The Pharma Innovation Journal 2022; 11(6): 1217-1221

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2022; 11(6): 1217-1221

www.thepharmajournal.com
Received: 09-02-2022
Accepted: 24-05-2022

Anshuman Singh
Research Scholar, Department of Fruit Science, Acharya Narendra Deva University of Agriculture & Technology, Kumarganj, Ayodhya, Uttar Pradesh, India

Bhanu Pratap
Associate Professor, Department of Fruit Science, Acharya Narendra Deva University of Agriculture & Technology, Kumarganj, Ayodhya, Uttar Pradesh, India

Ravi Pratap Singh
Section Officer, Department of Horticulture, Municipal Corporation of Delhi, Government of India

Alok Kumar
Research Scholar, Department of Fruit Science, Acharya Narendra Deva University of Agriculture & Technology, Kumarganj, Ayodhya, Uttar Pradesh, India

Corresponding Author:
Anshuman Singh
Research Scholar, Department of Fruit Science, Acharya Narendra Deva University of Agriculture & Technology, Kumarganj, Ayodhya, Uttar Pradesh, India

Response of pruning intensities on morpho-physiological parameters under the high density planting of mango cv. Amrapali

Anshuman Singh, Bhanu Pratap, Ravi Pratap Singh and Alok Kumar

Abstract
A field experiment was carried out at Main Experiment Station, Department of Fruit Science, Acharya Narendra Deva University of Agriculture & Technology, (Kumarganj), Ayodhya (U.P.) during the year 2019-2021. The experiment was conducted in Randomized Block Design with four treatments *i.e.* control (no pruning), light pruning (10 cm from apical end), moderate pruning (20 cm from apical end), severe pruning (30 cm from apical end) in five replications and considering one plants as a unit. The pruning was performed in the first week of August. The observations were recorded morpho-physiological properties of Amrapali variety of mango fruits give the different response of pruning intensities. The maximum number of shoot bud sprouts, were observed with the severe pruning (30 cm from apical end) followed by Moderate Pruning (20 cm from apical end) and the minimum canopy volume were observed with the Severe Pruning (30 cm from apical end) followed by moderate pruning (20 cm from apical end). Whereas shoot length, Trunk girth, were maximum observed with the moderate pruning (20 cm from apical end) followed by Severe Pruning (30 cm from apical end).

Keywords: Mango, pruning intensity, canopy, shoots

Introduction
The mango (*Mangifera indica* L.) is a considered to be the king of fruit. It is, undoubtedly, one of the choicest and most ancient fruits known to mankind. Several authorities have testified to the origin of mango in the Indo Burma region. The mango which combine utility with beauty has the status of the national tree of India and is very rightly considered King among fruits grown in the country. The mango tree is medium in size, ranging from 8-10 meters in height. Mango is an evergreen tree bearing numerous branches. Mango trees produce basically three types of shoots, *viz*. (i) vegetative shoots which bears only leaves, (ii) generative shoots which bears terminal panicles and (iii) mixed shoots produces both leaves and inflorescences within the same internodes. In the mango cultivar Amrapali under high density planting (2.5X2.5M) starts fruiting from third year onwards with subsequent increase in yield every year up to the age of 12 years. Beyond this period, i.e. 13th year onwards it shows progressive decline in yield due to over crowding of canopies. In the mango essentially, pruning maintains an ideal balance between the growth and the fruiting. Pruning is dependent on the plant height and the canopy spread.

Materials and Methods
The experiment was carried out at Main Experiment Station, Department of Fruit Science, College of Horticulture and Forestry, Acharya Narendra Deva University of Agriculture and Technology, Kumarganj, Ayodhya, Uttar Pradesh during year 2019- 20 and 2020- 21. Twenty-five-year-old bearing mango trees of cv. Amrapali of uniform vigour and size and planted under high density (2.5 x 2.5 m) were selected for the present studies. All the trees were maintained under uniform cultural practices during the course of investigation. The experiment was laid out as per Randomized Block Design (R.B.D.). All the treatments were replicated five times and one tree served as a unit of treatment in each replication. The total number of trees marked for the experiment were twenty. The pruning was performed in the first week of August. Three intensity of pruning. i.e. severe (removal of branches with 30 cm from apical end), moderate (removal of branches with 20 cm from apical end) and mild (removal of branches with 10 cm from apical end) was done manually using pruning saw and secateurs.

A. Plant growth characters

1. **Number of shoot bud sprouted per branch:** Four scaffold branches each in East, West, North and South directions were selected for all replication. Vegetative growth (shoots) was monitored by counting the number of shoots at the different growth stages starting from the 1st week of October.
2. **Shoot length:** New vegetative shoots on each branch in all the four directions i.e., East, West, North and South were tagged at each vegetative flush. Data on shoot length were recorded at an interval of four months for calculation of growth rates of shoot.
3. **Canopy volume:** The data of canopy volume were recorded by measuring tape from root base of the plant in East to West and North to South direction up to spreading of vegetative growth of trunk. Volume of canopy calculated by the formulae derived by Samaddar and Chakrabarti (1988) as given as under:

Canopy volume (m^3) = 4/3 π r^2h
Where, r = diameter / 2, h= height of plant

The diameter was calculated from the average of the 5 readings in the following manner

a. Spread of canopy (North to South)
b. Spread of canopy (East to West)
c. Height of the plant (m)

4. **Tree girth:** The diameter of the trunk above the ground was taken before the pruning of tree and at four months interval in 2019-2020 and 2020-2021, respectively.

Results and Discussions

Morpho-physiological growth parameters

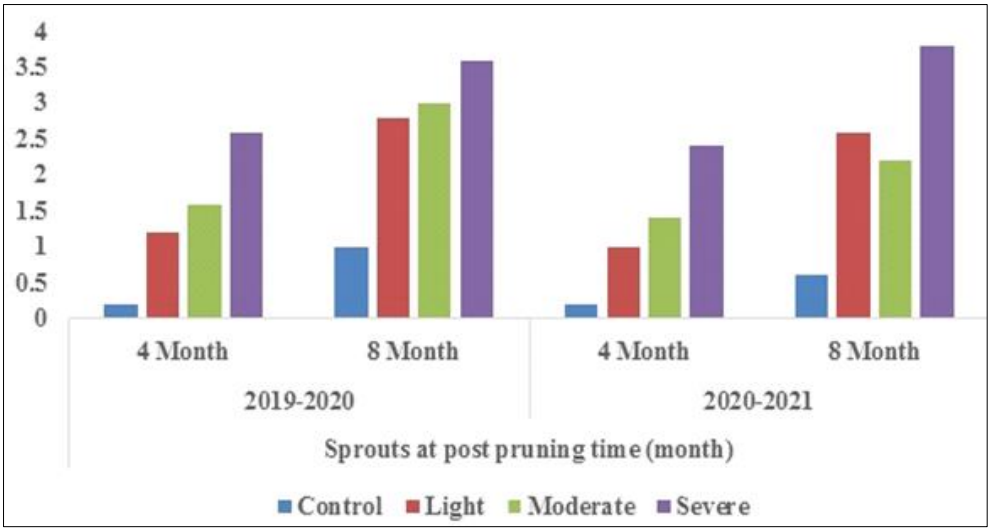
Number of shoot sprouted per branch

Table 1 and Graph 1 show findings on the number of shoot buds sprouted per branch at 4 and 8 months after pruning for various treatments. The data show that pruning severity had a significant impact on the number of shoot buds sprouted per branch throughout both years, irrespective of post-pruning time (4 or 8 months). Irrespective of pruning treatments, the number of shoot buds developed on pruned shoots grew significantly with the passing of time from 4 to 8 months after pruning, from 1.40 to 2.60 in 2019-2020 and 1.25 to 2.30 in 2020-2021. Similarly, the amount of pruning had a substantial impact on shoot bud sprouting when compared to the control. At 8 months after pruning in the 2019-2020 pruning season, the maximum shoot bud sprouts (3.60) were reported in the severely pruned treatment, followed by 3.00 in moderate and 2.80 in light pruning, and the minimum (1.0) sprouts in the control. At 4 months after pruning, the maximum sprouts (2.60) were observed in the severe pruning treatment, followed by 1.60 and 1.20 in the moderate and light pruning treatments, and the minimum (0.20) sprouts in the control. During the 2020-2021 seasons, a similar trend was found, except that the number of sprouts 3.80 was higher than 3.60 in severe pruning during 2019-2020, but the numbers 2.20 and 2.60 were lower than 3.00 and 2.80 in moderate and light pruning during 2019-2020.

Pruning treatments always resulted in a loss of apical dominance and secondary sprouts in these branches. When severe pruning was followed by moderate pruning, the maximum number of sprouts per shoot was attained (Table 1 and Graph 1). Several workers reported seeing similar effects (Singh *et al*., 2010).

Table 1: Effect of pruning on shoot bud sprouting (number/ branch) in mango cv. Amrapali

Treatments	Sprouts at post pruning time (month)			
	2019-2020		2020-2021	
	4 Month	8 Month	4 Month	8 Month
Control	0.20	1.00	0.20	0.60
Light	1.20	2.80	1.00	2.60
Moderate	1.60	3.00	1.40	2.20
Severe	2.60	3.60	2.40	3.80
Mean	1.4	2.6	1.25	2.3
S. Em ±	0.24	0.33	0.21	0.26
CD. at 5%	0.77	1.04	0.66	0.83



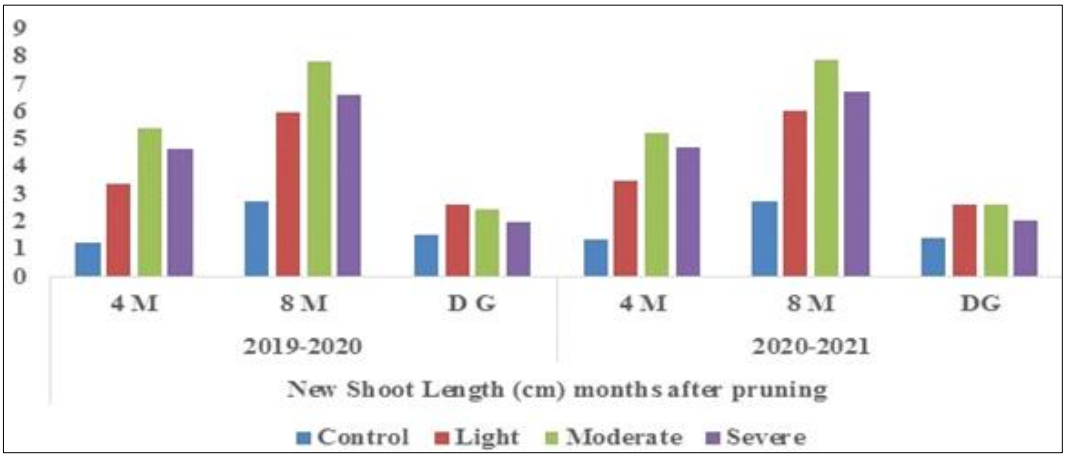
Graph 1: Effect of pruning on shoot bud sprouting (number/branch) in mango cv. Amrapalli

Shoot length (cm)

Pruning intensity had a significant impact on shoot length, which was also seen as the post-pruning duration progressed (Table 2 and Graph 2). Irrespective of the pruning intensities, overall shoot length increased as the duration increased, reaching a maximum (5.80cm) at 8 months, which was considerably superior to 4 months (3.66cm).

Table 2: Effect of pruning on new shoot length (cm) in mango cv. Amrapali

Treatments	New Shoot Length (cm) months after pruning					
	2019-2020			2020-2021		
	4 M	8 M	D G	4 M	8 M	DG
Control	1.26	2.76	1.50	1.32	2.74	1.42
Light	3.38	5.98	2.60	3.46	6.06	2.60
Moderate	5.38	7.84	2.46	5.24	7.88	2.64
Severe	4.62	6.62	2.00	4.68	6.72	2.04
Mean	3.66	5.8	2.14	3.67	5.85	2.175
S. Em ±	0.22	0.21	0.32	0.38	0.32	0.45
CD. at 5%	0.69	0.66	NS	1.21	0.99	NS



Graph 2: Effect of pruning on new shoot length (cm) in mango cv. Amrapalli

Depending on the time of observation, the increase in length of new sprouts owing to pruning treatments was observed to be significant, depending on the severity of pruning. Up to light pruning (2.60 cm), the increase in shoot length was linear, followed by moderate pruning (2.46 cm) and severe pruning (2.00 cm), which were non-substantially different. For the period of 4 to 8 months, there was a minimal increase in shoot length in the control (1.50 cm). The total length increase from shoot initiation to 8 months was highest in moderate pruning (7.84cm), followed by 6.62cm and 5.98cm in severe and light pruning, respectively. Shoot length was similarly highest (5.38 cm) in moderate pruning, followed by 4.62 cm and 3.38 cm in severe and light pruning, respectively, at 4 months post-pruning.

During the 2020-2021 season, a similar trend was seen, with the rate of increase from 4 to 8 months after pruning being highest in moderate pruning (2.64 cm). However, the second highest increase rate (2.60 cm) was seen in light pruning, followed by 2.04 cm in severe pruning, reversing the pattern from the 2019-2020 pruning season. Furthermore, like the 2019-2020 season, overall shoot length at 8 months (7.88 cm) and 4 months (5.24 cm) after pruning was significantly higher. The next best shoot lengths were found at 8 months after pruning (6.72 cm) and (6.06 cm), respectively, under the severe and light pruning treatments. Similarly, the best shoot length was obtained in severe pruning (4.68 cm), followed by 3.46 cm in light pruning, at 4 months after pruning, which was consistent with the trend observed during the 2019-2020 season.

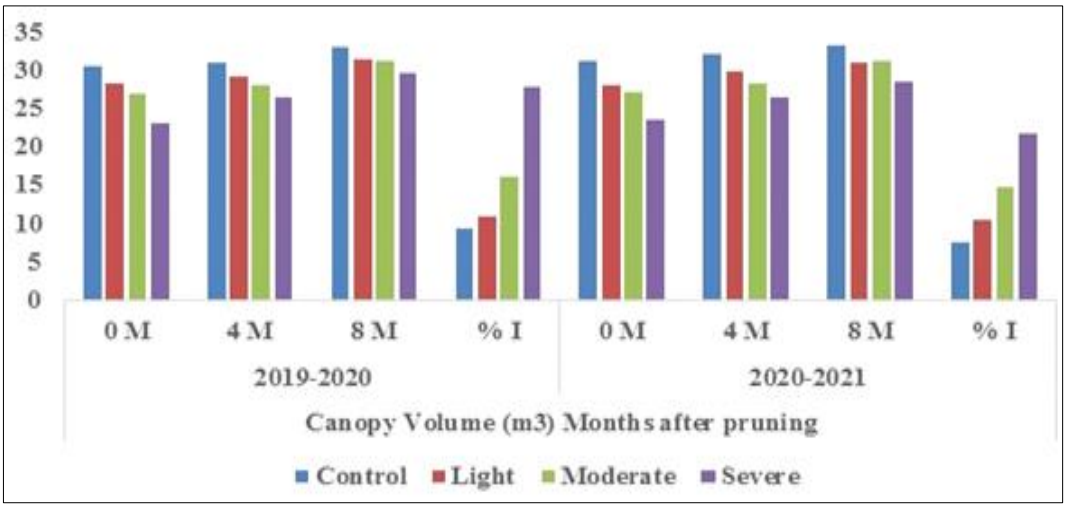
Moderate pruning, followed by severe pruning, resulted with the greatest increase in shoot growth. Light pruning resulted in a low number of shoots, resulting in slow development. Earlier, similar results were obtained (Singh *et al*., 2010).

Canopy volume (m^3)

Table 3 and Graph 3 show the canopy volume (m3) of mango cv. Amrapali at 4 and 8 months after pruning. According to the results, the various pruning treatments had a significant influence on canopy volume at 4 months and 8 months is non-significant in the first year and both durations (4 and 8 months) are significant in the second year. Irrespective of pruning treatments, the canopy volume increased significantly from 27.20 m3 to 31.34 m3 during the 2019-2020 season and from 27.46 m3 to 31.01 m3 during the 2020-2021 season. During the 2019-2020 pruning season, the highest canopy volumes were reported under control (31.01 m3) and (33.11 m3) at 4 and 8 months after pruning, respectively, followed by light (29.31 m3 and 31.40 m3) and moderate (28.16 and 31.27 m3) pruning. Similarly, during the season 2020-2021, the maximum canopy volume was recorded under control (32.21 m3 and 33.26 m3) at 4 and 8 months after pruning, followed by light (29.98 m3) and moderate (28.36 m3) pruning at 4 months. At 8 months after pruning, however, the increase in canopy volume was higher under moderate (31.24 m3) than light (30.92 m3) pruning.

Table 3: Effect of pruning on canopy volume (m^3) of mango cv. Amrapali

Treatments	Canopy Volume (m^3) Months after pruning							
	2019-2020				2020-2021			
	0 M	4 M	8 M	% I	0 M	4 M	8 M	% I
Control	30.45	31.01	33.11	9.41	31.16	32.21	33.26	7.53
Light	28.30	29.31	31.40	10.93	27.99	29.98	30.92	10.50
Moderate	26.92	28.16	31.27	16.17	27.20	28.36	31.24	14.85
Severe	23.15	26.47	29.60	27.96	23.48	26.51	28.61	21.87
Mean	27.20	28.74	31.34	16.12	27.46	29.26	31.01	13.69
S. Em ±	0.79	0.88	0.82	0.63	0.79	0.81	0.82	0.44
CD. at 5%	2.46	2.74	NS	1.98	2.47	2.52	2.55	1.38



Graph 3: Effect of pruning on canopy volume (m^3) of mango cv. Amrapalli

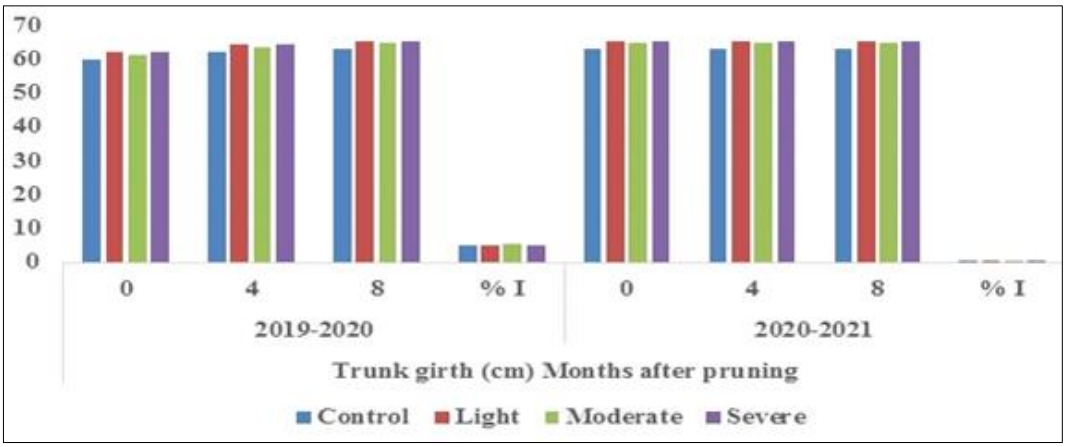
Canopy volume is very important when growing perennial plant species at high or ultra high densities. Wider spacing is often used in traditional planting systems to avoid branch intermingling. It is one of the most important factors to consider while creating high-density tree planting. Pruning should be done in such a way that the balance between vegetative and reproductive growth is maintained. According to the findings of this study, moderate pruning had the best rejuvenating impact on Arnrapali mangoes (Table 3 and Graph 3). Despite the fact that light pruning increased tree canopy volume more than other pruning severity treatments, the percent increase was highest in severe pruning in both years, followed by moderate pruning. In addition, (Singh *et al*., 2010) saw an increase in canopy volume.

Trunk girth (cm)

In the years 2019-2020, the effect of pruning on trunk girth per cent increase was shown to be significant, but non-significant in the years 2000-2001. (Table 4 and Graph 4). The moderate pruning treatment resulted with the greatest increase in trunk girth (5.59%), which was statistically comparable to the severe and control pruning treatments' increases of 5.04 and 5.02 percent, respectively. However, during 2020-2021, a non-significant minimum increase (5.01%) was recorded in the light pruned treatment, while the maximum (0.088%) increase was also observed in light pruned trees, but it was not significantly different from the other treatment observations.

Table 4: Effect of pruning on trunk girth (cm) of mango cv. Amrapali

Treatments	Trunk girth (cm) Months after pruning							
	2019-2020				2020-2021			
	0	4	8	% I	0	4	8	% I
Control	60.08	62.02	63.10	5.02	63.10	63.10	63.12	0.030
Light	62.14	64.16	65.26	5.01	65.28	65.28	65.34	0.088
Moderate	61.22	63.42	64.64	5.59	64.64	64.66	64.68	0.058
Severe	62.28	64.36	65.42	5.04	65.42	65.44	65.46	0.062
Mean	61.43	63.49	64.60	5.17	64.61	64.62	64.65	0.0595
S. Em ±	0.55	0.54	0.58	0.30	0.59	0.59	0.60	0.05
CD. at 5%	NS	1.70	NS	NS	NS	NS	NS	NS



Graph 4: Effect of pruning on trunk girth (cm) of mango cv. Amrapalli

The trunk girth of 25-year-old mango plants grown in high density was unaffected by either of the pruning severity treatments when compared to the control. This finding implies that this trait is exclusive to dwarf genotypes like Amrapali. In self-rooted or complex plants, however, consistent results are produced, which are entirely dependent on rootstock genetic homogeneity and stionic impact. Furthermore, Amrapali is a regular bearing cultivar, resulting in little vegetative development, which then translocates little to storage organs such as the trunk and roots. The trunk girth increased minimally as a result of the altered physiology. In mango, and Lal *et al*. (2000) [2] expressed similar opinions (Singh *et al*., 2010 in mango).

Summary and Conclusion

Observations on vegetative growth indicated that the shoot buds number increased significantly from 2.60 to 3.60 during 2019-2020 and 2.40 to 3.80 in 2020-2021 with severe pruning. The shoot length increased significantly from 3.66 cm in 4 month to 5.80 cm in 8 month in 2019-2020 and from 3.67 cm to 5.84 cm in 2020-2021 and the maximum growth has been recorded in light pruning i.e. 2.60 cm and moderate pruning i.e. 2.64 cm in 2019-2020 and 2020-2021 respectively. The canopy volume of the tree showed maximum increase with the severe pruning (27.96 per cent, 21.87 per cent), followed by moderate (16.17 per cent, 14.85 per cent), light (10.93 per cent, 10.50 per cent) and control (9.41 per cent, 7.53 per cent) in both the years. Trunk girth of the experimental trees did not vary much with the pruning treatments in 2019-2020 but slight increase was noted in the second year 2020-2021.

References

1. Davenport TL. Pruning strategies to maximize tropical mango production from the time of planting to restoration of old orchards. Hort. Science. 2006;41:544-8.
2. Lal B, Rajput MS, Rajan S, Rathore DS. Effect of pruning on rejuvenation of old mango trees. Indian J Hort. 2000;57(3):240-242.
3. Lal B, Mishra D. Effect of pruning on growth and bearing behaviour of mango cv. Chausa. Indian Journal of Horticulture. 2007;64:240-2.
4. Pratap Bhanu, Sharma HC, Goswami AM, Singh SK, Mishra LN. Effects of pruning on photosynthetic rate, canopy micro-climate and yield of mango cv. Amrapali under high-density planting. Indian Journal of Horticulture. 2003;60:339-2.
5. Shivashankara KS, Mathai CK. Inhibition of photosynthesis by flowering in mango (*Mangifera indica* L.): A study by gas exchange methods. Scientia Horticulturae. 2000;83:205-12.
6. Samaddar HN, Chakrabarti U. Effect of different rootstock on Himsagar and Langra. Acta Horticulture. 1988;231:220-4.
7. Sharma RR, Singh Room. Pruning intensity modifies canopy micro-climate and influences sex ratio, malformation incidence and development of fruited panicles in 'Amrapali' mango (*Mangifera indica* L.). Scientia Horticulturae. 2006;109:118-2.