



P-ISSN: 2349-8528

E-ISSN: 2321-4902

IJCS 2018; 6(4): 2869-2873

© 2018 IJCS

Received: 26-05-2018

Accepted: 27-06-2018

**PL Rawat**

Associate Director, KVK,  
Moradabad, Sardar Vallabhbhai  
Patel University of Agriculture  
& Technology, Meerut, Uttar  
Pradesh, India

**Yogesh Prasad Rajbhar**

Professor Horticulture,  
Department of Horticulture,  
Sardar Vallabhbhai Patel  
University of Agriculture &  
Technology, Meerut, Uttar  
Pradesh, India

## Studies on the effect of pruning on growth and yield of old and senile mango varieties

**PL Rawat and Yogesh Prasad Rajbhar**

**Abstract**

The present study was conducted on 60 years old and senile orchard of mango. Cv Dashehari, Bombay Green, Banarasi Langra and Chausa under ownership of Sri Sanjeev Agrawal at Rampur (Uttar Pradesh). Maximum tree height (8.90m) was noted under in control after six years of pruning; however, it was statistically at par to V<sup>th</sup> order. The minimum tree height (7.92m) was recorded under I<sup>st</sup> order of pruning. Maximum shoot length (3.67m) was noted under in Ist order after six years of pruning; however, it was statistically at par to II<sup>nd</sup> order. The minimum shoot length (1.77m) was recorded under control. It narrates that the maximum spread of branches under North and South direction was 7.19m in the V<sup>th</sup> order which was statistically at par to IV<sup>th</sup> order after six year of pruning. Maximum spread of branches under East-West direction was 7.71m in the V<sup>th</sup> order which was statistically at par to control. The minimum spread 6.82m) was noted in I<sup>st</sup> order after six years of pruning. The minimum fruit yield 127kg was noted during the year 2014 in variety Dashehari which was recorded in increasing order upto III<sup>rd</sup> order of pruning. Then it was observed in decreasing of yield in IV<sup>th</sup> and V<sup>th</sup> order of pruning. Maximum fruit yield (437kg/tree) was noted during 2017; however, it was recorded minimum (174.3kg/tree) under control. Further, it was noted that the maximum fruit yield (650.3kg/tree) was recorded in Banarasi Langra variety at III<sup>rd</sup> order of pruning while it was noted minimum in control of Dashehari during 2017 (Table 6). It further evinces that maximum fruit yield (286.7kg/tree) was noted in Banarasi Langra variety at III<sup>rd</sup> order after six years of pruning; however, it was statistically at par with Bombay Green. A critical observation was recorded that III<sup>rd</sup> order of pruning was found to be the best in accordance with fruit yield in all the varieties.

**Keywords:** Studies, effect, pruning, growth, old and senile mango varieties

**Introduction**

Old mango trees of 60 years exhibit decline in fruit yield because of overcrowded branches. The trees do not get proper sunlight resulting in decreased production of shoots. New emerging shoots become weak and unsuitable for flowering and fruiting; the insects and pests population builds up and the diseases incidence increased in such orchards. These unproductive trees may be converted into productive ones by pruning them new technique known as rejuvenation. Intermingling, dead and diseased branches are removed. Thereafter undesirable branches of unproductive trees were marked. At the end of December, these marked branches are beheaded at different heights from distal end and the cut portions were pasted with copper oxychloride solution. During March-April, a number of new shoots were emerged around cut portions of the pruned branches. Only 8 to 10 outward growing healthy shoots were retained at proper distance so that a good frame-work was developed in the following years. These rejuvenated trees were fertilized with 2.5 kg urea, 3.0 kg single superphosphate and 1.5 kg muriate of potash per plant. The half dose of fertilizers was applied in the month of February and the other half at the end of June. The plants were irrigated at an interval of 15 days especially in the months of April, May and June for healthy growth of new shoots. In the first week of July 150 kg of compost per tree was also applied. Unwanted emerging new shoots were regularly removed to maintain the tree canopy and avoiding recrowding of the branches. It also helped in getting proper nourishment to retained shoots. After two years of pruning new shoots came into bearing and the yield of fruit increased gradually. Thus, old and unproductive trees are converted into productive ones.

**Materials and methods**

The present study was conducted on 60 years old and senile orchard of mango. Cv Dashehari, Bombay Green,

**Correspondence****PL Rawat**

Associate Director, KVK,  
Moradabad, Sardar Vallabhbhai  
Patel University of Agriculture  
& Technology, Meerut, Uttar  
Pradesh, India

Banarasi Langra and Chausa under ownership of Sri Sanjeev Agrawal at Rampur (Uttar Pradesh). The average maximum and minimum temperature ranges from (41°C) (May- June) and 4°C (December-January), respectively. The average maximum and minimum relative humidity fluctuates between 87 per cent and 34 per cent during rainy and summer season, respectively. The trees were dense overcrowded with upright growth resulted in decline in yield due to non-availability of productive branches. Treatments were imposed during December 2011 with five pruning severities. Heading back upto secondary branches was considered as I<sup>st</sup> order pruning, Heading back upto tertiary branches was considered as II<sup>nd</sup> order. Heading back upto quarter nary branches was considered as III<sup>rd</sup> order. Heading back upto quinary branches was considered as IV<sup>th</sup> order. Heading back upto sentry branches was considered as V<sup>th</sup> order. Therefore, Central leader branch was unpruned and the tree was considered as control. The treatments were laid out as Randomized Block Design with three replications. After pruning operation, the cut surface of the branches were treated / smeared with Chaubattia paste to prevent microbial infections. The next year numerous branches were produced. Only 8-10 branches were selected and others were discarded to check the overcrowding and competition among the branches. All the

trees were supplied with the recommended dose of manure and fertilizers and plant protection measures. Observations on tree height, canopy spread, shoot length and shoot girth were recorded. The percentage of flowering was calculated by counting the flowering on mature shoots per tree. The fruit yield data were recorded at the time of harvesting. Fruit quality was considered through organoleptic taste. The data were statistically analysed for coefficient of variance. The significance of variance of different treatments were noted by applying F test and the critical difference at 5 % level of probability as by Panse and Sukhatme.

### Results and discussion

**Tree height:** It evinces that maximum tree height (8.90m) was noted under in control after six years of pruning; however, it was statistically at par to V<sup>th</sup> order. The minimum tree height (7.92m) was recorded under I<sup>st</sup> order of pruning. Further, maximum tree height (8.75m) was noted in Chausa variety while it was minimum in Dashehari. A critical observation evinces that maximum tree height (9.36m) was recorded in Chausa variety while it was found minimum in Dashehari after six years of pruning. The rest of the treatments behaved in between these extremities (Table1).

**Table 1:** Tree Height (m)

	Dashehari	Bombay Green	Banarasi Langra	Chausa	Mean A
Ist order	7.76	8.00	7.80	8.13	7.92
2 <sup>nd</sup> order	8.23	8.36	7.96	8.63	8.29
3 <sup>rd</sup> order	8.50	8.73	7.86	8.66	8.43
4 <sup>th</sup> order	8.63	8.76	8.03	8.80	8.50
5 <sup>th</sup> order	8.80	8.90	8.23	8.93	8.71
Control	8.73	9.10	8.43	9.36	8.90
Mean B	8.44	8.64	8.05	8.75	
Factors	C.D.	SE(d)	SE(m)		
Factor(A)	0.259	0.128	0.091		
Factor(B)	0.211	0.105	0.074		
Factor(A X B)	N/A	0.256	0.181		

**Length of retained shoot:** It evinces that maximum shoot length (3.67m) was noted under in Ist order after six years of pruning; however, it was statistically at par to II<sup>nd</sup> order. The minimum shoot length (1.77m) was recorded under control. Further, maximum shoot length (4.39m) was noted in Chausa

variety while it was minimum in Dashehari. A critical observation evinces that maximum shoot length (4.96m) was recorded in Chausa variety while it was found minimum in Dashehari after six years of pruning (Table 2).

**Table 2:** Length of Retained Shoot (m)

	Dashehari	Bombay Green	Banarasi Langra	Chausa	Mean A
I <sup>st</sup> order	2.2	3.6	3.95	4.967	3.679
2 <sup>nd</sup> order	2.2	3.467	3.85	4.9	3.604
3 <sup>rd</sup> order	2	3.167	3.567	4.933	3.417
4 <sup>th</sup> order	1.8	3.017	3.55	4.283	3.163
5 <sup>th</sup> order	1.633	2.8	3.217	4.133	2.946
Control	0.6	1.113	2.207	3.167	1.772
Mean B	1.739	2.861	3.39	4.397	
Factors	C.D.	SE(d)	SE(m)		
Factor(A)	0.117	0.058	0.041		
Factor(B)	0.096	0.047	0.034		
Factor(A X B)	0.235	0.116	0.082		

**Shoot girth:** It is clear that maximum shoot girth (35.57cm) was noted under in Ist order after six years of pruning; however, it was statistically at par to II<sup>nd</sup> order. The minimum shoot girth (23.22cm) was noted under control. Further, it was observed that the maximum shoot girth (36.31cm) was noted in Chausa variety while it was minimum in Dashehari. A

critical observation evinces that maximum shoot girth (40.86cm) was recorded in Banarasi Langra variety which was statistically at par with Chausa in both I<sup>st</sup> and II<sup>nd</sup> order; while it was found minimum (11.56cm) under control in variety Dashehari after six years of pruning. The rest of the varieties behaved in between these extremities (Table 3).

**Table 3:** Girth of Retained Shoot (cm)

	Dashehari	Bombay Green	Banarasi Langra	Chausa	Mean A
I <sup>st</sup> order	23.86	37.20	40.86	40.36	35.57
2 <sup>nd</sup> order	22.76	36.10	38.90	40.06	34.45
3 <sup>rd</sup> order	20.76	34.10	37.56	36.86	32.32
4 <sup>th</sup> order	16.96	31.20	35.30	36.83	30.07
5 <sup>th</sup> order	14.16	29.83	32.50	33.23	27.43
Control	11.56	24.16	26.66	30.50	23.22
Mean B	18.35	32.1	35.3	36.31	
Factors	C.D.	SE(d)	SE(m)		
Factor(A)	1.891	0.936	0.662		
Factor(B)	1.544	0.764	0.541		
Factor(A X B)	3.781	1.872	1.324		

Canopy Spread (North –South direction): It narrates that the maximum spread of branches under North and South direction was 7.19m in the V<sup>th</sup> order which was statically at par to IV<sup>th</sup> order after six year of pruning. However, the minimum (6.39m) was recorded at Ist order of pruning. Further,

maximum spread (8.20m) was noted in Chausa variety while it was minimum in Dashehari. A critical observation evinces that maximum spread (8.36m) was recorded in Chausa variety while it was found minimum in Dashehari (Table 4).

**Table 4:** Canopy Spread (N-S)

	Dashehari	Bombay Green	Banarasi Langra	Chausa	Mean A
Ist order	5.66	6.00	6.60	7.30	6.39
2 <sup>nd</sup> order	6.00	6.46	6.93	7.70	6.77
3 <sup>rd</sup> order	6.23	6.60	7.16	7.63	6.90
4 <sup>th</sup> order	6.26	6.66	7.33	7.80	7.01
5 <sup>th</sup> order	6.30	6.43	7.66	8.36	7.19
Control	6.30	6.70	6.43	8.20	6.90
Mean B	6.12	6.47	7.02	7.83	
Factors	C.D.	SE(d)	SE(m)		
Factor(A)	0.246	0.122	0.086		
Factor(B)	0.201	0.1	0.07		
Factor(A X B)	0.492	0.244	0.172		

Canopy Spread (East-West direction): It narrates that the maximum spread of branches under East-West direction was 7.71m in the V<sup>th</sup> order which was statistically at par to control. The minimum spread 6.82m) was noted in I<sup>st</sup> order after six years of pruning. Further, maximum spread (8.37m) was noted in Chausa variety while it was minimum in Dashehari.

A critical observation evinces that maximum spread (8.37m) was recorded in Chausa variety while it was found minimum in Dashehari (Table). It might be due to vigour characteristics of Chausa, Banarasi Langra and Bombay Green varieties of mango as compared to Dashehari (Table 5).

**Table 5:** Canopy Spread (E-W)

	Dashehari	Bombay Green	Banarasi Langra	Chausa	Mean A
Ist order	5.96	6.50	7.06	7.76	6.82
2 <sup>nd</sup> order	6.43	6.76	7.50	8.13	7.20
3 <sup>rd</sup> order	6.56	6.86	7.60	8.33	7.34
4 <sup>th</sup> order	6.76	7.16	7.73	8.56	7.55
5 <sup>th</sup> order	6.80	7.10	8.23	8.73	7.71
Control	6.73	7.36	7.67	8.70	7.61
Mean B	6.54	6.96	7.63	8.37	
Factors	C.D.	SE(d)	SE(m)		
Factor(A)	0.216	0.107	0.076		
Factor(B)	0.176	0.087	0.062		
Factor(A X B)	N/A	0.214	0.151		

Fruit yield: There was no fruiting of consecutive two years at I<sup>st</sup> and II<sup>nd</sup> order of prunings in all the mango varieties. The minimum fruit yield 127kg was noted during the year 2014 in variety Dashehari which was recorded in increasing order upto III<sup>rd</sup> order of pruning. Then it was observed in decreasing of yield in IV<sup>th</sup> and V<sup>th</sup> order of pruning. Maximum fruit yield (437kg/tree) was noted during 2017; however, it was recorded

minimum (174.3kg/tree) under control. Almost the same trend of variability was noted in rest of the varieties. Further, it was noted that the maximum fruit yield (650.3kg/tree) was recorded in Banarasi Langra variety at III<sup>rd</sup> order of pruning while it was noted minimum in control of Dashehari during 2017 (Table 6).

**Table 6:** Fruit yield of mango varieties at different order of pruning

	Dashehari						Bombay Green						Banarasi Langra						Chausa					
	1 <sup>st</sup> order	2 <sup>nd</sup> order	3 <sup>rd</sup> order	4 <sup>th</sup> order	5 <sup>th</sup> order	Control	1 <sup>st</sup> order	2 <sup>nd</sup> order	3 <sup>rd</sup> order	4 <sup>th</sup> order	5 <sup>th</sup> order	Control	1 <sup>st</sup> order	2 <sup>nd</sup> order	3 <sup>rd</sup> order	4 <sup>th</sup> order	5 <sup>th</sup> order	Control	1 <sup>st</sup> order	2 <sup>nd</sup> order	3 <sup>rd</sup> order	4 <sup>th</sup> order	5 <sup>th</sup> order	Control
2012	0	0	143.0	136.6	131.0	121.6	0	0	153.6	146.0	136.6	126.6	0	0	169.6	158.0	148.6	129.3	0	0	157.3	153.0	143.3	128.0
2013	0	0	155.3	148.3	141.3	126.3	0	0	168.6	159.7	151.3	133.0	0	0	193.6	171.3	162.3	141.3	0	0	174.6	168.0	156.0	137.6
2014	127.0	143.5	190.0	178.0	144.0	133.6	133.9	154.1	192.6	197.3	155.0	134.3	143.5	162.5	232.0	217.0	199.3	144.0	137.5	156.5	230.6	204.3	157.3	144.6
2015	148.1	166.1	221.6	207.6	183.0	145.6	160.1	179.5	258.6	251.0	243.6	157.0	367.8	392.5	504.3	466.0	427.0	267.6	230.8	287.5	367.6	351.3	313.6	166.3
2016	167.5	170.8	255.3	241.6	174.0	157.6	184.5	188.5	295.3	280.3	262.0	172.3	387.5	396.1	547.3	484.0	447.0	272.6	287.5	402.5	515.3	484.0	447.0	172.6
2017	213.3	231.6	437.0	390.0	230.3	174.3	222.3	236.0	373.6	378.6	361.0	199.0	435.3	445.6	650.3	602.3	558.6	297.6	325.3	439.3	552.6	526.3	477.6	204.3

The data further evince that maximum fruit yield (286.7kg/tree) was noted in Banarasi Langra variety at III<sup>rd</sup> order after six years of pruning; however, it was statistically

at par with Bombay Green. A critical observation was recorded that III<sup>rd</sup> order of pruning was found to be the best in accordance with fruit yield in all the varieties (Table 6a).

**Table 6a:** Interaction of mango varieties with different order of pruning

	1 <sup>st</sup> order	2 <sup>nd</sup> order	3 <sup>rd</sup> order	4 <sup>th</sup> order	5 <sup>th</sup> order	Control	Mean A
Dashehari	109.3	118.6	233.7	217.0	167.2	143.2	164.8
Bombay Green	116.8	126.3	240.4	235.5	218.2	153.7	181.8
Banarasi Langra	222.3	232.8	382.8	349.7	323.8	208.7	286.7
Chausa	163.5	214.3	333.0	314.5	282.5	158.9	244.4
Mean B	153.0	173.0	297.5	279.2	247.9	166.1	

**Table 6b:** Interaction of mango varieties with different years after pruning

	2012	2013	2014	2015	2016	2017	Mean A
Dashehari	88.7	95.2	152.6	178.7	194.5	279.4	164.8
Bombay Green	93.8	102.1	161.2	208.3	230.5	295.1	181.8
Banarasi Langra	100.9	111.4	183.0	404.2	422.4	498.3	286.7
Chausa	96.9	106.0	171.8	286.2	384.8	420.9	244.4
Mean C	95.1	103.7	167.2	269.3	308.0	373.4	

**Table 6c:** Interaction of pruning order with different years after pruning

	2012	2013	2014	2015	2016	2017	Mean B
1 <sup>st</sup> order	0	0	135.4	226.7	256.7	299.0	153.0
2 <sup>nd</sup> order	0	0	154.1	256.4	289.5	338.1	173.0
3 <sup>rd</sup> order	155.9	173.0	211.3	338.0	403.3	503.4	297.5
4 <sup>th</sup> order	148.4	161.8	199.1	319	372.5	474.3	279.2
5 <sup>th</sup> order	139.9	152.7	163.9	291.8	332.5	406.9	247.9
Control	126.4	134.5	139.1	184.1	193.8	218.8	166.1
Mean C	95.1	103.7	167.2	269.3	308.0	373.4	

Factors	C.D.	SE(d)	SE(m)
Factor(A)	4.091	2.078	1.469
Factor(B)	5.01	2.545	1.8
Intraction A X B	10.02	5.09	3.599
Factor(C)	5.01	2.545	1.8
Intraction A X C	10.02	5.09	3.599
Intraction B X C	12.272	6.234	4.408
Intraction A X B X C	24.543	12.468	8.817

The data again evince that maximum fruit yield was noted during 2017 in all the varieties under study. So, it infers that as the age of shoots increased the fruit yield increased simultaneously (Table 6b).

Further data evince that maximum fruit yield was noted at III<sup>rd</sup> order of pruning while it was decreased at IV<sup>th</sup> and V<sup>th</sup> of pruning (Table 6c).

The pruned branches produced more shoot length as compared to unpruned trees. The effect of pruning treatment was more pronounced on shoot girth as compared to shoot length. It was very informative to observe that the greater the height of pruning, lesser were girth and length of emerged shoots near the cut end. Hence, less severe pruning in IV<sup>th</sup> and V<sup>th</sup> order induced more canopy area. Emerged shoots in I<sup>st</sup> and II<sup>nd</sup> order had greater girth than IV<sup>th</sup> and V<sup>th</sup> order pruning, which was probably due to

diversion of enormous nutrients to these shoots being closer to the main trunk of trees. The maximum shoot girth was recorded in the I<sup>st</sup> order pruned trees and least in the control in all the varieties. In general I<sup>st</sup> and II<sup>nd</sup> order pruned trees induced more vegetative growth, whereas it was less in IV<sup>th</sup> and V<sup>th</sup> order of pruning. The I<sup>st</sup> and II<sup>nd</sup> order pruned branches produced only vegetative shoots for first two successive years. Yield in the III<sup>rd</sup> order pruning treatment was highest than the IV<sup>th</sup> and V<sup>th</sup> order of pruning. Durland (1997) [1]; Rao (1971) [7]; Lal, *et al* (2000) [4], Kalloo *et al* (2005) [2] and Lal, *et al* (2007) [3] also reported on different aspects as facilitating light penetration, young shoots and canopy management during fruit growth might lead to increased yield. Mishra, *et al.* (2007) [5]; Mitra, *et al* (2008) [6]; Singh (2005) [10]; Singh and Chanana (2005) [11]; Singh and

Singh (2007) <sup>[12]</sup> have narrated the pruning aspects in guava for improvement of fruit yield.

### Conclusion

Orchard establishment is a long term process and takes much care on accordance with canopy management during decreasing of fruit yield. Heading back upto quarternary branches was considered as III<sup>rd</sup> order was found to be most appropriate pruning technique for maximum fruit yield and canopy management. So, rejuvenation is said to helps in restoring the production potential of old unproductive and diseased orchards in shortest period. Also, it restoring the production potential as well as canopy management. It also sustains the healthy life of orchardists with higher production to a great extent.

### References

1. Durland G. Effects of light availability on the architecture of canopy in mango (*Mangifera indica* L.) cv. Manzana trees. *Acta Horticulture*. 1997; 455: 217-272.
2. Kalloo G, Reddy BMC, Singh G, Lal b. Rejuvenation of old and senile orchards. Pub. CISH, Lucknow, 2005, 40.
3. Lal B, Mishra D. Effect of pruning on growth and bearing behavior of mango cv. Chausa. *Indian Journal of Horticulture*. 2007; 64(3):268-270.
4. Lal B, Rajput MS, Rajan S, Rathore DS. Effect of pruning on rejuvenation of old mango trees. *Indian Journal of Horticulture*. 2000; 57(3):240-242.
5. Mishra D, Pandey D, Mishra R, Pathak RK. Performance of improved aonla cultivars during top working of senile trees. *Indian Journal of Horticulture*. 2007; 64(4):396-398.
6. Mitra SK, Gurung MR, Pathak PK. Guava production and improvement an improvement in India: an overview. *Acta Horticulture*. 2008; 787:59-65.
7. Rao VNM. A note on pruning as a remedy for irregular bearing mango. *Andhra Agricultural Journal*. 1971; 18:242-245.
8. Singh G. Strategies for improved production of guava. *Souvenir, 1st Inter. Guava Symp, Lukhnow, India*. 2005, 26-39.
9. Singh G, Mishra R, Gupta S. Modifying existing Guava tree canopies for increased production efficiency. *Acta Horticultural*. 2007; 735:243-248.
10. Singh G, Mishra R, Singh GP. Guava rejuvenation. *Central institute of Subtropical horticulture, Lucknow*. 2005, 1-20.
11. Singh Gurdarsha, Chanana YR. Influence of pruning intensity on and pruning frequency on vegetative and reproductive attributes in guava cv. L-49. *1st International Guava Symposium, December, 5-8. Organized by Central Institute of Subtropical Horticulture, Rehmankhera, Lucknow, 2005, 52.*
12. Singh VK, Singh G. Photosynthetic efficiency, canopy microclimate and yield of rejuvenated guava trees. *Acta Horticultural*. 2007; 735:249-25.