J. Hortl. Sci.
Vol. 5 (2): 117-119, 2010

High density planting in mango cv. Alphonso

N.V. Dalvi, B.R. Salvi, S.A. Chavan and M.P. Kandalkar
Regional Fruit Research Station
Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth
Vengurle - 416 516, India
E–mail: nitesh_flori@yahoo.com

ABSTRACT

A trial was conducted to optimize spacing for high density planting in mango cv. Alphonso to obtain higher yield/ unit area at the Agriculture Research Station, Mulde, during 2006-07 to 2008-09 with four close spacings and one normal spacing as control. Highest yield (6.4 MT/ha) was recorded with a spacing of 5 m x 5 m without reduction in fruit size in 10 year old plants compared to the mean yield of 1.12 MT/ha in 10m x 10m normal spacing. High density plantation helped to get significantly higher yield per unit area compared to the normal spacing, without affecting size and quality of mango fruits. The highest cost:benefit ratio (2.33) was recorded in high density plantation of 5m x 5m, with maximum net returns of Rs.1,12,000/- per hectare. The present findings show promise for more yield and returns per unit area during the initial years of mango plantation by adopting 5m x 5m high density planting.

Key words : Mango, Alphonso, spacing, high density planting

INTRODUCTION

Alphonso mango (*Mangifera indica* L.) is a leading cultivar grown commercially in the Konkan region of Maharashtra and occupies an area of 1,64,000 ha. The variety is highly preferred for export. But, alternate bearing and low productivity (3.0 t/ha) realized with normal spacing gives low net returns to the farmer. To overcome this constraint, a trial was conducted at the Agriculture Research Station, Mulde with five different spacings during the period 1997 to 2009. Efforts were made to accommodate higher number of plants per unit area so as to get higher yield from the mango plantation during the initial period of orchard development. It takes at least 15 to 20 years to cover all the area with canopy in a mango orchard. This leads to low net returns to the grower. As a result, there is a feeling among mango growers that mango cultivation is not economical. To increase net returns per unit area of mango cultivation, this trial was undertaken. The major objective of the study was to optimize spacing for high density planting to obtain higher yields per unit area during the early period of the plantation.

MATERIAL AND METHODS

The study was conducted at Agriculture Research Station, Mulde, Sindhudurg District, Maharashtra State. The trial was laid out in Randomized Block Design, with five replications. The soil was red laterite, with pH range 5.5 to 6.5, and was rich in iron content. Soil nutrient status of this experimental plot was as follows : N (2.24%), P (0.10%), K (0.72%) and minor nutrients Zn (63.7 ppm), Cu (12.1 ppm), Fe (72.70 ppm) and Mn (68.8 ppm).

Average rainfall in this region is 3000–4000 mm, with relative humidity of 85–90%. Maximum average temperature is 35^{O}C and minimum average temperature 16^{O}C, with average sunshine hours of 9.00 h. Weather conditions are ideally suited to mango cultivation.

Five spacings used for the planting were: 1) 2.5m x 10m, 2) 5m x 5m, 3) 5m x 7.5m, 4) 5m x 10m and 5) 10m x 10m. Unit area /treatment /replication and details of number of plants /treatment are given below:

Treatment	Spacing	Number of plants/ plot/ treatment	Number of replications	Total number of plants/ treatment
T_1	2.5m x 10m	20	5	100
T_2	5m x 5m	20	5	100
T_3	5m x 7.5m	13	5	65
T_4	5m x 10m	10	5	50
T_5	10m x 10m	5	5	25

The trial was conducted under rainfed conditions. Planting was done during 1997. Plants were given recommended fertilizer doses and prophylactic measures (with standard dose of paclobutrazol) were practised during July – August every year. Age of the trees was ten years. Regular pruning of overcrowded branches was done in the trial. Three vegetative flushes occurred in June, October and March every year which led to luxuriant growth. Observations were recorded at fortnightly intervals. To get better yield during the initial years, pruning of dead, diseased, weak and intermingling branches of mango plants was done at the age of eight years. Observations on vegetative growth, flowering and number of fruits/plant and average yield kg/plant were recorded and yield expressed as metric tons/ha. Data reported here is the average of three years (2006-07 to 2008-09) and was statistically analyzed as per Panse and Sukhatme (1985) for Randomized Block Design. Mean values are reported for the physico chemical properties like fruit length, breadth, size, weight, TSS, acidity, stone, peel, pulp ratio and shelf life.

RESULTS AND DISCUSSION

Vegetative parameters

Vegetative parameters of plants under different treatments are presented in Table 1. Plant height was found to be significantly higher (9.10m) with 2.5m x 10m treatment, whereas normal spacing (6.99m) was at par with the spacing 5m x 7.5m (9.05m). No significant differences were observed with respect to plant girth and spread among the treatments. In high density planting natural tendency of the plant is to put forth vertical growth rather than horizontal, due to mutual shading of plants. These findings are in line with earlier reports of Ram *et al* (1996) and Gunjate *et al* (2003).

Table 1. Vegetative parameters in high density orchard of 'Alphonso' mango

Treatment	Spacing	No of trees/ha	Tree height (m)	Tree girth (cm)	Tree spread (cm)	
					E –W	N – S
T_1	2.5 m x 10 m	400	9.10	59	4.85	4.60
T_2	5 m x 5 m	400	7.12	57	5.12	5.30
T_3	5 m x 7.5 m	267	9 .05	51	4.75	4.63
T_4	5 m x 10 m	200	7.80	53	5.10	5.05
T_5	10 m x 10 m	100	6.99	61	6.70	5.78
	SEm±		0.31	0.81	0.20	0.24
	CD *(P=0.05)*		0.93	NS	NS	NS

* The figures are average/mean values of three years' data (2006-07 to 2008-09)

Flowering and fruit yield parameters

High density planting with 2.5m x 10m (T_1) spacing recorded a mean of 42 fruits/tree during both years and average fruit yield of 16.9 kg/tree, also in the same treatment. Maximum fruit yield (6.4 t/ha) was recorded in 5m x 5m spacing, whereas, normal spacing recorded the lowest fruit yield (1.12 t/ha). All the high density treatments recorded higher fruit yield compared to normal spacing. Maximum fruit yield (6.4 t/ha) in 5m x 5m spacing was due to higher number of plants and maximum number of fruiting branches. It was seen that under the Konkan agroclimatic zone, the hot and humid climate favours luxuriant growth of cv. Alphonso. During the initial years, high density orcharding with 2.5m x 10m, 5m x 5m and 5m x 7.5m spacings appears promising. These results are in line with those reported by Ram *et al* (1996) in 'Dashehari' mango. More number of plants /unit area resulted in more number of fruits/plant, higher yield/ha, and thereby, more tonnage from the same unit area. These results are similar to those reported earlier by Gunjate *et al* (2003) and Nath *et al* (2007).

Fruit quality

Data on physico chemical properties are presented in Table 3. The study on fruit quality attributes of 'Alphosno' mango showed that maximum fruit weight (248g) was recorded in the spacing 2.5m x 10m, which was significantly

Table 2. Flowering and yield parameters in 'Alphonso' mango as influenced by high density planting

Treatment	Spacing	No. of trees/ha	Flowering (%)		No. of fruits/tree		Average. fruit yield (kg/tree)		Average. yield (t/ha)
			2008	2009	2008	2009	2008	2009	
T_1	2.5 m x 10 m	400	31.80	30.83	32	52	8.3	13.1	4.280
T_2	5 m x 5 m	400	27.52	29.83	45	89	11.2	22.5	6.400
T_3	5 m x 7.5 m	266	16.50	15.83	39	74	9.7	18.4	3.737
T_4	5 m x 10 m	200	07.83	08.33	43	71	10.2	18.0	2.820
T_5	10 m x 10 m	100	15.80	15.00	31	48	8.0	12.3	1.12
	SEm±		2.21	2.57	1.1	1.4	0.42	0.79	0.19
	CD *(P=0.05)*		6.72	7.60	3.4	4.1	1.3	2.5	0.67

Table 3. Fruit quality attributes of 'Alphonso' mango under high density planting during Year 2009

Treatments	Spacing	Fruit length (cm)	Fruit breadth (cm)	Pulp weight (g)	Stone weight (g)	Peel weight (g)	Fruit weight (g)	Pulp: stone ratio	TSS(^{0}B)	Acidity(%)	Shelf life at room temperature (days)
T_1	2.5 m x 10 m	7.0	6.8	122.0	29.0	40.0	248.0	3.2	18.0	0.30	13
T_2	5 m x 5 m	7.0	7.0	120.0	35.0	39.0	194.0	3.2	18.0	0.29	14
T_3	5 m x 7.5 m	6.5	6.5	119.6	38.0	39.4	197.0	3.1	16.75	0.35	17
T_4	5 m x 10 m	8.0	7.0	122.2	38.0	39.8	200.0	3.2	17.00	0.29	18
T_5	10 m x 10 m	6.5	6.2	123.0	34.0	40.0	243.0	3.2	19.50	0.28	15
	SEm±	0.4	0.8	3.2	0.6	0.8	4.3	0.2	0.7	0.6	0.1
	CD *(P=0.05)*	N.S.	N.S.	N.S.	N.S.	N.S.	12.9	N.S.	N.S.	N.S.	0.3

N.S.=Non-Significant

Table 4. Cost: benefit ratio under high density planting in 10-year old Alphosno mango trees

Treatment	Expenditure/ ha (Rs.)	Receipts realized (Rs.)*	Net profit/ha	C:B ratio
T_1	48,000	1,0,7000	59,000	1.23
T_2	48,000	1,60,000	1,12,000	2.33
T_3	42,640	93,425	50,785	1.19
T_4	40,000	70,500	30,500	0.76
T_5	36,000	28,000	-8,000	-0.22

*Fruits were sold @ Rs. 25/kg

superior over the spacing 5m x 10m, and was at par with normal spacing (10m x 10m). The rest of quality parameters like TSS, acidity, pulp to stone ratio, etc., did not show significant differences between treatments. These results show that a closer spacing and high density mango plantation does not influence or hamper the quality of fruit. Regular training and pruning helps generate good aeration, thus ensuring better quality. The present findings are in line with earlier reports of Krishna *et al* (2003) and Gunjate *et al* (2003).

Cost : Benefit ratio

Data in Table 4 show that maximum net returns (Rs.1,12,000/-) and cost benefit ratio (2.33) was recorded in the spacing 5m x 5m, whereas, normal spacing of 10m x 10m fetched lower net returns (Rs.8,000/-) and cost: benefit ratio (0.22). Normal spacing 10m x 10m may have yielded lower net returns as the trees were 10 years old and 'Alphonso' orchards become profitable only after 15 years. These findings indicate that high density planting of 'Alphonso' mango not only gives higher yield/unit area during the initial years, but also promises higher net returns subsequently.

Though the present findings are based on three years yield data these sufficiently indicate that high density plantation in 'Alphonso' mango with 5m x 5m spacing is helpful for getting higher yield and more net returns/unit area.

REFERENCES

Kumbhar, A.R., Gunjate, R.T., Thimaiah, I.M. and Amin, S.M. 2009. Growth and fruiting of some mango cultivars under high density plantation in arid conditions of Gujarat (India). *Acta Hort.,* **820**: 403-406

Krishna, B., Kale, A.N., Dhake, A.V., Despande, S.S. and Balsubrahmanyam, V.R. 2009. High density plantation in marginal soils and processing of mango. *Acta Hort.,* **820:** 447-462

Nath,V., Das, B. and Rai, M. 2007. Standardization of high density planting in mango (*Mangifera indica*) under sub humid alfisols of eastern India. *Ind. J. Agril., Sci*., **77**:3-7

Ram, S., Singh, C.P. and Kumar, S. 1996. Success story of high density orcharding in mango. Proceeding of the 5th International Mango Symposium. *Acta Hort.,* **55**:375-382

Panse, V.G. and Sukhatme, P.V. 1985. Statistical methods for Agriculture worker, edn. 4. Indian council of Agricultural Research, New Delhi

(MS Received 14 March 2010, Revised 7 October, 2010)