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Response of foliar spray of nutrients on flowering and fruit set in Sapota cv. Kalipatti

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Abstract

The present experiment was conducted during the year 2020-21 at two different locations *viz.* Regional Horticultural Research Station, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari and Fruit Research Station, NAU, Gandevi. The experiment was laid out in Completely Randomized Design with ten treatments and three repetitions. Foliar spray was done twice during last week of February and March. The flowering and fruit set parameters *viz.* maximum number of flower buds/shoot (11.93, 12.33 and 12.13), number of fruit set/shoot (6.00, 5.27 and 5.63), fruit set (30.40, 30.89 and 30.65%) and fruit retention (60.63, 72.44 and 66.54%) with minimum flower development period (25.53, 23.80 and 24.67 days), days required from flowering to harvest (282.22, 265.67 and 273.95) and fruit drop (39.37, 27.56 and 33.46%) were noted in the treatment T₇ (Novel organic liquid nutrients 2.0%) for both the locations *viz.* Navsari, Gandevi and in pooled, respectively.

Keywords: sapota, Kalipatti, novel organic liquid nutrients, flowering, fruit set

Introduction

Sapota [*Manilkara achras* (Mill.) Forsberg] is commonly known as “Chiku”, “Sapodilla”, “Chico”, “Naseberry” or “Nispero”. The word ‘Sapodilla’ is derived from the Spanish word “Zapotilla”, meaning “small sapote”. It is an evergreen and ever fruiting tree of the family Sapotaceae and the order Ericales. It is an exotic tree and native to Tropical America especially the South Mexico or Central America. Sapota flowers almost throughout the year, but in India, main seasons of flowering are February to April and October to December. It bears heavy flush all over the year in Indian subcontinent, but all the flowers do not develop into fruits and all the fruits do not reach up to maturity. About 95% sapota floral buds develop into flowers and out of these, only 50% flowers fruit setting occurs and among these fruit sets, only 10% reach to the maturity, it means the dropping of fruits instantly take place after the fruit setting (Akshay *et al.*, 2020) ^[1].

The foliar application of nutrients plays a vital role in improving setting and retention of fruits. The foliar feeding of fruit trees has gained much importance in recent years, as nutrients applied through soil are needed in higher quantity because some amount leaches down and some become unavailable to the plant due to complex soil reactions. The various nutrients *viz.* calcium nitrate, potassium silicate, calcium silicate, zinc sulphate, boric acid, Novel organic liquid nutrients and seaweed extract were used to increase flowering and fruit set. Novel Organic Liquid Nutrients have been developed from banana pseudostem comprising of 10 macro and 10 micro-nutrients along with growth promoting substances like cytokinin, GA₃, *etc.* (Anon., 2014) ^[2]. It is used for initiation of flowering, increase fruit setting and reduce fruit drop in number of fruit and vegetable crops.

Material and Methods

The present experiment was carried out during the year 2020-21 at two different locations *i.e.* Regional Horticultural Research Station, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari and Fruit Research Station, Navsari Agricultural University, Gandevi. About 30 year old uniform sapota trees cv. Kalipatti planted at spacing of 10 m x 10 m, were selected for the experiment. The improved cultural practices with respect to manures and fertilizers, irrigation, interculturing, plant protection measures, *etc.* were carried out in sapota orchard during the experimental period as recommended by NAU.

The experiment was laid out in Completely Randomized Design with ten treatments *viz.* T₁: Calcium nitrate 0.4%, T₂: Potassium silicate 0.5%, T₃: Calcium silicate 0.5%, T₄: Zinc silicate 0.5%, T₅: Boric acid 0.2%, T₆: Novel organic liquid nutrients 1.0%, T₇: Novel organic liquid nutrients 2.0%, T₈: Seaweed extract 1.0%, T₉: Seaweed extract 2.0% and T₁₀: Control with three repetitions. Foliar spray was done twice during last week of February and March.

Results and Discussion

The results and the significant findings of the current research have been adequately discussed under relevant headings.

Number of flower buds/shoot

The result showed (Table 1) that number of flower buds were significantly altered due to foliar spray of nutrients. It was clearly evident that treatment T₇ (Novel organic liquid nutrients 2.0%) had significantly highest number of flower buds per shoot *i.e.* 11.93, 12.33 and 12.13 for both the locations *viz.* Navsari, Gandevi and in pooled data, respectively. Whereas the minimum number of flower buds per shoot *i.e.* 7.47, 7.00 and 7.23 were obtained in treatment T₁₀ (Control) for both the locations *viz.* Navsari, Gandevi and in pooled data, respectively. The increase in number of flower buds per shoot due to foliar application of Novel organic liquid nutrients 2% might be due to the presence of macro and micronutrients along with growth regulators in Novel organic liquid nutrients. Due to that the plants remain physiologically more active to build up sufficient food stock for the developing flowers by creating favourable C:N ratio in terminals which ultimately resulted into increased number of flower buds per shoot. The similar results were also reported by Anon. (2012) ^[3] and Patel *et al.* (2018) ^[8] in mango.

Flower development period (days)

Minimum days taken for flower development *i.e.* 25.53, 23.80 and 24.67 was recorded with the treatment T₇ (Novel organic liquid nutrients 2.0%) at both the locations *viz.* Navsari, Gandevi and in pooled data, respectively (Table 1). Flower development period recorded minimum in treatment T₇ was at par with T₆, T₉, T₈ and T₂ treatments at Navsari location. Whereas it was at par with T₆, T₉ and T₈ at Gandevi location. In pooled data, treatments T₆ and T₉ was at par with T₇. The maximum days taken for flower development *i.e.* 30.87, 29.00 and 29.93 was noted in the treatment T₁₀ (Control) for both the locations *viz.* Navsari, Gandevi and in pooled data, respectively. The minimum flower development period noted in the treatment T₇ (Novel organic liquid nutrients 2.0%) might be due to novel organic liquid nutrients is a major source of macro and micronutrients which plays a vital role in increasing the physiological activities like chlorophyll synthesis, these metabolic activities may help in production of good amount of biomass that leads to early flower development. The present investigation is in conformity with the results reported by Anon. (2012) ^[3] and Patel *et al.* (2018) ^[8] in mango.

Days required from flowering to harvest

The results (Table 1) showed minimum number of days required from flowering to harvest by foliar application Novel organic liquid nutrients 2.0% (T₇) for both the locations *viz.* Navsari (282.22), Gandevi (265.67) and in pooled (273.95). It was at par with all the other treatments except T₅ and control at Navsari location. Further, for Gandevi location and in

pooled it was at par with all the other treatments except T₄, T₅ and control. While maximum days required from flowering to harvest *i.e.* 317.05, 309.28 and 313.17 was noted in the treatment T₁₀ (Control) for both the locations *viz.* Navsari, Gandevi and in pooled data, respectively.

Number of fruit set/ shoot

The maximum number of fruit set per shoot *i.e.* 6.00, 5.27 and 5.63 (Table 2) were recorded with the foliar application of Novel organic liquid nutrients 2.0% (T₇) for both the locations *viz.* Navsari, Gandevi and in pooled data, respectively. The treatment T₇ was statistically at par with treatment T₆ for both the locations and in pooled data. Further, it was at par with T₉ for both the locations. For Gandevi location, treatment T₇ was at par with the treatments T₈ and T₂. The minimum number of fruit set per shoot *i.e.* 4.60 was recorded under the treatment T₁₀ (Control) for both the locations *viz.* Navsari, Gandevi and in pooled data.

Fruit set (%)

Significantly higher fruit set *i.e.* 30.40, 30.89 and 30.65% (Table 2) was recorded with the foliar application of Novel organic liquid nutrients 2.0% (T₇) for both the locations *viz.* Navsari, Gandevi and in pooled data, respectively. The treatment T₇ was statistically at par with all the remaining treatments except T₅ and control at Navsari location. At Gandevi location and in pooled, treatment T₇ was statistically on par with the treatments T₆, T₉, T₈ and T₂. Similarly, lower fruit set *i.e.* 21.35, 24.04 and 22.70% was recorded under the treatment T₁₀ (Control) for both the locations *viz.* Navsari, Gandevi and in pooled data, respectively. Significant increase in number of fruit set per shoot and fruit set percentage of sapota due to the foliar application of Novel organic liquid nutrients 2.0% (T₇) might be due to presence of micronutrients in Novel organic liquid nutrients which are directly involved in various physiological processes and enzymatic activities resulting into better photosynthesis, greater accumulation of starch in fruits and involvement of Zn in auxin synthesis. The balance of auxin in plant increased the fruit setting of the plants (Patel *et al.* 2018) ^[8]. It also contains small amount of essential nutrients and growth boosters and these constituents are known to have positive effect on fruiting parameters of the crops (Rathod *et al.*, 2017) ^[10]. These results are in close conformity with the findings of Anon. (2012) ^[3], Patel *et al.* (2018) ^[8] and Modi *et al.* (2019) ^[5] in mango; Anon. (2014) ^[2] and Patil *et al.* (2017) ^[9] in banana.

Fruit Drop (%)

Significantly the minimum fruit drop *i.e.* 39.37, 27.56 and 33.46% (Table 2) was obtained with foliar application of Novel organic liquid nutrients 2.0% (T₇) for both the locations *viz.* Navsari, Gandevi and in pooled data, respectively, but treatment T₇ was statistically at par with treatments T₆ (Novel organic liquid nutrients 1.0%) and T₉ (Seaweed extract 2.0%) for Navsari location. Whereas maximum fruit drop *i.e.* 65.26, 63.34 and 64.30% was recorded under the treatment T₁₀ (Control) for both the locations *viz.* Navsari, Gandevi and in pooled data, respectively.

Fruit retention (%)

The foliar application of Novel organic liquid nutrients 2% (T₇) showed significantly maximum fruit retention *i.e.* 60.63, 72.44 and 66.54% for both the locations *viz.* Navsari, Gandevi

and in pooled data, respectively (Table 2). At Navsari location, the treatment T₇ was found statistically at par with the treatments T₆ (Novel organic liquid nutrients 1.0%) and T₉ (Seaweed extract 2.0%). Whereas, the minimum fruit retention *i.e.* 34.74, 36.66 and 35.70% was reported in treatment T₁₀ (Control) for both the locations *viz.* Navsari, Gandevi and in pooled data, respectively. The minimum fruit drop and maximum fruit retention recorded with foliar application of Novel organic liquid nutrient 2.0% (T₇) might be due to Novel organic liquid nutrients contains a good amount of essential nutrients and growth boosters and these

constituents are known to have positive effect on fruiting parameters of the crops (Rathod *et al.*, 2017) [10]. It also has a good amount of K and the role of K in reducing the fruit drop is expected due to its catalytic effect in biochemical reactions occurring in physiological processes of the plant (Baiea *et al.*, 2015) [4]. It is also responsible for enhancement of auxin in the plant which is known to reduce fruit drop and increase the fruit retention by delaying the formation of abscission layer (Nason and Mc Elroy, 1963) [6]. These results are in close conformity with the findings of Parmar *et al.* (2018) [7] in papaya and Rathod *et al.* (2017) [10] in pomegranate.

Table 1: Effect of foliar application of nutrients on flowering parameters of Sapota

Treatments	No. of flower buds per shoot			Flower development period (Days)			Days required from flowering to harvest		
	Navsari	Gandevi	Pooled	Navsari	Gandevi	Pooled	Navsari	Gandevi	Pooled
T ₁	8.80	8.47	8.63	28.27	26.33	27.30	298.75	289.40	294.07
T ₂	9.60	9.27	9.43	27.40	25.60	26.50	293.24	281.52	287.38
T ₃	9.13	8.93	9.03	28.00	26.13	27.07	295.01	285.22	290.11
T ₄	8.20	7.73	7.97	29.00	27.07	28.03	301.59	294.45	298.02
T ₅	8.07	7.53	7.80	29.40	28.00	28.70	307.81	300.88	304.34
T ₆	11.07	11.13	11.10	26.27	24.40	25.33	286.14	271.19	278.66
T ₇	11.93	12.33	12.13	25.53	23.80	24.67	282.22	265.67	273.95
T ₈	9.80	9.60	9.70	27.00	25.20	26.10	290.95	277.57	284.26
T ₉	10.33	10.27	10.30	26.40	24.67	25.53	286.84	272.92	279.88
T ₁₀	7.47	7.00	7.23	30.87	29.00	29.93	317.05	309.28	313.17
S.Em. ±	0.22	0.26	0.17	0.68	0.60	0.41	6.78	8.76	5.84
C.D. at 5%	0.66	0.77	0.47	2.00	1.78	1.17	20.01	25.85	16.75
C.V. %	4.08	4.93	4.51	4.21	4.03	4.13	3.97	5.33	4.93
S.Em. ± (L x T)	-	-	0.24	-	-	0.64	-	-	8.26
C.D. at 5% (L x T)	-	-	NS	-	-	NS	-	-	NS

Table 2: Effect of foliar application of nutrients on fruit set parameters of Sapota

Treatments	No. of fruit set/ shoot (Upto 6 weeks)			Fruit set (%)			Fruit drop (%)			Fruit retention (%)		
	Navsari	Gandevi	Pooled	Navsari	Gandevi	Pooled	Navsari	Gandevi	Pooled	Navsari	Gandevi	Pooled
T ₁	5.07	4.67	4.87	27.34	26.58	26.96	52.48	51.77	52.13	47.52	48.23	47.87
T ₂	5.33	4.93	5.13	28.30	28.23	28.26	49.05	46.97	48.01	50.95	53.03	51.99
T ₃	5.20	4.87	5.03	27.78	27.25	27.52	51.19	49.89	50.54	48.81	50.11	49.46
T ₄	4.93	4.73	4.83	26.91	26.18	26.55	55.23	57.20	56.21	44.77	42.80	43.79
T ₅	4.87	4.67	4.77	23.05	24.97	24.01	61.81	59.57	60.69	38.19	40.43	39.31
T ₆	5.87	5.20	5.53	29.95	29.60	29.77	43.70	36.37	40.03	56.30	63.63	59.97
T ₇	6.00	5.27	5.63	30.40	30.89	30.65	39.37	27.56	33.46	60.63	72.44	66.54
T ₈	5.40	5.00	5.20	29.37	28.55	28.96	47.00	45.14	46.07	53.00	54.86	53.93
T ₉	5.60	5.07	5.33	29.71	28.72	29.22	44.98	41.77	43.37	55.02	58.23	56.63
T ₁₀	4.60	4.60	4.60	21.35	24.05	22.70	65.26	63.34	64.30	34.74	36.66	35.70
S.Em. ±	0.14	0.12	0.10	1.44	1.03	0.85	2.55	2.91	1.93	2.55	2.91	1.93
C.D. at 5%	0.41	0.36	0.27	4.26	3.03	2.41	7.53	8.59	5.50	7.53	8.59	5.50
C.V. %	4.58	4.35	4.72	9.13	6.48	7.91	8.67	10.51	9.58	9.03	9.69	9.39
S.Em. ± (L x T)	-	-	0.13	-	-	1.25	-	-	2.74	-	-	2.74
C.D. at 5% (L x T)	-	-	NS	-	-	NS	-	-	NS	-	-	NS

Conclusion

On the basis of the present study, it is concluded that foliar application of Novel organic liquid nutrients 2.0% during last week of February and March increased the number of flower buds/shoot, number of fruit set/shoot, fruit set percentage and fruit retention percentage and reduced the flower development period, days required from flowering to harvest and fruit drop percentage in sapota cv. Kalipatti.

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