

# Effect of spraying of different chemicals on the flowering and fruiting of seven mango varieties

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**Abstract:** An experiment was conducted in factorial Randomized Complete Block Design (RCBD) with three replications at the Germplasm Centre (GPC) of Fruit Tree Improvement Project (FTIP), Department of Horticulture, Bangladesh Agricultural University, Mymensingh during the period from January to September, 2004 to determine the effect of different chemicals on the flowering and fruiting of seven mango varieties. Among the seven mango varieties the highest number of inflorescences per plant were recorded on Hybrid-10 treated with KNO<sub>3</sub> (80 g/L) and the lowest was found in untreated Mixed Special plant. The highest number of fruits obtained from Amrapali treated with NAA (40 ppm).

**Keywords:** Effect, chemicals, flowering, fruiting, mango varieties

## Introduction

Most of the varieties in Bangladesh are alternate bearer with large canopy. Regular bearer variety with small canopy is very important for mango. Some exotic mango varieties such as Amrapali, Mallika, Hybrid-10, Shindu etc. including hybrid mangoes are gaining popularity in Bangladesh. Low productivity due to relative alternate bearing, flower malformation, low fruit set and excessive fruit drop are main problem in mango. To overcome this problem, Oosthuysen (1993), successfully applied Potassium nitrate, Urea and NAA. Many investigator found that spraying mango trees with NAA at different concentrations (20, 25 and 40 ppm) increased fruit set percentage and fruit retention (Prasad and Pathak, 1974; Oksher *et al.*, 1980; Singh and Ram, 1983). Under Bangladesh condition this chemical were not tried earlier for higher mango production. In this study, different chemicals were tested to observe its effect on the flowering of some selected mango varieties.

## Materials and Methods

The present study was carried out at the Germplasm Centre (GPC) of Fruit Tree Improvement Project (FTIP), Department of Horticulture and the Laboratory of the Department of Biochemistry, Bangladesh Agricultural University, Mymensingh during the period from January to September, 2004. In the experiment seven mango varieties such as Gopalbhog, Mallika, Sraboni, Mixed special, Shindhu, Hybrid-10 and Amrapali were taken and different chemicals like potassium nitrate (40 and 80 g/L), NAA (40 and 80 ppm), GA<sub>3</sub> (40 and 80 ppm), Urea (1%, 3% and 6%), KH<sub>2</sub>PO<sub>4</sub> (1%) and combination of KH<sub>2</sub>PO<sub>4</sub> (1%) + Urea (1%) were used. The experiment was laid out in a Randomized Complete Block Design (RCBD) with three replications. The total number of plants was  $7 \times 12 \times 3 = 252$ , one plant considered as an individual replication. Planting was in hexagonal system giving spacing of 3 m. Data was collected on different parameters such as number of

inflorescences per plant, number of fruits per plant and individual fruit weight. Intercultural operations were done whenever necessary. Different Chemicals were sprayed once before inflorescences bloom. Harvesting was done periodically depending on the maturity of seven mango varieties from May 30 to June 30, 2004. The recorded data on different parameters of the study were analyzed statistically using MSTAT computer package programme. Analyses of variances of different parameters were performed by 'F' variance test. The mean of different parameters was compared by LSD as described by Gomez and Gomez (1984).

## Results and Discussion

**Number of inflorescences per plant :**On the basis of flowering and fruiting of different mango varieties, the months of December to July may be termed as 'on' season. It was observed that during 'on' season inflorescences started to open most of all varieties from 10<sup>th</sup> February, except Mixed Special (from 20<sup>th</sup> February) and gradually increased up to 22<sup>nd</sup> March. Among the varieties, there were significant differences in respect of number of inflorescences per plant In 'on' the highest number of inflorescences (88.89) was observed in the variety Hybrid -10 followed by Gopalbhog (59.72) and the lowest (20.78) in Mixed Special (Table 1). This difference was probably for their genetical characters of the mango which varies from variety to variety.

Effect of different chemical treatments on number of inflorescences per plant showed significant difference. It was observed that inflorescence initiation was started in all chemical treatments from 10<sup>th</sup> February. The highest number of inflorescences (79.81) was observed in NAA (40 ppm) followed by KNO<sub>3</sub> (80 g/L) (74.24), whereas the lowest number (7.33) of inflorescences per plant was found in untreated (control) plants (Table 2). The results are in agreement with the findings of Rawash *et al.* (1998).

The combined effects of varieties and chemical treatments in respect of number of inflorescences per plant were found to be significant. At 10<sup>th</sup> February, the highest (40.00) number of inflorescences per plant was found in Hybrid-10 sprayed with NAA (40ppm) which was statistically identical with the same variety (38.67 and 37.33) treated with Urea (3%) and KNO<sub>3</sub> (80 g/L) respectively and the lowest number (0.67) was found in untreated (control) Mallika and Amrapali. At the same date, in Mixed Special, there was no inflorescence initiation in any chemical treatments.

Again, at 22<sup>nd</sup> March the highest (120.00) the number of inflorescences per plant was observed in Hybrid -10 sprayed with KNO<sub>3</sub> 80g/L. (Plate 1) which was statistically identical with the same variety (118.00) in NAA 40 ppm treated plants. The lowest number of inflorescences (3.33) was found in Mixed Special with untreated plant.

Table 1. Effect of chemicals spraying on different mango varieties

Variety	Number of inflorescences/plant at different date during Feb.-march 2004				
	10/02	20/02	02/03	12/03	22/03
Gopal bhog	20.89	34.19	43.92	53.22	59.72
Mallika	40.69	20.31	27.50	36.53	44.22
Sraboni	9.00	13.03	16.28	19.39	21.89
Mixed Special	0.00	8.00	12.28	16.89	20.78
Shindhu	13.92	19.81	30.44	36.97	42.81
Hybrid -10	26.92	43.33	63.36	79.78	88.89
Amrapali	11.62	16.92	22.06	25.86	30.83
LSD(0.01)	1.927	2.543	5.585	5.539	5.511

Table 2. Comparative efficiency of different chemicals.

Chemicals	Number of inflorescences/plant at different date during Feb.-march 2004				
	10/02	20/02	02/03	12/03	22/03
KNO <sub>3</sub> (40g/L)	14.43	23.10	30.29	39.57	43.43
KNO <sub>3</sub> (80g/L)	21.29	35.52	53.29	68.40	74.24
NAA (40ppm)	24.86	36.57	47.14	71.10	79.81
NAA (80ppm)	18.38	28.29	41.10	50.90	59.00
GA <sub>3</sub> (40ppm)	6.62	11.00	15.52	19.14	22.95
GA <sub>3</sub> (80ppm)	9.10	15.48	21.33	25.10	29.86
Urea (1%)	16.62	29.38	40.29	46.67	51.62
Urea (3%)	23.19	33.90	46.57	57.71	66.52
Urea (6%)	12.38	19.05	26.48	32.19	39.14
KH <sub>2</sub> PO <sub>4</sub> (1%)	7.95	13.33	19.19	23.00	25.67
KH <sub>2</sub> PO <sub>4</sub> (1%)+Urea (1%)	10.71	18.33	24.38	29.24	32.29
Control	0.86	2.76	4.43	5.95	7.33
LSD(0.01)	2.523	3.329	7.313	7.253	7.216

Quijada *et al.* (2000) reported that KNO<sub>3</sub> sprayed plants produced the greatest number of inflorescences per plant. The variation on the number of inflorescences per plant in treated with different chemicals among the varieties may be due to genetical potential of the varieties.

**Number of fruits per plant:** The differences in respect of number of fruits per plant among different varieties were significant. It was observed that the fruiting behaviour of different mango varieties was similar to flowering. Among the varieties, pea sized fruits were started to count from 1<sup>st</sup> March and continued up to harvest (30<sup>th</sup> May, 20<sup>th</sup> June and 30<sup>th</sup> June). It was found that inflorescence initiation to pea sized fruits development; 18 days were required for all

varieties except Mixed Special. At 1<sup>st</sup> March, the highest (10.25) number of fruits per plants was observed in variety Gopalbhog followed by Hybrid- 10 (9.25) and the lowest was observed in Sraboni (4.58). At 30<sup>th</sup> May, 20<sup>th</sup> June and 30<sup>th</sup> June the highest number (11.47), (8.92) and (8.50) of fruits was observed in variety Amrapali. At 30<sup>th</sup> May and 20<sup>th</sup> June the lowest number (4.72) and (3.56) was observed in Mixed Special. There were some late varieties, so harvesting continued up to 30<sup>th</sup> June and in that day the lowest number was (3.94) obtained from Sraboni (Table 3).

Effect of different chemical treatments on number of fruits per plant showed statistical difference.

Table 3. Varietal differences as regarded to number of fruits/plant recorded at different date

Variety	Number of fruits/plant at different date during Feb.-march 2004												
	01/03	10/03	20/03	30/03	10/04	20/04	30/04	10/05	20/05	30/05	10/06	20/06	30/06
Gopalbhog	10.25	23.50	25.50	20.54	15.44	12.42	11.28	9.72	7.44	8.50	0.00	0.00	0.00
Mallika	7.08	11.50	15.47	13.47	12.17	10.92	9.14	8.19	6.25	4.83	3.83	2.94	0.00
Sraboni	4.58	7.25	10.53	9.61	9.00	8.47	7.94	7.03	6.39	5.56	4.92	4.47	3.94
Mixed Special	0.00	7.11	10.33	15.28	14.11	12.36	10.83	8.86	6.28	4.72	3.56	3.08	0.00
Shindhuh	7.19	15.64	22.72	14.14	23.19	19.61	16.92	14.94	13.00	11.47	9.97	8.67	8.11
Hybrid -10	9.25	17.69	20.94	17.89	15.83	12.58	10.08	8.83	7.78	6.64	5.64	2.33	0.00
Amrapali	6.14	11.22	14.08	17.53	16.31	15.00	13.92	12.89	11.56	10.44	9.64	8.92	8.50
LSD(0.01)	0.469	1.117	1.407	2.809	1.312	1.077	1.095	0.798	0.832	0.976	0.586	0.375	0.745

0.86 and 0.62) was found in control (Table 4).

At 1<sup>st</sup> March, the highest number of fruits (16.81) was observed in NAA (40 ppm) followed by KNO<sub>3</sub> (80 g/L) (12.48), the lowest number of fruits was observed in untreated plants. At 30<sup>th</sup> May, 20<sup>th</sup> June and 30<sup>th</sup> June, the highest (17.19, 10.24 and 7.64). In that dates, the lowest (2.00,

The present study, confirm the findings of Rawash *et al.* (1998) who reported that after spraying with NAA (40 ppm) on mango trees increased number of mature fruits per inflorescence and number of mature fruits per trees were recorded.

Table 4. Effect of different chemicals on number of fruits/plant at different date

Chemicals	Number of fruits/plant at different date during Feb.-march 2004												
	01/03	10/03	20/03	30/03	10/04	20/04	30/04	10/05	20/05	30/05	10/06	20/06	30/06
KNO <sub>3</sub> (40g/L)	6.81	12.00	15.67	16.33	15.24	13.95	12.52	10.86	9.24	7.67	5.33	4.38	2.62
KNO <sub>3</sub> (80g/L)	12.48	27.43	31.05	31.43	26.29	22.14	19.62	17.43	13.81	13.04	10.86	9.24	6.00
NAA (40ppm)	16.81	35.62	47.62	49.00	40.14	32.05	26.43	23.48	19.43	17.19	12.14	10.24	7.67
NAA (80ppm)	7.52	13.67	17.24	18.00	15.62	14.24	12.74	11.62	10.05	8.81	6.62	5.81	4.29
GA <sub>3</sub> (40ppm)	1.71	4.33	5.94	7.14	6.52	5.95	5.48	4.62	3.90	3.29	2.24	1.67	0.95
GA <sub>3</sub> (80ppm)	2.86	6.38	8.76	9.19	8.52	6.86	6.24	5.38	4.43	3.62	2.48	1.90	1.10
Urea (1%)	5.00	11.81	14.67	14.71	13.27	11.90	10.29	9.00	7.38	6.22	4.62	3.67	2.29
Urea (3%)	10.43	19.29	23.67	23.57	21.14	20.00	16.57	14.48	12.48	10.62	8.48	7.05	4.81
Urea (6%)	5.10	11.48	14.62	14.57	12.10	10.90	9.62	8.24	6.86	5.62	4.00	3.38	2.00
KH <sub>2</sub> PO <sub>4</sub> (1%)	3.38	7.48	14.62	10.33	9.00	8.05	7.14	6.48	5.24	4.38	2.95	2.38	1.38
KH <sub>2</sub> PO <sub>4</sub> (1%) + Urea (1%)	3.86	9.33	11.52	11.14	9.19	8.24	7.14	6.24	5.38	4.71	3.24	2.57	1.52
Control	0.33	2.19	4.57	5.47	4.76	4.05	3.57	3.00	2.43	2.00	1.43	0.86	0.62
LSD (0.01)	0.615	1.463	1.843	3.678	1.717	1.410	1.344	1.045	1.090	1.278	0.768	0.492	0.975

The combined effects of different varieties and chemicals in respect of number of fruits per plant were found to be significant. Incase of number of fruits per plant at 1<sup>st</sup> March the highest (33.67) was found in Hybrid 10 sprayed with NAA (40 ppm) followed by Gopalbhog (23.00) treated with NAA (40 ppm) and the lowest number of fruits

(0.00) was marked in variety Sraboni, Shindhuh, Hybrid-10 and Amrapali with un treated plants. In Mixed Special there was no pea size fruits observed in that day in any chemical treatments. Again, the number of fruits per plant at final harvest date the highest number of fruits (23.67) was observed in Amrapali sprayed with NAA (40

ppm) followed by in Shindhu (23.33) with same treatment. The lowest number of fruits (0.67) was found in Sraboni under control treatment (Plate 3 and 4). The obtained results are in line with the findings of Prakash and Ram (1986), who reported that fruit yield was in the highest in trees treated with NAA alone or with ethephon.

**Individual fruit weight:** Significant variation was found in weight per mango of different mango varieties. The highest (518.29 g) weight was found in Hybrid-10 followed by 437.70 g in Mallika. On the other hand, the lowest (132.46 g) was found in Gopalbhog (Table 5).

Table 5. Combined effect of seven varieties and chemical treatments on individual fruit weight (g) of mango

Chemical treatments	Variety						
	Gopalbhog	Mallika	Sraboni	Mixed Special	Shindhu	Hybrid -10	Amrapali
KNO <sub>3</sub> (40g/L)	148.4	460.5	433.33	360	176.92	557.14	250
KNO <sub>3</sub> (80g/L)	146.8	450	408	348	153.85	545.1	191.49
NAA (40ppm)	108.4	416.66	375	334.4	153.38	476	156.67
NAA (80ppm)	106.6	422.42	382	333.33	92.4	470	158
GA <sub>3</sub> (40ppm)	115.5	424	392	335	100	494	160
GA <sub>3</sub> (80ppm)	116.6	426	395	338	110	500	165.71
Urea (1%)	145.4	446	415	345.2	145.71	535	190
Urea (3%)	148	452	425	350	162.5	550.2	200
Urea (6%)	138.8	442	410	342	142.86	520	190
KH <sub>2</sub> PO <sub>4</sub> (1%)	132.4	428	400.04	340	131.58	508	168.4
KH <sub>2</sub> PO <sub>4</sub> (1%) +Urea (1%)	132.6	430	405	341	141.18	512	182.76
Control	148	455	428	352	164.29	552	205
LSD(0.01)	41.129						

Effect of different chemicals on individual fruits weight of mango showed significant differences. The highest weight (340.90 g per mango) was recorded from KNO<sub>3</sub> (40 g/L) followed by control (329.18 g). On the other hand, the lowest fruit weight (278.93 g) was observed in NAA (80 ppm) treatment (Table 5).

The combined effects of different varieties and chemicals in respect of individual fruit weight was found to be significant. The highest weight of fruit (557.10 g) was found in Hybrid-10 which was treated with KNO<sub>3</sub> (40 g/L) and followed by control (552.00 g) in the same variety. The lowest (85.38 g) was found in Shindhu where NAA (40ppm) was applied (Table 5).

From the findings of the present investigation it is concluded that Amrapali was found to be best in respect of yield and Sindhus also produced higher yield when both the varieties were treated with NAA (40 ppm). After spraying KNO<sub>3</sub> (80 g/L) and NAA (40 ppm) number of inflorescences and number of fruits were increased compared to other chemical treatments. Individual fruit weight was the highest in Hybrid-10 sprayed with KNO<sub>3</sub> (40 g/L).

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