

## The Effect of Panicle Pruning in Mango (*Mangifera indica* L.) to Control Floral Malformation

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### ABSTRACT

The present study was carried out at college farm, Shri Durga Ji P.G. college- Chandeshwer, Azamgarh, Uttar Pradesh 2017-2019. Experimental material consisted of 22 years old, nine bearing mango trees of three cultivars named Dashahari (T1), Chaunsa (T2) and Neelum (T3). All experimental trees received similar cultural practices for fertilizers, irrigation and plant protection during the investigation period. Malformed and fruit carrying panicles (healthy panicles) and barren panicles (whose fruit dropped after betting with a pencil) were pruned on April 02, 16 and May 02. Significant results were recorded regarding month wise emergence of flushes, flush size and number of leaves per flush in these varieties. Emergence of cease flushes, double and triple flushes on terminals of selected varieties was significantly different and the emergence of malformed panicles on these flushes was also significantly different in selected varieties. Emergence of ceased flushes was significantly higher in cultivar Dashahari, followed by Chaunsa and Neelum respectively. Number of double flushes was higher on Chaunsa followed by Neelum and Dashaheri respectively. Dashaheri produced highest number of triple flushes followed by Chaunsa and Neelum respectively. More number of malformed panicles emerged on triple flush shoots than on double and ceased flush shoots respectively. Malformed panicles were highest on triple followed by double and cease flush (respectively) in Chaunsa followed by Dashaheri and Neelum respectively.

**Keywords:** Panicle pruning, Flushing pattern, Mango cultivars and Carryover malformation

### INTRODUCTION

Mango (*Mangifera indica* L.) is one of the most important tropical fruit crops in India as well as in world. In India it occupies 22,63,000 ha area, total production 19,68,70,000 MT productivity 8.7 MT/ha. Moreover, mango fruit is increasingly becoming well established as an item of international trade.

Mango malformation is known to be the most destructive disorders of mango trees which not only negatively effect plant health but reduces yield. Floral malformation reducing the yield directly because malformed panicles seldom produce fruit rather presents an ugly look as they persist long on the tree (Singh & Dhillon, 1993).

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Floral malformation is an intricate disorder directly linked with vegetative growth behavior of mango, annually causing about 37% losses which is reduced to 15% today and seriousness of malady vary from region to region and with the cultivar (Verma et al., 1971). The prevalence of this disorder since long and causing heavy yield losses has attracted many agencies and governments of various mango growing countries to find out the causes to control this enigmatic malady. A lot of useful work has been done on vegetative growth and malformation of inflorescence but the phenomenon is yet least understood due to much complicated growth systems in mango (Mishra et al., 2000). Understanding physiology of floral malformation and its relationship with vegetative growth of mango tree is very important as vegetative growth and floral malformation of mango trees vary greatly depending upon variety (Singh, 1978).

Several researchers attributed this disorder due to certain biotic and/or abiotic factor like viruses, mango hopper as vector, (Narasimhan, 1954), fungi (*Fusarium subglutans*, *F. moniliform*) (Ram et al., 1997), deficiency of certain micro elements and imbalanced synthesis of certain hormones (Singh & Dhillon, 1993). Infestation is more dominant and significant in the ignored and neglected orchards and a tree once infested maintains its level of infestation. Moreover, prolonged hanging of malformed panicles would delay the emergence of lateral shoots which increased malformation percentage pruning of young malformed panicles or shoots reduced infection of fungal mycelium (Tripathi and Ram, 1998). This disorder is highly intricate in its manifestation. On different shoots of a single terminal, few buds produce healthy panicles, while others were malformed.

Similarly, on the same panicle, one rachis contains healthy florets and others are malformed. Such observation point toward complex physiology of malformation and indicates that there is some disorder in the internal system which either stops proper functioning or promotes abnormal functions at

a certain site, as a result normal growth of the panicle is disrupted. Thus, it may be expected that the responsible factor might be localized in the infected site and immediate removal of malformed part would help to check further spread of malformation. So, keeping the plant in healthy condition and removal of malformed panicles may help to reduce disorder. Therefore, the present studies were designed to minimize the incident through pruning of malformed panicles for prompt emergence of healthy flushes which would yield healthy panicles during subsequent year.

### MATERIAL AND METHODS

The trial was conducted at college farm, Shri Durga Ji P.G. college- Chandeshwer, Azamgarh, Uttar Pradesh 2017-2019. Experimental material consisted of 22 years old, nine bearing mango trees of three cultivars named Dashahari (T1), Chaunsa (T2) and Neelum (T3). All these trees exhibited natural occurrence of malformation and alternate bearing. During investigation, all experimental trees treated similar cultural practices for nutrition, irrigation and plant protection. As earlier reported by Muhammad et al. (1999) that prolonged hanging of panicles on shoots delayed the emergence of lateral flushes which further increased percentage of malformed panicles in forthcoming blooming season, so different type of panicles i.e. “malformed and healthy (fruit carrying) were pruned and tagged on April 02, 16 and May 02 to study their vegetative and reproductive growth behavior. To select another type of panicles at each date of pruning, panicles were lightly beaten with lead pencil, the panicles whose fruit dropped, were pruned and tagged as “barren panicles”. Thirty panicles (ten of each type of panicles from each tree) were randomly selected, all around the tree from shoulder height in each term of pruning practice. Emerging flushes (as a result of panicle pruning) on tagged shoots were classified on the basis of their growth habit i.e. April, May, June, July, August or September flushes. Tagged shoots which did not produced

any further growth after its first flush, were categorized as “ceased flushes” and if there were two flushes second on the terminal of first and three flushes produced as third on the terminal of second and second on the terminal of first, tagged shoots, were named as “double and triple flushes”, respectively. Each treatment was replicated three times. Varietal response towards malformation of inflorescence was observed by recording shoot growth of pruned terminals, number of emerging flushes, flush size and number of leaves per flush at fortnightly intervals.

The experiment was analyzed by using to randomized block design (RBD) with factorial arrangements. The experimental data was subjected to analysis of variance (ANOVA) using Genstat Release 8.2 (Lawes Agricultural trust, Rothmsted Experimental Station, UK). Within the analysis of variance, the effects of different treatments and their interaction were assessed. Least significant differences (Fisher’s protected LSD) was calculated following significant F test ( $P=0.05$ ). All assumptions of analysis were checked to ensure validity.

## RESULTS AND DISCUSSION

### Varietal response against month-wise emergence of vegetative growth (flushes)

There were significant differences between varieties regarding month wise emergence of flushes (Table 1). Emergence of flushes in different months and interaction of varieties and month of emergence was also significant. From Table 1 it was clear that highest number of flushes (3.87) sprouted on tagged shoots of cv. Neelum which was statistically at par with cv. Chaunsa followed by Dashahari (1.86 flushes). In month wise emergence of flushes, highest number of flushes (6.17) was recorded in June followed by May which was statistically similar to the emergence of flushes in April and July. Regardless to the variety, there was least number of flushes emerged in September, August and July, respectively. In interaction, maximum flushes (8.61) emerged on terminals of Chaunsa during June which was at par with Neelum during the same month. There were zero emergences of flushes in Chaunsa during September followed by Dashahari with 0.67 flushes during September as shown in Table 1.

**Table 1: Varietal response against month-wise emergence of vegetative growth (flushes)**

Month	Dashahari	Chaunsa	Neelum	Means
April	3.61 bcd	4.17 bc	1.22 ef	3.00 bc
May	2.39 cde	4.05 bc	3.67 bcd	3.37 b
June	2.28 cde	8.61 a	7.61 a	6.17 a
July	0.83 ef	1.83 def	5.17 b	2.60 bc
August	1.39 ef	0.33 ef	4.22 bc	1.98 c
September	0.67 ef	0.00 f	1.33 ef	0.67 d
Means	1.86 b	3.17 a	3.87 a	

Any two means not sharing a letter in common differ significantly at 5% level of significance.

Diversity in flushing pattern of selected cultivars under same agro climatic conditions are in agreement with the findings of Majumdar et al. (1989), Singh & Chadha (1981), Chacko (1984, 1986) and (Singh, 1978) who reported that vegetative growth patterns of mango trees vary greatly depending upon variety. Different in intensity of flushing in selected cultivars might be due inbuilt potential which is proved to be different in different cultivars under same agro climatic

conditions. Different in month wise emergence of flushes in mango cultivars might be due to difference in genetic make up in them.

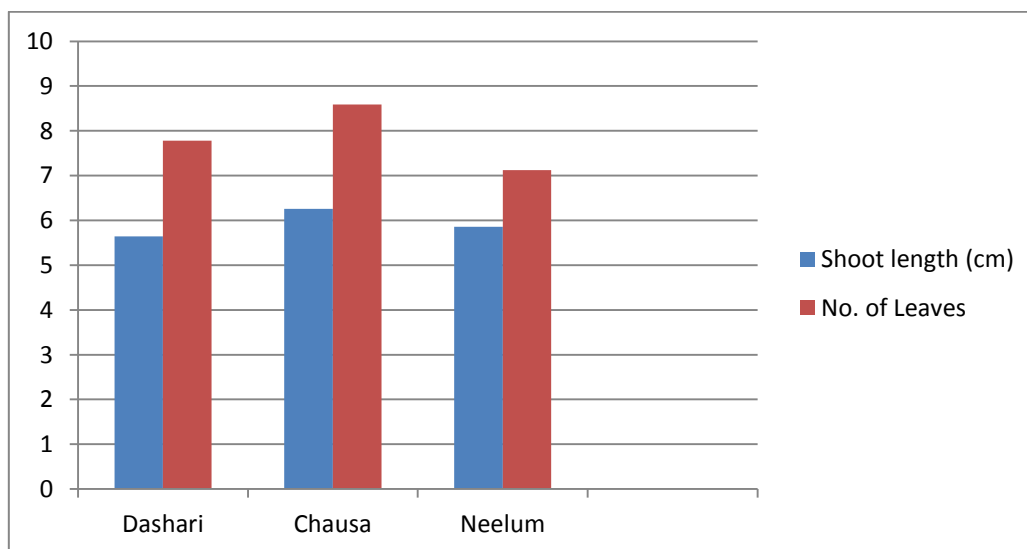
### Effect of pruning of different panicles on month wise emergence of flushes

Emergence of flushes in different months on malformed, healthy and barren panicle pruned terminals was statistically significant while means of flushes emergence these terminals did not significantly vary (Table 2). Highest number of flushes (6.17 flushes) were counted

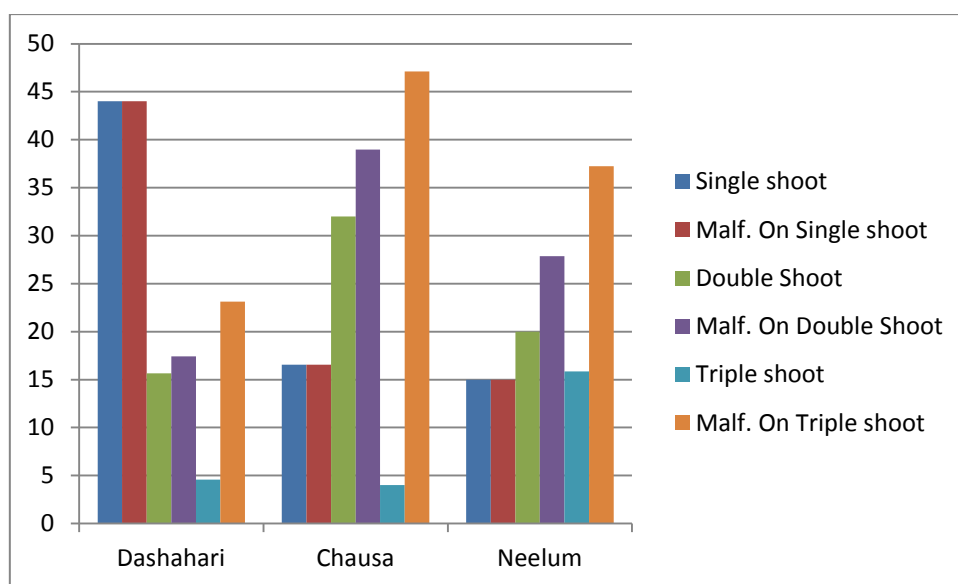
in June followed by May (3.37). There was no statistical difference in the emergence of lateral flushes on panicles pruned terminals during April, May and July as shown in Table 2. In interaction of type of panicle pruned and month wise emergence of flushes, significant number of flushes (7.27) emerged in June on terminals whose fruit barren panicles were pruned. This was at par with healthy panicle pruned terminals during the same month followed by malformed panicle pruned terminals with emergence of lateral flushes of 4.17 during June. Minimum number of flushes sprouted on barren panicle pruned terminals in April. Our results are in accordance with the findings of Willis and Marler (1993).

**Ratio of flush length to leaf number**

Significant difference in flush length to leaf ratio was recorded in selected mango cultivars as shown in Figure 1. The highest length of flush (6.87 cm) and number of leaves (7.76) was recorded on cultivar Chausa followed by Neelum and Dashahari with mean values of 5.86 cm and 5.18cm, respectively. Results further showed a positive correlation between flush lengths to leaf number. Trees of cultivar Chausa were proved more vigorous than rest of the varieties. Results are inline with the statement of (Chanana, 2005; Shrivastava et al., 1987) that flushes vigor and number of leaves is known to vary in different cultivars of mango.



**Fig. 1: Varietal response different mango cultivars to leaf flush ratio.**  
Vertical bars represent mean ( $\pm$ S.E.) of three replications ( $P < 0.05$ )



**Fig. 2: Varietal response of different mango cultivar to flushing and malformation of inflorescence.**  
Vertical bars represent mean ( $\pm$ S.E.) of three replications ( $P < 0.05$ )

### Type of flush and its relation with carryover effect of malformation

There was significant difference between varieties regarding the emergence of “cease flushes”, “double flushes” and “triple flushes”. A large number of cease flushes (43%) was recorded in Dashahari, followed by Chaunsa and Neelum with 17.54% and 11.21%

respectively (Figure 2). The highest percentage of double flushes (30.40%) was observed on Chaunsa followed by Neelum and Dashahari with 17.66% and 14.70% double flushes, respectively. Number of triple flushes was more (13.84%) in Neelum followed by Chaunsa and Dashahari with 2.63% and 2.45% respectively (figure no.2).

**Table 2: Effect of pruning of different panicles on month wise emergence of flushes**

Panicles pruned	Barren panicles	Malformed panicles	Healthy panicles	Means
April flushes	1.61 de	3.67 bc	3.72 bc	3.00 bc
May flushes	3.06 bcd	3.22 bcd	3.83 bc	3.37 b
June flushes	7.27 a	4.17 b	7.06 a	6.17 a
July flushes	2.94 bcd	1.33 de	3.56 bc	2.60 bc
August flushes	2.50 bcde	1.28 de	2.17 cde	1.98 c
September flushes	0.61 e	0.61 e	0.78 e	0.67 d
Means	3.0	2.38	3.52	

### Any two means not sharing a letter in common differ significantly at 5% level of significance.

From above results it is revealed that different cultivars of mango receiving same cultural practices vary significantly in their vegetative growth behavior. It might be due to reason that each mango cultivar have different genetic make than others that is way they differ in flushing pattern and hence vary in intensity of malformation and production. Our results are in line with the finding of Muhammad (2000) who proved that within the same cultivar, individual trees may exhibit variation in behavior pertaining to time and the number of different type of flushes.

More number of malformed panicles emerged on triple flush shoots than on double and ceased respectively (Figure 2). Maximum numbers of malformed panicles (46%) were recorded on triple flush shoots in Chaunsa followed by Neelum and Dashahari with 39% and 21%, respectively. Maximum numbers of malformed panicles (39%) were emerged on double flush shoots in cv. Chaunsa followed by Neelum and Dashahari with 27% and 17% respectively. On cease flush shoots, highest intensity of carryover malformation (31%) was observed in cv. Chaunsa plants followed by Neelum and Dashahari with 21% and 12%, respectively. A perusal of results shows that

the incidence of carryover effect of malformation was highest in cultivar Chaunsa, followed by Neelum and Dashahari, This shows that floral malformation is highly linked with flushing pattern in all cultivars of mango.

Our results proved that more number of malformed panicles emerged on triple flushes followed by double and ceased flushes, regardless to the variety. This shows an agreement with the finding of (Maiti & Sen, 1978) who noted that early cessation of vegetative growth favors increased fruit production and leads to reduction of malformation of inflorescence. It is again speculated that the emergence of more malformed panicles on double and triple flushes could be due to prolonged growth of these shoots, leading to depletion of their carbohydrate reserves, and thus to a reduced number of sufficiently matured terminals for normal development of panicles (Ping Lu, 2005; Sing, 1978; Reddy, 1983). Generally, single flush shoots are more fruitful than double and triple flush shoots. These results supports to the findings of (Muhammad et.al., 1999,) who proved that older flushes (ceased flushes) got maximum maturity and thus got maximum blooming with low intensity of malformation of inflorescence.

**CONCLUSION**

Pruning of panicles found vigorous vegetative growth and number of leaflets with good flush length. The malformation was found maximum in triple flushes followed by double flushes. Controlling of vegetative growth in mango orchards will be helpful to minimize the malformation occurrence.

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