



# Effect of special horticultural practices on physical and chemical parameters in fruit of mango (*Mangifera indica* L.) cv. Ratna

R.D. Aghav<sup>1</sup>, P.M. Haldankar<sup>2</sup>, K.V. Malshe<sup>3</sup>, Y.R. Parulekar<sup>4</sup>, H. A. Saste<sup>5</sup> and A. P. Samant<sup>6</sup>

<sup>1,4,5,6</sup>Department of Fruit science, College of Horticulture, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, 415712 (MS)

<sup>2</sup>The Director of Extension Education, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli 415712 (MS)

<sup>3</sup>Agronomist, Regional Coconut Research Station, Bhatye, Ratnagiri (MS)

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**Abstract**— The investigation was conducted on mango at College of Horticulture, Dapoli, Dist. Ratnagiri (MS) during the year 2020-21 to assess the effect of special horticultural practices on physical and chemical parameters in fruit of mango (*Mangifera indica* L.) cv. Ratna. The experiment was laid out in RBD with three replications and ten treatments viz; girdling on first fortnight of October ( $T_1$ ), girdling on first fortnight of November ( $T_2$ ), girdling on first fortnight of October and November ( $T_3$ ), girdling on first fortnight of October and tip pruning ( $T_4$ ), girdling on first fortnight of November and tip pruning ( $T_5$ ), girdling on first fortnight of October and November and tip pruning ( $T_6$ ), tip pruning ( $T_7$ ), removal of new shoots below old shoot ( $T_8$ ), smudging ( $T_9$ ) and control ( $T_{10}$ ). Treatment girdling on first fortnight of October and November and tip pruning resulted highest fruit weight, fruit length, fruit diameter, pulp weight, pulp stone ratio at harvest stage and ripe stage. The chemical parameter TSS, reducing sugar, total sugar, acidity, pH and ascorbic acid were non-significant at both stages.



**Keywords**— Ratna, Mango, Girdling, Tip pruning, TSS, pH and Ascorbic acid

## I. INTRODUCTION

The mango (*Mangifera indica* L.) is an important commercial fruit crop grown in tropical and subtropical region of the country. Mango is autotetraploid or amphidiploid in nature belongs to family Anacardiaceae and genus *Mangifera*. In India, almost all commercial cultivars are belonging to single species *Mangifera indica* L. It is originated from the Indo-Burma region. Among the various commercial varieties, the variety Ratna was developed by DBSKKV, Dapoli (M.S.) and it is regular bearer. The tree of Ratna is semi-dwarf in nature and the fruits is large ovate in shape (400-500g) with firm and fibreless deep orange colour pulp. Girdling is well known method to induce flower buds and fruiting in fruit crops, girdling or ringing is one of the horticultural practice methods which stops the downward flow of sap through

phloem which enhance the flowering, fruit set and fruit size in horticulture plants. Girdling is the removal of the bark in a circular manner of either branch of the plant or woody plant. Late flowering leads to delayed fruit development and harvesting. Pruning is an science and art of removing some plant part or cutting of infected plant parts for better and valuable growth. Shoot pruning reduce the auxin synthesis at the apex of the branches, directing the transport of assimilates and cytokinin's to the axillary buds of branches under flowering condition, including the formation of axillary inflorescence (Srivastava, 2002). Mango flowers can be induced through smudging, an ancient technique. This method is used in some regions of the Philippines to get 'Carabao' and 'Pico' mangoes to flower early. It has been determined that the active ingredient in smearing that causes flowering is ethylene (Dutcher, 1972).

## II. MATERIAL AND METHODS

A field experiment was conducted on 30 years old mango trees (cv. Ratna) at college of horticulture, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, Dist. Ratnagiri (M.S.) India, Pin- 415712 located between 17°45' N latitude and 73°12' E longitude on West coast of Maharashtra. It has an altitude of 240 m from the MSL. The experiment laid out in randomized block design with three replications and ten treatments *viz.*, girdling on first fortnight of October (T<sub>1</sub>), girdling on first fortnight of November (T<sub>2</sub>), girdling on first fortnight of October and November (T<sub>3</sub>), girdling on first fortnight of October and tip pruning (T<sub>4</sub>), girdling on first fortnight of November and tip pruning (T<sub>5</sub>), girdling on first fortnight of October and November and tip pruning (T<sub>6</sub>), tip pruning (T<sub>7</sub>), removal of new shoots below old shoot (T<sub>8</sub>), smudging (T<sub>9</sub>) and control (T<sub>10</sub>). Each treatment was given two trees. The girdling was done on tertiary branches of experimental tree by giving circular deep cut with help of sharp knife as per treatments. The total 50 branches were girdled per experimental plant. On these plants vegetative shoots were emerged in month of November of the total new shoots. 200 shoots per experimental plant were removed at the point of emergence of mature shoots. The smudging was done in month of December. During smudging, the colour of newly emerged shoots was light green. Smudging was done early in the morning. In the previous day the material like rice straw, dry residues of plant were collected at the base of plant canopy. Then next day early in the morning smudging was done for about 2 hours. The entire process of smudging was performed four times at four days interval. The data on average weight fruit (g), fruit length (cm), fruit diameter (cm), pulp weight (g), pulp to stone ratio at harvest stage and ripe stage were recorded. The chemical parameters *viz.*; TSS(°B), reducing sugars (%), total sugar (%), acidity (%) pH and ascorbic acid (mg/100g) were recorded. The reducing sugar were estimated by using Lane and Eynon (1923) method, total sugar was estimated by method given Ranganna (1977) and ascorbic acid content of sample was determined by 2,6- dichlorophenol indophenols titration method described by Rao and Deshpande (2006). The data were analysed by the using statistical methods suggested by Panse and Sukhatme (1995).

## III. RESULT AND DISCUSSION

The data on effect of girdling, tip pruning and smudging on physical and chemical parameter of fruits of mango cv. Ratna at harvest and ripe stage. The data are illustrated in Table no. 1(a), 1(b), 2(a) and 2(b) respectively.

### Fruit weight, Fruit Length and Diameter at harvest stage

The largest fruit were observed in treatment girdling on first fortnight of October and November and tip pruning (448.27g). The highest fruit length (12.93cm) and maximum fruit diameter (9.55cm) were reported in this treatment. According to Ghadge *et al.* (2017) observed significantly maximum fruit weight (310.66g) with 1.50 cm of girdling width. Nabila *et al.* (2015) found highest fruit length (2.63 and 2.80) during 2009 and 2010 respectively because of girdling during April in both seasons of the study. Warang (2019) and Nachare (2020) also observed the same results. Improvement in fruit size due to pruning was observed in mango by Fivaz and Stassen, (1997) in mango cv. Sensation. El- sherbini (1992) concluded that fruit diameter and size significantly increased by girdling at stage II of peach cv. Riogrande. The girdling in first fortnight of October did not improve average fruit weight, fruit length and fruit diameter may be due to excess of shoots on tree it may cause lower interception of sunlight inside the canopy which results lower photosynthesis rate and lower supply of photosynthate to fruit. According to E. Lahav *et al.* (1972) due to girdling fruit weight decreases (265g) as compared to control (326g) in 'Ettinger' cultivar of avocado. Also smudging treatment did not influence on fruit weight, length and diameter of mango cv. Ratna. Smudging practice could be location specific and induces flowers only if shoot is in condition to flower. These inferences indicate that this technique could not work under changing climatic condition of Konkan region.

### Pulp weight and Pulp to Stone ratio at harvest stage.

The highest pulp weight (341.03g) observed in treatment first fortnight of November and tip pruning and had maximum pulp to stone ratio (6.24) seen in the same treatment. Ghadage *et al.* (2017) reported significantly maximum volume of pulp (190.55 ml) was obtained with 1.50 cm of girdling width. The girdling on 15<sup>th</sup> July (T<sub>1</sub>) produced significantly maximum pulp volume (184.73ml) in mango cv. Alphonso. Similar results with respect to pulp weight (g) and pulp stone ratio were also reported by Bhanupratap *et al.* (2009) in mango cv. Amrapali. Nachare (2020) found maximum weight of pulp (346.40g) in girdling on first fortnight of the September and tip pruning (removal of new shoots) in mango cv. Ratna. However, Soudagar *et al.* (2018) reported that the pulp weight and pulp to stone ratio did not vary due to tip pruning treatments. The lower pulp weight and pulp to stone ratio by girdling in first fortnight of October and smudging can be attributed to minimum fruit size and maximum stone weight.

Table No.1 a) Effect of girdling, tip pruning and smudging on physical parameters of fruit of mango cv. Ratna at harvest stage.

Treatments	Physical parameters at harvest stage				
	Avg. fruit weight (g)	Fruit length (cm)	Fruit diameter (cm)	Pulp weight (g)	Pulp to stone ratio
T1	405.23	10.22	8.24	270.67	4.49
T2	407.90	10.72	8.25	280.33	4.87
T3	408.63	11.41	9.15	279.37	4.67
T4	425.10	11.33	9.21	307.20	4.68
T5	446.53	12.60	9.30	341.03	6.24
T6	448.27	12.93	9.55	337.03	6.08
T7	437.17	12.18	8.79	308.20	5.54
T8	445.43	12.43	9.38	323.60	5.65
T9	403.87	10.34	8.16	249.20	4.06
T10	374.27	9.53	7.90	243.21	3.95
<b>Mean</b>	420.24	11.37	8.79	293.98	5.02
<b>SEm ±</b>	1.15	0.24	0.10	3.66	0.12
<b>CD @ 5%</b>	3.42	0.72	0.31	10.87	0.35

Table No.1 b) Effect of girdling, tip pruning and smudging on physical parameters of fruit of mango cv. Ratna at ripe stage.

Treatments	Physical parameters at ripe stage		
	Fruit weight (g)	Pulp weight (g)	Pulp to stone ratio
T1	387.63	254.80	4.10
T2	389.37	258.93	4.47
T3	392.73	257.87	4.42
T4	404.73	290.43	4.35
T5	414.77	308.17	6.11
T6	418.60	325.13	5.71
T7	407.43	290.30	5.22
T8	411.43	307.63	5.13
T9	362.63	217.20	3.97
T10	341.43	220.93	3.74
<b>Mean</b>	393.08	273.14	4.72
<b>SEm ±</b>	3.62	2.34	0.08
<b>CD @ 5%</b>	10.75	6.96	0.23

**Fruit weight, Pulp weight and pulp to stone ratio at ripe stage**

The maximum fruit weight (418.60g) and pulp weight (325.13g) were reported in treatment girdling on first fortnight of October and November and removal of new shoots at ripe stage and maximum pulp to stone ratio observed in treatment girdling on first fortnight of November and tip pruning. There was increase in weight of fruit (g), pulp weight (g) and pulp stone ratio of mango cv. Ratna due to effect of girdling and tip pruning (removal of new shoots). The results in the present investigation are in confirmation with findings of Gopu *et al.* (2014) in mango cv. Alphonso; Warang *et al.* (2019) in mango cv. Alphonso; Nachare *et al.* (2020) in mango cv. Ratna. However, Soudagar *et al.* (2018) reported non-significant effect of tip pruning on mango on fruit length and diameter cv. Alphonso.

**TSS, reducing sugar, total sugar, acidity, pH and ascorbic acid.**

The effect girdling, tip pruning and smudging does not significantly observe on TSS, reducing sugar, total sugar, acidity, pH and ascorbic acid in fruit at harvest stage and ripe stage. Removal of new shoots, girdling and smudging did not affect TSS, reducing and total sugars of fruit at harvest and ripe stage. Shinde *et al.* (2014) also reported that the different girdling time had non-significant effect on TSS, titratable acidity, reducing sugar, total sugars, and ascorbic acid of fruits in mango cv. Alphonso. Warang *et al.* (2019) found that effect of girdling and removal of new shoot had non-significant effect on acidity, pH and ascorbic acid of fruits in mango cv. Alphonso. Nachare (2020) reported that effect of girdling and tip pruning had non-significant effect on acidity, pH and ascorbic acid of fruits in mango cv. Ratna.

Table No.2 a) Effect of girdling, tip pruning and smudging on chemical parameters of fruit of mango cv. Ratna at harvest stage.

Treatments	Chemical parameters at harvest stage					
	TSS (°B)	Reducing sugar (%)	Total Sugar (%)	Acidity (%)	pH	Ascorbic acid (mg/100g)
T1	10.27	1.43	3.33	2.65	2.93	66.40
T2	9.83	1.61	3.15	3.25	2.43	65.30
T3	10.50	1.49	3.28	2.77	2.73	68.87
T4	10.67	1.25	3.31	2.96	2.92	65.33
T5	10.37	1.55	3.41	3.27	2.60	76.27
T6	10.20	1.90	3.40	3.20	2.63	74.57
T7	10.70	1.75	3.35	3.53	2.80	65.50
T8	10.63	1.83	3.40	3.23	2.60	66.63
T9	10.35	1.66	3.30	3.17	2.60	70.87
T10	10.23	1.36	3.17	3.24	2.77	71.87
<b>Mean</b>	10.38	1.58	3.31	3.13	2.70	69.16
<b>SEm ±</b>	0.23	0.14	0.13	0.18	0.14	2.93
<b>CD @ 5%</b>	NS	NS	NS	NS	NS	NS

**IV. CONCLUSION**

From these findings, it can be concluded that girdling, tip pruning (removal of new shoots) and smudging in mango cv. Ratna is beneficial for increasing length of fruit, diameter of fruit, weight of fruit, pulp weight and pulp stone

ratio at harvest and ripe stage. The girdling, tip pruning (removal of new shoots) and smudging does not influence the chemical parameters viz; TSS, reducing sugar, total sugar, acidity, pH and ascorbic acid in the fruits of mango at both stages.

Table No.2 b) Effect of girdling, tip pruning and smudging on chemical parameters of fruit of mango cv. Ratna at ripe stage.

Treatments	Chemical parameters at ripe stage					
	TSS ( <sup>0</sup> B)	Reducing sugar (%)	Total Sugar (%)	Acidity (%)	pH	Ascorbic acid (mg/100g)
T1	21.17	3.15	12.53	0.22	4.50	50.65
T2	21.88	4.13	14.20	0.18	4.80	56.16
T3	20.79	3.29	12.63	0.19	4.13	59.07
T4	22.47	2.75	12.87	0.23	4.37	57.19
T5	21.81	4.10	13.80	0.18	4.53	51.33
T6	21.44	3.37	14.83	0.19	4.90	52.47
T7	22.54	3.27	14.30	0.20	4.60	53.70
T8	22.39	3.05	13.90	0.20	4.33	54.83
T9	21.78	2.57	12.47	0.21	4.07	56.20
T10	21.51	2.70	12.53	0.22	4.23	47.47
<b>Mean</b>	21.78	3.24	13.41	0.20	4.45	53.91
<b>SEm ±</b>	0.44	0.30	0.68	0.03	0.20	3.14
<b>CD @ 5%</b>	NS	NS	NS	NS	NS	NS

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