International Journal of Chemical Studies

P-ISSN: 2349–8528
E-ISSN: 2321–4902
IJCS 2019; 7(4): 2099-2101

Received: 22-05-2019
Accepted: 24-06-2019

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Influence of foliar application of various nutrients on hastening maturity of post monsoon vegetative flush and yield in mango cv. Alphonso

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Abstract
The investigation was carried out at Indo Israel Project Mango Block, College of Agriculture, Dapoli, Dist. Ratnagiri, Maharashtra during the season 2015-16 to study the effect of foliar application of various nutrients on hastening maturity of post monsoon vegetative flush in relation to induction of flowering in Alphonso mango. Foliar nutrition treatments included viz; Urea (1 and 3%), potassium nitrate (1 and 3%) and orthophosphoric acid (0.1 and 0.2%). Two sprays were taken in each treatment as 1st spray immediately after emergences of new vegetative flush and second 15 days after first spray. The early induction of flowering (67.67 days) and maximum flowering (70.3 per cent), maximum panicle length and breadth (34.01 cm and 27.94 cm, respectively) and highest hermaphrodite flowers (8.48 per cent) were observed in Potassium nitrate – 3% (T_5) treatment. The maximum yield (284.67 fruits and 72.45 kg/tree) was also in Potassium nitrate – 3% treatment.

Keywords: Mango, foliar nutrition, KNO_3

Introduction
Mango (*Mangifera indica* L.) is one of the oldest and most popular fruits having delightful flavour and taste of the tropical world and is known as "King of tropical fruits". India is the leader with maximum sharing percentage of the world's mango production. Currently, mango is cultivated in the largest area i.e. 2,500.02 thousand hectares and the production is around 18.00 million tons, contributing 40.48% of the total world production of mango. It is grown all over India. The area under mango cultivation in Maharashtra is 4.82 lakh hectares. Konkan region on the west coast of Maharashtra which comprises five mango growing districts is one of the largest mango growing belts in the country.

India has rich wealth of mango germplasm with more than 1000 varieties growing throughout the country. Among them, Alphonso tops the list and is grown along the west coast of India; Maharashtra, Goa, Karanataka and Gujarat which is acclaimed as one of the best Indian mango variety. It enjoys its virtual dominance both in domestic as well as in international market due to its typical sugar acid blend, attractive colour and shape, pleasant aroma, highly appreciable flavor and taste and distinctly having long keeping quality.

Lack of environmental signals for flowering being a limiting factor for obtaining consistent mango production especially in Alphonso cultivar. The phenomenon of flowering and fruiting in mango is complex. Mango flowering is predominantly influenced by the biochemical constituents present in the phase for the floral stimuli at bud break stage. The maturity of terminal shoot and accumulation of carbohydrate in the leaves and shoot apex are in some way associated with the synthesis of the floral stimulus in mango trees (Kumar *et al*., 2013) [4].

Generally, after monsoon when the rainfall ceases and dry spell commences, the flowering occurs in mango from October November. Normally three flowering flushes are produced by the plant. This phenomenon is considerably disturbed for last decade due to climatic abbreviations especially during flower initiation period. The temperature increases considerably after monsoon before winter. Because of such climatic abbreviations, instead of flowering flush the plant produces vegetative flush. This vegetative flush does not produce flowers upto 60 days. Hence, the flowering is delayed. The delayed flowering ends up with delayed fruit development and harvest. Therefore, it is also necessary to hasten the maturity of newly produced vegetative shoots so that it will produce early flowering. The present investigation was undertaken to study the effect of foliar application of various nutrients on

hastening maturity of post monsoon vegetative flush in relation to induction of flowering in Alphonso mango.

Materials and Methods

The present investigation was carried out at Indo Israel Project Mango Block, College of Agriculture, Dapoli, Dist. Ratnagiri, Maharashtra during the season 2015-16. Uniformly growing, 35 years old mango trees (Cv. Alphonso) were selected for experiment. The recommended cultural practices were followed uniformly for management of trees. The experiment was laid in RCBD design with three replications and seven treatments. Each treatment consisted three trees. The treatments included viz; Urea (1 and 3%), Potassium nitrate (1 and 3%) and Orthophosphoric acid (0.1 and 0.2%). Two sprays were taken in each treatment as 1st spray immediately after emergences of new vegetative flush and second 15 days after first spray. The observation on vegetative flush, flowering, fruit set and yield were recorded. Data were analyzed statistically (Panse and Sukhatme, 1985) [6]

Results and Discussion

The data on post monsoon vegetative flush and flowerings are presented in Table 1. The post monsoon vegetative flush did not differ significantly. The days required for induction of flowering was differed significantly and early induction (67.67 days) was observed in Potassium nitrate – 3% (T_5) which was followed by Potassium nitrate – 1. % (T_2). The significantly highest flowering (70.3 per cent) was recorded in Potassium nitrate – 3% (T_5) treatment followed by Orthrophosphoric acid – 0.2% (T_6). The lowest flowering (29.3 per cent) was noticed in Control (T_7). The earliness in flowering by 24.23 days than control was observed in Potassium nitrate – 3% treatment which may be because of early maturity of vegetative shoots. The earlier flowering in KNO_3 may be due to breaking of dormancy of shoots. Earlier flowering in mango promoted by foliar spray of KNO_3, which promotes ethylene biosynthesis has also been reported by Mosqueda-Vazquez and Avila- Resendiz (1985) [5]. Similar effect KNO_3 on induction of early flowering had been reported in mango by Dalal *et al.* (2005) [2]. Patil *et al.* (2010) [7] reported that Potassium nitrate (3%) showed significant effect on flowering in Alphonso mango.

The length and breadth of panicle was significantly differed by the nutrient treatments (Table 2). Maximum panicle length and breadth (34.01 cm and 27.94 cm, respectively) was recorded in T_5. The sex ratio in nutrients treatments was also significantly improved than control. The maximum percentage of hermaphrodite flowers (8.48%) was observed in T_5 treatment which was at par with T_2 and T_6. The results are in accordance with Sudha *et al*. (2012) [8] in mango. The sex ratio in mango panicle is correlated with the panicle length. There was no more variation in the panicle length and breadth ratio.

The data on fruit set, retention, fruit weight and yield is depicted in Table 3. The fruit set and fruit retention was differed significantly and the maximum fruit retention (12.62 per cent) was occurred in Potassium nitrate – 3% (T_5) treatment (Table 2) which was closely followed by T_2, T_6, and T_4. The lowest fruit retention (9.43 per cent) was in control (T_7). The higher retention percentage might be due to supplementary nutrition through foliar spray. Dalal *et al.*, (2005) [2] also reported the highest fruit set (2.08%) with potassium nitrate in mango cv. Pairy in Akola, Maharashtra, India. Khattab *et al.* (2006) [3] claimed that KNO_3 at 4% had improved flowering and fruiting in mango cultivars Ewais and Sidik, in Giza, Egypt. The similar results were also obtained by Patil *et al.* (2010) [7].

The fruit weight was also influenced by the nutrient treatments. The highest fruit weight (258.0 g) was observed in Potassium nitrate – 3% (T_5) treatment which was at par with the treatments of Potassium nitrate – 1% (T_1) and Urea (1 and 3 percent). The maximum yield in terms of number of fruits and weight per tree (284.67 fruits and 72.45 kg/tree) was in T_5 and lowest yield was in control (138.97 fruits and 32.08 kg/tree). The maximum yield in Potassium nitrate treatments was observed due to higher flowering percentage, better fruit set. The increase in yield due to potassium was also reported by Dalal *et al.* (2005) [2] and Bansode (2012) [1] in mango.

From the present investigation, it is concluded that KNO_3 was beneficial for induction of early flowering by hastening maturity of post monsoon vegetative flush in Alphonso mango. The intensity of flowering and yield was also higher in this treatment.

Table 1: Effect of foliar nutrients on vegetative flush and flowering of mango (Cv. Alphonso)

Treatments	Post monsoon vegetative flush (%)	Days required for induction of flowering	Earliness in flowering over control	Flowering Intensity (%)
T_1: Urea-1%	41.7 (40.20)*	78.00	14.00	53.7 (47.10)
T_2: Potassium nitrate - 1%	43.3 (41.17)	71.67	20.33	65.0 (53.73)
T_3: Orthrophosphoric acid- 0.1%	46.7 (43.09)	76.67	13.33	57.0 (49.02)
T_4: Urea-3%	43.3 (41.17)	76.00	16.00	58.3 (49.80)
T_5: Potassium nitrate - 3%	41.7 (40.20)	67.67	24.33	70.3 (57.00)
T_6: Orthrophosphoric acid- 0.2%	50.0 (45.00)	73.67	18.33	66.7 (54.74)
T_7 –Control	45.0 (42.13)	92.00	-	29.3 (32.79)
SE M ±	2.34	2.20	-	2.75
C.D. (at 5%)	N.S.	6.77	-	8.47

(*Arcsin transformed value)

Table 2: Effect of foliar nutrients on panicle and hermaphrodite flower percentage of mango (Cv. Alphonso)

Treatments	Panicle length (cm)	Panicle Breadth (cm)	Panicle Length : Breadth ratio	Hermaphrodite flower (%)
T_1	28.79	23.53	1.22	6.92
T_2	32.97	26.95	1.22	8.35
T_3	31.84	25.41	1.25	7.04
T_4	31.90	25.38	1.26	6.98
T_5	34.01	27.94	1.22	8.48

T_6	33.09	25.93	1.28	7.88
T_7	27.32	22.28	1.23	6.01
SE M ±	1.19	0.87	-	0.32
C.D. (at 5%)	3.68	2.67	-	0.99

Table 3: Effect of foliar nutrients on fruit set, fruit retention and yield of Alphonso Mango

Treatments	Fruit set per panicle	Fruit retention at harvest per panicle	Fruit retention (%)	Fruit weight (g)	No. of fruits/ tree	Yield (kg/ tree)	Yield (t/ha)
T_1	7.13	0.75	10.55	242.00	199.40	48.42	4.84
T_2	7.72	0.97	12.56	255.33	256.93	65.35	6.54
T_3	7.92	0.90	11.41	248.00	228.37	56.60	5.66
T_4	6.44	0.79	12.31	252.33	211.70	53.45	5.34
T_5	8.87	1.12	12.62	258.00	284.67	72.45	7.25
T_6	7.86	0.98	12.43	245.67	264.83	65.32	6.53
T_7	6.36	0.60	9.43	225.67	138.97	32.08	3.21
SE M ±	0.50	0.04	0.53	5.58	21.61	4.63	-
C.D. (at 5%)	1.55	0.13	1.60	17.19	66.59	14.27	-

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