Journal of Plant Studies; Vol. 3, No. 1; 2014
ISSN 1927-0461 E-ISSN 1927-047X
Published by Canadian Center of Science and Education

Effect of Pruning on Flowering and Yield of Jamun cv. Konkan Bahadoli

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Received: October 21, 2013 Accepted: February 10, 2014 Online Published: February 20, 2014

doi:10.5539/jps.v3n1p114 URL: http://dx.doi.org/10.5539/jps.v3n1p114

Abstract

Jamun (*Syzygium cuminii*) is an important fruit crop belongs to family Myrtaceae. It is indigenous to India and West Indies. In Maharashtra (India), it has gained attention in recent years and since last decade farmers have established jamun orchards of variety Konkan Bahadoli. Jamun reaches the height up to 30 m. Fruits are hand plucked as the peel of jamun is very thin. It is necessary to climb jamun tree for harvesting. It is therefore necessary to manage a canopy of jamun which will facilitate the harvesting without affecting the yield level. Hence, the experiment was conducted on canopy management in jamun. Investigation was undertaken at two different locations with two different set of treatments. At each location four treatments which were replicated five times in Randomize Block Design. At location A as well as location B T_2 was superior in respect of per cent plants flowered, per cent flowering intensity and number of flowers per branch let. Similarly, performance of T_2 for number of fruits per branch let, yield per tree (kg/plant) and yield (t/ha) was superior as compared to other treatments. Percentage of sellable fruits was more in T_1 and T_2 as compared to T_3 and T_4. Similarly, time required for harvesting per kg fruits was less in T_1 and T_2 as compared to T_3 and T_4.

Keywords: jamun (*Syzygium cuminii*), Konkan Bahadoli, pruning, flowering, flowering intensity, yield, sellable fruits

1. Introduction

Jamun (*Syzygium cuminii*) is an important fruit crop belongs to family Myrtaceae. It is indigenous to India and West Indies (Patil, Thorat, & Rajasekaran, 2012). In India, it is found from lower ranges of Himalaya to Tamilnadu in south. In Maharashtra, it has gained attention in recent years and since last decade farmers have established jamun orchards of variety Konkan Bahadoli developed by Dr. B. S. Konkan Krishi Vidyapeeth, Dapoli-415712, Dist.-Ratnagiri, (M.S.), India. Jamun grow tall and reaches to a height of 30 m. It flowers from January onwards. The inflorescence in jamun is generally born in axils of one season old branch let. The floral buds assume a club shaped appearance. The inflorescence carry about 35-45 flowers (Mishra & Bajpai, 1975). Flowering occurs from January onwards and fruits are harvested in May and June. The fruit is of economic importance which is oblong, ovoid, green when young and turns pink to shining crimson black as it ripens. Jamun is known for its medicinal properties and effective in treatment of diabetes, mellitus inflammation, ulcers and diarrhea. It is a rich source of anthocyanin. The seeds are claimed to contain alkaloid jambosin and glycoside jambolin which haults the diasthetic conversion of starch into sugar (Swami, Thakor, Patil, & Haldankar, 2012). The fruit bearing branches are situated on the periphery of canopy throughout its height and spread. All fruits in a bunch do not mature at one time. About 4-5 pluckings are required for harvesting ripe fruits in a bunch. The peel of jamun is very thin and hence, fruits are to be essentially harvested by hand plucking. For this, it is necessary to climb jamun tree. Harvesting becomes laborious and 30 to 40 percent fruits are lost during harvesting. Due to differential ripening time no machine is used. Being non climacteric fruit, half ripe fruits do not ripe after plucking. Hand plucking being only inevitable way, managing canopy of tree at proper height is the only way to have proper harvest of clean and ripe fruits with labour economy. There is hardly any work on canopy management of minor but very important fruit crops and jamun is one of them. Efforts were made to

manage the tree by adopting various levels of pruning by the present experiment.

2. Material and Methods

Two different experiments at two locations were conducted during 2012-13. The details are as under Location A- Uniformly grown, 9 years old grafted plants of jamun var. Konkan Bahadoli were selected at Vangaon, Dist. Thane (MS), India, situated at 19° 52' 0" N Latitude and 75° 45' 0" E longitude. The soil is medium black and the climate is hot and humid with high rainfall. Selected jamun plants were of average 6.3 m height with average spread of 5 m. The experiment was conducted in Randomized Block Design with four treatments viz. T_1 - Pruning at 2.7 m height, T_2 - Pruning at 3.6 m height, T_3- Pruning at 4.5 m height and T_4 - control (no pruning). All treatments were replicated five times with a unit of two trees per treatments per replication.

Location B - Uniformly grown, 7 years old grafted plants of jamun var. Konkan Bahadoli were selected at Konkangaon, Dist. Nashik (MS), India, situated at 20° 12' 0" N Latitude and 73° 49' 59" E longitude. The soil is medium black and the climate is hot and dry. All selected plants were of 3.6 m average height with average spread of 3.45 m. The experiment was conducted in Randomized Block Design with four treatments viz. T_1- Pruning at 2.1 m height, T_2- Pruning at 2.7 m height, T_3- Pruning at 3.3m height and T_4- control (no pruning). These treatments were replicated five times with a unit of two trees per treatment per replication.

As per respective treatment, the pruning by heading back was performed in month of October at both locations. The observations viz. plants flower (%), flowering intensity per m^2 (%), number of flowers per branch let, number of fruit per branch let, yield (kg/plant), yield (t/ha), percent sellable fruits and time required for harvest (minutes/kg) were recorded.

2.1 Statistical Analysis

The statistical analysis was performed as per the Annova suggested by Panse and Sukhatme (1997). The "P" value of data was estimated by students paired t-test. Standard Deviation was calculated as per the procedure advocated by Rangaswami (1995).

3. Results and Discussion

Table 1. Effect of pruning on plant flowered (%), flowering intensity (%) and number of flowers per branch let

Location A				Location B			
Treatments	**Plants flowered (%)**	**Flowering intensity Per m^2 (%)**	**No. of flowers per branch let**	**Treatments**	**Plants flowered (%)**	**Flowering intensity Per m^2 (%)**	**No. of flowers per branch let**
T_1 (2.7 m)	75	71.60^b (71.60 ± 4.08)	39.30^b (39.30 ± 4.18)	**T_1 (2.1 m)**	75	38.30^b (38.30 ± 7.52)	38.60^b (38.60 ± 9.68)
T_2 (3.6 m)	75	85.00^a (85.00 ± 5.47)	47.30^a (47.30 ± 4.67)	**T_2(2.7 m)**	83	61.60^a (61.60 ± 14.71)	46.60^a (46.60 ± 4.84)
T_3 (4.5 m)	67	65.00^b (65.0 ± 12.24)	36.60^b (36.60 ± 9.26)	**T_3 (3.3 m)**	50	35.0^b (35.00 ± 5.47)	37.00^b (37.00 ± 7.56)
T_4 (Control)	50	60.00^{bc} (60.00 ± 6.32)	35.30^b (35.30 ± 9.26)	**T_4 (Control)**	50	33.30^b (33.30 ± 10.32)	32.60^b (32.60 ± 7.76)
S.E±	-	2.30	2.58	**S.E±**	-	3.09	2.55
CD @5%	-	6.71	7.54	**CD @5%**	-	9.03	7.46
% P value	-	0.00000119	0.031	**% P value**	-	0.0000059	0.013

At location A, significant variation in flowering due to pruning treatments was recorded. The percentage plants

flowered (75.00), flowering intensity per m^2 (85.00%) and number of flowers per branch let were maximum in treatment T_2. This treatment was significantly superior over other treatments for flowering intensity and number of flowers per branch let. It was followed by T_1 where 75.00 per cent plants were flowered with 71.60 per cent flowering intensity and 39.30 flowers per branch let. In control (T_4), 50 per cent plants recorded flowering with 60 per cent flowering intensity and 35.30 flowers per branch let.

At location B, T_2 was found to be superior where flowering was found on 83 per cent plants with 61.60 per cent flowering intensity and 46.60 flowers per branch let. It was followed by T_1 where 75 per cent plants exhibited flowering with 38.30 per cent flowering intensity and 38.60 flowers per branch let. The control plants recorded lowest magnitudes for all parameters under study. Jamun (*Syzygium cuminii*) is a medium tree with strong central leader, which put forth more vertical growth as compared to horizontal growth making the tree taller. The lower portion of plant remains in shade and the number of branch lets responsible for flowering are remarkably reduced. Control of plant height by decapitation of central leader blocks the vertical growth. Controlled vegetative growth and tree size increases the overall fruit bearing potential. It also increases and enchases yield. Unmanageable tree shape reduces production efficiency (Awasthi & Mehata, 2004). As tree size decreases, shade area within the tree minimizes (Heinicke, 1964). Thus, at location A, where plants were more vigorous the reduction of canopy to 3.6 m was found to be appropriate where as at location B where plants were less vigorous, the canopy height of 2.7 m was found to be adequate for proper flowering. Higher flowering resulted in citrus by pruning upright branches (Goswami, Saxena, & Kurian, 1993). Ram (1993) recorded that in aonla, indeterminate shoots neither flower nor shade the leaves but put forth further vegetative growth of the tree.

Table 2. Effect of pruning on fruits per branch let, yield (kg/plant) and yield (t/ha)

Location A				Location B			
Treatments	**No. of fruits per branch let**	**Yield (Kg/plant)**	**Yield(t/ha)**	**Treatments**	**No. of fruits per branch let**	**Yield (Kg/plant)**	**Yield(t/ha)**
T_1 (2.7m)	6.66^{a} (6.66 ± 1.63)	44.80^{b} (44.80 ± 3.18)	17.90^{b} (17.90 ± 1.27)	**T_1 (2.1 m)**	6.33^{b} (6.33 ± 1.50)	25.33^{a} (25.33 ± 2.87)	13.13^{a} (13.13 ± 5.46)
T_2 (3.6 m)	7.33^{a} (7.33 ± 1.03)	49.30^{a} (49.30 ± 3.32)	19.70^{a} (19.70 ± 1.33)	**T_2(2.7 m)**	7.66^{a} (7.66 ± 0.81)	35.00^{a} (36.6 ± 3.18)	17.26^{a} (17.26 ±17.51)
T_3 (4.5 m)	5.33^{ab} (5.33 ± 1.63)	41.60^{b} (41.60 ± 7.08)	16.70^{b} (16.70 ± 2.83)	**T_3 (3.3 m)**	5.66^{b} (5.66 ± 1.50)	21.33^{ab} (21.33 ± 3.18)	10.51^{ab} (10.51± 4.84)
T_4 (Control)	5.00^{b} (5.00 ± 1.67)	38.30^{bc} (38.30 ± 2.87)	15.30^{bc} (15.30 ± 1.15)	**T_4 (Control)**	4.66^{bc} (4.66 ± 1.03)	18.66^{b} (18.66 ± 7.08)	9.18^{ab} (9.18± 7.44)
S.E±	0.53	1.40	0.56	**S.E±**	0.44	3.46	1.69
CD @5%	1.56	4.09	1.6	**CD @5%**	1.29	10.10	4.96
% P value	0.013	0.00022	0.00023	**% P value**	0.001709	0.000224	0.0302

The performance of treatment T_2 for number of fruits per branch let, yield per plant and yield per hectare was superior to other treatments at location A. It was followed by T_1 where number of fruits per branch let was at par with T_2 but yield (kg/plant) as well yield (t/ha) was significantly inferior to T_2. In T_3, number of fruits per branch let and yield (kg/plant) as well yield (t/ha) were at par to control. At location B, maximum number of fruits per branch let and yield (kg/ plant) as well yield (t/ha) were recorded in T_2 which was at par with T_1 and significantly superior over T_3 and T_4. At both the locations the control plants exhibited lowest number of fruits per branch let, yield (kg/plant) and yield (t/ha).

Thus, it was observed that canopy at the lower side is more productive in jamun at location A where plants were more vigorous and 3.6 m was found to be the best canopy height. The further, reduction in canopy to 2.7 m

resulted in loss in fruitful area which might have lead to reduced yield level. The further increase in height to 4.5 m resulted in increased unproductive vegetation which ultimately reduced the yield. At Location B, where plants were less vigorous the plant height of 2.7 m was found to be appropriate. In pear, highest fruit yield per tree was recorded in pruning at 2.5 m height (Singh, Gill, Dhillon, & Singh, 2012). Similarly, in 'Alphonso' mango, heading back was found beneficial for earliness and getting higher yield (Mistry & Patel, 2009).

Table 3. Effect of pruning on sellable fruits and time required for harvesting

Location A			Location B		
Treatments	**Sellable fruits (%)**	**Time required for harvesting (min/kg)**	**Treatments**	**Sellable fruits (%)**	**Time required for harvesting (min/kg)**
T_1 (2.7m)	85.00^a (85.00 ±0.63)	11.33^a (11.33± 0.81)	**T_1 (2.1m)**	87.00^a (87.00 ± 2.09)	10.33^a (10.33 ± 1.03)
T_2 (3.6m)	84.50^a (84.50 ±2.34)	11.83^a (11.83 ± 0.75)	**T_2(2.7m)**	86.10^a (86.10± 0.75)	11.00^a (11.00 ± 0.89)
T_3 (4.5m)	70.10^b (70.10 ±4.35)	12.33^{ab} (12.33 ± 0.51)	**T_3 (3.3m)**	75.00^b (75.00± 1.78)	12.00^b (12.00 ± 0.63)
T_4 (Control)	60.80^c (60.80 ±0.98)	17.33^b (17.33 ± 1.50)	**T_4 (Control)**	66.60^c (66.60 ± 2.58)	15.50^c (15.50 ± 1.37)
S.E±	0.80	0.28	**S.E±**	0.68	0.30
CD @5%	2.35	0.82	**CD @5%**	1.99	0.88
% P value	0.00000672	0.000533	**% P value**	0.00000120	0.00000011

At both the locations, the percentage of sellable fruits increased as the height of plant decreased. The sellable fruits obtained at location A, were maximum in T_1 (85.00%) which was at par and followed by T_2 (84.50%). Both these treatments were significantly superior over T_3 and T_4. It took 11.33 minutes to harvest 1 kg fruits in T_1 followed by 11.83 minutes in T_2 at location A. Similar trend was noticed at location B. The unpruned plants of control exhibited reduced sellable fruits and recorded longer time for harvesting at both the locations. Jamun is a delicate fruit which is harvested by hand. The dwarf canopy facilitated for easy harvesting which helped for less damage of fruits contributing in getting higher percentage of sellable fruits. The easy harvesting reduced the time required for harvesting. Harvesting the fruits from upper canopy eventually gives a diminishing rate of return, especially if labor cost is relatively high and fruit become more difficult to pick (Thorp & Stowell, 2001).

4. Conclusion

It was concluded that vigorous jamun plants of 6.5 m height beheaded back at 3.6 m and less vigorous jamun plants of 3.6 m height should be pruned to 2.7 m height for obtaining more number of flowered plants, higher flowering intensity, more number of flowers and fruits per branch let and yield as well as for more number of sellable fruits and less time required for harvesting the fruits.

Acknowledgement

We sincerely wish to thank Mr. S.M. Tidke, A/P- Kokangaon Dist. Nasik (MS) and Mr. Vivek Shah, A/P-Vangaon, Dist.- Thane (MS) for providing their orchards and necessary help for conducting these experiments.

References

Awasthi, & Mehata, K. (2004). Strategies for canopy management in tree fruit crops. *Crops Improvement and Production Technology of horticultural crops*. In K. L. Chadda, B. S. Ahloowalia, K. V. Prasad & S.K.Singh (Eds.), (Vol. 1, pp. 320-310).

Goswami, A. M., Saxena, S. K., & Kurian, S. (1993). *High density planting in citrus. In Advances in Proc. Amer. Soc. Horticulture*. In K. L. Chadha & O. P. Pareek, (Eds.). (Vol. 2, pp. 645-48). New Delhi: Malhotra Publishing House.

Heinicke, D. R. (1964). The microclimate of fruit trees. The effect of tree size on light penetration and left area in red delicious apple trees. *Product Amer. Society. Hort. Sci., 83*, 1-11.

Misra, R. S., & Bajpai, P. N. (1975). Studies on Floral Biology of *Jamun* (Java Plum [*Syzygium Cuminii* (L) Skeels], *Indian Journal of Horticulture*.

Mistry, P. M., & Patel, B. N. (2009). Impact of heading back plus paclobutrazol on rejuvenation of old and over crowed Alphonso orchards. *Indian J. Hort, 66*(4), 520-521.

Panse, V. G., & Sukhatme, P. V. (1997). *Statistical methods for agricultural workers*. ICAR Rev. In P. V. Sukhatme & V. N. Amble (Eds.). (pp. 97-156).

Patil, S. S., Thorat, R. M., & Rajasekaran, P. (2012). Utilization of jamun fruit (Syzygium *cumini*) for production of red wine. *Journal of advanced laboratory research in biology, 3*(3), 200-203.

Ram, S. (1993). *Flowering and fruit growth in Indian gooseberry*. In Advances in Horticulture. In K. L. Chadha & O. P. Pareek (Eds.) (Vol. 3, pp. 1237-42). New Delhi: Malhotra Publishing House.

Rangaswamy, R. (1995). *Textbook of agricultural statistics* (2nd ed.). New Age International Publishers.

Singh, S., Gill, P. S., Dhillon, W. S., & Singh, N. (2012). Effect of heading back on photosynthesis, yield and fruit quality in pear. *Notulae Scientia Biologicae, 4*, 90-94.

Swami, S. B.,Thakor, N. J. Patil, M. M., & Haldankar, P. M. (2012). Jamun (*Syzigium cuminii* (Linn.)): A Review of its food and medicinal uses. *Food and Nutrition Sciences*. Retrieved from http:// www.SciPP.org/journal/fns

Thorp, T. G., & Stowell, B. (2001). Pruning height and selective limb removal affect yield of large 'Hass' avocado trees. *Hort Science, 36*(4), 699-702.