment had lowest length. Also, no-pruning and complete branch omitting treatments had highest and lowest length of branches respectively (Table 2). Interaction effects showed that, the highest branch length was achieved at 15 June-no pruning treatment and the lowest was at 31 May-complete branch omitting. The result also showed the effect of green pruning time on the growth of young branches which this caused to increasing the length and diameter of the lateral tree branches. Our results are similar to the results of Miller (1999) and Ikinici (2014).

Fruit size

The highest and lowest length of fruit was obtained on 15 June and 31 May treatments. Also, the highest and lowest length of fruit obtained from $\frac{1}{2}$ branch pruning and complete branch omitting (Table 2). The highest and lowest length of fruit were obtained from 15 June- $\frac{1}{2}$ branch pruning and 31 May- complete branch omitting (Fig. 1). Miller (1999) surveyed effect of green pruning on fruit length, yield and the amount of fruit sugar on peach; they indicated that green pruning increased the studied traits.

Yield

The highest and lowest tree yield observed at 15 June and 31 May treatments. The mean comparison on pruning severity had shown the highest and lowest tree yield at $\frac{1}{2}$ branch pruning and complete branch omitting treatments (Table 2). According to the interaction effects results, 31 May- $\frac{1}{2}$ branch pruning and 15 June- $\frac{1}{2}$ branch pruning had highest tree yield whereas, the lowest was seen 31 May- complete branch omitting (Fig. 1). Similar to results of Trevisan (2006) and Kumar and colleagues (2010) fruit yield reduced with increasing intensity of the pruning.

Total of fruits Acid

The highest and lowest total fruits Acid content was obtained from 31 May and 15 June. The highest and lowest total fruits Acid observed at no-pruning and $\frac{1}{3}$ branch pruning (Table 2). Furthermore the result of their interaction effects showed the highest and lowest of this value at 15 June- no pruning and 15 June- $\frac{1}{3}$ branch pruning (Fig. 1).

Fruit sugar

The highest and lowest rates of the fruits sugar were achieved at 15 June and 1 July (Table 2). Complete branch omitting and $\frac{1}{3}$ branch pruning treatments pruning severity dates had highest and lowest rate of fruit sugar (Table 2). In addition, the highest rate of the fruits sugar was related to 15 June - $\frac{1}{2}$ branch pruning and the lowest rate of

Table 1. Analysis of variance of the data for pruning date and severity of pruning

Source	df	Length of branch	Total of fruits Acid	Yield	Length of fruit	Fruits sugar	TSS
R	2	2.226 ^{ns}	0.003 ^{ns}	0.018 ^{ns}	0.09 ^{ns}	0.068 ^{ns}	0.039 ^{ns}
T ₁	2	9.551 ^{**}	2.522 ^{**}	11.498 ^{**}	31.05 ^{**}	1.717 ^{**}	9.18 ^{**}
T ₂	3	13.3701 ^{**}	23.867 ^{**}	23.432 ^{**}	71.21 ^{**}	2.018 ^{**}	9.265 ^{**}
T ₁ × T ₂	6	12.475 ^{**}	1.329 ^{**}	1.736 ^{**}	15.36 ^{**}	0.386 ^{**}	1.77 ^{**}
E	22	1.203	0.034	0.055	0.084	0.037	0.042
CV%	-	7.47%	2.66%	1.02%	0.83%	5.08%	1.9%

ns is non-significant and ** is significant at 1%.

Table 2. Comparison of means for pruning date and severity of pruning

treatment	Length of branch	Total of fruits Acid	Yield	Length of fruit	Fruits sugar	TSS
a ₁	15.64a	6.808b	22.11c	53.53c	3.567b	11.76a
a ₂	14.50ab	6.608b	24.04a	56.54a	4.200a	10.36b
a ₃	13.88b	7.483a	22.81b	54.05b	3.525b	10.15b
b ₁	11.31c	5.167d	23.47b	55.39b	3.300c	10.51b
b ₂	18.39b	6.456c	24.98a	58.17a	3.900b	11.49b
b ₃	0d	7.178b	21.22d	51.47d	4.367a	11.60a
Non pruning	29a	9.067a	22.28c	53.81c	3.489c	9.422c

Different letters in each column indicate significant difference at p≤0.05

sugar was seen at 15 June- ½ branch pruning and 1 July with ½ branch pruning (Fig. 1).

According to Kumar and colleagues studies (2010) the effect of intensity of pruning on all psycho-chemical characteristics, acid Ascorbic content and TSS had significant in the varieties of flora. The concentration of carbohydrates as a source of energy storage in temperate trees is influenced by multiple factors including temperature, light and humidity and pruning that increase the amount of carbohydrates. Demirtaş et al. (2010) studied the influence of summer pruning on peach and concluded that the 50% pruning of branches at first of July cause to increasing the size length of the fruit, sugar and fruit yield.

Total Soluble Solids (TSS)

The result of mean comparison had shown that

the highest and lowest percentage of the total soluble solids (TSS) were seen at 31 May and 1 July and the highest and lowest TSS were at complete branch omitting and no-pruning treatments (Table 2). The pruning severity at pruning dates had highest and lowest TSS at 31 May- ½ branch pruning and 1 July- ½ branch pruning respectively (Fig 1). The results of this study were in matched with those of found by Ercisli (2009) and Esitken et al. (2003).

CONCLUSION

In conclusion, the highest length of branch was seen at a₂b₄ (15 June- no pruning). In addition, the highest total fruits Acid was stimulated at a₁b₄ (31 May - no pruning). Furthermore, the highest yield was at a₁b₂ (31 May - ½ pruning) and a₂b₂ (15 June and ½ pruning) treatment. Thus, ½ pruning treatment more effective on yield than pruning

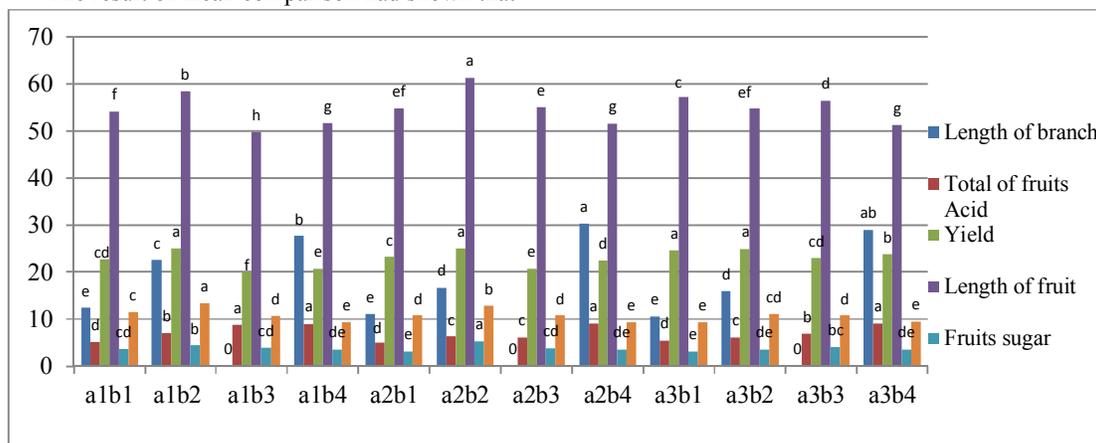


Fig1. Comparison of means of pruning date at severity of pruning

date. Moreover, the highest length of fruit and fruits sugar obtained from a₂b₂ treatment (15 June-½ pruning). Whereas, the highest TSS was achieved at a₁b₂ (31 May-½ pruning) treatment. Therefore, ½ pruning-15June were best of rate and time pruning in Moghan region.

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