



Influence of Pruning Methods on Growth and Fruiting of Naomi Mango Trees under New Valley Conditions

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ABSTRACT

During the 2021 and 2022 seasons, this research was conducted in the Balat area of Afaq Farm, located in the New Valley Governorate. Evaluating the timing and location of pruning and its effect on the growth and fruiting of Naomi mango trees. The experiment was carried out in a completely randomized block design with seven treatments and using three replicates, with two trees for each treatment.

The current results are as follows: Shoot length, leaf area, total chlorophyll, shoot length, fruit set, and fruit set were significantly increased due to above- or below-bud pruning in March, May, or August compared to unpruned trees (check treatment). Pruning in May or August is generally better than in March. In addition, pruning under the buds at any time is better than pruning above the buds. There were no significant differences in most of the studied traits between the use of pruning in the months of May and August. In addition, the use of no previous treatments increased productivity and improved fruit quality compared to unpruned trees. In general, pruning trees in May above or below the bud gave the highest values for these studied traits. All pruning operations led to a significant

improvement in the chemical components of fruit juice in terms of higher values of total and reducing sugars and total soluble solids and a significant decrease in total acidity compared to the control treatment. The results obtained indicated a noticeable improvement in vegetative growth and fruiting characteristics because of pruning Naomi mango trees during the months of May and August, much less than buds.

Keywords: Pruning, Growth, Fruiting, Mango Naomi.

Introduction

Mango is a tropical and seasonal fruit that is generally available during the summer season in Egypt and the main harvest collection period is May to September. The mango (*Mangifera indica* L., Family Anacardiaceae) is known as the queen of fruit with an excellent exotic flavor. Global production of the fruits of mango amounted to about 50 million tons (FAO, 2020). In Egypt, among the fruit crops, mango is second, followed by citrus. The area under mango tree cultivation in the reclaimed land has increased particularly rapidly. It reached about 32, 10 acres, with 294, 10 acres of productive mango, while annual production totaled 76, 61 tons, according to statistics (M.A.L.R.2021). Mango is one of favorite fruits in New Valley Governorate.

Nevertheless, mango cultivation is still limited and large quantities of mango are imported from other governorates, although mango is one of the most successful fruit crops that can be grown in newly reclaimed desert land. However, this work could contribute to the provision of cultural information on mango cultivation in the New Valley Governorate. The Naomi tree is medium-sized and fairly erect. Young leaves are reddish-brown. The seed is mono-embryonic. The flesh is fiber-free, yellow in color, and has a mild flavor. The fruits are medium in size, rectangular, oval in shape, and change color when ripe. Naomi is a mid-season mango (Tomer *et al.*, 1993).

In mango, just before or during flowering the removal of the apical bud or inflorescence on terminal buds results in the development of auxiliary suppressive buds usually adjacent to the point of the cut. These buds usually develop as inflorescences, from the initiation of normal bud development especially if pruning is performed before or shortly after flowering (Issarakraisila *et al.*, 1991).

Some mango varieties have been successfully grown that were previously introduced to Egypt and exhibited excellent fruit quality under various regional conditions such as Keitt, Kent, Heidi, Naomi and Tommy Atkins cultivars (Abouraya *et*

al., 2012; El-Agamy *et al.*, 2018). According to Rugayah. (2009), to motivate dormant vegetable buds, umbrella pruning is carried out so that buds grow a lot and easily create an umbrella. To prevent trees from being large through annual pruning, three trim strategies have been developed as part of the flowering management program, the regeneration of completely large trees that are no longer produced due to volume and height, and the reshaping of medium-sized trees to be smaller and more manageable sizes. Generally, the commercial production of mango trees starts from three to four years after cultivation with the enlargement of the aircraft and the continuation of the production of increasing returns until the shading of the adjacent trees is forced to grow up and away from the harvest. Because of the shading by the upper branches, the low branches that support the productive legs for the previous year decrease. It occurs on flowering stem stations and fruit production in mangoes. Therefore, with an increase in the size of the umbrella, the continuation of the competition for the available light and the production moves to the top. The branch cut for the mango leads to several buds in the next flow period. By declining in the bud, pruning aims to form an umbrella, the aim of pruning in trees is to reduce umbrella dimensions or make it more suitable for trim that has become crowded as part of the flowering management program. Depending on the original size of the trees, this type of pruning requires cutting branches, which countries range from 2 to 10 cm. To restore the umbrella within the final required dimensions, the depth of pruning should be at least one meter in the canopy. (Daven port, 2006).

Mango plants that are one trimming (flow) can stimulate directly spy buds in their separation, and the growth of the new buds (HIIDAYAT, 2005). For a number more than the buds produced through pruning, and for the formation of buds, there are many ready nodes. The principle of pruning is to stimulate the obstetric; the formation of vegetative buds and to increase the productivity of the mango factory, the branch

is broader. (Kusumo, 1989). The growth of mango trees is evident in the branches of the station that stem through the outskirts of the scaffolding to the union of graft. To form a group of buds at every termination of a flow, each flow of vegetative growth must be characterized by a close to each other in long internal shapes. The growth record of these flows in the branches was described as intercalary units and buds and the leaves are collected at the end of each intercalary unit from STEM as intermittent menus (Davenport & Nunez-Elisea, 1997).

Therefore, from the current study the goal was to study the methods of pruning and their effects on the growth and fruiting of mango Naomi.

Materials and Methods

The current research was implemented during two seasons, 2021 and 2022 on the developing mango trees in the Balat area in the farm of Afaq, New Valley Governorate, Egypt. Where the soil is from the conjunctiva. Relative humidity data and monthly air temperatures during the two studied seasons, as the averages are in Table (1)

Table (1): Monthly air temperature and relative humidity during the two seasons

Year	2021				2022			
	Temperature(°C)		R. humidity		Temperature(°C)		R. humidity	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
Jan	23.3	7.7	64	36	18.9	4.8	77	31
Feb	18.9	8.2	60	27	22.2	6.8	65	26
Mar	28.3	12.1	59	20	25.3	9.4	52	15
April	33.6	16	26	15	37.1	19.1	39	14
May	40	22.7	35	10	36.5	20.8	38	16
Jun	39	23.9	39	15	39.1	23.9	38	17
July	40.9	25.6	36	12	39.5	24.4	43	18
Aug	41.4	25.4	35	15	39.9	25.3	46	29
Sep	36.6	22.5	56	20	38.9	23.7	52	20
Oct	33.4	18.3	63	28	35.6	17.8	59	26
Nov	29.4	13.8	72	33	31.5	12.7	65	32
Dec	21.8	7.3	79	34	23.7	6.5	75	34

After New Valley, the weather station.

The pruning location is shown in **Plate (1)** according to **Fadhilnor and Tengku Ab. Malik (2018)**.

The trees were 6 years old and spaced 2x3 meters apart. The seven different treatments were as follows:

- 1-Unpruned trees control (T1).
- 2-Prune in March above node (T2).
- 3-Prune May above node (T3).
- 4-Prune August above node (T4).
- 5-Prune in March below node (T5).
- 6-Prune in May below node (T6).
- 7-Prune in August below node (T7).

Growth transactions are evaluated and the following transactions have been studied.

1-Vegetative growth and flowering criteria:

All vegetative and flowering growth criteria shoot length, leaf area and panicle were measured in the mid of July. Leaf area (cm²): (Ahmed & Morsy, 1999) and Total chlorophyll was measured in leaves by using chlorophyll meter.

2-Yield parameters:

a- **Fruit set:** fruit set percentage was calculated by dividing number of fruit

set at pea stage per panicle to number of hermaphrodite flowers per and expressed in percentage.

b–Fruit weight and yield per tree: fruit were harvested and their weight (kg) recorded, then the yield / tree (kg) was recorded by multiplying the average fruit weight (kg) by total number of fruits per trees.

c–Fruit diminution: were measured by Vernier Caliper (in cm).

3–Fruit chemical characteristics:

A–Total soluble solids percentage (T.S.S. %):

Was estimated by hand refractometer.

b–Total and reducing sugars: –

The percentages of reducing and total sugars were determined according to the volumetric method of Lane and Eynon outlined in **A.O.A.C. (2000)**.

C–Total acidity: –The percentage of acidity was determined according to **A.O.A.C. (2000)**.

Statistical analysis:-

The least significant difference (LSD) test was used at the 5% level to differentiate between means and a completely randomized design with three replications and a factorial was followed throughout the entire work according to **Snedecor and Cochran (1990)**.

Results

1–Vegetative and flowering traits:

Data represented in in Figure (1) and Table (2) declared the effect of pruning methods on total chlorophyll, leaf area and shoot length as well as panicle length and fruit set of Naomi mango trees during 2021 and 2022 seasons. From the data obtained, it is clear that the results during the two studied seasons followed the same trend.

In a general show, the data in the Table and the following figure showed that pruning is in May or August, whatever, above or below buds significantly stimulated the shoot length, leaf area and total chlorophyll as well

as panicle length and fruit set compared to prune in March or untreated ones (control). The maximum values of shoot length, leaf area and total chlorophyll as well as panicle length and fruit set were recorded on pruning in May below node (T6), followed by pruning in May above nodes (T3), respectively. On the other hand, the lowest values for growth and flowering parameters were obtained in untreated (control) trees (T1), followed by pruning in March above the node (T2).

Then the highest shoot length was (13.2 & 14.00 cm), leaf area (101.2 & 103.8 cm²), total chlorophyll (52.2 & 47.8%), panicle length was (29.2 & 33.2 cm) and fruit set (1.31 & 1.37) consecutively during the two seasons studied. From another perspective, the lowest is due to control (T1) in shoot length was (9.20 & 9.10 cm), leaf area (79.60 & 83.60 cm²), total chlorophyll (44.20 & 43.90%), panicle length (24.50 & 27.80 cm), fruit set was (0.82 & 0.90) during the two seasons studied, respectively. Therefore, the corresponding increment of shoot length was (43.47 & 53.85%), leaf area (27.14 & 24.31%), total chlorophyll (18.1 & 8.88%) panicle length was (19.18 & 19.42 cm), fruit set (59.76 & 52.22) during the two seasons studied, respectively. No significant differences were found in shoot length leaf area, and total chlorophyll due to pruning trees in May or August above or below nodes. In addition, no significant differences were found in panicle length, fruit set and fruit retention due to pruning trees in May above or below nodes were done.

Therefore, pruning trees in May or August above or below nodes significantly improves vegetative traits and total leaf surface area, which leads to a significant increase in flower formation and fruit set.

The positive effects of this pruning certainly improve growth and flowering traits leading to increase the yield production.

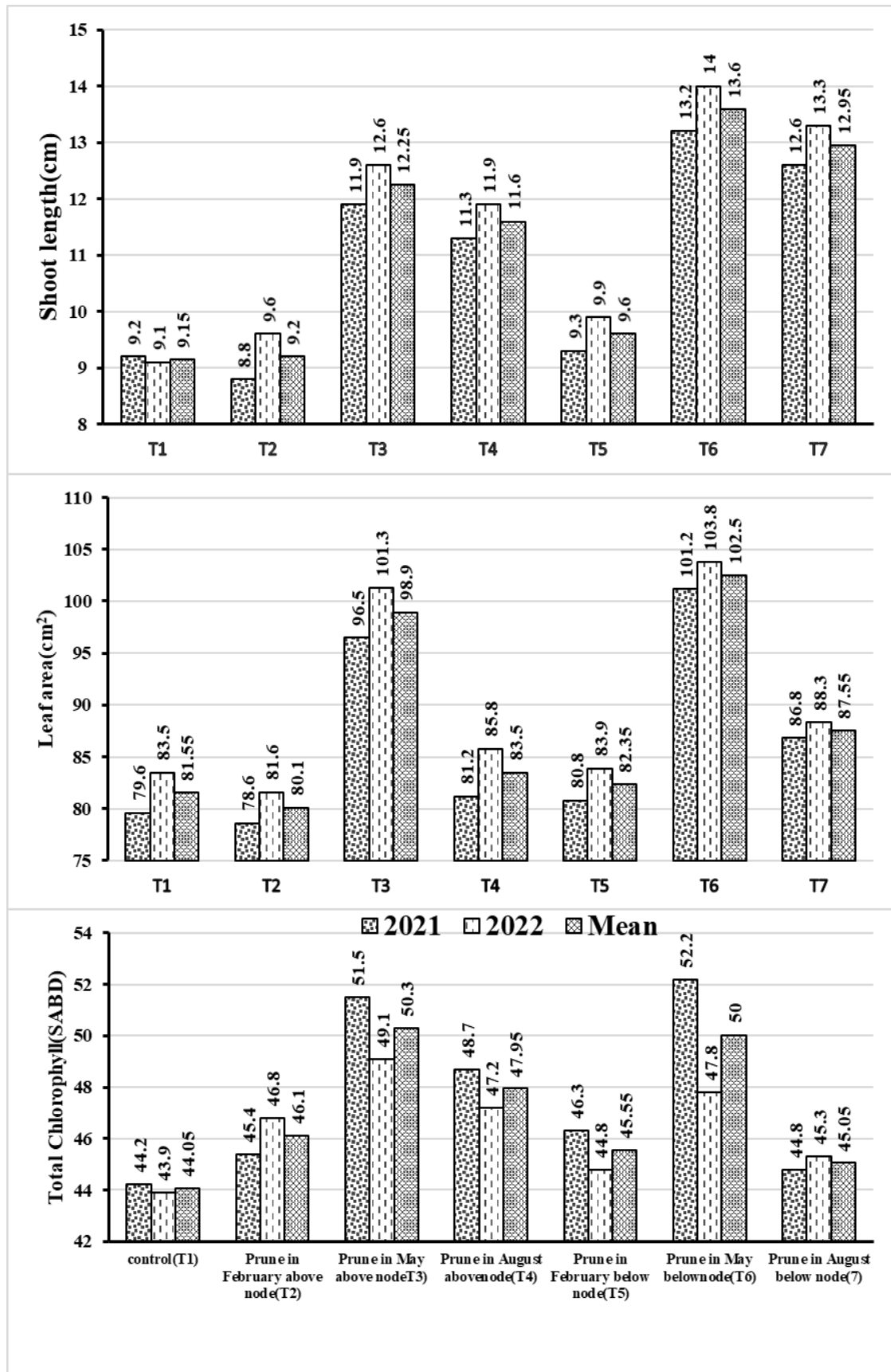


Fig (1): Effect of pruning methods on Shoot length (cm), Leaf area(cm²) and Total chlorophyll (SABD) of Naomi mango trees during 2021 and 2022 seasons

Table (2): –Effect of pruning methods on flowering traits of Naomi mango trees during 2021 and 2022 seasons

Treatments	Panicle length(cm)			Fruit set %		
	2021	2022	Mean	2021	2022	Mean
T1	24.50	27.80	26.15	0.82	0.90	0.86
T2	23.40	26.90	25.15	1.16	1.23	1.195
T3	28.50	32.10	30.30	1.22	1.28	1.25
T4	25.30	28.60	26.95	0.89	0.95	0.92
T5	24.10	27.50	25.80	0.93	0.98	0.955
T6	29.20	33.20	31.20	1.31	1.37	1.34
T7	26.10	30.10	28.10	0.81	0.85	0.83
NEW LSD %	1.82	2.11		0.07	0.08	

1–Unpruned trees control (T1). 2–Prune in March above node (T2).
 3–Prune May above node (T3). 4–Prune August above node (T4).
 5- Prune in March below node (T5). 6- Prune in May below node (T6).
 7- Prune in August below node (T7).

2-Yield components and fruit characters:

The clear data in Table (3.4) affects pruning methods on No. fruit/tree, yield/tree and fruit weight as well as fruit diminution, percentage of pulp and peel of Naomi mangoes during 2021 and 2022 seasons. It appears that the results followed the same trend during the two seasons studied from the data obtained. In general, view pruning trees in May and August above or below the node, significantly increased the number of fruit per tree and yield/tree as well as fruit weight, fruit dimension and percentage of pulp and peel to untreated one (control). The highest yield components and fruit physical characters were recorded on the trees that pruned below the node in May (T6) followed by pruning above the node in May (T3).

The obtained highest values of fruit numbers / tree were (37.7 & 35.0 fruit), yield/tree (17.13 & 14.72 kg) and fruit weight (454.6 & 420.6) g as an av. of two seasons studied due to pruned trees in May below the node (T6) or pruned trees in May above the node (T3), respectively. Contrarily, these values on check tree were (25.0 fruit, 6.48 Kg & 260.7 g) respectively. Hence, the corresponding increment percentage for yield

was (164.35 & 127.16%) and fruit weight was (74.38 & 61.33%) due to use (T6 and T3) over control (T1), respectively.

The better fruit diminution registered on trees that pruning in May below the node (T6) or in May above the node (T3) (15.35&15.00 cm) in fruit length and (8.65&8.2) as an av. of studied seasons, respectively, whereas the least fruit diminution was recorded on trees that unpruned (control, T1) (10.9 & 5.85 cm), respectively. Then, the corresponding increment percentage of fruit diminution due to such treatments over control (T1) was (40.73 & 37.61%) and (47.86 & 40.17) respectively.

Moreover, the obtained highest values of percentage of pulp were (86.27 & 85.85 %) due to prune trees in May below the node (T6) or above the node (T3) respectively. Contrarily, these values on check tree were (80.97%) as an av. of studied seasons, respectively. Hence the corresponding increment percentages for such trait over check treatment were (6.54 & 6.03%) respectively.

On other side, the percentage of peel significantly decreased due to use any pruning methods compared to unpruned. The

least peel % was recorded due to prune the trees at May below the node (T6, 10.16%) followed by pruned trees at May above the node (T3, 10.50%). Whereas the highest peel fruit % was recorded on trees that unpruned (control, 14.10%) as an av. of two studied seasons. Hence, the decrement % of peel was attained (27.94 & 25.53%) either due to prune below or above node compared to unpruned one, respectively.

The best yield components and fruit characters were recorded on pruned shoots in May below node (T6) during the two studied seasons. On other hand, the worse results were recorded on unpruned trees (control) (T1) during the two studied seasons.

Typically, we can conclude that pruning trees in May or August above or below the node improved the productivity of Naomi mango trees. Moreover, the pruning below the node is better than pruning done above it.

Table (3): Effect of pruning methods on yield components of Naomi mangos during 2021 and 2022 seasons

Treatments	No. Fruit/tree			Yield/tree(kg)			Fruit weight(g)		
	2021	2022	Mean	2021	2022	Mean	2021	2022	Mean
T1	23.6	26.3	25.0	6.19	6.76	6.48	262.50	258.8	260.7
T2	26.5	32.8	29.7	9.58	11.74	10.66	361.50	357.6	359.6
T3	31.6	38.3	35.0	13.25	16.19	14.72	418.40	422.8	420.6
T4	25.1	27.5	26.3	8.93	9.89	9.41	355.30	362.3	358.8
T5	28.6	31.8	30.2	11.31	12.10	11.71	395.60	380.5	388.1
T6	35.3	40.1	37.7	16.28	17.98	17.13	460.80	448.4	454.6
T7	24.5	25.8	25.2	9.32	9.50	9.41	380.5	368.8	374.7
NEW LSD %	1.43	1.48		0.55	0.48		18.96	17.84	

1–Unpruned trees control (T1).

2–Prune in March above node (T2).

3–Prune May above node (T3).

4–Prune August above node (T4).

5–Prune in March below node (T5). 6–Prune in May below node (T6).

7–Prune in August below node (T7).

Table (4): Effect of pruning methods on fruit dimension and percentage of pulp and peel of Naomi mangos during 2021 and 2022 seasons

Treatments	Fruit length(cm)			Fruit diameter(cm)			Pulp%			Peel%		
	2021	2022	Mean	2021	2022	Mean	2021	2022	Mean	2021	2022	Mean
T1	11.20	10.60	10.90	6.10	5.60	5.85	80.65	81.28	80.97	13.83	14.36	14.10
T2	13.80	13.30	13.55	7.70	7.20	7.45	84.13	84.89	84.51	12.11	12.53	12.32
T3	15.20	14.80	15.00	8.50	7.90	8.20	85.51	86.19	85.85	10.24	10.75	10.50
T4	13.90	13.50	13.70	8.10	7.40	7.75	84.62	85.15	84.89	12.62	13.13	12.88
T5	14.10	13.70	13.90	8.20	7.40	7.80	85.15	85.64	85.40	11.64	12.12	11.88
T6	15.50	15.20	15.35	9.00	8.30	8.65	85.90	86.63	86.27	9.93	10.38	10.16
T7	14.40	13.60	14.00	8.20	7.50	7.85	84.85	85.52	85.19	12.11	12.62	12.37
NEW LSD %	0.71	13.52		0.46	0.44		3.11	3.52		0.53	0.68	

1–Unpruned trees control (T1). 2–Prune in March above node (T2).

3–Prune May above node (T3). 4–Prune August above node (T4).

5–Prune in March below node (T5). 6–Prune in May below node (T6).

7–Prune in August below node (T7).

3–Fruit chemical quality

Table 5 shows the chemical components of fruit juice and their impact on the different dates and conditions of pruning during the 2021 and 2022 seasons. The data showed that all thoughtful pruning methods led to a significant improvement in the chemical ingredients of fruit juice in terms of high values, total sugar contents, total soluble solids, and a significant decrease in total acidity compared to the control. The highest percentage of reduced sugars and total soluble solids and the lowest total acidity were obtained in trees trimmed in May under the node (T6) and then above the node (T3) respectively during the two seasons studied. On the contrary, the highest acidity and lowest values of these qualities have been recorded in untreated trees (control, T1). The highest values of T.S.S. were (11.89 & 12.0%), total sugar, (9.90 & 10.01%), reducing sugar, (4.57 & 4.71%), and the least

total acidity was (0.198 & 0.185%) as an av. of the two studied seasons, due to prune the trees in May above the intercalary (T3) or below the intercalary (T6) respectively. On other hand, these values on trees that unpruned (T1) were, T.S.S. (11.05 %), total sugar, (9.16%), reducing sugar (4.17%), and total acidity (0.257 % as an av. of the two studied seasons), respectively. Hence, the corresponding increase percentage in these attributes due to use previous treatments over control (T1) attained (7.31 & 8.30%) for T.S.S., (8.08 & 9.28%), total sugars and (9.59 & 12.95%) for reducing sugar, respectively. In addition, such pruning methods induce decrement percentage in total acidity attained (22.96 & 28.02), respectively.

According to the current results, it can be recommended that pruning trees in May or August above or node led to improve fruit chemical quality.

Table (5): Effect of pruning methods on chemical properties of Naomi mangos during 2021 and 2022 seasons

Treatments	T.S.S.%			Total sugar			Reducing sugar			Acidity%		
	2021	2022	Mean	2021	2022	Mean	2021	2022	Mean	2021	2022	Mean
T1	10.92	11.23	11.08	9.05	9.26	9.16	4.11	4.23	4.17	0.265	0.249	0.257
T2	11.41	11.84	11.63	9.53	9.87	9.70	4.39	4.58	4.49	0.219	0.198	0.209
T3	11.63	12.14	11.89	9.72	10.08	9.90	4.48	4.65	4.57	0.206	0.190	0.198
T4	11.35	11.71	11.53	9.45	9.70	9.58	4.32	4.47	4.40	0.231	0.210	0.221
T5	11.67	12.18	11.93	9.78	10.10	9.94	4.52	4.71	4.62	0.205	0.185	0.195
T6	11.74	12.25	12.00	9.86	10.15	10.01	4.61	4.80	4.71	0.194	0.175	0.185
T7	11.33	11.84	11.59	9.55	9.88	9.72	4.42	4.63	4.53	0.225	0.203	0.214
NEW LSD %	0.38	0.43		0.31	0.28		0.18	0.23		0.032	0.026	

1–Unpruned trees control (T1). 2–Prune in March above node (T2).
3–Prune May above node (T3). 4–Prune August above node (T4).
5–Prune in March below node (T5). 6–Prune in May below node (T6).
7–Prune in August below node (T7).

Discussion

The number of newly developed flows has increased pruning significantly (Sahaban, 2009), mango Alfonso trees were trimmed in March, leading to immediate production of vegetative growth (Kulkarni, 1983), by trimming stimulating buds. Mango buds should be removed, and start from Nunez-Elisea et al., 1996).

The results showed that pruning trees below nodes is better than pruning above this unit. This finding maybe due to the transferring

the carbohydrates and nutrients contained in the remaining part of the wood to the new growth increasing its growth.

Olivira et al., (2017), mentioned that pruning of all kinds, has in effect on the mango crop. It is also important that may emerge or not, and, accordingly, the growth of height with increased density of cultivation is that the way the plant is trained is important, (Sousa et al., 2012).

mango trees that divide the shape at 5 meters x 4 m dramatically not reduce the

return when the orchard is less than 10 years old. The tree height can be maintained at 2.5 meters without greatly affecting the return during the first years of the garden. Operations such as spraying and harvesting can be performed effectively (Chitakunye *et al.*, 2023)

Conclusion

In light of the results obtained, pruning trees in May over or under nodes is useful to improved vegetative and floral growth, this leads to high productivity with good fruit quality.

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تأثير طرق التقليم علي نمو واثمار اشجار المانجو الناعومي تحت ظروف الوادي الجديد

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أجريت هذه الدراسة خلال موسمي 2021، 2022 لدراسة تأثير موعد وموضع التقليم المختلفة علي أشجار المانجو الناعومي المنزرعة بمزرعة أفاق بمنطقة بلاط بالوادي الجديد، حيث تم دراسة تأثير مواعيد التقليم المختلفة خلال أشهر مارس ومايو وأغسطس وموضع التقليم من حيث فوق وتحت (العقدة) علي النمو الخضري والمحصول وخصائص الثمار.

وقد أظهرت النتائج:

- أدي تقليم الأشجار خلال شهري مايو وأغسطس فوق وتحت (العقدة) إلي زيادة معنوية في النمو الخضري والزهري للأشجار وتحسين نسبة العقد للثمار.
 - سبب تقليم الأشجار خلال شهر مايو فوق وتحت (العقدة) إلي زيادة في وزن وأبعاد الثمار وبالتالي زيادة المحصول النهائي للأشجار وأيضا زيادة نسبة اللحم مقارنة بالمعاملات المختلفة.
 - أظهرت النتائج تفوق تقليم الأشجار خلال أشهر مايو وأغسطس فوق وتحت (العقدة) في نسبة السكريات الكلية والمختزلة ونسبة المواد الصلبة الذائبة الكلية وتقليل نسبة الحموضة للثمار.
 - من نتائج هذه الدراسة يمكن التوصية بأهمية تقليم أشجار المانجو الناعومي خلال شهري مايو او أغسطس فوق (العقدة) لتحسين النمو الخضري والزهري وزيادة عدد النموات علي الأشجار وبالتالي إنتاج محصول عال ذو خصائص ثمرية جيدة.
- الكلمات الدالة:** التقليم-النمو الخضري-المحصول-العقدة-المانجو الناعومي.