EFFECT OF VARIOUS ORGANIC AND INORGANIC FORMULATIONS ON FRUIT SETTING AND YIELD IN MANGO CV. KESAR

ABSTRACT

The present experiment was carried out at Fruit Research Station, Sakkarbaugh, Department of Horticulture, College of Agriculture, Junagadh Agricultural University, Junagadh (Gujarat). The results of the study indicated that the spraying of MPP 2 % + Boron 0.8 % + *Panchgavya* 3 % was found effective in fruit setting where as spraying of KNO_3 2 % + NAA 50 ppm + *Jeevamrut* 5 % exhibited the minimum fruit drop at marble stage (58.89 %), harvest stage (49.44 %), maximum fruit retention (48.89 %), maximum number of fruits per panicle (2.08), maximum number of fruits per tree (88) and highest fruit yield (13.57 kg/tree and 3.76 t/ha).

Keywords: Mango cv. Kesar, KNO_3, NAA and *Jeevamrut*.

INTRODUCTION

Mango (*Mangifera indica* L.) belongs to the family Anacardiaceae and the genus is believed to be originated in the Indo-Burma region. The fruit is having excellent adaptability and regarded as "King of Fruits" (Radha and Mathew, 2007). Mango is one of the major fruit crop of Asia and has developed its own importance all over the world (Bose *et al*. 2001). Mango is a national fruit of India because of its excellent flavour, delicious taste, delicate fragrance and attractive colour. In mango, heavy fruit drop is an important factor contributing to low fruit yield and sometimes only 0.1% of fruits reached up to maturity. The maintenance of fruit quality is critical while, employing any new technology for increasing production and shelf life. Thus, fruit set in mango is crucial event which greatly influence the ultimate fruit yield.

MATERIALS AND METHODOLOGY

The present investigation was carried out at Fruit Research Station, Sakkarbaugh, Department of Horticulture, College of Agriculture, Junagadh Agricultural University, Junagadh (Gujarat) during 2020-21. Junagadh is situated at 21.5^{o} N latitude and 70.5 ^{o} E longitude with an altitude of 60 meters above the mean sea level on the western side at the foot hills of mountain Girnarsierra. The experiment was laid out with various organic and inorganic formulations in Randomized Block Design with three replications. The experiment comprising of eight treatments including: T_1: Control, T_2: MPP 2 % + NAA 50 ppm + *Novel* 4 %, T_3: KNO_3 2 % + CPPU 10 ppm + Cow urine 25 %, T_4: KNO_3 2 % + NAA 50 ppm + *Jeevamrut* 5 %, T_5: MPP 2 % + Boron 0.8 % + *Panchgavya* 3 %, T_6: MPP 2 % + *Jeevamrut* 5 % + *Novel* 4 %, T_7: Boron 0.8 % + *Jeevamrut* 5 % + *Panchgavya* 3 % and T_8: KNO_3 2 % + Boron 0.8 % + *Jeevamrut* 3 %+ *Panchgavya* 3 % + *Novel* 4 % with three replications. The foliar application of various organic and inorganic formulations applied once during the investigation at pea stage in 'Kesar' mango orchard.

RESULTS

FRUITING PARAMETERS

The results revealed that the effect of various organic and inorganic formulations on fruit set at pea stage per cent, fruit drop per cent at marble and harvesting stage, fruit retention at harvesting stage were recorded during experiment trial and presented in Table 1.

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Effect on fruit set percentage

The maximum fruit set (13.75 %) was noted in T_5 treatment (MPP 2 % + Boron 0.8 %+ *Panchgavya* 3 %), which was statistically at par with T_2 (MPP 2 % + NAA 50 ppm + *Novel* 4 %) (12.75 %), T_4 (KNO_3 2 % + NAA 50 ppm + *Jeevamrut* 5 %) (12.42 %) and T_7 (Boron 0.8 % +*Jeevamrut* 5 %+ *Panchgavya* 3 %) (12.75 %) treatments. The minimum fruit set (10.75 %) was observed in T_8 treatment (KNO_3 2 % + Boron 0.8 % + *Jeevamrut* 3 %+ *Panchgavya* 3 % + *Novel* 4 %).

Effect on fruit drop percentage at marble and harvest stage

The minimum fruit drop per cent at marble stage (58.89 %) was recorded in T_4 treatment (KNO_3 2 % + NAA 50 ppm + *Jeevamrut* 5 %), which was statistically at par with T_1 (Control) (61.36 %), T_3 (KNO_3 2 %+ CPPU 10 ppm + Cow urine 25 %) (63.16 %), T_6 (MPP 2 % +*Jeevamrut* 5 % + *Novel* 4 %) (65.04 %), T_8 (KNO_3 2 % + Boron 0.8 % + *Jeevamrut* 3 %+ *Panchgavya* 3 % + *Novel* 4 %) (60.61 %). The maximum fruit drop at marble stage (69.61 %) was recorded in T_2 treatment (MPP 2 % + NAA 50 ppm + *Novel* 4 %).

Effecton fruit retention percentage

The maximum fruit retention (48.89 %) was observed in treatment T_4 treatment (KNO_3 2 % + NAA 50 ppm + *Jeevamrut* 5 %), which was statistically at par with treatments T_7 (Boron 0.8 % +*Jeevamrut* 5 %+ *Panchgavya* 3 %) (45.28 %) and T_8 (KNO_3 2 % + Boron 0.8 % + *Jeevamrut* 3 %+ *Panchgavya* 3 % + *Novel* 4 %) (43.06 %). Where as, the minimum fruit retention (30.97 %) was noted in T_1 (Control).

FRUIT YIELD PARAMETERS

The results revealed that the effect of various organic and inorganic formulations on number of fruits per panicle, number of fruits per tree, fruit yield (kg/tree) and (t/ha) were recorded during experiment trial and presented in Table 2.

Number of fruits per panicle

The maximum number of fruits per panicle (2.08) was noted in treatment T_4 (KNO_3 2 % + NAA 50 ppm + *Jeevamrut* 5 %) whereas minimum number of fruits per panicle (1.17) was recorded in treatment T_1 (Control).

Number of fruits per tree

The maximum number of fruits per tree (88.00) was observed in treatment T_4 (KNO_3 2 % + NAA 50 ppm + *Jeevamrut* 5 %). The minimum number of fruits per tree (25.00) was observed in treatment T_1 (Control).

Fruit yield (kg/tree)

The highest yield (13.76 kg) was resulted in treatment T_4 (KNO_3 2 % + NAA 50 ppm + *Jeevamrut* 5 %). While the lowest yield (3.56 kg) was resulted in treatment T_1 (Control).

Fruit yield (t/ha)

The highest yield (3.81 t/ha) was observed in treatment T_4 (KNO_3 2 % + NAA 50 ppm + *Jeevamrut* 5 %). Where as the lowest yield (0.99 t/ha) was observed in treatment T_1 (Control).

DISCUSSION

FRUITING PARAMETERS

The fruit set percentage was significantly influenced by the various organic and inorganic formulations. The maximum fruit set was recorded in T_5 treatment (MPP 2 % + Boron 0.8 % + *Panchgavya* 3 %). It means the contribution of mono potassium phosphate along with boron and *panchgavya* was excellent in fruit setting. Results are in line with those of Sruamsiri (1997), Srihari

and Rao (1998), Sarker and Rahim (2013) and Oosthuyse (2015) in mango. This result fully confirms the assertions of Agusti (2003) that the availability of mineral elements becomes critical at the time of flowering and setting and demand must be properly satisfied, as is the case with MPP.

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The fruit drop percentage at marble and harvest stage was significantly influenced by the various organic and inorganic formulations. The minimum fruit drop at marble and harvest stage was noted in T_4 treatment (KNO_3 2 % + NAA 50 ppm + *Jeevamrut* 5 %). These might be due to the increased in fruit set percentage and fruit retention percentage in application of KNO_3, NAA and *Jeevamrut*.

Potassium lowers osmotic potential thus reducing water stress and it is also an essential constituent of carbohydrate synthesis. On the other hand, nitrogen in the experimental plants as a consequence of KNO_3 application enhanced carbohydrate reserves, which ensured better fruit set. All these reduce metabolites and water stress caused by competition among fruitlets, fruit setting and further development. It has been reported by different workers that nitrogen increases auxin content (Addicot, 1970) and auxin plays a decisive role in enhancing fruit set and fruit retention by checking abscission layer formation in fruit stalk. Nitrogen and potash promote the growth of settled fruit and boost up their retention on the tree till harvesting. Potassium nitrate and potassium di-hydrogen phosphate interacted positively with fruits, encouraged their favorable characters and their active implications increased fruit set and fruit retention (Barun, 2006) in mango.

The enhancement effect of NAA sprays on fruit set and fruit retention percentage, number of fruits per tree and yield may be due to auxin is well known as inhibitors for abscissic acid and ethylene which cause fruit drop (Ram and Bose, 2000 in mandarin). The use of NAA may regulate fruit set in many fruit crops and spraying mango trees with NAA increased fruit set and fruit retention percentages (Oksher*et al.*, 1980 and Singh and Ram, 1983), which reflected on increased of number of fruits per tree and yield. The results of NAA regarding their positive effect on fruit set, fruit retention, number of fruits per tree and yield are in harmony with the findings of Chattha*et al.* (1999).

The maximum fruit retention was noted in treatment T_4 treatment (KNO_3 2 % + NAA 50 ppm + *Jeevamrut* 5 %). The application of KNO_3, NAA and *Jeevamrut* in the present investigation has increased the better fruit set, better fruit retention, which might have better due to optimum nutrient availability to the plants. As the number of leaves, leaf area increased by the dry matter production increased. There will be more synthesis of metabolites which transmitted into fruits and resulted significant increase in fruit at all stages of growth and development. The increased fruit retention upto maturity might be due to proper supplementation of the nutrients and prevention in formation of an abscission layer by inhibiting the enzymetic activities with the application of NAA. These findings are in agreement with the findings of Kumar *et al.* (2003), Baghel and Tiwari (2003), Ruby and Brahmachari (2004), Maurya and Singh (1979), Gupta and Brahmachari (2004) in mango and Prasad *et al.* (2012) in strawberry.

FRUIT YIELD PARAMETERS

The maximum number of fruits per panicle, number of fruits per tree, highest yield were noted in treatment T_4 (KNO_3 2 % + NAA 50 ppm + *Jeevamrut* 5 %). In the present investigation, the plant treated with KNO_3 2 %+ NAA 50 ppm + *Jeevamrut* 5 % found the significantly higher fruit retention and number of fruits per tree and ultimately resulted in higher fruit yield which directly contributed to increased number of fruits per panicle. The beneficial effect of nutrients in increasing the fruit yield seems to the increase of fruit retention per panicle and fruit size. Moreover, the applied nutrients (K, N and P) might have stimulated the functioning of a number of

enzymes which in turn increase the translocation and mobilization of metabolites and photosynthates towards the developing fruits, resulted in highest number of fruits and fruit yield (Barun, 2006).

The increase in the fruit yield sprayed with KNO_3 may be due to increase in fruit set and due to synthesis of protein from amino acids for which potassium is essential. The findings of Sarker and Rahim (2013), Reddy and Kurian (2012), Stino and Kelani (2011), Nahar*et al.* (2010) and Kumar and Reddy (2008) in mango are in conformation with the present investigation.

Jeevamrut at 5 % also found increase yield in this present study. The beneficial effects of *Jeevamrut* was reported by Palekar (2006) and swethkumar (2006) was attributed to huge quantity of microbial load and growth harmones which might have enhanced the soil biomass thereby sustaining the availability and uptake of applied as well as native soil nutrients which ultimately resulted in growth and yield of crops.

CONCLUSIONS

The observations recorded from the present investigation revealed that the in mango at pea stage, spraying of MPP 2 % + Boron 0.8 % + *Panchgavya* 3 % was found effective with respect to fruit setting parameters like maximum fruit set percentage, while spraying of KNO_3 2 % + NAA 50 ppm + *Jeevamrut* 5 % was found better for minimum fruit drop percentage at marble and harvest stage, maximum fruit retention percentage at harvest stage, maximum number of fruits per panicle, maximum number of fruits per tree, maximum fruit yield (kg/tree) and (t/ha). Hence, the spraying of KNO_3 2 % + NAA 50 ppm + *Jeevamrut* 5 % at pea stage for obtaining better fruit setting and yield of mango cv. Kesar.

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REFERENCES

Addicot, F. T. (1970). Plant hormones in the control of abscission. *Biology Reviews*, **45**: 485-24.

Agusti, M. (2003). Citricultura. Second edition. *Mundi Prensa editions*, Madrid. 422.

Baghel, B. S. and Tiwari, R. (2003). Individual and integrated effect of urea and NAA on flowering and fruiting of mango (*Mangiferaindica* L.). *South Indian Horticulture*, **51**(1/6): 1-6.

Barun (2006). Effect of Paclabutrazol, potassium nitrate and urea on bearing of mango. Ph. D. Thesis Submitted to Dr.Rajendra Prasad Central Agricultural Univerity, *Bihar*.

Bose, T. K., Mitra, S. K., &Sanyal, D. (2001). Fruits: Tropical and Subtropical (3rded.). Calcutta, India: NayaUdyog.

Chattha, G. A.; Anjum, M. A. and Hussain, A. (1999). Effect of various growth regulators on reducing fruit drop in mango (*Mangiferaindica* L). *Int. J. of Agriculture and Biology*, **4**:288-289.

Kumar, A. M. and Reddy, Y. N. (2008). Preliminary investigations on the effect of foliar spray of chemicals on flowering and fruiting characters of mango cv. Baneshan. *Indian J. of Agricultural Research*,**42**(3): 164-170.

Kumar, P.; Reddy, Y. N. and Srihari, D. (2003). Effect of foliar spray of chemicals on flowering and fruiting of shoot emerging after pruning on mango (*Mangiferaindica* L.) cv. Baneshan. *South Indian Horticulture*, **51**(1-6): 7-11.

Nahar, N.; Choudhary, M. S. H. and Rahim, M. A. (2010). Effect of $KClO_3$, KNO_3 and urea on the flowering and fruiting of mango and longan. *J. of Agroforestry and Environment*,**4**(1): 31-34.

Oksher, A. K.; Ramachandran, C. and Pyhodath, J. S. (1980). Effect of planofix on fruit set in mango. *Agric. Res. J. Kereale*, **17**(1): 105 (*Horticulture Abst.* 50, 5712).

Oosthuyse, S. A. (2015). Spray application of KNO3, low biuret urea and growth regulators and hormones during and after flowering on fruit retention, fruit size and yield of mango cv. Tommy Atkins. *Acta Horticulture*, **1075**: 135-142. DOI: 10.17660/ActaHortic.2015.1075.14

Palekar, S. (2006). Text book on shoonyabandovaladanaisargikakrushi, *Published by SwamyAnand, AgriPrakashana, Bangalore.*

Prasad, M. Minz, M. Kumar, R. and Das, B. (2012). Effect of mulching and PGRs on growth, yield and economics of strawberry (*Fragariaananassa*Duch.) cv. Douglas. *J. of Interacademicia*,**16**(1): 44-55.

Radha, T. and Mathew, L. (2007). Fruit Crops. New Delhi: New India Publishing Agency.

Ram, R. A. and Bose, T. K. (2000). Effect of foliar application of magnesium and micronutrients on growth, yield and fruit quality of mandarin (*Citrus reticulate* Blanco). *Indian J. of HorticultureSci*., **57**(3): 215-220.

Reddy, Y. T. N. and Kurian, R. M. (2012). Effect of pruning and chemicals on flowering and fruit yield in mango cv. Alphonso. *J. Horticulture Sci.,* **7**(1):85-87.

Ruby, R. and Brahmachari, V. S. (2004). Effect of growth substances and calcium compounds on fruit retention, growth and yield of Amrapali mango. *Orissa J. of Horticulture*,**32**(1): 15-18.

Sarker, B. C. and Rahim, M. A. (2013). Yield and quality of mango (*Mangiferaindica* L.) as influenced by foliar application of potassium nitrate and urea. *Bangladesh J. Agril. Res.*,**38**(1): 145-154.

Sarker, B. C. and Rahim, M. A. (2013). Yield and quality of mango (*Mangiferaindica* L.) as influenced by foliar application of potassium nitrate and urea. *Bangladesh J. Agril. Res*., **38**(1): 145-154.

Singh, R. S. and Ram, S. (1983). Studies on the use of plant growth substances for fruit retention in mango cv. Dashehari. *Ind. J. Horticulture*, **40**(3/4): 188.

Srihari, D. and Rao, M. M. (1998). Effect of spraying nutrients and chemicals on vegetative growth and flowering in "off" phase Alphonso mango trees. *Karnataka J. Agril. Sci.*,**11**(1) pp. 257-259.

Sruamsiri, P. (1997) Increase of perfect flower and fruit set in mango cv. Kaew by using foliar fertilizer. ISHS *ActaHorticulturae*, 992: IX International Mango Symposium.

Stino, G. R. and Kelani, R. A. (2011). Productivity and fruit quality of three mango cultivars in relation to foliar sprays of calcium, zinc, boron or potassium. *J. of Horticultural Science and Ornamental Plants*,**3**(2): 91-98.

Vasanthkumar, H. H. R. (2006). Jeevamrut slurry preparation. *Siri Samruddhi*, 4-5.

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Table- 1: Effect of various organic and inorganic formulations on fruit setting parameters of mango cv. Kesar

Sr. no.	Treatment	Fruit setting parameters			
		Fruit set (%)	**Fruit drop at marble stage (%)**	**Fruit drop at harvest stage (%)**	*** Fruit retention (%)**
1.	T_1	11.08	61.36	72.08	30.97
2.	T_2	12.75	69.61	60.83	39.17
3.	T_3	11.92	63.16	61.53	38.47
4.	T_4	12.42	58.89	49.44	48.89
5.	T_5	13.75	65.92	63.33	36.67
6.	T_6	11.50	65.04	61.67	38.33
7.	T_7	12.75	69.00	54.72	45.28
8.	T_8	10.75	60.61	58.61	43.06
	S. Em	**0.582**	**2.187**	**2.974**	**2.746**
	C. D. at 5%	**1.66**	**6.23**	**8.47**	**7.82**
	C. V. %	**8.32**	**5.90**	**8.55**	**11.86**

* Fruit retention (%) at harvest stage.

Table- 2: Effect of various organic and inorganic formulations on fruit yield parameters of mango cv. Kesar

Sr. no.	Treatment	Fruit setting parameters			
		Number of fruits per panicle	Number of fruits per tree	Fruit yield (kg/tree)	Fruit yield (t/ha)
1.	T_1	1.17	25.00	3.56	0.99
2.	T_2	1.50	26.00	4.59	1.27
3.	T_3	1.58	45.67	8.21	2.27
4.	T_4	2.08	88.00	13.76	3.81
5.	T_5	1.58	47.67	7.79	2.16
6.	T_6	1.67	73.00	11.78	3.26
7.	T_7	1.75	32.67	5.77	1.60
8.	T_8	1.58	25.33	4.99	1.38
	S. Em	**0.112**	**2.647**	**0.405**	**0.112**
	C. D. at 5%	**0.32**	**7.54**	**1.15**	**0.32**
	C. V. %	**12.01**	**10.10**	**9.29**	**9.29**