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Effect of planting space and pruning intensity in mango (*Mangifera indica* L.) cv. Amrapali

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Abstract

Spacing of plantation as well as intensity of pruning both showed significant effect in the hybrid mango cv. Amrapali. Spacing with 5m x 5m gave significantly higher fruit yield per plant (51.778 kg) and 50% pruning gave significantly higher yield per plant (39.833 kg). Interaction between spacing and intensity of pruning also showed significant effect and treatment combination '5m x 5m + 50% pruning' gave significantly higher fruit yield per plant (65.33 kg). In terms of fruit yield per hectare, which is more important while comparing of different spacing of mango plantation, spacing showed non-significant effect whereas, pruning as well as their interaction effect showed significant effect because of number of plants per hectare increases with the decreasing of spacing and vice-versa. 50% pruning gave significantly higher fruit yield per hectare (289.78 q) and best treatment combination was '2.5m x 2.5m + 50% pruning' with the highest fruit yield per hectare (349.33 q). On the basis of these observations it is suggested that ultra-high density plantation of mango cv. Amrapali may be pruned up to 50% foliage just after fruit harvesting in the month of first week of July for better fruit yield.

Keywords: Pruning, high density, mango, Amrapali

Introduction

Mango (*Mangifera indica* L.) is one of the ancient fruits of India and its cultivation have begun 4000 years ago (Condole, 1984)^[4]. Its home was suggested as eastern India extending from Assam to Myanmar or possibly further in Malay region (Popenoe, 1920)^[8]. Mango, the king of fruit, is the most important fruit in tropical as well as sub-tropical regions of the world in which, India contributes a major share in area and production. It is one of the choicest fruit known to mankind in India. Most of the conventional varieties of mango in India are selection from the seedlings. However, during last a few decades, quite a good number of mango hybrids have been released having improvement over the existing varieties. In Jharkhand mango is being cultivated in almost all district. Most of the varieties of this region are alternate or irregular bearing in nature. Hybrid varieties of mango are suitable to this region and having regular bearing habit.

Available information suggest that the concept of high density planting in mango took practical shape after development of dwarf and regular bearer mango hybrid viz., Amrapali at IARI, New Delhi (Majumdar *et al.*, 1982)^[6]. In other parts of India the concept of high density in Amrapali and Dashehri was found superior (Majumdar and Sharma, 1988^[5] and Sant *et al.*, 1997^[9]).

The environmental factors influenced under different densities of planting on yield and quality production whereas the producers view is to achieve domestic and export market with good price (Mhetre *et al.*, 2011)^[7]. So keeping this in mind, the maximum utilization of land, light and canopy with quality produce, the experiment on effect of pruning on different spacing of high density plantation of mango cv. Amrapali was carried out.

Materials and methods

An investigation was carried out at Zonal Research Station, Chianki, Palamau (Birma Agricultural University, Ranchi), Jharkhand, India during kharif 2007-2008. The experiment was laid out in Randomized Block Design with factorial concept in three spacing treatments and three levels of pruning with three replications in twelve years old orchards of similar height and canopy of mango plants cv. Amrapali. The main treatment was allowed according to spacing which was at 2.5m x 2.5m (S₁), 2.5m x 5m (S₂) and 5m x 5m (S₃). The sub-treatments were three levels of pruning viz., 25% (P₁), 50% (P₂) and No pruning (P₃). The plants were under uniform cultural operations and provide proportionate plant protection measures. Pruning was done just after harvesting of matured fruits in the first week of July 2007.

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Plant protection measures after pruning were followed as per the recommended package of practices for mango orchards. The five parameters of fruit characters were taken after the harvesting of well matured fruits. The average weight of fruits (g), maximum weight of fruits (g), number of fruits per plant, yield per plant (kg) and yield per hectare (q) were recorded and mean data was subjected to the suitable statistical analysis.

Results and Discussion

Results of the study are presented in Table 1, 2, 3, 4 and 5. The investigation revealed that fruit characters of mango cv. Amrapali showed significant effect for almost all characters for spacing as well as intensity of pruning except, average and maximum fruit weight of fruits for pruning and fruit yield per hectare for spacing. Interaction effect between spacing and pruning showed significant effect for all characters under studies. For average fruit weight, spacing showed significant effect but intensity of pruning was non-significant. The interaction effect between these two factors also showed significant effect. The average fruit (table 1) was significantly higher in the spacing of 5m x 5m (249 g/fruit) and intensity of

pruning gave higher average fruit weight (232.78 g/fruit) which was non-significant. The best treatment combination was '5m x 5m + 25% pruning' with the highest value (280.33 g/fruit) which was significantly highest over rest of the treatment combinations. The maximum fruit weight per fruit (table 2) was also in the same fashion of average fruit weight. Effect of spacing showed significantly highest value (279 g/fruit) and intensity of pruning gave highest maximum fruit weight (277 g/fruit), which was non-significant. The interaction effect between both the factors was significant and highest value (326 g/fruit) was in the treatment combination '5m x 5m + 25% pruning' which was best treatment combination for this character. The higher fruit weight in pruned plants may be due to an improved micro-climate and higher photosynthetic rates (Sharma and Singh, 2006) [11]. Although the photosynthetic rate was not recorded in this experiment, as reported by other authors, variation in the radiation interception of the plant canopy (leaves growing in shade vs. exposed sunlight) can effect fruit size through variation in supply of assimilated carbon (Bulwalda, 1994) [2].

Table 1: Average fruit weight (g) at maturity stage of mango cv. Amrapali

Pruning (P) Spacing (S)	25% pruning (P ₁)	50% pruning (P ₂)	No pruning (P ₃)	Mean
2.5m x 2.5m (S ₁)	218.67	230.67	219.33	222.89
2.5m x 5.0m (S ₂)	199.33	208.67	236.33	214.78
5.0m x 5.0 (S ₃)	280.33	230.00	236.67	249.00
Mean	232.78	223.11	230.78	

Factors	CD (5%)	SE (d)	SE (m)
Spacing (S)	13.37	6.304	4.458
Pruning (P)	N.S.	6.304	4.458
S x P	23.152	10.918	7.721

Table 2: Maximum fruit weight (g) at maturity stage of mango cv. Amrapali

Pruning (P) Spacing (S)	25% pruning (P ₁)	50% pruning (P ₂)	No pruning (P ₃)	Mean
2.5m x 2.5m (S ₁)	252.00	256.67	251.33	253.33
2.5m x 5.0m (S ₂)	253.00	238.67	272.33	247.00
5.0m x 5.0 (S ₃)	326.00	242.00	269.00	279.00
Mean	277.00	245.78	264.22	

Factors	CD (5%)	SE (d)	SE (m)
Spacing (S)	22.88	10.790	7.629
Pruning (P)	N.S.	10.790	7.629
S x P	39.62	18.688	13.215

For number of fruits per plant (table 3), spacing and intensity of pruning both were found significant effect. The interaction effect was also found significant. The spacing 5m x 5m gave significantly highest number of fruits per plant with 243 fruits per plant and intensity of pruning gave highest number of fruits at 50% pruning of existing foliage with the value of

190.78 fruits per plant. The best treatment combination was '5m x 5m + 50% pruning' with 299.5 fruits per plant which was significant. However, increasing of average fruit weight was found to be decrease in the number of fruits per trees, but still remained higher in pruned trees (Asrey *et al.*, 2013) [1].

Table 3: Number of fruits per plant at maturity stage of mango cv. Amrapali

Pruning (P) Spacing (S)	25% pruning (P ₁)	50% pruning (P ₂)	No pruning (P ₃)	Mean
2.5m x 2.5m (S ₁)	55.67	111.67	56.67	75.44
2.5m x 5.0m (S ₂)	130.67	160.00	141.50	149.11
5.0m x 5.0 (S ₃)	233.00	299.50	218.17	243.33
Mean	139.67	190.79	137.44	

Factors	CD (5%)	SE (d)	SE (m)
Spacing (S)	13.40	6.319	4.468
Pruning (P)	13.40	6.319	4.468
S x P	23.21	10.945	7.739

Unlike the other mango varieties, Amrapali utilizes its rainy season growth for developing fruit shoots. After harvesting new growth (fruit shoots) requires 4-5 months of inductive (cool) temperatures for effective flowering and fruiting (Scholefield *et al.*, 1986) [10]. As far as fruit yield per plant (table 4) is concerned, both spacing and intensity of pruning were found significant effect. The interaction effect between these two factors also showed significant effect. Highest fruit yield per plant was obtained by 5m x 5m spacing with 51.78

kg fruits per plant and in case of intensity of pruning highest fruit yield per plant was harvested by 50% level of pruning with the value of 39.83 kg fruits per plant. The best treatment combination for this character was '5m x 5m + 50% pruning' with the harvesting of 65.33 kg fruits per plant which was significantly highest over rest of the treatment combinations. Asrey *et al.* (2013) [1] also reported similar finding in Amrapali cultivar of mango from New Delhi, India.

Table 4: Fruit yield per plant (kg) at maturity stage of mango cv. Amrapali

Spacing (S) \ Pruning (P)	Pruning (P)			Mean
	25% pruning (P ₁)	50% pruning (P ₂)	No pruning (P ₃)	
2.5m x 2.5m (S ₁)	13.167	21.833	8.167	14.389
2.5m x 5.0m (S ₂)	25.500	32.333	22.000	26.611
5.0m x 5.0 (S ₃)	52.667	65.333	37.333	51.778
Mean	30.444	39.833	22.500	

Factors	CD (5%)	SE (d)	SE (m)
Spacing (S)	4.616	2.177	1.539
Pruning (P)	4.616	2.177	1.539
S x P	7.995	3.771	2.666

Production of mango fruit per unit area is the main objective of any fruit growing farmers. Therefore, fruit yield per hectare (table 5) was estimated and statistically analyzed data showed significant effect for pruning but non-significant for spacing. Interaction effect between these two factors for this character was found significant, which showed role of pruning at different spacing with different intensity of pruning. 50% pruning of existing foliage after fruit harvesting in the month of July gave highest fruit yield per hectare with the value of 289.78 quintal fruits per hectare. The highest fruit yield per

hectare was harvested in the spacing 2.5m x 2.5m which was non-significant. The best treatment combination for fruit yield per hectare was '2.5m x 2.5m + 50% pruning' with good quality mango fruits of 349.33 quintal per hectare followed by '5m x 5m + 50% pruning' with the harvesting of 261.33 quintal fruits per hectare. It was also proved that pruning appears to be an alternative strategy to obtain better yield and quality in high populated old mango orchards (Asrey *et al.*, 2013) [1].

Table 5: Fruit yield per hectare (q) at maturity stage of mango cv. Amrapali

Spacing (S) \ Pruning (P)	Pruning (P)			Mean
	25% pruning (P ₁)	50% pruning (P ₂)	No pruning (P ₃)	
2.5m x 2.5m (S ₁)	210.67	349.33	130.67	230.22
2.5m x 5.0m (S ₂)	204.00	258.67	176.00	212.89
5.0m x 5.0 (S ₃)	210.67	261.33	149.33	207.11
Mean	208.44	289.78	152.00	

Factors	CD (5%)	SE (d)	SE (m)
Spacing (S)	N.S.	16.136	11.410
Pruning (P)	34.21	16.136	11.410
S x P	59.26	27.949	19.763

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