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INFLUENCE OF SUMMER PRUNING ON GROWTH, FLOWERING AND FRUITING OF "FLORIDA PRINCE" PEACH CULTIVAR.

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ABSTRACT

Peach trees require thinning due to their heavy bearing of fruits. Summer pruning was carried out in three different dates on "Florida Prince" peach cultivar during the two successive seasons 2001 and 2002. These dates were May 15th , June 15th or July 15th by removing about one third of current and previous season shoots located at the interior part of the canopy. Four weeks following each summer pruning, parameters of exterior shoots such as leaf chlorophyll content, shoot length and diameters were taken. In the following season, flowering and fruiting characteristics of these exterior shoots were also determined. Early summer pruning in May 15th caused a reduction in leaf chlorophyll of exterior shoots as compared with that of pruning on June or July 15th however, shoot length and diameter during the current season were not generally different with various summer pruning dates. In the following season, summer pruning in previous season on May 15th caused a reduction in each of the number of flowers per exterior shoot, flowering density, number of fruits per shoot and fruiting density in both seasons when compared with the control (no summer pruning). The number of double fruits (as a physiological disorder) was significantly reduced as a result of summer pruning in the middle of May or June as compared with the control or late pruning in the middle of previous July. This study provided evidence that summer pruning of interior shoots early in the current season would have remarkable effect on flowering

and fruit characteristics in the following season and could be used to save labor cost in peach orchards.

INTRODUCTION

Considerable potential exists for using pruning as a mean for regulating tree vigor and maintaining the balance between vegetative and reproductive growth. Mostly, Pruning is conducted during the dormant period of the tree. Since peach pruning is a hard, labor-intensive cultural practice,and peach trees are characacterized by their annual heavy bearing, it will be desired to restrict the vegetative growth of young shoots during current summer to thin out some differentiated buds and to preserve carbohydrates before the dormancy period in winter. Thus Summer pruning could modify the nutritive and hormonal status of the induced flower buds in peach trees. It could be also utilized to replace the use of inhibitory chemicals (Cao and Zhang, 1992).

Reports on summer pruning of fruit trees have been controversial (Marini and Barden,1982, Lord *et al.,* 1979). Variations in the responses to summer pruning might be due to the stage of shoot growth, type of pruning cut, and length of the growing season following pruning (Stiles, 1984). Summer pruning has the potential to be used as a thinning agent. Thinned-peach trees also produce fruits of much better quality (Kappel and Bouthillier, 1995).It has been tried to utilize summer pruning to alter the physiology of the tree in a positive manner since this type of pruning is conducted during the active period of tree growth.

Recent observations suggest that summer pruning of peach during May or within 2-3 weeks after full bloom may reduce growth considerably more than later pruning in June (Crassweller, 1999). The inadequate definition of the pruning techniques that must be employed and the appropriate time of summer pruning need further investigations.

Thus, the objectives of this study were to study the effect of summer pruning of “Florida Prince” peach trees on the current seasons growth and the season following that kind of pruning. It was also aimed at investigating the effect of summer pruning on fruiting density and quality and the formation of the double fruits.

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MATERIALS AND METHODS

This study was conducted during the two successive seasons 2001 and 2002. The experimental site was in El-Tahrir, Beheira governorate. Four years old "Florida Prince" peach trees spaced at 4×4m were under drip irrigation system. This cultivar was budded on Nemaguard rootstock. The experimental plot was under standard cultivar practices in terms of fertilization, irrigation, pest control, soil management and dormant pruning. Trees were trained as open center system. The treatments were replicated three times in a complete randomized block design and 36 trees were assigned 4 treatments. Three replications for each treatment were used and each replication comprised three trees.

After two weeks of harvest, when the shoot averaged 15 cm in length, the following treatments were applied to the trees :(a) Control (no summer pruning); (b) summer pruning on May 15; (c) summer pruning on June 15; (d) summer pruning on July 15.

Approximately one third of current and previous season shoots located in the interior of the canopy was pruned out at their point of origin at each pruning date. Four weeks after each summer pruning, five current season's growths located at the exterior of the canopy were sampled from each replicate tree. Leaf chlorophyll content in this sample was determined by using SPAD Minolta Chlorophyll Meter (SPAD–502). The shoot length (cm) and diameter(cm) were also determined at the end of the current season(Table 1).

In the season following summer pruning treatments, a similar sample of external shoots was taken for the determination of flowering and fruiting characteristics (Table 2) which were: number of flowers per shoot, blooming density (expressed as the number of fruits per one meter of shoot), number of fruitlets per shoot, fruiting density (expressed as the number of fruits per one meter of shoot), and the percentage of double fruits (a physiological disorder that adversely affects fruit marketability).

Statistical analysis was done by using the Costat computer software. Mean separation in columns was accomplished by using the least significant difference test at 0.05 level.

RESULTES AND DISCUSSION

Parameters of current season's shoot growth are shown in (Table 1). Their data indicated that various summer pruning dates didn't adversely affect shoot length during 2001 season. However, pruning in the middle of June resulted in significantly longer shoots by the end of the current season as compared with the earlier pruning in the middle of May. Similar trend was obtained during 2002 season where June pruning caused a significant increase in shoot length as compared with May pruning. This finding could be due to the abundance of more stored carbohydrates in the middle and upper parts of the trunk during that period especially starch and soluble sugars. (Clair. *et al;* 1994). Meanwhile shoots were significantly shorter than the control when summer pruning was carried out in May or July in the second season.

Shoot diameter at the end of the summer pruning season was not significantly altered. However, shoots tended to be thinner with Mid June pruning than those of the control in both seasons (Table 1).

Chlorophyll content of leaves, 4 weeks after summer pruning was significantly increased by that pruning of July 15th when compared with the control during both seasons (Table 1). Early pruning in the middle of May, however, did not result in a significant change in leaf chlorophyll content in the current season as compared with the control. However, early summer pruning in the middle of May tended to reduce leaf chlorophyll of exterior shoots when compared with June 15th or July 15th pruning.

With regard to the consequence of summer pruning in previous summer on flowering and fruiting characteristics in the following season, the data in (Table 2) indicated that there was a significant thinning effect in both seasons. The number of flowers per twig was significantly reduced due to pruning in the previous summer. The highest degree of the thinning was obtained with early pruning of last May. It was clear from (Table 2) that both June and July summer pruning dates were effective in reducing the number of flowers per twig in both seasons. Moreover, pruning in the previous season in the middle of June caused more flowering per twig as compared with May 15th pruning in both seasons (Table 2).

Blooming density, as indicated by the number of flowers per one meter of shoot, was also influenced by previous summer pruning. It

Table1: Some shoot characteristics of current season, 4 weeks after treatment, as influenced by summer pruning in the two seasons 2001 and 2002.

Treatment	Leaf Chlorophyll Content (spad)		Shoot Diameter (cm)		Shoot Length (cm)	
	Seasons					
	2001	2002	2001	2002	2001	2002
Control	40bc	39.2b	0.43a	0.45a	35.0ab	39.33b
SP*at 15/5	37.73c	38.2b	0.37a	0.38ab	34.03b	33.33c
SP at 15/6	44.0ab	40.4b	0.36a	0.36b	44.0a	48.6a
SP at 15/7	46.33a	45.8a	0.33a	0.36b	37.3ab	32.0c
LSD(0.05)	4.36	3.75	0.099	0.068	8.83	5.7

Mean separation in columns the least significant difference at 0.05 level.
* SP stands for summer pruning.

was found that the control plants had the highest blooming density in both seasons. Furthermore, early summer pruning in May led to the formation of more blooming density than that done late in the middle of July of previous season (Table 2).

The number of fruitlets per shoot was also in agreement with the flowering pattern May 15th pruning of previous summer, which caused a marked reduction in the number of fruitlets in the subsequent season (Fig.1). The most sever thinning was achieved by May 15th pruning of last summer pruning in June and July. Moreover, there was no significant difference between the number of fruitlets per shoot whether the summer pruning was done in June or July,(Table 2). Similar trend of results was obtained with fruiting density expressed as the number of fruits per one meter of shoot. Early summer pruning in May of both seasons resulted in significant lower fruiting density than the control (Fig.1). Similarly, June 15th pruning had moderate fruit thinning in the following season. This trend was consistent in both seasons (Table 2).

Formation of double fruits was also found to respond to summer pruning dates in the previous season (Table 2). This physiological disorder adversely affect the marketability of peach fruits. In this study, summer pruning in the middle of May or June was found to dramatically reduce double fruits if compared with late summer pruning in July 15th or the control. Meanwhile, the percentage of

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double fruits in the control trees was not significantly different from that of summer-pruned trees in the middle of previous July.

Results of this study whether on current season resumed growth or flowering and fruiting in the following season were supported by the findings of others. Early summer pruning has been reported to deprive the tree from growth promoting hormones such as cytokinins. However late summer pruning performance reflects mainly on ABA reduction (Ferree et al., 1984; Mags, 1965; Ferree and Stang, 1980; Rom, 1982, Myers and Ferree, 1983). The concentration of cytokinins has been shown to increase after summer topping in grapes (Matsuri *et al*, 1979). Myers (1981) found that 6 days after summer pruning, free abscisic acid (ABA) in apple buds was 54% lower than levels in similar buds of unpruned trees.

Early summer pruning in the middle of May, in this study, caused a reduction in flowering and fruiting the following season which agreed with the finding of Rada Jewska (1995) and Kluge, (1993).This reduction could be due to the removal of actively growing shoots in the previous season. The tree was not able to replinesh the loss in carbohydrates and hormones such as cytokinins and auxins. This explanation is supported by Ferree *et al*.,1984.

This is why summer pruning in the middle of June and July (Table 2) led to more fruits per shoot than that obtained by early summer pruning on May 15th in the season following that pruning. This explanation is supported by Jackson (1986) who reported that late-summer pruning has limited dwarfing effect and less adverse influence on the tree vigor since the length of time with fewer leaves, as the source of photosynthates, is less while early summer pruning deprived the tree from some leaves for longer period of time. The correlation between summer pruning and the occurrence of physiological disorders, namely bitter pit, has been reported (Struklec, 1994). In this study, summer pruning either in the middle of May or June resulted in a significant reduction in the formation of double fruits. This doubling has been considered a physiological disorder caused by exposure of differentiated flower buds to heat stress or direct sunlight which results in the formation of double pistils. (Ryugo, 1988). However, the direct relationship between summer pruning and the occurrence of double fruit is not clear and needs further investigations.

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الملخص العربي

تأثير التقليم الصيفي علي النمو والإزهار والإثمار لصنف الخــوخ "فلوريدا برنس"

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تحتـاج أشـجار الخـوخ للخـف ويرجـع ذلـك للحمـل الثقيـل مـن الثمـار الـذي تحملـه الأشجار، وقد اجري التقليم الصيفي فـي ثـلاث مواعيـد مختلفـة (15 مـايو ، 15 يونيـو ، 15 يوليو) علـي صـنف خـوخ "فلوريـدا بـرنس" وذلـك بإزالـة 3/1 عـدد نمـوات الموسـم الحـالي والنموات عمر سنة (نموات الموسم السابق) والتي توجد داخل قمة الشجرة.

وقد تم قياس محتوي الأوراق من الكلوروفيل، طول وسمك الأفرع النامية حديثاً بعد أربعة اسابيع من التقليم.

وفـي الموسـم التـالي تـم قيـاس التزهيـر والإثمـار علـي الأفـرع الموجـودة فـي محـيط الشجرة. وقد ادي التقليم الصيفي بتـاريخ 5/15 لانخفـاض محتـوي الأوراق مـن الكلوروفيـل وذلك مقارنـة بالتقليم الصيفي في المواعيد المختلفة.

كذلك أدي التقليم الصيفي في 5/15 لانخفاض كل من عدد الأزهـار وكثافـة التزهيـر وعدد الثمار وكثافـة الثمـار وذلـك علـي الأفـرع فـي كـل مـن موسـمي الدراسـة وذلـك مقارنـة بالأشجار غير المعاملة.

كـذلك أدي التقلـيم الصـيفي فـي 5/15 ، 6/15 لانخفـاض النسـبة المئويـة للثمـار المزدوجة (اختلال فسيولوجي) انخفاضاً معنوياً وذلك مقارنة بالكنترول والتقليم الصيفي فـي 15 يوليو.

وتفيد هذه الدراسة في أن التقليم الصيفي مبكراً في موسم النمو له تأثير ملحوظ علي التزهير والإثمار في الموسم التالي ومن ثم يمكن استخدامها وذلك لتوفير التكلفة والجهد المبذولين في بساتين الخوخ لإجراء عملية الخف.

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