

PRODUCTION AND QUALITY 'PONKAN' TANGERINE TREE AFTER RECOVERING PRUNING

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ABSTRACT - This research was aimed to test top pruning effect in the lowering of the top and pruning the lower part of the plant on the recovering of 12 years old 'Ponkan' tangerine tree, 4 meters height, spaced 6 x 4 m and grafted on the 'Cravo' lemon tree. This experiment was carried out at Vito Crincoli Farm at Perdões/MG, Brazil. It was used randomized blocks in a factorial scheme of 4 x 2, top pruning (without pruning, pruning at 3.0; 2.5 and 2.0m) and skirt pruning (with and without pruning) with 4 replications. The useful parcel used three plants. The heavy top pruning damaged the production in the first tree years, also, after the second year, the plants showed a very good recovering. This result was confirmed in the third harvest, when diferents kinds of top pruning did not differ in the years. The plant's skirt pruning treatment was superior to the treatment without pruning. The useful plot was constituted of three Tangerine plants. After the third year the treatment those who had more severe pruning obtained heavier fruits, indicating this kind of pruning to recover fruit quality.

Key words: *Citrus reticulata* Blanco, cultural treat production

PRODUÇÃO E QUALIDADE DE FRUTOS DA TANGERINEIRA 'PONKAN' APÓS PODA DE RECUPERAÇÃO

RESUMO - Objetivou nesta pesquisa testar o efeito da poda de topo no rebaixamento da copa e poda da saia na recuperação da tangerineira 'Ponkan' com 12 anos de idade, altura de 4 metros, espaçadas de 6 x 4 m e enxertadas sobre limoeiro 'Cravo'. O experimento foi conduzido na Fazenda Vito Crincoli localizada no município de Perdões, MG. O delineamento experimental utilizado foi em blocos ao acaso, em esquema fatorial 4 x 2, sendo poda do topo (sem poda, poda a 3,0; 2,5 e 2,0m) e poda da saia (sem e com a poda) com quatro repetições. A parcela útil foi constituída de três plantas. As podas drásticas de topo prejudicaram a primeira produção, contudo a partir do segundo ano da poda, as plantas apresentaram boa recuperação. Essa afirmativa foi confirmada na terceira colheita, quando os diferentes tipos de podas do topo não se diferenciaram na produtividade, sendo que o tratamento com poda da saia foi superior ao sem poda. Os diferentes tipos de poda não prejudicaram a qualidade de frutos de tangerineira 'Ponkan' nas três safras subsequente as podas. Após o terceiro ano as plantas que sofreram podas mais severas produziram frutos com peso superiores, demonstrando a viabilidade da poda na recuperação da qualidade dos frutos

Palavras-chave: *Citrus reticulata* Blanco, tratos culturais e produção

INTRODUCTION

In adult citric plants, is common to find an excess of shade inside of the pantry top (3% to 4% of the maximum solar radiation). Consequently, as the plant measure turns old, many branches in its interior use to die and in consequence the plant internal production becomes

null. A small hole, removing two or three branches with handsaw, can to show excellent results and to allow a good photosynthesis around whole plant (Medina, 2001).

The knowledge of the vegetation habit, fruition and the productive potential of the citric plants of an orchard, guides the correct use and the appropriate type of pruning (Donadio & Rodrigues, 1992). The pruning can modify the natural tendency of accumulate weak,

declining and/or died branches in the interior of the pantry top; at the same time, its favor the fruition in the inferior parts by the increase of the aeration and isolation (Stuchi, 1994).

The pruning of adult citric plants is not an usual practice in the orchards from Brazil, however, it is common in some countries from north hemisphere, when the main objective is the production of fruits for the natural consumption (Donadio & Rodrigues, 1992). Therefore, the citric plants can be pruned during all life, the example of this is the conduction of 'Clementina' tangerine tree lead with pruning during 27 years, reaching excellent productions and good size of fruits (Oren, 1988).

Pruning the half of the length of all ramification or the suppression (a base pruning) of 50% of the ramification in 'Montenegrina' tangerine tree, before the full flowering, decrease the number of fruits of the 3^a category, without reduce the total production in kg/plant, besides breaking the production alternation. However, these types of pruning are more efficient when they are realized with frequency of two years (Panzenhagen et al., 1991).

Factors as the productivity, precocity, conduction forms, interpretation of the vegetative situation of the tree, interventions and reactions of the tree are components connected to this practical, becoming indispensable for its knowledge and domain.

According to Petto Neto (1991), studies and assays have to be incentive to the different types of pruning for orientation as to the accomplishment of this natural practice. Fallahi & Kilby (1997), alert for the effect of the drastic pruning that can compromise severely the productivity and the quality of the fruits in the following harvests.

This research aimed to test the production of quality 'Ponkan' tangerine tree in three subsequent harvests to the treatments with top pruning and pruning circumference.

MATERIALS AND METHODS

This experiment was done at the Vito Crincoli's Farm in Perdões/MG, Brazil, in tangerine tree (*Citrus reticulata* Blanco cv. Ponkan) with 12 years old, 4 meters height, 6 x 4 m spacing grafted on 'Cravo' lemon tree.

It was used randomized plots in a factorial scheme of 4x2, being four types of top pruning (without pruning, pruning at 3.0; 2.5 and 2.0 measured from the ground) and with and without skirt pruning (removed of some unproductive branches located 30 cm above the leg, branches with symptoms of attack of plagues and diseases and badly located). The pruning at 3,0; 2,5 and 2,0 m and

skirt pruning had been carried through an only time in 12/11/01. The experimental parcel was constituted of five plants, being that only three central plants had constituted the useful parcel. Each treatment was repeated 4 times.

Twenty days after the pruning, the production fertilizations start with N, P and K, as analysis of soil. The nitrogen, in the ammonium sulfate form, was applied in three applications (300, 250 and 250 g/plant) in the months of December, February and April, respectively. The phosphorus, in the form of simple superphosphate, an only application (220g/plant) in December. The potassium, in the potassium chloride form, was parceled in two applications (40 and 30g/planta) in the months of December and April, respectively. These fertilizations had been repeated, in the same amounts, in the three harvests where the evaluations were made.

The effect of the pruning had been evaluated in the three subsequent harvests by the following variable: number of fruits per plant, production per plant (kg) and esteemed productivity (t/ha). The quality of the fruits was evaluated in the harvest of 2002 in a sampling of five fruits per plant, through the characteristics average weight of fruits (g), diameter of the fruit (cm), total soluble solids - SST (%), total titratable acidity - TTA (%), ratio (SST/TTA). In harvest of 2003 were evaluated: average weight of the fruits (g), percentage of juice, SST, ratio (SST/TTA) and TTA (%). In following harvest of 2004, were evaluated average weight of fruit (g), volume of longitudinal and transversal diameters (cm), percentage of juice (mL), TTA (%), SST (%), percentage of juice and ratio (SST/TTA). The first harvest was gathered in 03/06/2002, second gathered in 17/06/2003 and third gathered in 23/06/2004.

The results had been submitted to the analysis of variance and the data averages were compared for the test of Tukey 5% of probability.

RESULTS AND DISCUSSION

Number of fruits, production and productivity in the first harvest after the pruning

In the first harvest (2002) subsequent to the treatments with the pruning, the characteristics: number of fruits per plant, production and productivity had presented significant differences for the test F ($P < 0,05$) having been influenced by the interaction between the two types of pruning (Table 1).

The biggest number of fruits for plants (330,5) was observed in the treatment with skirt pruning without top pruning. This result reflected in the variable production and productivity that had presented 96,13 kg and 39,9 t ha⁻¹, respectively (Table 1).

TABLE 1 Number of fruits per plant (NFP), production and productivity of 'Ponkan' tangerine after Top pruning and Skirt pruning in harvest of 2002. Lavras, MG, Brazil, 2005.

Skirt pruning	Top pruning	NFP*	Production (kg)	Productivity (t ha ⁻¹)
Without	without	302,8 a B	63,90 a B	26,6 a B
	3,0 m	176,8 b B	43,00 ab A	17,9 a A
	2,5 m	132,5 b A	28,00 b A	11,6 b A
	2,0 m	118,0 b A	23,73 b A	9,9 b A
With	without	330,5 a A	96,13 a A	39,9 a A
	3,0 m	270,3 a A	64,57 b A	25,6 b A
	2,5 m	141,3 b A	28,23 c A	11,7 c A
	2,0 m	44,0 bA	10,53 c A	4,4 c A
CV (%)		28,78	33,41	33,41

* Averages followed for the same capital letter in the column does not differ between the types of skirt pruning and small letter in the column does not differ between the intensities of top pruning for the test of Tukey to 5%.

Comparing plants with pruning and without pruning was observed a reduction around 600% in the plants production that had received the pruning of 2,0m in relationship with the check treatment (without pruning).

The reduction in the production in the first harvest presented in the treatments with drastic pruning in part can be explained in function of the time of the accomplishment of the pruning, since they had been realized in November, when the plant presented fruits in development, being thus removed great part of the fruits already in development. Stuchi, (1994) recommends that the severe top pruning, be realized more early, minimizing the loss of productive parts of the trees, preventing vigorous regrowth that this operation propitiates.

The reduction of the production due to the pruning in the subsequent year is bigger as severe had been the pruning (Bevington, 1980). According to this author, the number and the size of the branches had been bigger when the pruning was more severe.

In three systems of pruning; pruning of the half of the length of 50% of the ramification in July; pruning of the half of the length of all the ramification in July and suppression (base pruning) of 50% of the ramification in July, Panzenhagen et al. (1991) they had evidenced reduction in the production in the first harvest of the 'Montenegrina' tangerine tree, but they had observed increases in the number of fruits of 1^a category (diameter bigger that 67 mm).

In the top pruning, as the culture lowers the height, minors are the accumulated productions and when it is made annually it promotes a low accumulated a production when compared with the frequencias biennial, triennial and without pruning (Stuch, 1994). However, the severe lowering of the pantry propitiates increases in the size of the fruit (Fallahi & Kilby, 1997). Petto Neto (1991), says that well treated plants, after two years the production stabilizes itself with improvements in the fruits

quality. Another result that detached in the production was the top pruning at 3,0m associated to the skirt pruning, obtaining 64,57 kg of fruits per plant.

The reduction in the production presented in the treatments with drastic pruning confirms what it was said by Fallahi & Kilby (1997), in relationship to the behavior of the productivity in the following harvests.

Testing the water availability in an 'Baianinha' orange tree orchard submitted the sub soiling associated with light pruning (10 to 20% of the aerial part) and drastic pruning (50 to 60% of the aerial part) Souza, et al. (2004) was reported that the best answers had been obtained with the treatments with sub soiling ground without pruning and light pruning in the plants. Castle (1983) reports that in 'Murcote' tangerine tree with the reduction of 50% of its pantry, pruning considered severe for the citrus, there are recovery of the initial volume in 4 years, with significant reduction of the productivity in the three first years after and recouping the productivity after 4 years.

Number of fruits, production and productivity in the second harvest after the pruning

In the second harvest (2003) subsequent to the treatments with the pruning, the characteristics: number of fruits for plant, production and productivity had also presented significant differences for test F (P<0,05) being influenced by the interaction between the two types of pruning (Table 2). The best answers for the number of fruits per plant had obtained in the treatment with top pruning at 3,0m without skirt pruning and in the treatment with top pruning at 2,5m and with skirt pruning that presented values of 622,94 and 527,07 respectively. The same happened with the production per plant that was 134,03kg and 122,84 kg and productivity of 55,76 of ha⁻¹ and 51,10 t ha⁻¹, respectively in the same treatments (Table 2).

TABLE 2 - Number of fruits per plant (NFP), production and productivity of 'Ponkan' tangerine tree after top pruning and skirt pruning in the harvest of 2003. Lavras, MG, Brazil, 2005.

Skirt pruning	Top pruning	NFP*	Production (kg/plant)	Productivity (t ha ⁻¹)
Without	without	562,25 ab A	125,33 a A	52,14 a A
	3,0 m	622,94 a A	134,03 a A	55,76 a A
	2,5 m	417,61 c A	101,70 a B	42,31 a A
	2,0 m	474,06 bc A	112,74 a A	46,90 a A
With	without	327,21 bc A	85,73 ab B	35,66 ab B
	3,0 m	412,08 b A	104,56 ab B	43,50 ab B
	2,5 m	527,07 a A	122,84 a A	51,10 a A
	2,0 m	305,67 c A	75,83 b B	31,55 b A
CV (%)		10,51	17,46	17,46

* Averages followed for the same capital letter in the column do not differ between the types of skirt pruning and small letter in the column does not differ between the intensities of top pruning for the test of Tukey to 5%.

The answers presented in the second harvest already evidence a certain recovery of the plant, a time that, the value found in the treatment with top pruning at 3,0m without skirt pruning (55,75 t ha⁻¹) was superior to the presented one for the check treatment (52,13 t ha⁻¹) that did not receive any type of pruning. Another important question observed during the harvest is that, even with a good production, the plants that had received pruning did not presented broken twigs, very common fact in the treatments that had not received top pruning in function of the irregular architecture of the plant, does not

supporting, a great number of fruits. Thus, in the harvest, these plants did not pruning presented broken twigs and branches in contact with the ground, having depreciated great part of its production.

Number of fruits, production and productivity the third crop after pruning

On the third crop (2004) the characteristics, number of fruits, production and productivity, per plant presented significant differences only on the test F (P <0,05) for treatments with skirt pruning (Table 3).

TABLE 3 – Number of fruits per plant (NFP), production and productivity of ‘Ponkan’ tangerine tree after top pruning and plant’s low part (skirt) pruning at crop 2004. Lavras, MG, UFLA, Brazil, 2005.

Top pruning	NFP	Production (kg/ it plant)	Productivity (t.ha ⁻¹)
Without	383,00 a	68,02 a	28,30 a
3,0 m	337,00 a	66,68 a	27,74 a
2,5 m	216,25 a	49,247 a	20,49 a
2,0 m	236,00 a	57,05 a	23,73 a
CV (%)	43,68	44,61	44,61
Skirt pruning			
without	225,94 B	48,54 B	20,19 B
With	360,18 A	71,96 A	29,94 A
CV (%)	43,68	44,61	44,61

* Averages proceeded by the same capital letter in the column don’t differ between the types of skirt pruning and small letter in the column don’t differ among the intensities of top pruning for the of Tukey to the 5%.

On the table are presented the results in relation to the production on the third crop after the treatments with pruning. The number of fruits per plant was bigger (360, 18) in the treatment that only received skirt pruning. In treatments with top pruning there weren’t significant differences. In relation to the production and the productivity, the best results also had been obtained in the treatments that only received skirt pruning, were most of production and productivity 71, 96 (kg, plant) and 29, 94 (t.ha⁻¹), respectively. Also for these two characteristics there weren’t statistical differences in relation to top pruning.

These answers confirm the plant recovery, on the third crop after the treatments with pruning, agreeing with what was told by Petto Neto (1991), when he affirmed that the pruned citric plants can compromise the production or don’t produce any fruit at the following crop, but if it is well treated, from the second year of the pruning, the production can be good and fruits of better quality.

In top pruning, the more is lowered the height, lower are the accumulated productions and when it is done annually it promotes a low accumulated production when compared to the biennial, triennial frequencies and without pruning (Stuchi, 1994). However, the severe

lowering of the cup affords the increase of the fruit size (Fallahi & Kilby 1997).

On the other hand, the importance of the skirt pruning is evidenced (removing of the branches above de ramification) that affords a reduction of the intern vegetative part of the plant, with removing of unproductive branches, branches with symptoms of curses and diseases attack, giving a larger aeration of the top, consequently decreasing the amount of drains that favored to a larger plant's production. In the illustration 1, stay evidenced that the skirt pruning had a positive answer in

the improvement of the productivity. The effects of the treatment that received this pruning were very superior to the without this pruning. We could check, in the illustration 1, that the effect of the treatment without top pruning with the skirt pruning and of the treatment with skirt pruning and top pruning to 3m were the ones that provided the largest accumulated productivity in three crops after the pruning with the accumulated productivity of 113,63 t.ha⁻¹ and of 106,06 t.ha⁻¹, respectively. These two treatments were superior to the witness, that didn't receive any type of pruning.

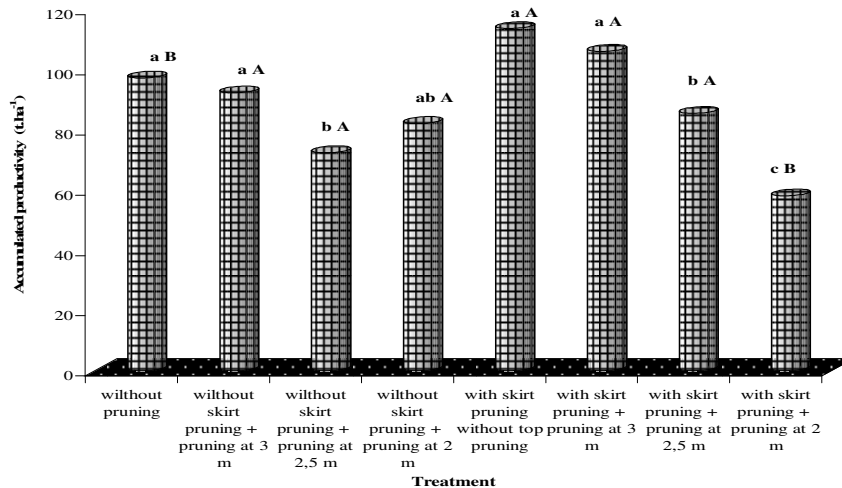


ILLUSTRATION 1 Accumulated productivity of the tangerine ‘Ponkan’ in the three crops after the pruning. Small letters indicate differences for the Tukey test to 5% inside of each treatment with top pruning and capital letter inside of each treatment with skirt pruning. Lavras, MG, Brazil, 2005.

In the citrus the pruning is a practice little recommended by reduce the plant productivity and grow of the plant (Koller, 1994), however, for tangerine, when we want fruits of good quality for consumption *in nature*, the pruning is an important practice (Panzenhagen, 1992, Miozzo, 1992) and Rodriguez & Villalba (1998). Besides, the pruning contributes to better top aeration, it facilitates the manual selection of fruits, the crop and the accomplishment of treatments against illnesses (Sartori, et al. 2004).

The reduction in the body of the plant is a technique also used for selection of fruits, like this being, the fruits produced by the plant has better development conditions giving a final product of better quality (Panzenhagen et al., 1991).

The tangerine “Ponkan” is prone to the production alternation (Caetano 1980), characterized by a load of fruits in one year and little or any production in the subsequent year.

Analyzing the tree crops, it is verified that the pruning didn't break the tangerine production alternation.

Although the production of the third crop has been superior to the production of the first, the third crop wasn't superior to the second, what characterizes production alternation, very common fact in the tangerine.

Quality of the fruits in the three crops after the different pruning kinds

In the table 4 are presented the medium values of the fruits quality characteristics of the tangerine ‘Ponkan’ at first crop (2002) after the different pruning kinds. With relation the fruits intern quality, the two pruning types didn't provoke alterations, with SST, ratio and ATT presenting values on average 9,55%, 18,93 and 0,508%, respectively, maintaining the fruits intern quality the was also observed for Morales & Davis (2000) in Tangelo “Orlando”. The medium weight and the longitudinal diameter of the fruits didn't also present differences between the treatments, presenting on average 225,18g and 8,98cm respectively.

TABLE 4 – Medium values of the medium weight of the fruit (PMF), longitudinal diameter of the fruit (DLF), SST, ratio, ATT of the tangerine ‘Ponkan’ after top pruning and skirt pruning, in the crop 2002. Lavras, MG, Brazil, 2005.

Skirt	Top pruning	PMF (g)	DLF (cm)	SST (%)	ratio	ATT (%)
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pruning						
without	without	213,25	8,86	9,65	20,3	0,48
	3,0 m	250,75	8,95	9,48	19,2	0,50
	2,5 m	208,75	9,01	9,58	18,5	0,52
	2,0 m	217,00	8,90	9,63	19,7	0,49
with	without	250,25	9,10	9,25	18,7	0,49
	3,0 m	226,75	9,07	9,55	18,7	0,51
	2,5 m	200,00	8,95	9,83	18,1	0,55
	2,0 m	234,75	9,02	9,58	18,4	0,52
CV (%)		18,92	5,36	4,80	8,60	8,33

For the variance analysis it is verified that there wasn't significant effect for the test F ($p < 0,5$) for any variable analyzed on crop 2003, as observed at previous crop. On crop 2003 the medium values of the characteristics of quality of the tangerine fruits "Ponkan",

as in the crop 2002, they didn't differ statistics, were the fruits medium weight, % of juice, SST, ratio and ATT presented medium values of 241,6g; 34,67%; 9,56%; 18,93 and 0,507% respectively (Table 5).

TABLE 5 – Medium values of the weight of the fruit (PMF), % juice, SST, ratio, ATT of tangerine 'Ponkan' after top pruning and skirt pruning, in the crop 2003. Lavras, MG, Brazil, 2005.

Skirt pruning	Top pruning	PMF (g)	% juice	SST (%)	ratio	ATT (%)
Without	without	221,75	34,29	9,65	20,30	0,48
	3,0 m	225,25	36,36	9,48	19,15	0,50
	2,5 m	239,75	34,66	9,58	18,50	0,52
	2,0 m	244,0	34,58	9,63	19,70	0,49
with	without	232,75	36,55	9,25	18,7	0,49
	3,0 m	247,25	34,02	9,55	18,65	0,51
	2,5 m	252,75	33,33	9,83	18,08	0,55
	2,0 m	270,0	33,54	9,58	18,35	0,52
CV (%)		10,08	11,21	4,91	9,11	8,93

Evaluating the effect of different pruning types in revenue and in lemon tree 'Lisbon' Fallahi & Kilby (1997) also consisted that after two years of the application of treatments the different types of pruning didn't alter the titratable total acidity of the fruits.

On the Table 6 are shown the characteristics results of the fruits picked in the crop 2004, three years after the accomplishment of the pruning. Was verified that just the characteristics TTA and Ratio presented

significant differences for the test F ($P < 0,05$). The juice volume, longitudinal diameter, total soluble solids, pH and % of juice didn't present significant differences for test F ($P < 0,05$). The general average for these quality attributes was of 463,59mL; 7,38cm; 9,38 %; 4,32 and 35,53%, respectively, for juice volume, longitudinal diameter, total soluble solids, pH and % of juice.

TABLE 6 – Juice volume (JV), longitudinal diameter of the fruit (DLF), SST, Ratio, TTA of tangerine 'Ponkan' after top pruning and skirt pruning, in the crop 2004. Lavras, MG, Brazil, 2005.

Skirt pruning	Top pruning	JV (mL)	DLF (cm)	SST (%)	Ratio*	TTA (%)	% juice
without	without	437,50	6,8425	9,78	20,60 b A	0,48 a A	35,33
	3,0 m	492,50	7,5550	10,28	25,30 a A	0,41 b A	35,83
	2,5 m	450,00	7,5150	9,83	21,49 b A	0,46 ab A	33,20
	2,0 m	477,50	7,575	9,93	23,49 ab A	0,42 ab A	33,76
with	without	420,00	7,2875	9,80	23,80 a A	0,41 a A	37,27
	3,0 m	440,00	7,1150	10,20	23,33 a A	0,44 a A	39,40
	2,5 m	445,00	7,4350	10,40	22,54 a A	0,46 a A	34,52
	2,0 m	546,25	7,7800	9,73	23,97 a A	0,41 a A	34,99

CV (%)	17,46	6,80	5,34	7,70	7,57	10,02
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* Averages proceeded by the same capital letter in the column don't differ between the types of skirt pruning and small letter in the column don't differ among the intensities of top pruning for the of Tukey to the 5%.

Between the different treatments and TTA was statistics larger (0,48%) in the treatment without the two pruning types. Although, statistics, this treatment didn't differ of the treatments with no skirt pruning and pruning to 2,5 and 2,0m that presented values for TTA of 0,46% and 0,42% respectively.

For the statistical analysis of referring values to the relation SST/TTA (ratio), it is verified in the Table 6 that the best answers were obtained in the treatments without skirt pruning and top pruning to 3,0m (25,30) and in the treatments without skirt pruning and top pruning to 2,0m (23,49), values these that are very above demanded

ones by the Classification Program of tangerines of the Horticulture Quality Center in – Company of warehouses and General Grocery stores of São Paulo state/ Brazil (CEAGESP), that demand for São Paulo State and Triângulo Mineiro, Brazil values of 'ratio' of 9,5. These values found were also superior to medium values for tangerine 'Ponkan' (12,7) found by Genú (1985).

On the illustrations 2 and 3 the values are shown for the weight and traverse diameter of the fruits. Was verified that the severity of the pruning was positive in the improvement on the fruits, providing a larger growth starting from 3 years of the pruning.

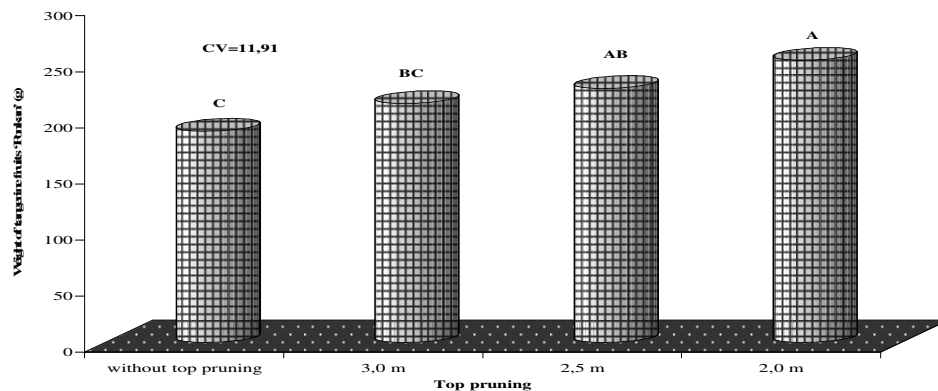


ILLUSTRATION 2 Weight of tangerine fruits 'Ponkan' in the crop 2004 in the treatments with top pruning. Letters indicate significant differences for the Tukey test to 5%. Lavras, MG, Brazil, 2005.

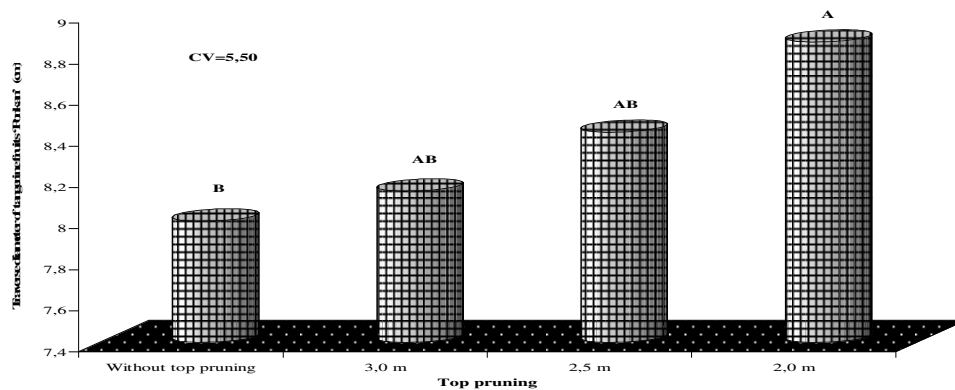


ILLUSTRATION 3 Traverse diameter of tangerine fruits 'Ponkan' in the crop 2004 in the treatments with top pruning. Letters indicate significant differences for the Tukey test to 5%. Lavras, MG, Brazil, 2005.

The severe lowering of the cup propitiates the increase of the fruit; they affirm Fallahi & Kilby (1997). Evaluating the effect of different pruning types in the revenue and in the quality of lemon tree 'Lisbon' Fallahi & Kilby (1997) also consisted that after two years the treatments with severe pruning in the two plant's sides and

the top pruning provide the obtaining of fruits larger weight (107,7g).

According to Fonfría et al. (1996), several factors interns determine the final fruit size; among them should stand out the genetic factors, the position of the fruit in the sprout and the competition among the organs in development.

The size may vary among quite wide margins for a same variety. Like this, the young trees produce fruits of larger size, with thicker and wrinkled peel. In general, when the size is very big and stands back a lot of the ideal type, can appear undesirable characteristics, such as, thick peel and wrinkled and little juice (Fonfría et al. 1996).

CONCLUSION

The drastic top pruning harms the production on first crop after the pruning. Starting from the second pruning year, the plants demonstrated certain recovery, confirmed on third crop where the different types of top pruning didn't differ in the productivity and the treatment with skirt pruning was superior to the without.

The different pruning types didn't harm the quality of fruits of the tangerine 'Ponkan', on the three subsequent crops to the pruning.

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