

Effect of Pruning Techniques on Yield and Economics in High Density Plantation of Guava cv. Sardar

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Abstract: The present investigation entitled, "Effect of pruning techniques on yield and economics in high density plantation of guava cv. Sardar" was carried at Instructional-Cum Farm, Department of Horticulture, Mahatma Phule Krishi Vidyapeeth, Rahuri, during 2012 and 2013 year. The experiment was conducted on 3.5 years old healthy, vigorous high density plantation. The treatments comprised of four spacings viz; 2×1 m (M_1), 2×2 m (M_2), 3×2 (M_3) and 3×3 m (M_4) and three pruning intensity i.e. upto last two season growth (S_1), upto last three season growth (S_2) and upto last four season growth (S_3) with six plants in a treatment replicated three times in split plot design. The higher yields with closer spacings were mainly due to increased tree number per unit area. The net income per hectare at cost C ranged from Rs. -67474/- in treatment, M_4S_3 to Rs. 2,31,560/- in treatment, M_2S_1 . Thus, the most distinguished wide range was observed for net income. Although, the high density increases the cost of cultivation per hectare, the much higher yield from close spacing indicates that the added cost is economically feasible. Increased density from 1111 to 2500 plants/ha reduced the per quintal cost of cultivation at cost C from Rs.1696/- to Rs.541/- respectively. All these findings are in close agreement with those of Yadav (1978) and according to him close planting reduce the cost of production, produce the larger profit and increase the returns on investment. The maximum (1.84) Benefit: Cost ratio at cost C was observed in treatment M_2S_1 while minimum (0.54) Benefit: Cost ratio was observed in treatment M_4S_4 . It confirmed the returns per rupee invest is the greatest from the closest planting.

Keywords: Guava, pruning intensity.

INTRODUCTION

The guava (*Psidium guajava* L.) the apple of tropics is one of the important fruit crops of India. Though it is native to tropical America its cultivation has expanded to all. Guava is rich source of vitamin C, vitamin A, vitamin B₂ (Riboflavin) and minerals like calcium, phosphate and iron. The success of any enterprise in agriculture can best be judged by assessing the economic benefits earned by the farmer. If we grant that the goal of commercial producer is the profit, then the optimum population will be one in which the profit is the greatest. Its basic function is to confine the exploitation zone of the plant with regard to light, water and nutrients, so the highest total yield potential can be reached in the smallest possible area (Singh, 2005). With ever increasing land costs and the need for early returns on invested

capital, there is a worldwide trend towards high density planting. The present investigations were, therefore, undertaken to standardization of pruning techniques in high density planting of guava (*Psidium guajava* L.) cv. Sardar.

MATERIALS AND METHODS

The present investigations entitled, "Effect of pruning techniques on yield and economics in high density plantation of guava cv. Sardar" was carried out at Instructional-Cum-Research Farm, Department of Horticulture, Mahatma Phule Krishi Vidyapeeth, Rahuri during 2012 and 2013 year. The experiment was carried out on high density planting guava trees cv. Sardar during the year, 2012 and 2013. The treatments comprised of six plants spaced at 2×1 m (M_1), 2×2 m (M_2), 3×2 (M_3) and 3×3 m (M_4) and

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three pruning intensity *i.e.* upto last two season growth (S₁), upto last three season growth (S₂) and upto last four season growth (S₃) with six plants in a treatment replicated three times in split plot design. The pruning of plants was done in January, 2012 with three pruning intensities *i.e.* 1-Upto last two seasons growth, 2-Upto last three seasons growth and 3-Upto last four seasons growth. Harvesting of fruits was done at the end of July, 2012. Second trial was started in mid of the August at that time 50% current season growth was pruned in all treatments and harvesting of fruits was done during Jan-Feb-2013. Due to famine in Maharashtra state, pruning for third trial was done in June-2013. In that pruning, the 50% current season growth was pruned. Harvesting of fruits of third trial was done during Nov-Dec-2013.

The yield was recorded plantwise and treatmentwise. The operating cost of production was worked out for the period from 2012 and 2013 year. The amount realized from selling the fruits. The profit/loss account (Net income), gross income, unit cost of production and benefit cost ratio were calculated as under :

$$\text{Profit/loss account} = \text{Gross income in rupees} - \text{Total expenditure (Net income)}$$

$$\text{Gross income} = \text{Yield per ha. (t)} \times \text{Number of season} \times 10000$$

$$\text{Cost of produce} = \frac{\text{Expenditure in rupees}}{\text{Quantity of produce in quintals}}$$

$$\text{Benefit cost ratio} = \frac{\text{Gross income in rupees}}{\text{Total expenditure in rupees}}$$

RESULTS AND DISCUSSION

Economics of High Density Guava Production

The economical study of Farm Business Management is always concerns with the efficiency of enterprise. The data regarding the economics of guava production under the high density plantation during 2012-2013 years is presented in Table 1 and 2 based on estimation of cost.

Gross Income During first three Fruiting Crops

The data presented Table 1 indicate that the gross income increased with density nearly in the proportion of number of plants per hectare. The amount realized from the sale of fresh fruits from treatments M₁S₁, M₁S₂, M₁S₃, M₂S₁, M₂S₂, M₂S₃, M₃S₁, M₃S₂, M₃S₃, M₄S₁, M₄S₂ and M₄S₃ were Rs. 6,00,080/-,

5,12,280/-, 4,46,360/-, 5,04,710/-, 4,12,820/-, 3,39,250/-, 2,80,600/-, 2,04,520/-, 1,78,630/-, 1,65,570/-, 1,34,810/- and 96,810/- respectively. Due to planting of 5000 plants/ha the gross income was increased by 6.19 times over 1111/plants/ha.

Orchard Establishment Cost

The data in Table 1 indicate that the orchard establishment cost was increased from Rs. 75,981/- to Rs. 2, 86,800/- (3.77 times) with increase in population from 1111 (3 × 3 m) to 5000 (2 × 1 m) plants/ha.

Cost of Cultivation for three Season Fruit Crops

The cost of cultivation at cost A was increased from Rs. 1,17,913/- to Rs. 3,69,799/- (3.13 times) with increase in the population from 1111 (3 × 3 m) to 5000 (2 × 1 m) plants/ha. The cost of cultivation at cost B was increased from Rs. 1,49,349/- to Rs. 4,28,807/- (2.87 times) with increase in the population from 1111 (3 × 3 m) to 5000 (2 × 1 m) plants/ha. The cost of cultivation at cost C was increased from Rs. 1,64,284/- to Rs. 4,71,688/- (2.87 times) with increase in the population from 1111 (3 × 3 m) to 5000 (2 × 1 m) plants/ha (Table 1).

Table 1
Various costs involved in economical issues of Orchard Management for high density guava plantation during 2012 and 2013 years

Treatment (Plant density)	Cost of cultivation/ha (Rs)			Per quintal Cost of cultivation (Rs)			
	Gross income/ha (Rs)	At Cost A	At Cost B	At Cost A	At Cost B	At Cost C	
T ₁ (M ₁ S ₁)	600080	369799	428807	471688	616	715	786
T ₂ (M ₁ S ₂)	512280	369799	428807	471688	721	837	921
T ₃ (M ₁ S ₃)	446360	369799	428807	471688	828	961	1056
T ₄ (M ₂ S ₁)	504710	207077	248317	273149	410	494	541
T ₅ (M ₂ S ₂)	414820	207077	248317	273149	499	598	658
T ₆ (M ₂ S ₃)	339250	207077	248317	273149	610	731	805
T ₇ (M ₃ S ₁)	280600	152297	187687	206455	542	668	735
T ₈ (M ₃ S ₂)	204520	152297	187687	206455	744	917	1009
T ₉ (M ₃ S ₃)	178630	152297	187687	206455	852	1050	1155
T ₁₀ (M ₄ S ₁)	165570	117913	149349	164284	712	902	992
T ₁₁ (M ₄ S ₂)	134810	117913	149349	164284	874	1107	1218
T ₁₂ (M ₄ S ₃)	96810	117913	149349	164284	1217	1524	1696

*Control plantation density and unpruned

Cost A = Working capital (includes expenditure on labour, manures and fertilizers, irrigation charges, insecticides and pesticides, incidental charges, repairs) + 6% interest on working capital + land revenue taxes + depreciation cost of farm structure.

Cost B = Cost A + land rental value (10% of Govt. land value) + interest on fixed capital @ 1000/- per annum + amortization cost (refer Appendix II)

Cost C = Cost B + supervision charges @ 10% of cost B

PER QUINTAL COST OF CULTIVATION

It is evident from Table 1 that within increased density from 1111 to 5000 plants/ha the respective per quintal cost of cultivation was drastically reduced from Rs. 1217 to Rs. 410 at cost A, Rs. 1542 to Rs. 492 at cost B and Rs. 1696 to Rs. 541 at cost C.

Profit /Loss Account for Initial Phase of High Density Guava Plantation

The profit/loss account determines the economic feasibility of various spacing's in high density plantings. The net income was worked out as a difference between gross income and cost of cultivation at respective costs during first three fruiting crops depicted in Table 2. The net income at cost C it ranged from minimum of Rs. -67,474/- in treatment M_4S_3 and maximum of Rs. 2,31,560/- in treatment M_2S_1 . cost C it clearly demonstrated that ultra closer spacing treatments (*i.e.* M_1S_1 , M_1S_2 , M_2S_1 and M_2S_2) was in profit indicating positive net income while rest treatments resulted in minimum net income. Particularly only two ultra closer spacing (2×1 m and 2×2 m) treatments (*i.e.* M_1S_1 , M_2S_1 and M_2S_2) only recorded significant profit more than Rs. 1,00,000/- during first three fruiting crops; amongst which treatment M_2S_1 proved its superiority with the profit of Rs 2,31,560/- *i.e.* above to Rs. Two lakh.

BENEFIT

Cost (B : C) Ratio

The efficiency of farm enterprise is commonly measured in terms of Benefit: Cost ratio. It specifically indicates the rate at which net income could be obtained over the investment.

Table 2 clearly showed that increased density from 1111 to 5000 plants/ha demonstrated proportionately higher B : C ratio 0.54 to 1.84 at cost C. The highest B: C ratio (1.84) was received in the treatment M_2S_1 while minimum (0.54) was received in the treatment M_4S_3 .

Table 2
Yield of HDP, guava, profit and loss account B : C ratio during 2012-13.

Treatment (Plant density)	Total Yield per ha. (t)	Gross income/ha (Rs)	Cost of cultivation/ha (Rs)	Net income (Rs)	B : C ratio (t)
$T_1 (M_1S_1)$	20.00	600080	471688	128392	1.27
$T_2 (M_1S_2)$	17.08	512280	471688	40592	1.08
$T_3 (M_1S_3)$	14.88	446360	471688	-25328	0.94
$T_4 (M_2S_1)$	16.82	504710	273149	231561	1.84
$T_5 (M_2S_2)$	13.83	414820	273149	141671	1.51
$T_6 (M_2S_3)$	11.31	339250	273149	66101	1.24
$T_7 (M_3S_1)$	9.35	280600	206455	74145	1.35
$T_8 (M_3S_2)$	6.82	204520	206455	-1935	0.99
$T_9 (M_3S_3)$	5.95	178630	206455	-27825	0.86
$T_{10} (M_4S_1)$	5.52	165570	164284	1286	1.00
$T_{11} (M_4S_2)$	4.49	134810	164284	-29474	0.82
$T_{12} (M_4S_3)$	3.23	96810	164284	-67474	0.54

The results showed that the density had a tremendous effect on the yield of guava. In 2×1 m spacing maximum fruit yield (20.00t/ha) was recorded in two season down pruning intensity while, the lowest yield of 3.23 tons/ha was recorded from the 3×3 m spacing in four season down pruning intensity. The increase in yield was 6.19 times. The greater yield with closer spacings was also recorded in different crops by Phillips (1975), Cripps *et al*, (1975), Westwood *et al.*, (1976), Yadav *et al* (1992) and Shirsath (2013)

The higher yield with closer spacings was mainly due to increased tree number per unit area, since the yield per plant did not differ greatly to offset the difference in plant number.

The results of cost and income for each level of population indicated that during year 2012-13, the net income per hectare ranged from a loss of Rs. -67,474/- in low density (1111 pl/ha.) to a gain of Rs. 2,31,560/- in ultra high density (2500 plants/ha).

In ultra high densities, the expenditure on layout, irrigation management, fertilization, plant protection, harvesting, etc. increased. However, it got leveled off due to higher return and ultimately the close planting turned out to be the most profitable.

The cost per quintal of produce considerably reduced due to increased plant population. The output-input ratio increased from 0.54 to 1.84 indicated that the return per rupee investment is the greatest from the closest planting. Although, the high density planting increased the cost of cultivation per hectare, the much higher yield from close spacing indicated that the added cost is economically feasible.

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