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Studies on the comparative behaviour of different treatments for the control of malformation in mango (*Magnifera indica* L.) blossoms

BRAJ MOHAN* AND SATYA PRAKASH[1]
Department of Horticulture, S.V.Patel University of Agriculture and Technology, MEERUT (U.P.) INDIA

ABSTRACT

In order to find out the most effective control measures of malformation, an experiment was carried out for two years, with a view to study the comparative behaviour of different treatments for the control of malformation in Amrapali mango blossoms. Results revealed that of all the treatments applied in the study, exogenous application of NAA 200 ppm in the first fortnight of October (before bud break stage) and deblossoming at bud burst stage was found to be the most effective treatment (-64.63% reduction over control) than NAA application alone without deblossoming, shoot pruning, acaricide application and stalk pruning for reducing the incidence of floral malformation and improving the fruit yield and quality of 'Amrapali' mango under the climatic conditions of Western Uttar Pradesh. The treatments, namely, NAA application alone without deblossoming (-57.91% reduction over control) and pruning of 20 cm shoot bearing malformed panicle in January (-55.10% reduction over control) were the next best ones in suppressing the disorder. The deblossoming alone without NAA application or NAA application alone without deblossoming and shoot pruning treatments did not prove better than deblossoming in combination with NAA in reducing the incidence of malformation. Among the treatments of shoot pruning, moderate pruning of shoot (20 cm) bearing newly emerged malformed panicle at early stage of panicle emergence was found to be more effective than other treatments of shoot pruning in suppressing the incidence of malformation which is usually very high in early emerging flower buds and panicles.

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Key words : Mango, NAA, Deblossoming, Acaricide, Pruning

INTRODUCTION

Mango (*Mangifera indica* L.) occupies a premium position at national and international levels. It is an important fruit crop of Western Uttar Pradesh, which has the reputation in producing quality mango. In spite of these facts, mango is affected by a number of insects/pests, diseases and physiological disorders at all stages of development, right from the plants in the nursery to the fruits in transit and storage. The most serious diseases and physiological disorders infecting mango trees are powdery mildew, anthracnose, die-back, sooty mold, gummosis, internal fruit necrosis, bacterial disease, malformation, fruit drop, alternate bearing, black tip, scorching of leaves, jelly seed, vivipary and spongy tissue. They cause heavy losses to the orchardists if not managed properly. However, among these diseases and disorders found in mango crop, the century old most important recurring annual problem 'malformation' is undoubtedly posing a serious threat to the mango industry particularly in subtropical regions because of its most destructive and wide spread nature and also because of its effective control yet to be discovered with uniform results (Kumar *et al.*, 1980; Sirohi *et al.*, 2006). Out of two forms of malformation *i.e.* Vegetative and floral, it is the floral malformation which directly affects the productivity. During the past 4 decades many approaches have been tried to initiate possible control measures of this important recurring annual problem. The control measures advocated to date have been either controversial or are impractical for wide scale application under severe disease conditions. Owing to lack of uniformity in recommendation for the control of malformation, the investigation was carried out to study the comparative behavior of different treatments and to find out the most effective control measures of floral malformation among the existing control measures in Amrapali mango, which is the most popular, dwarf, regular and highly susceptible cultivar to the disorder of mango blossom. During the study period, the effectiveness of different chemicals (including acaricide and growth promoter) and mechanical (Deblossoming, shoot pruning and stalk pruning) treatments on the control of malformation was compared.

MATERIALS AND METHODS

The present investigation was conducted at Horticultural Research Centre of Sardar Vallabhbhai Patel

*** Author for correspondence.**
[1]Krishi Vigyan Kendra (S.V.B.P. University of Agriculture and Technology), Baghra, MUZAFFARNAGAR (U.P.) INDIA

University of Agriculture and Technology, Meerut, Uttar Pradesh, consequently for two years from 2005-06 and 2006-07 on 11 years old 'Amrapali' mango trees, which were planted at a distance of 2.5 x 2.5 m. All the trees of uniform growth and vigor were selected for the study and they were maintained healthy by timely and uniformly application of appropriate cultural practices. The trees showing consistent heavy incidence of floral malformation during preceding years were selected for the study. The experiment was laid out using randomized block design. There were a total of 17 treatments including control with three replications under each treatment (Table 1). Each tree was used as a treatment unit.

RESULTS AND DISCUSSION

When compared the effect of chemical and mechanical treatments on per cent increase (+) or decrease (-) in malformation, the data presented in table-2 indicated that, in comparison to control trees, the malformation was significantly most reduced [(-) 64.63 per cent reduction in malformation over control] with foliar application of NAA 200 ppm in October followed by deblossoming (T_2) closely followed by T_1 (foliar application of NAA 200 ppm in October) [(-) 57.91 per cent reduction in malformation over control] and T_7 (removal of malformed panicle with 20 cm shoot in January) [(-) 55.10 per cent reduction in malformation over control], while the malformation was least reduced [(-) 19.92 per cent reduction in malformation over control] with stalk pruning. The acaricide application was found to be less effective [(-) 39.42 per cent reduction in malformation over control] than NAA application with deblossoming [(-) 64.63 per cent reduction in malformation over control] and NAA application (in October) alone without deblossoming [(-) 57.91 per cent reduction in malformation over control] in reducing the incidence of malformation during both the years of study, with the increase in the severity of shoot pruning, the incidence of malformation was decreased considerably upto 20 cm and thereafter it was increased delay in pruning of shoot bearing malformed panicle in the month of February and March, gave less satisfactory results than pruning in January. The scientists, namely, Singh *et al.* (1974), Tripathi and Ram (1998) and Sharma and Singh (2006) have also observed that among all the chemical and mechanical treatments, NAA 200 ppm application in October followed by deblossoming at bud burst stage was found to be best in reducing the incidence of floral malformation. They further reported that the foliar spray of 200 ppm naphthalene acetic acid at bud break stage followed by early deblossoming at bud burst stage not only reduced the malformation but also significantly increased the productivity of malformed trees.. Singh *et al.* (1979) also supported the findings of present study by reporting that NAA 200 ppm application in October at bud break stage followed by deblossoming at bud burst stage reduced the malformation in early and late maturing cultivars, namely, Dashehari, and Samar Behist Chausa, respectively. The significant reduction of floral malformation with exogenous application of NAA suggested its association with depletion of auxin (Pandey *et al*., 1974 and Kumar *et al*., 1980). In the present study, NAA application with deblossoming was more effective than NAA application alone without deblossoming which was found to be the second best treatment in reducing the incidence of malformation.

Though, the pruning of shoot bearing malformed panicles in the study was comparatively less effective than NAA application with or without deblossoming, it could considerably reduce the incidence of malformation over control trees. The positive effect of shoot pruning on the reduction of malformation was also reported by Sirohi *et al.* (2006) who observed that pruning of 20 cm shoot bearing malformed panicles at panicle emergence stage in the month of January was most effective in suppressing the incidence of malformation in cv. DASHEHARI. Other researchers, namely, Campbell and Marlatt (1986), Darvas (1987), Dorsal *et al.* (1976) and Singh *et al.* (1983) had also reported that removal of infected branch/shoot with or without flower shoot reduced malformed and enhanced the production of healthy panicles. Pruning of infected branches (Darvas, 1987), also endorsed as a control measures in the United State (Campbell and Marlatt, 1986). In this study, early shoot pruning in the month of January was found to be more effective than late pruning performed in February and March because of the fact that malformation intensity is usually very high in early emerging flower buds and panicles as reported by Majumdar *et al.* (1970) and Singh *et al.* (1974). Sirohi *et al.* (2006) also got similar response of early (January) shoot pruning in controlling malformation.

Sharma and Singh (2006) and Sirohi *et al.* (2006) also endorsed the findings of present study which reveal the effectiveness of moderate (removal of 20 cm shoot with malformed panicle) pruning in comparison to light and severe pruning in reducing the incidence of malformation.

Conclusion:

The malformation was significantly most reduced with the foliar application of NAA 200 ppm in October and deblossoming (T_2) followed by foliar application of

Table 1 : Effect of chemical and mechanical treatments on the emergence of healthy and malformed panicles in Amrapali mango

Sr. No.	Treatments	Total number of panicles/tree		Number of malformed panicles/tree		Number of healthy panicles per tree		% Healthy panicles per tree		% Malformed panicles per tree	
		2005-06	2006-07	2005-06	2006-07	2005-06	2006-07	2005-06	2006-07	2005-06	2006-07
1.	T_1 Foliar application of NAA 200 ppm in October	419.67	429.00	76.33	76.67	343.33	352.33	81.89	82.15	18.11	17.85
2.	T_2 Foliar application of NAA 200 ppm in Oct. followed by deblossoming	527.33	538.33	84.67	76.33	442.67	462.00	83.95	85.83	16.05	14.17
3.	T_3 Foliar application of acaricide 0.05% immediately after flushing	357.33	361.67	95.67	89.67	261.67	272.00	73.05	75.20	26.95	24.80
4.	T_4 Stalk pruning after fruit harvesting	305.00	284.00	104.33	97.33	200.67	186.67	65.80	65.77	34.20	34.23
5.	T_5 Removal of malformed panicles without shoot in January	340.00	317.33	98.33	88.00	241.67	229.33	71.04	72.31	28.96	27.69
6.	T_6 Removal of malformed panicles with 10 cm shoot in January	360.67	308.33	100.33	78.00	260.33	230.33	72.17	74.73	27.83	25.26
7.	T_7 Removal of malformed panicles with 20 cm shoot in January	376.67	405.00	74.00	76.00	302.67	329.00	80.40	81.24	19.60	18.76
8.	T_8 Removal of malformed panicles with 30 cm shoot in January	299.00	275.00	69.67	62.67	229.33	212.33	76.67	77.11	23.33	22.89
9.	T_9 Removal of malformed panicles without shoot in February	323.00	309.00	95.67	84.33	227.33	224.67	70.37	72.70	29.63	27.30
10.	T_{10} Removal of malformed panicles with 10 cm shoot in February	306.33	292.33	84.33	78.67	222.00	213.67	72.49	73.02	27.51	26.98
11.	T_{11} Removal of malformed panicles with 20 cm shoot in February	311.00	316.33	65.00	61.67	246.67	254.67	79.21	80.48	20.79	19.52
12.	T_{12} Removal of malformed panicles with 30 cm shoot in February	273.33	246.67	68.00	57.00	206.00	189.67	75.31	76.87	24.69	23.13
13.	T_{13} Removal of malformed panicles without shoot in March	305.67	271.67	93.67	86.33	212.00	191.33	69.40	70.42	30.60	29.58
14.	T_{14} Removal of malformed panicles with 10 cm shoot in March	318.33	291.67	94.67	82.33	223.67	209.33	70.14	71.78	29.86	28.22
15.	T_{15} Removal of malformed panicles with 20 cm shoot in March	294.67	285.00	64.33	60.33	230.33	225.33	78.21	79.08	21.79	20.92
16.	T_{16} Removal of malformed panicles with 30 cm shoot in March	269.33	243.33	66.33	59.00	202.33	184.67	75.12	75.87	24.88	24.13
17.	T_{17} Control (No treatment applied)	256.67	233.33	109.00	100.33	147.67	133.00	57.54	57.02	42.46	42.98
	S.E. ±	14.36	8.91	4.63	4.12	11.59	7.65	1.06	0.95	1.06	0.94
	C.D. (P=0.05)	41.54	25.78	13.40	11.93	33.55	22.15	3.08	2.73	3.08	2.71

Table 2 : Effect of chemical and mechanical treatments on per cent increase (+) or decrease (-) in malformation over control in Amrapali mango

Sr. No.	Treatments	% increase(+)/ decrease(-) in malformation over control
1.	T_1-Foliar application of NAA 200 ppm in October	(-) 57.91
2.	T_2-Foliar application of NAA 200 ppm in October followed by deblossoming	(-) 64.63
3.	T_3-Foliar application of acaricide 0.05% immediately after flushing	(-) 39.42
4.	T_4-Stalk pruning after fruit harvesting	(-) 19.92
5.	T_5-Removal of malformed panicles without shoot in January	(-) 33.68
6.	T_6-Removal of malformed panicles with 10 cm shoot in January	(-) 37.85
7.	T_7-Removal of malformed panicles with 20 cm shoot in January	(-) 55.10
8.	T_8-Removal of malformed panicles with 30 cm shoot in January	(-) 45.90
9.	T_9-Removal of malformed panicles without shoot in February	(-) 33.36
10.	T_{10}-Removal of malformed panicles with 10 cm shoot in February	(-) 36.21
11.	T_{11}-Removal of malformed panicles with 20 cm shoot in February	(-) 52.83
12.	T_{12}-Removal of malformed panicles with 30 cm shoot in February	(-) 44.03
13.	T_{13}-Removal of malformed panicles without shoot in March	(-) 29.56
14.	T_{14}-Removal of malformed panicles with 10 cm shoot in March	(-) 32.02
15.	T_{15}-Removal of malformed panicles with 20 cm shoot in March	(-) 50.02
16.	T_{16}-Removal of malformed panicles with 30 cm shoot in March	(-) 42.63
17.	T_{17}-Control (No treatment applied)	-

NAA 200 ppm alone without deblossoming in October (T_1) and pruning of 20 cm shoot bearing malformed panicle in January, while the incidence of malformation was highest in trees received stalk pruning incomparision with chemical and mechanical treatments applied during both the years of study.

Therefore it may be concluded, on the basis of results obtained from the study that of all the treatments applied in the study, exogenous application of NAA 200 ppm in the first week of October (before bud break stage) and deblossoming at bud burst stage was found to be the most effective treatment (-64.63% reduction over control) than NAA application alone without deblossoming, shoot pruning, acaricide application and stalk pruning for reducing the incidence of floral malformation and improving the fruit yield and quality of 'Amrapali' mango under the climatic conditions of Western Uttar Pradesh. The treatments, namely, NAA application alone without deblossoming (-57.91% reduction over control) and pruning of 20 cm shoot bearing malformed panicle in January (-55.10% reduction over control) were the next best ones in suppressing the disorder. The deblossoming alone without NAA application or NAA application alone without deblossoming and shoot pruning treatments did not prove better than deblossoming in combination with NAA in reducing the incidence of malformation.

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