

## Effect of Pruning on the Yield and Quality of Kinnow Fruit

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### ABSTRACT

The effect of pruning on the yield and quality of Kinnow fruit was studied. The experiment was laid out according to the RCBD with four replications. Mature bearing trees of Kinnow mandarin were pruned like heavy pruning (T3), light pruning (T2) and non-pruning (T1). Maximum yield in term of number of fruits per plant (610 in 1<sup>st</sup> year & 841 in 2<sup>nd</sup> year) was noted in T3 (heavy pruning). Attractive fruit colour and better quality fruit with maximum fruit weight (248.5 g) and maximum juice percentage (46.39) were also observed in the same treatment. Conclusively, heavy pruning appeared to be the best pruning method to obtain the maximum yield, quality and orange red colour of Kinnow fruits.

**Key Words:** Pruning; Mandarin; TSS; Mature bearing tree; Canopy; Photosynthesis

### INTRODUCTION

Citrus has naturally sympodial growth habit, forming a large bush (18 - 20 feet tall) if left un-pruned. Pruning, the judicious removal of any vegetative part, is an important culture operation for the fruiting trees. Pruning prolong the bearing age of the tree. An un-pruned tree becomes very large, inhibiting light penetration. As a result, leaf sprout is decreased and photosynthesis activity remains low. The importance of sunlight intercepted by the tree canopy in the production of high yield of good quality fruit cannot be over emphasized. Light becomes a limiting factor in crowded groves and pruning improves light access. Adjustments must be made in the height, row middle width, and hedging angle to maximize sunlight penetration through the canopy. Sunlight not only influences the flowering and fruit set but also enhances fruit quality and colour development of fruit. The main object of pruning the bearing trees is to maintain the framework and to secure the higher yield and better grade fruits in each year. The requirement of pruning varies with species therefore, thus the present project was initiated to investigate the influence of various effects of pruning on the yield and other quality parameters of Kinnow fruit.

An elaborated work on different pruning method and their effect on citrus fruit have been reviewed as under:

Chadha (2001) reported that lightly pruned, young trees of Limon made greater development of roots and shoots. Singh *et al.* (2004) observed that citrus trees, which were begun to decline in vigor, yield and size of fruit, need pruning to help the restore their condition. Malik (1994) stated that the objective of pruning is to produce maximum fruit of good quality by maintaining a balance between fruiting and vegetative wood. Decreasing the number of fruit buds will usually give fewer but larger fruit and may

increase the percentage of desirable fruits (Denisen, 1979). Yeshitela *et al.* (2003) observed that there was no statistically significant difference among the treatments for the total number of fruit or average fruit per tree in 'TA' mango cultivars. Stassen *et al.* (1999) observed increase in fruit weight due to pruning on sensation mango. Studies by Sites and Reitz (1949) showed that increased soluble solids contents and improved rind colour was correlated with increased light intensity. Fucik (1977) noted an increase in the proportion of fruit inside and near the bottom of the canopy when 10 - 15 years old grapefruit trees were topped at 3 m and hedged to 4 m widths. Burns *et al.* (1977) reported that pruning is essential for lemon production. Israel and Monselise (1951) stated the importance of full sunlight for maximum yields. They suggested that citrus trees were sciophilous in their vegetative growth, but for maximum fruiting, full sunlight is required. However, some researchers enlighten the bad effect of pruning like Anon (1967) who stated that removal of appreciable amount of foliage reduced the yield without compensation in size and quality of fruit. Similarly Oostrum (1962) reported that one year harvesting is lost after severe pruning in south Africa. This study was conducted to assess the effect of pruning on the yield and quality of Kinnow fruit.

### MATERIALS AND METHODS

The experiment was carried out at Horticultural Research Institute Faisalabad on twelve year old Kinnow trees. Kinnow trees were pruned in the month of January and February of both years according to the following treatments:

- T1= Control (un-pruned)
- T2= Light pruning (Removal of water sprout dried, & diseased branches).
- T3= Heavy pruning (Removal of water sprout & diseased branches along with healthy but congested branches through canopy of plants)

Plants were pruned just after the fruit harvesting. In order to maintain the optimum level of accuracy experiment was replicated three times and four trees per treatment according to the Randomized Complete Block Design were selected. Experimental material was kept under similar cultural practices (fertilizers and irrigation).

Data were recorded of fruit yield and quality characters. Yield was measured as number of fruit at harvesting time, per tree in individual treatments. The fruit size both in length and width was measured in centimeters. The twelve fruits were weighted and per unit mean weight was obtained. Then the juice of these twelve fruits was extracted and was expressed as % of total fruit weight. Same procedure was adopted in the case with peel and rag percentage. Total soluble solids (T.S.S) were determined with the help of Refractometer, while the acidity was calculated by titrating the juice sample against N/ 10 sodium hydroxide using a few drops of phenolphthalein check spelling as an indicator. The results were expressed as % citric acid using the factor 0.0064 for each sample. T.S.S was divided by acidity to find out the T.S.S/ Acid ration. Number of seeds were accounted in individual fruit. The colour of fruit was noted individually with visual observation according the standard chart.

## RESULTS AND DISCUSSION

**Yield.** Statistically significant difference was noted in yield among various treatments (Table I). The plants, which were pruned heavily, produced maximum number of fruits (610) per plant as compared to the minimum number of 550 fruits per plant in un-pruned plantation. Almost similar trend was noted during the next year (which year). These findings are supported by Singh *et al.* (2004), who reported that trees, which have begun to decline in vigor, yield and size of fruit need pruning to help the restore their condition. In current investigation it can be concluded the pruning of old and undesirable branches stimulated the growth of new shoots to obtain new fruiting wood. So the numbers of fruits were more in pruned trees as compared to un-pruned.

**Fruit size.** The fruit size both in length and diameter measured in centimeters was found non-significant (Table I). However, maximum fruit length (7.42 cm) and diameter (8.43 cm) were attained by the fruits, which were harvest from the heavily pruned plants. Same trend was also noted in next year.

**Fruit weight.** It is evident from the data presented in Table I that individual fruit weight has been found significantly different from each other in different pruned plants. Maximum weight of fruit was in heavily pruned plants (242.5 g) during first year. Almost similar results were found during the next year. These results are also correlated with the findings of Singh *et al.* (2004).

**Juice percentage.** Pruning of Kinnow plants significantly affected the Juice percentage during the both year is study (Table I). Maximum juice percentage (46.39) was noted in

**Table I. Effect of pruning on the yield and quality of Kinnow fruits**

Characters	Year of pruning	No pruning	Light pruning	Heavy pruning	FR
Yield (No. of fruit/ plant)	2002	550	585	610	077 NS
	2003	560	703	841	3.74 *
Fruit length (cm)	2002	5.73	6.12	5.99	1.12 NS
	2003	5.62	7.42	7.05	1.15 NS
Fruit width (cm)	2002	6.00	7.29	7.53	1.18 NS
	2003	7.23	8.25	8.43	1.21 NS
Fruit weight (gms)	2002	182.5	225.5	242.5	18.5 *
	2003	194	201	211	1.05 NS
Peel percentage	2002	13.62	21.51	20.62	8.18 *
	2003	12.2	14.42	14.69	7.12 *
Juice percentage	2002	35.71	44.36	46.39	4.18 *
	2003	41.5	45.12	117.00	1.15 NS
Rag percentage	2002	50.65	34.13	32.99	2.21 *
	2003	41.0	35.12	31.12	2.78 *
No. of Seed (per fruit)	2002	29.14	20.12	19.11	5.10 *
	2003	26.12	18.12	15.12	6.18 *

**Table II. Effect of pruning on the total soluble solid (T.S.S) and acid and T.S.S ratio**

Characters	Year	No. Pruning	Light pruning	Severe pruning	FR
Total Soluble Solid %	2002	10.0	11.5	10.5	0.62 NS
	2003	10.5	1.2	11.1	0.55 NS
Aciding (%)	2002	0.96	0.92	0.87	32.12 *
	2003	0.69	0.62	0.62	21.15 *
TSS/Acid ratio	2002	10.41	12.50	12.06	0.5 NS
	2003	15.21	18.06	17.90	0.77 NS

fruits, which were harvested from the heavily pruned plants followed by light pruning (44.36) during 2002. Almost similar trend was noted during 2003. The present results fully correlated the finds of Sites and Reitz (1949).

**Peel percentage.** Data regarding peel percentage was significantly different (Table I) among the treatments. According to the observation recorded in 2002, minimum peel percentage (13.62) was found in fruits, which were harvested from heavily pruned plants. Maximum peel percentage (21.51) was found in non-pruning. Similar trend was observed during 2003.

**Rag percentage.** The study of data in Table I revealed that rag percentage was significantly different among the treatments. Maximum rag percentage (34.13) was found in light pruning followed by heavy pruning (32.99%) in 2002. These results showed the same trend, which were collected during 2003.

**No. of seeds/ fruit.** The data regarding the effect of pruning seed/ fruit are presented in Table I Statistical analysis showed significant difference among the treatments. Maximum numbers of seeds per fruit (29.14) were noted in non-pruning plants minimum number of seeds (19.00) was found in heavy pruning).

**Total soluble solids.** The statistical difference in total soluble solids (T.S.S) was non-significant (Table II). However, T.S.S was 11.5 and 10.5% in light pruning and heavy pruning, respectively. Same trend was observed in

**Table III. Effect of pruning on the colour of Kinnow fruit in 2002**

	T1	T2	T3
1.	Yellow Green	Orange Red	Orange Red
2.	Green Yellow	Green Yellow	Orange red
3.	Yellow Green	Orange Red	Orange Red
4.	Green Yellow	Yellow Green	Orange Red
5.	Orange Yellow	Orange Red	Orange Red
6.	Orange Yellow	Orange Red	Orange Red
7.	Orange Red	Orange Yellow	Orange Red
8.	Orange Red	Orange Red	Orange Red
9.	Orange Yellow	Orange Red	Orange Red
10.	Green Yellow	Orange Yellow	Orange Red
11.	Orange Yellow	Green Yellow	Orange Red

**Table IV. Effect of pruning on the colour of Kinnow fruit in 2003**

	T1	T2	T3
1.	Orange Yellow	Orange Red	Orange Red
2.	Green Yellow	Green Yellow	Orange red
3.	Yellow Green	Orange Red	Orange Red
4.	Green Yellow	Yellow Green	Orange Red
5.	Orange Yellow	Orange Red	Orange Red
6.	Orange Yellow	Orange Red	Orange Red
7.	Orange Red	Orange Yellow	Orange Red
8.	Orange Yellow	Orange Red	Orange Red
9.	Orange Yellow	Orange Red	Orange Red
10.	Green Yellow	Orange Yellow	Orange Red
11.	Orange Yellow	Green Yellow	Orange Red

next year. The findings of Sites and Reitz (1949) support these results, where he observed that increased T.S.S contents and improved colour were correlated with light intensity due to pruning in citrus plantation.

**Acidity.** Data regarding acidity is presented in Table II. Maximum acidity 96% was noted in the fruits of un-pruned plants followed by light pruned (0.92%) and heavy pruned plants (0.87%). Almost similar results were noted in the next year.

**T.S.S/Acid Ratio.** Results regarding T.S.S/acids ratio were non-significant (Table II). However, maximum ratio (12.50)

was not in fruits of lightly pruned plants followed by heavily pruned plants (12.06). Similar results were noted in the next year.

**Fruit colour.** The surface colour of kinnow fruit in that three treatment was examined by visual observation (Table III & IV). The examination revealed that fruits harvested from the plants, which were pruned heavily had orange red colour, while fruits from light pruned and un-pruned plants had prominent green orange yellow and yellow green colour. These findings are also supported by Singh *et al.* (2004), who reported that due to pruning sunlight enhances the colour development in citrus fruit.

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