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Effect of plant growth regulators and chemicals on fruit retention, yield and quality of mango cv. Keshar

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Abstract

Present experiment entitled "Effect of plant growth regulators and chemicals on fruit retention, yield and quality of Mango cv. Keshar" laid out in FRBD with seven treatments of plant growth regulators and three fruit stages with three replications., carried out at Research farm of Horticulture Section, College of Agriculture, Dhule (M.S.) during 2016-17. The different chemicals and plant growth regulators were used to study their effect on fruit growth, retention, quality and yield. The highest percentage of fruit retention, highest size of fruit i.e. polar diameter and equatorial diameter, weight of the fruit, yield parameters namely number of fruit per tree and yield (kg/tree) was observed when spraying with CPPU@10ppm was done under study. The overall results indicated that foliar application of CPPU 10ppm was significantly found to be beneficial to the economically important characters viz. fruit retention, number of fruits, average fruit weight and yield⁻¹ plant and the cost benefit ratio was 2.99.

Keywords: Mango, Spermine, NAA, CPPU, yield character

Introduction

Mango (*Mangifera indica* L) belongs to Anacardiaceae family, is the world's most luscious fruit has been recognized as the 'King of fruits' in India long back. Due to its wide adaptability, high nutritive value, richness in variety, delicious taste, pleasant flavour, attractive appearance. Keshar is the most popular mango variety in Maharashtra and has good export potential. The area under this variety has increased not only in Maharashtra but also in neighboring states like Gujarat, Madhya Pradesh and Rajasthan because of its higher productivity, regularity in bearing, superior fruit quality, rich flavor and pleasant aroma. It is widely appreciated by the consumers for its attractive shape, size and colour. The fruit is highly valued because of its excellent flavour, appealing aroma, delicious taste, attractive shades of colour and nutritive value, which has attracted the world market. Many investigators found that spraying mango trees with NAA at different concentrations (20, 25 and 40 ppm) increased fruit set percentages and fruit retention (Oksher *et al.*, 1980)^[12]. CPPU can be used to produce better size in all the food crops and fruits return to grower (Ahmed and Abdel-Aal, 2007)^[11]. Spermine is a polyamine involved in cellular metabolism found in all eukaryotic cells. Fruit drop can be significantly controlled by the plant growth regulators (Anila and Radha, 2003). Considering the problem of fruit drop and fruit retention, the investigation was carried out to study the effect of different PGRs viz., NAA (40 ppm and 50ppm), CPPU (10ppm and 20 ppm) and chemicals (Spermine 0.1mM and 0.2mM) on fruit retention and yield of mango cv. Keshar

Materials and Methods

The experiment was conducted at horticultural farm, horticulture section, college of agriculture Dhule, during 2016-17 on mango cv. keshar. planted at a spacing of 10 × 10 m. The experimental trees were 15 years old. Totally, 7 different treatments of spermine, NAA, CPPU at different concentrations these were T₁ (spermine - 0.1mM), T₂ (spermine - 0.2mM), T₃ (NAA - 40 ppm), T₄ (NAA -50 ppm), T₅ (CPPU -10 ppm), T₆ (CPPU- 20ppm) and T₇ (control), sprayed in mango orchard with three replications. The experiment was laid out in a Factorial Randomized Block Design. The yield was recorded at the time of harvest and expressed in terms of kg⁻¹ plant. The data recorded was analyzed using the statistical procedures as described by Panse and Sukhatme (1995)^[12].

Result and Discussion

Yield character

The highest percentage of fruit retention (21.41%) was found in treatment S₁T₅ i.e. CPPU 10 ppm spray at mustard stage of fruit were statistically at par with treatment S₁T₆ i.e. CPPU 20ppm with mustard stage (21.03%) (Table -2). Similar results were obtained by Pujari *et al.* (2016) [14] in Alphonso mango, Naqvi *et al.* (1992) [10] in mango cv. Sindhuri, Notodimedj (1999) [11] in mango cv. Arumanis and Bhamare *et al.* (2014) [4] in mango cv. Mallika and agreement with the above results.

Both length and diameter of fruit were influenced by spraying of different PGRs. The highest polar diameter of fruit (8.58 cm) was registered in treatment S₃T₅ (i.e. CPPU 10ppm at marble stage). (Table-2) The highest equatorial diameter of fruit (5.32 cm) was registered in treatment S₃T₂ (i.e. Spermine 0.2mM at marble stage) (Table-2). Similar results were also reported by Greene (2001) [6] in McIntosh apple and Said (2002) [15] on Anna apple, Stern *et al.* (2002) [17] on pear and Nampila *et al.* (2010) [9] on grape. Kumar *et al.* (2013) [8] reported that the fruit weight, fruit length and fruit breadth were gradually increased by increasing the concentration of CPPU in kiwi fruit.

The weight of fruit was significantly influenced by different PGRs. The highest weight of fruit (242.00 g) was found in the treatment S₃T₅ i.e. CPPU 10 ppm with marble stage (Table-3). Similar results were also reported by Notodimedjo (1999) [11]

in mango cv. Arumanis. Kumar *et al.* (2013) [8] reported that the fruit weight, fruit length and fruit breadth were gradually increased by increasing the concentration of CPPU in kiwi fruit.

Yield parameters like number of fruit per tree and yield (kg/tree) were significantly influenced by different PGRs. Significantly highest numbers of fruits per tree (312.67) were noticed in treatment S₂T₅ (i.e. CPPU 10 ppm at pea stage). Treatments S₂T₄ (296.67), S₂T₆ (295.00), S₂T₃ (293.33), S₁T₅ (286.33) and S₁T₆ (283.33) were statistically at par with each other (Table-3). CPPU application increases fruit set and fruit retention which ultimately increases number of fruits. CPPU increases fruit set reported by Oksher *et al.* (1980) [12] in mango and Sugiyama and Yamaki (1995) [18] in Persimmon which might be increases the number of fruit per tree.

Highest yield per plant (73.99 kg) were noted in treatment S₂T₅ i.e. CPPU 10 ppm at pea stage, while, lowest yield per plant (30.33 kg) was observed in treatment S₃T₇ i.e. marble stage with control (Table-3). Results obtained pertaining to yield was in agreement with the results given by Singh (2005) [16] stated that the improvement in fruit yield is related to the increase in fruit retention/panicle and fruit size. The results are in agreement with the findings of Fathi *et al.* (2011) [5] in persimmon, Banyal *et al.* (2013) [3] in apple, Kulkarni *et al.*, (2017) [7] stated that foliar spray of PGRs during mustard, pea and marble stages of fruit development were beneficial for increasing yield of mango cv. Keshar.

Table 1: Effect of plant growth regulator and chemicals on fruit retention (%), size of fruit (cm), number of fruits per plant, fruit weight (gm), yield (kg-1 plant)

Treatment details	Fruit retention %	Size of fruit(cm)		Number of fruits per tree	Weight of fruits per tree	Yield (kg ⁻¹ plant)
		Polar diameter	Equatorial diameter			
Main treatments						
T ₁ -Spermine 0.1mM	8.63	7.60	5.01	243.56	193.36	45.91
T ₂ -Spermine 0.2mM	9.15	7.82	5.17	242.22	197.05	46.86
T ₃ -NAA 40ppm	10.02	8.00	5.01	261.11	219.02	56.40
T ₄ -NAA 50ppm	10.59	8.09	4.97	265.22	227.34	59.21
T ₅ -CPPU 10 ppm	11.51	8.14	5.09	280.11	239.28	66.58
T ₆ -CPPU 20 ppm	11.22	8.40	5.20	276.78	235.67	63.85
T ₇ -Control	7.20	6.65	4.46	210.22	150.01	30.38
S. E.(m) ±	0.091	0.021	0.020	0.356	0.258	0.113
C. D. at 5%	0.261	0.060	0.057	1.019	0.738	0.322
Sub treatments						
S1- Mustard stage	19.02	7.64	4.94	254.52	205.76	52.15
S2- Pea stage	9.07	7.76	4.93	272.33	208.85	56.66
S3-Marble stage	1.19	8.04	5.06	235.67	211.85	49.41
S. E.(m) ±	0.179	0.0412	0.118	0.6999	0.507	0.221
C. D. at 5%	0.512	0.1178	NS	2.0005	1.449	0.632

Table 2: Interaction effects of plant growth regulators and chemicals on fruit retention and size of fruits in mango cv. Keshar

1. Fruit retention %					
Treatments details	S ₁ - Mustard stage	S ₂ - Pea stage	S ₃ - Marble stage	S.E. (m)±	C. D. at 5%
T ₁ -Spermine 0.1 mM	17.82	7.43	0.64	0.474	1.356
T ₂ -Spermine 0.2 mM	18.11	8.52	0.80		
T ₃ -NAA-40 ppm	19.86	9.01	1.19		
T ₄ -NAA-50 ppm	20.70	9.62	1.46		
T ₅ -CPPU-10 ppm	21.41	11.16	1.95		
T ₆ -CPPU-20 ppm	21.03	10.82	1.81		
T ₇ -Control	14.17	6.92	0.50		
2. Size of fruits a) Polar diameter (cm)					
T ₁ -Spermine 0.1 mM	7.31	7.43	8.06	0.109	NS
T ₂ -Spermine 0.2 mM	7.55	7.83	8.09		
T ₃ -NAA-40 ppm	7.77	8.00	8.23		
T ₄ -NAA-50 ppm	8.02	7.97	8.27		
T ₅ -CPPU-10 ppm	8.15	8.47	8.58		
T ₆ -CPPU-20 ppm	8.01	8.16	8.25		

T7-Control	6.69	6.48	6.77		
3. Size of fruits b) Equatorial diameter (cm)					
T1-Spermine 0.1 mM	5.07	4.89	5.07	0.103	NS
T2-Spermine 0.2 mM	5.05	5.14	5.32		
T3-NAA-40 ppm	5.05	4.98	4.99		
T4-NAA-50 ppm	4.95	4.89	5.06		
T5-CPPU-10 ppm	5.10	5.23	5.27		
T6-CPPU-20 ppm	4.96	5.15	5.15		
T7-Control	4.57	4.23	4.57		

Table 3: Interaction effects of plant growth regulators and chemicals on yield and yield contributing parameters in mango cv. Keshar

1. Number of fruits per plant					
Treatments details	S ₁ - Mustard stage	S ₂ - Pea stage	S ₃ - Marble stage	S. E. (m) ±	C. D. at 5%
T1-Spermine-0.1 mM	243.33	247.00	240.33	1.852	5.293
T2-Spermine-0.2 mM	240.00	249.67	237.00		
T3-NAA-40 ppm	256.33	293.33	233.67		
T4-NAA-50 ppm	260.33	296.67	238.67		
T5-CPPU-10 ppm	286.33	312.67	241.33		
T6-CPPU-20 ppm	283.33	295.00	252.00		
T7-Control	212.00	212.00	206.67		
2. Weight of fruits (g)					
T1-Spermine- 0.1 mM	189.22	193.28	197.59	1.342	NS
T2-Spermine- 0.2 mM	194.13	195.38	201.64		
T3-NAA-40 ppm	215.68	220.14	221.25		
T4-NAA-50 ppm	223.39	227.45	231.17		
T5-CPPU-10 ppm	234.91	240.95	242.00		
T6-CPPU-20 ppm	233.76	236.41	236.84		
T7-Control	149.22	148.37	152.43		
3. Yield (kg/plant)					
T1-Spermine-0.1mM	44.61	47.45	45.66	0.585	1.62
T2-Spermine-0.2 mM	45.85	48.11	46.60		
T3-NAA-40 ppm	54.24	63.56	51.41		
T4-NAA-50 ppm	57.46	65.27	54.89		
T5-CPPU-10 ppm	66.70	73.99	59.04		
T6-CPPU-20 ppm	65.73	67.85	57.96		
T7-Control	30.44	30.36	30.33		

Conclusion

On the basis of present investigation the following conclusion could be drawn. Application of PGRs at Pea stage was found effective in increasing fruit retention percentage, number of fruit and yield of fruit than other stages. Among the different PGRs and stages of application, CPPU 10 ppm at pea stage recorded maximum fruit yield 73.99kg/tree. Treatment T₅ - CPPU 10 ppm shows highest yield *i.e.* 6.65 t ha⁻¹ having maximum monetary returns of Rs. 1, 99,740.00 with a Cost: Benefit ratio 1:2.99 which was economically beneficial among the all other treatments.

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