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Standardization of harvesting methods in litchi cv. Bombai

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ABSTRACT

Standardization of harvesting methods with different intensity of pruning (non removal of fruiting branch i.e. removal of fruits from the branch only; harvesting of fruits along with the fruiting branch from the base; pruning of 5, 10, 15 and 20 cm branches along with fruiting branch) during harvesting and their effect on flowering and fruit quality was studied at the farmer's field, Beniagram, New Farakka, Murshidabad, West Bengal during 2008. The experiment was conducted in a randomized block design with four replications on 25 years old plant at spacing of 10 x 10m. Pruning of 10 cm branches produced the maximum number of primary (1.94) and secondary rachis (19.58) per panicle followed by pruning of 15 cm branches (1.89 and 18.54). Maximum number of flowers (1499.38) per panicle was noted due to 15 cm pruning and maximum hermaphrodite flowers (390.86) per panicle with lowest sex ratio (2.81) were recorded by pruning of 10 cm branches. Maximum number of initial (61.80 fruits panicle^{-1}) as well as final (20.47 fruits panicle^{-1}) fruit set per panicle was recorded by pruning of 10 cm branches followed by 15 cm branches with 59.73 and 17.51fruits panicle^{-1}, respectively. Maximum fruit weight (22.06g) and size (3.94 x 3.53 cm) were recorded by pruning of 20 cm branches. From the investigation it was suggested that moderate pruning of 10 to 15 cm branches during harvesting is beneficial to obtain higher yield with quality fruits.

Keywords : *Bombai, harvesting, litchi, pruning, yield*

The litchi (*Litchi chinensis* Sonn.) is one of the most important evergreen sub-tropical fruit plants of family sapindaceae having excellent fruit quality, pleasant flavour, juicy flesh (aril) and attractive appearance. Pruning plays an important role in regulating and controlling growth, flowering and fruiting of litchi trees. Fully grown trees are pruned to maintain the canopy height, spread and density required for easy spraying, fruit thinning and harvesting. However, the main reason of pruning of mature litchi trees is to encourage better fruiting by maintaining a balance between vegetative and reproductive growth and synchronous flowering of the two sexes for better pollination and fruit set. In litchi, pruning is automatically done during harvesting. But there is no scientific information regarding the amount and extent of pruning in litchi at harvesting. Therefore the standardization of harvesting methods with different intensity of pruning was conducted in litchi cv. Bombai under this experiment.

MATERIALS AND METHODS

The experiments were studied at the farmer's field, Beniagram, New Farakka, Murshidabad, West Bengal during 2008. The experiment was conducted in a randomized block design with four replications and six treatments *viz*. $\mathbf{T_1}$: Non removal of fruiting branch i.e. removal of fruits from the branch only, $\mathbf{T_2}$: Harvesting of fruits along with the fruiting branch from the base, $\mathbf{T_3}$: Pruning of 5 cm branches along with fruiting branch, $\mathbf{T_4}$: Pruning of 10 cm branches along with fruiting branch, $\mathbf{T_5}$: Pruning of 15 cm branches along with fruiting branch, $\mathbf{T_6}$**:** Pruning of 20 cm branches along with fruiting branch. The experiment was done on 25 years old plant at spacing of 10 x 10m. A nutrient mixture of 100kg FYM, 1000g N_2, 700g P_2O_5 and 1000g K_2O plant^{-1} per year were applied in two split doses. Full amount of FYM, P_2O_5 and half of N_{-2} and K_2O were given after fruit harvest (July). Remaining amount of N_2 and K_2O were applied 15 days after fruit set during March followed by irrigation with ring and basin method. The plant nutrients were supplied in the form of urea, single super phosphate and muriate of potash. Growth of new shoot, emergence of panicle, flowering details, fruit set, fruit yield and morphological characters of harvested fruit were also observed.

RESULTS AND DISCUSSION

Standardization of harvesting methods with different intensity of pruning during harvesting and their effect on flowering and fruit quality was studied in this experiment. The highest number of new shoots were recorded by T_6 *i.e.* pruning of 20 cm branches (2.81) along with fruiting branch followed by T_5 *i.e.* pruning of 10 cm branches (2.78) compared with (T_1) non removal of fruiting branch *i.e.* removal of fruits from the branch only (1.92) in table 1. Similar results were obtained by Joubert (1983). He reported that 50 cm of branch along with fruits at harvesting encouraged terminal shoot formation and improved subsequent fruiting. The linear growth of shoot was found to increase steadily from July

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Table 1: Plant morphological characters due to different intensity of pruning in litchi cv. Bombai

Treatment	No. of new shoot	Panicle emergence (%) (cm)	Panicle length (cm)	Panicle breadth panicle^{-1}	No. of primary rachis panicle^{-1}	No. of secondary rachis
T_1	1.92	45.79 (42.55)*	32.05	15.63	1.40	14.07
T_2	2.11	54.55 (47.65)	31.35	15.11	1.58	15.54
T_3	2.53	59.82 (50.79)	32.53	16.38	1.83	17.79
T_4	2.78	66.68 (54.92)	34.24	16.96	1.94	19.58
T_5	2.47	60.60 (51.20)	34.05	16.84	1.89	18.54
T_6	2.81	56.19 (48.60)	31.71	15.47	1.68	15.16
SEm (±)	**0.38**	**1.00**	**0.90**	**0.69**	**0.17**	**1.04**
LSD(0.05)	**1.09**	**2.90**	**2.59**	**1.98**	**0.49**	**2.99**

*Angular transformed values in parenthesis

Table 2: Effect of pruning on flowering and fruit set in litchi cv. Bombai

Treatment	No. of flowers Panicle^{-1}	Hermaphrodite flowers	Sex ratio (M_1+M_2) : F	Initial fruit set/ panicle	Fruits retention % (at harvest)	Fruits panicle^{-1} (at harvest)
T_1	1296.57	298.18	3.35	45.59	22.58 (28.29)*	10.08
T_2	1343.38	319.34	3.21	50.44	24.64 (29.70)*	12.13
T_3	1395.61	345.08	3.04	55.81	26.91 (31.21)*	14.82
T_4	1488.95	390.86	2.81	61.80	33.27 (35.21)*	20.47
T_5	1499.38	387.06	2.87	59.73	29.54 (32.90)*	17.51
T_6	1357.82	330.12	3.11	54.88	24.55 (29.62)*	13.28
SEm (±)	**38.53**	**11.88**	**-**	**3.38**	**0.95**	**2.28**
LSD(0.05)	**111.27**	**34.31**	**-**	**12.29**	**2.75**	**7.31**

*Angular transformed values in parenthesis

Table 3: Effect of pruning on yield and physical characters of fruit in litchi cv. Bombai

Treatment	Yield plant^{-1} (kg)	Fruit weight (g)	Pulp wt. (g)	Pulp/stone ratio	Fruit length (cm)	Fruit diameter (cm)
T_1	64.06	19.99	14.52	5.33	3.59	3.17
T_2	70.66	20.47	14.91	5.50	3.71	3.28
T_3	79.15	21.01	15.34	5.56	3.75	3.36
T_4	91.59	21.52	15.81	5.96	3.86	3.43
T_5	85.86	21.48	15.76	5.87	3.84	3.42
T_6	75.95	22.06	15.96	5.50	3.94	3.53
SEm (±)	**2.11**	**0.50**	**0.22**	**-**	**0.12**	**0.07**
LSD (0.05)	**6.09**	**1.46**	**0.64**	**-**	**0.34**	**0.19**

to October and thereafter, increment in shoot growth was at a slower rate. Control of tree size and manipulation were achieved effectively by 30 cm pruning during harvesting noticed by Oosthuizen *et. al.*,(1995). However, in the present investigation it was found that moderate pruning has some influences on growth compared with no pruning. Production of panicle in the new shoots was recorded maximum by removal of fruiting panicle along with 10 cm branches (66.68%) while the lowest of (45.79%) was observed from the

plants pruned with non removal of fruiting branches and harvesting of fruits along with the fruiting branch from the base (54.55%). The length and breadth of panicle were also influenced significantly by different pruning treatments. The plants pruned with 10 cm branches during harvesting caused the highest increase in length (34.24 cm) and breadth (16.96 cm) of panicle followed by pruning with 15 cm branches (34.05 and 16.84 cm respectively) in table 1. All the pruning treatments showed significant increase in the number of primary and secondary rachis per panicle and pruning of 10 cm branches produced the maximum number of primary (1.94) and secondary rachis (19.58) per panicle followed by pruning of 15 cm branches (1.89 and 18.54 respectively) in table 1. Due to more number of primary and secondary rachis per panicle, the number of flowers per panicle increased and subsequently an increase in yield was recorded. Maximum number of flowers (1499.38) per panicle was noted due to 15 cm pruning and maximum hermaphrodite flowers (390.86) per panicle with lowest sex ratio (2.81) were recorded by pruning of 10 cm branches in table 2. The number of hermaphrodite flowers increased significantly due to different intensity of pruning. The ratio between staminate and hermaphrodite flowers reduced considerably at moderate pruning level. Initial fruit set per panicle was also influenced by different pruning treatments and maximum number of initial fruit set (61.80) per panicle was recorded by pruning of 10 cm branches followed by 15 cm branches (59.73 fruits panicle^{-1}) while, the lowest was recorded from non-removal of fruiting branch *i.e.* T_1 (45.59 fruits panicle^{-1}) in table 2. The relative abscission pattern at different stages of fruit growth varied significantly in different pruning treatments. The abscission rate was very high at initial stage (two weeks after anthesis) and thereafter declined gradually with the advance of fruit growth and development. Similar abscission pattern in litchi cv. Bombai was recorded by Mitra *et. al.* (2005). Pruning of 10 cm branches recorded the lowest abscission rate and subsequently increased the highest retention percentage of harvestable fruits (33.27%) followed by pruning of 15 cm branches (29.54%). Finally, it was observed that pruning of 10 cm branches at harvesting produced the maximum number of fruits (20.47 fruits) per panicle followed by pruning of 15 cm branches (17.51 fruits per panicle) and minimum (10.08 fruits/ panicle) in non-removal of fruiting branch (T_1) in table-2. These results are also corroborated with the findings obtained by Hasan (1989) who exhibited that different intensity of pruning during harvesting significantly increased flowering as well as fruit set per panicle in the subsequent year as compared to non removal of fruiting branch.

Maximum yield (91.59 kg fruit) per plant was recorded from the plants pruned with 10 cm branches followed by pruning of 15 cm branches (85.86 kg fruits plant^{-1}) and pruning of 5 cm branches (79.15 kg plant^{-1}) and the lowest was in non removal of fruiting branch (64.06 kg plant^{-1}) in table 3. Other pruning treatments also gave the positive response in increasing yield. Similar observation was recorded by Roychoudhury and Banik (1993). Maximum fruit weight (22.06g) and size (3.94 x 3.53 cm) were recorded by pruning of 20 cm branches. Variations in pulp, peel and seed weight were also recorded with different pruning treatments. Maximum pulp weight of fruit (15.96g) was recorded by pruning of 20 cm branches followed by pruning of 10 cm branches (15.81g). Maximum pulp : stone ratio was recorded from the plants pruned with 10 cm branches (5.96) followed by 15 cm branches (5.87) and minimum with non-removal of fruiting branch *i.e.* T_1 (5.33) by the mean value in table 3. Hasan and Chattopadhyay (1995) reported to increase in fruit weight by pruning of 15.24 cm branches along with panicle in different varieties of litchi and moderate to heavy pruning caused maximum increase in length and diameter of fruits. From the results of the present investigation it may be suggested that moderate pruning of 10 to 15 cm branches during harvesting is beneficial to obtain higher yield with quality fruits.

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