



# Effect of Various Organic and Inorganic Formulations on Fruit Setting and Yield in Mango cv. Kesar

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## Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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## 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 monopotassium phosphate 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; *Jeevamrut*.

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## 1. 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” [1]. “Mango is one of the major fruit crop of Asia and has developed its own importance all over the world” [2]. “Mango is a national fruit of India because of its excellent flavour, delicious taste, delicate fragrance and attractive colour” [2]. 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.

## 2. MATERIALS AND METHODS

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° N latitude and 70.5° E longitude with an altitude of 60 meters above the mean sea level on the western side at the foot hills of mountain Girnar Sierra. The experiment was laid out with various organic and inorganic formulations in Randomized Block Design with three replications. The experiment comprised of eight treatments including: T<sub>1</sub>: Control, T<sub>2</sub>: Monopotassium phophate 2 % + NAA 50 ppm + *Novel* 4 %, T<sub>3</sub>: KNO<sub>3</sub> 2 % + CPPU 10 ppm +

Cow urine 25 %, T<sub>4</sub>: KNO<sub>3</sub> 2 % + NAA 50 ppm + *Jeevamrut* 5 %, T<sub>5</sub>: Monopotassium phophate 2 % + Boron 0.8 % + *Panchgavya* 3 %, T<sub>6</sub>: Monopotassium phophate 2 % + *Jeevamrut* 5 % + *Novel* 4 %, T<sub>7</sub>: Boron 0.8 % + *Jeevamrut* 5 % + *Panchgavya* 3 % and T<sub>8</sub>: KNO<sub>3</sub> 2 % + Boron 0.8 % + *Jeevamrut* 3 % + *Panchgavya* 3 % + *Novel* 4 % with three replications. The foliar application of various organic and inorganic formulations applied 15<sup>th</sup> February, 2019 during the investigation at pea stage in ‘Kesar’ mango orchard.

## 3. RESULTS

### 3.1 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.

#### 3.1.1 Effect on fruit set percentage

The maximum fruit set (13.75 %) was noted in T<sub>5</sub> treatment (MPP 2 % + Boron 0.8 % + *Panchgavya* 3 %), which was statistically at par with T<sub>2</sub> (MPP 2 % + NAA 50 ppm + *Novel* 4 %) (12.75 %), T<sub>4</sub> (KNO<sub>3</sub> 2 % + NAA 50 ppm + *Jeevamrut* 5 %) (12.42 %) and T<sub>7</sub> (Boron 0.8 % + *Jeevamrut* 5 % + *Panchgavya* 3 %) (12.75 %) treatments. The minimum fruit set (10.75 %) was observed in T<sub>8</sub> treatment (KNO<sub>3</sub> 2 % + Boron 0.8 % + *Jeevamrut* 3 % + *Panchgavya* 3 % + *Novel* 4 %).

**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 <sub>1</sub>	11.08	61.36	72.08	30.97
2.	T <sub>2</sub>	12.75	69.61	60.83	39.17
3.	T <sub>3</sub>	11.92	63.16	61.53	38.47
4.	T <sub>4</sub>	12.42	58.89	49.44	48.89
5.	T <sub>5</sub>	13.75	65.92	63.33	36.67
6.	T <sub>6</sub>	11.50	65.04	61.67	38.33
7.	T <sub>7</sub>	12.75	69.00	54.72	45.28
8.	T <sub>8</sub>	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

### 3.1.2 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<sub>4</sub> treatment (KNO<sub>3</sub> 2 % + NAA 50 ppm + *Jeevamrut* 5 %), which was statistically at par with T<sub>1</sub> (Control) (61.36 %), T<sub>3</sub> (KNO<sub>3</sub> 2 % + CPPU 10 ppm + Cow urine 25 %) (63.16 %), T<sub>6</sub> (Mono potassium phosphate 2 % + *Jeevamrut* 5 % + *Novel* 4 %) (65.04 %), T<sub>8</sub> (KNO<sub>3</sub> 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<sub>2</sub> treatment (Monopotassium phosphate 2 % + NAA 50 ppm + *Novel* 4 %).

### 3.1.3 Effect on fruit retention percentage

The maximum fruit retention (48.89 %) was observed in treatment T<sub>4</sub> treatment (KNO<sub>3</sub> 2 % + NAA 50 ppm + *Jeevamrut* 5 %), which was statistically at par with treatments T<sub>7</sub> (Boron 0.8 % + *Jeevamrut* 5 % + *Panchgavya* 3 %) (45.28 %) and T<sub>8</sub> (KNO<sub>3</sub> 2 % + Boron 0.8 % + *Jeevamrut* 3 % + *Panchgavya* 3 % + *Novel* 4 %) (43.06 %). Whereas the minimum fruit retention (30.97 %) was noted in T<sub>1</sub> (Control).

## 3.2 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.

### 3.2.1 Number of fruits per panicle

The maximum number of fruits per panicle (2.08) was noted in treatment T<sub>4</sub> (KNO<sub>3</sub> 2 % + NAA 50 ppm + *Jeevamrut* 5 %) whereas minimum number of fruits per panicle (1.17) was recorded in treatment T<sub>1</sub> (Control).

### 3.2.2 Number of fruits per tree

The maximum number of fruits per tree (88.00) was observed in treatment T<sub>4</sub> (KNO<sub>3</sub> 2 % + NAA 50 ppm + *Jeevamrut* 5 %). The minimum number of fruits per tree (25.00) was observed in treatment T<sub>1</sub> (Control).

### 3.2.3 Fruit yield (kg/tree)

The highest yield (13.76 kg) was resulted in treatment T<sub>4</sub> (KNO<sub>3</sub> 2 % + NAA 50 ppm + *Jeevamrut* 5 %). While the lowest yield (3.56 kg) was resulted in treatment T<sub>1</sub> (Control).

### 3.2.4 Fruit yield (t/ha)

The highest yield (3.81 t/ha) was observed in treatment T<sub>4</sub> (KNO<sub>3</sub> 2 % + NAA 50 ppm + *Jeevamrut* 5 %). Whereas the lowest yield (0.99 t/ha) was observed in treatment T<sub>1</sub> (Control).

## 4. DISCUSSION

### 4.1 Fruiting Parameters

The fruit set percentage was significantly influenced by the various organic and inorganic formulations. The maximum fruit set was recorded in T<sub>5</sub> 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 Sarker and Rahim [3] and Oosthuysen [4] in mango. This result fully confirms the assertions of Agusti [5] 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 monopotassium phosphate.

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<sub>4</sub> treatment (KNO<sub>3</sub> 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<sub>3</sub>, 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<sub>3</sub> 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 and auxin plays a decisive role in enhancing fruit set and fruit retention by checking abscission layer formation in fruit stalk” [6]. “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 in mango” [7].

**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 <sub>1</sub>	1.17	25.00	3.56	0.99
2.	T <sub>2</sub>	1.50	26.00	4.59	1.27
3.	T <sub>3</sub>	1.58	45.67	8.21	2.27
4.	T <sub>4</sub>	2.08	88.00	13.76	3.81
5.	T <sub>5</sub>	1.58	47.67	7.79	2.16
6.	T <sub>6</sub>	1.67	73.00	11.78	3.26
7.	T <sub>7</sub>	1.75	32.67	5.77	1.60
8.	T <sub>8</sub>	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

“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” [8]. “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, which reflected on increased of number of fruits per tree and yield” [9,10]. “The results of NAA regarding their positive effect on fruit set, fruit retention, number of fruits per tree and yield are in harmony” Chattha et al. [11].

The maximum fruit retention was noted in treatment T<sub>4</sub> treatment (KNO<sub>3</sub> 2 % + NAA 50 ppm + *Jeevamrut* 5 %). The application of KNO<sub>3</sub>, 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 enzymatic activities with the application of NAA. These findings are in agreement with the findings of Kumar et al. [12], Baghel and Tiwari [13], Ruby and Brahmachari [14], Maurya and Singh (1979), Gupta and Brahmachari (2004) in mango and Prasad et al. [15] in strawberry.

## 4.2 Fruit Yield Parameters

The maximum number of fruits per panicle, number of fruits per tree, highest yield were noted in treatment T<sub>4</sub> (KNO<sub>3</sub> 2 % + NAA 50 ppm + *Jeevamrut* 5 %). In the present investigation, the plant treated with KNO<sub>3</sub> 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” [7].

The increase in the fruit yield sprayed with KNO<sub>3</sub> 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 [3], Reddy and Kurian [16], Stino and Kelani [17], Nahar et al. [18] and Kumar and Reddy [19] 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 [20] and Vasanthkumar [21] was attributed to huge quantity of microbial load and growth hormones 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.

## 5. CONCLUSIONS

The observations recorded from the present investigation concluded that mango at pea stage spray of Monopotassium phosphate 2 % + Boron 0.8 % + *Panchgavya* 3 % was found effective with respect to fruit setting parameters like maximum fruit set percentage, while spraying of  $\text{KNO}_3$  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  $\text{KNO}_3$  2 % + NAA 50 ppm + *Jeevamrut* 5 % at pea stage for obtaining better fruit setting and yield of mango cv. Kesar.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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