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Effect of shoot pruning on flowering, yield and quality of mango cv. Mallika grown in laterite soil

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ABSTRACT

An experiment was conducted from June 2012 to June 2013 in laterite soil of West Bengal, India to evaluate the influence of shoot pruning in different times on flowering, fruit yield and quality of mango cultivar 'Mallika' planted under triangular system of planting. The results revealed that control plants recorded early flower initiation (17th January) with peak period of flowering (2nd February) and low (4.40 %) shoot mortality among the treatments. Shoot pruning gave rise to slightly delay but more uniform flowering comparative to control. Number of laterals produced per pruned shoots (5.2) was highest when pruning was done on 15th July. The shoots pruned on 15th June were recorded maximum shoot length (45.5 cm), fruited panicles per plant^{-1} (66.3%), fruit yield per plant (89.2 kg) total soluble solids (26.1^{0}Brix) and vitamin C content (36.6 mg 100 ml^{-1} juice). Fruit weight was maximum (361 g) recorded from the plants pruned on 15th September. Minimum acidity content was recorded on shoots pruned on 15th August. While no-pruning (control) had lowest fruit weight (281 g) and lower in yield (58.4 Kg) plant^{-1} with lowest total soluble solids (22.9^0 Brix). Conclusively, the 15th June shoot pruning for 'Mallika' could be recommended for restoring the maximum production and good quality fruits in triangular planting system of mango.

Keywords: Flowering pruning, shoot, yield

Mango (*Mangifera indica* L.) is the most important relished fruit crop in the sub-tropical and tropical regions of the India. It is an outstanding source of vitamin A, and also a good source of vitamin C apart from various minerals and vitamins. Mango occupies 35.80 per cent of the total area (25, 00,000 hectares) under fruits in India. The production under mango in India is about 180,02,400 tonnes in West Bengal it is cultivated an area of 92,500 hactares with annual production of 735,000 Million tonnes (Anon., 2013). Mallika variety of mango is gaining popularity in West Bengal due to its medium tree size, regular bearing habit, producing good sizeable fruits with minimum inputs and mid season maturity. Mallika cultivars often show sharp decline in yield and quality after 10 to 12 years of fruiting owing to overlapping or intermingling of branches, poor light interception, poor photosynthetic rate, non-availability of productive shoots and high incidence of pests and diseases (Lal and Mishra, 2007 and Singh *et al*., 2010). It was reported that annual shoot tip pruning in mango provides reliable synchronized flowering in selected shoots year after year in trees thus making them remaining in the same size for many years (Davenport, 2006). This is particularly useful where the trees have a vegetative flush just prior to flowering. The young flushes are cut back to mature wood; the resulting flush should be floral one tip pruning will also reduce tree size (Poffley and Owens, 2006). It not only causes a uniform flush of growth throughout the canopy, it removes growth and flower inhibiting factors in stems derived from the previous season's flowering and fruiting panicles also. No investigation has been made earlier to know the effect of shoot pruning on mango cv. Mallika grown in laterite soil of West Bengal. The present investigation, was therefore, undertaken to recommend correct time of shoot pruning to the fruited shoots for the next coming season and to evaluate the effect of shoot pruning on flowering, fruit yield and fruit quality parameters as affected by different pruning dates.

MATERIALS AND METHODS

Investigation was undertaken in a private farm, Jhargam, West Midnapur district of West Bengal on ten years old mango trees cv. Mallika planted at a spacing of 5.0 × 5.0 x 5.0m in triangular system. The shoots were pruned in different dates during 2012. All the shoots in the trees were pruned after harvesting of previous season crop except the control trees, which were left without any pruning. All the trees were maintained under uniform cultural practices during the entire course of investigation except shoot pruning. The experiment was consisted of five treatments replicated four times with complete randomized block design. Treatment details include:T_1: shoot tip pruned on 15th June, T_2: shoot tip pruned on 15th July,T_3: shoot tip pruned on 15th August, T_4: shoot tip pruned on 15th September,$T_{5:}$ Control (without any shoot pruned of trees).After pruning operations, cut surface of branches were smeared with copper oxy-chloride paste to prevent microbial infections. One hundred shoots were tagged under each treatment for recording the observations. The observation recorded were as follows: percentage of

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dead shoots, shoot length, number of laterals/ pruned shoots, date of flower initiation, peak period of flower, percentage of fruited panicles, total number of fruits plant^{-1}, fruit yield plant^{-1}, fruit weight, total soluble solids, acidity and ascorbic acid content of fruit. Percentage of dead shoots were recorded three months after pruning in each treatment, while average shoot length and average number of laterals produced from each pruned shoots were recorded four months after pruning in each treatment. Ten fruits were taken from each treatment for measuring average fruit weight with the help of balance. The total soluble solids (TSS) of mango juice were determined by using digital refractometer. The titratable acidity was determined by the method given by Association of Analytical Chemists (AOAC, 1990) using Phenolphthalein (1%) as an indicator by titrating against N/10 NaOH. The acidity was expressed in gram of citric acid per 100 ml of juice. Ascorbic acid content of the fruit was estimated by using 2, 6 dichlorophenol-indophenol dye titration method (Ranganna, 2003).

RESULTS AND DISCUSSION

Data from table 1 indicated that shoot pruning was found to be significant for shoot mortality. Maximum shoot mortality (21.90 %) was recorded on 15th August pruned shoots; this was *at par* with 15th July pruned shoots followed by 15th June pruned shoots and minimum (4.40 %) shoot mortality was observed in control. Longest shoot length was recorded (45.50 cm) in 15th June pruned shoots followed by 15th July pruned shoots (32.1 cm). It might be due to early shoot pruning just after harvest facilitates more utilization of nutrients in shoot development rather than their utilization for wood formation during transport from root system to upper branches. Lowest average shoot length (8.50 cm) was recorded in control. Number of laterals pruned shoot^{-1} was maximum (5.2) in15th July shoot pruned trees which is *at par* with all other treatments. A significant response to shoot pruning was observed with regard to flowering of mango cv Mallika. Early flower initiation (17th January) was observed in control followed by 15th September pruned shoots (20th January), and very late in 15th July pruned shoots treatment (3rd February). Peak period of flowering was early in control (2nd February) followed by 15th August pruned shoots (7th February) and very late in 15th July pruned shoots (20th February). Shoot pruned trees generally registered late flower bud initiation and peak period of flowering, while early in control. This might be due to the fact that shoot pruning increased the production of new shoots, which are the source of auxin(s), required for induction of flowering. The late physiological maturity of these new shoots lead to flowering late. The different shoot pruning times significantly improved the number of fruited panicles per branch. The 15th June shoot pruned trees showed maximum number of fruited panicles (66.3) tree^{-1}, while least (43.9) was recorded in un-pruned control trees. The yield which is the most important aspect for fruit growers was found to be significantly improved due to cultural practices like shoot pruning. Shoot pruning operation lead to increase in fruit yield as reported by Yeshitela *et al*. (2003) and Mukunda *et al*. (2006) which might be due to effective diverting of nutrients and water taken up by the tree to productive branches in mango. The highest fruit yield (89.20 kg tree^{-1}) was recorded in 15th June shoot pruned trees followed by 15th July pruned shoots (64.7 Kg tree^{-1}), whereas lowest fruit yield (37.50 kg tree^{-1}) was in 15th September pruned shoots treatment. Mean fruit weight was significantly influenced by different pruning dates and was highest (361 g) in lately pruned 15th September shoots followed by 15th June shoot pruned trees (334 g), while lowest fruit weight (281 g) was recorded in control plant. It may be due to lesser availability of nutrients for fruit growth. Total soluble solids (26.1^{o}Brix) and vitamin C (36.6 mg 100 g^{-1}) were highest in the 15th June shoot pruned trees while lowest TSS (22.9 ^{o}Brix) and ascorbic acid content (24.7 mg 100 g^{-1}) were recorded from unpruned trees. Minimum acidity content was recorded in 15th August shoot pruned trees (0.32 %) and highest (0.53 %) in the 15th September shoot pruned trees (T_4).

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Table 1: Effect of shoot pruning on flowering, yield and quality of mango cv Mallika

Pruning treatments	Shoot mortality (%)	Shoot length (cm)	No. of laterals Shoot^{-1}	Fruited panicles panicles plant^{-1}	Flower initiation (Day)	Peak period of flowering	Yield (Kg plant^{-1})	Fruit weight (g)	TSS (^{0}Brix)	Acidity (%)	Vitamin C (mg 100 g^{-1})
T_1 : 15th June	15.20 (4.02)	45.50	4.60	66.30	1-February	15-February	89.20	334.00	26.10	0.330	36.60
T_2 : 15th July	19.40 (4.51)	32.10	5.20	54.80	3-February	20-February	64.70	290.00	24.30	0.490	29.60
T_3 :15th August	21.90 (4.78)	17.50	4.80	47.40	25-January	7-February	63.70	259.00	24.90	0.320	28.10
T_4:15th September	8.40 (3.06)	18.70	4.00	47.10	20-January	10-February	37.50	361.00	25.00	0.530	24.70
T_5 : Control	4.40 (2.32)	8.50	3.20	43.90	17-January	2-February	58.40	281.00	22.90	0.510	25.30
L. S. D. (0.05)	**0.95 0.09**	**1.08**	**0.22**	**2.385**	-	-	**2.85**	**16.09**	**1.26**	**0.023**	**1.34**
SEm(1)	**0.30 0.03**	**0.34**	**0.07**	**0.765**	-	-	**0.91**	**5.167**	**0.40**	**0.007**	**0.43**
SE(d)	**0.43 0.04**	**0.49**	**0.10**	**1.082**	-	-	**1.29**	**7.307**	**0.57**	**0.010**	**0.61**
C.V.	**4.40 1.70**	**2.85**	**3.29**	**2.950**	-	-	**2.92**	**3.388**	**3.28**	**3.317**	**2.99**

Note: Figure in the parenthesis are square root transformed values.

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