



Effect of De-blossoming Treatments on Physical Characteristics of Different Mango Varieties during Off-season Fruit Production under South Gujarat Conditions

A. D. Chaudhary¹, T. R. Ahlawat^{1*}, D. R. Bhandari² and Dharmishtha Patel³

¹Department of Fruit Science, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari – 396 450, Gujarat, India.

²Department of Horticulture, N. M. College of Agriculture, Navsari Agricultural University, Navsari – 396 450, Gujarat, India.

³Krishi Vigyan Kendra, Tapi, Vyara, Navsari Agricultural University, Gujarat, India.

Authors' contributions

This work was carried out in collaboration among all authors. Authors TRA and DRB designed the study. Author ADC conducted the trial, recorded the observations, performed the statistical analysis and wrote the first draft of the manuscript. Author DP managed the literature searches and assisted. Author ADC in writing the manuscript. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/CJAST/2020/v39i830585

Editor(s):

(1) Dr. Hamid El. Bilali, University of Natural Resources and Life Sciences, Vienna, Austria.

Reviewers:

(1) Ilesanmi Funmilayo Florence, Nigerian Stored Products Research Institute, Nigeria.

(2) Schirley Costalonga, Universidade Federal do Espírito Santo, Brazil.

(3) Zakaria Fouad Fawzy Hassan, National Research Centre, Egypt.

Complete Peer review History: <http://www.sdiarticle4.com/review-history/55330>

Received 10 January 2020

Accepted 16 March 2020

Published 02 May 2020

Original Research Article

ABSTRACT

An investigation was conducted during 2013-14 and 2014-15 seasons under South Gujarat conditions to study the impact of de-blossoming in six mango varieties during regular flowering season on off season fruiting characters. The investigation consisted of four de-blossoming treatments i.e. foliar sprays of Naphthalene Acetic Acid at 400 and 800 ppm, hand de-blossoming and untreated trees which were imposed on six mango varieties i.e. Amrapali, Baramasi, Neelphanso, Neelum, Ratna and Totapuri. The trial was evaluated in a Randomized Block Design with factorial concept. De-blossoming was done at full bloom stage for induction of off season flowering. Results indicated that in regular season cultivar 'Totapuri' recorded significantly higher

*Corresponding author: E-mail: tahlawat4@gmail.com;

fruit weight, fruit length, fruit width and fruit volume during 2013-14 and 2014-15. With regard to off-season fruiting, significantly maximum value of the above traits was observed in 'Ratna' cultivar. Fruit weight, volume, length and width were lowest in cv. 'Neelphanso' in regular as well as in off-season. Hand de-blossoming was found superior over control for fruit weight and fruit volume in all the varieties selected for this study in the coastal climate of South Gujarat.

Keywords: Mango; de-blossoming; off-season; fruit weight; fruit length.

1. INTRODUCTION

Mango (*Mangifera indica* L.) is a well known, widely cultivated and most preferred fruit crop of tropical to sub-tropical regions. It is referred to as "King of Fruits" for its excellent and delicious flavor, taste, aroma and nutritional properties. In the past few decades, mango has also gained popularity in temperate countries of the globe [1]. Mango originated from the Indo-Burma region and has been cultivated for thousands of years in India. In fact, its cultivation is as old as Indian civilization. Recently scientists from Lucknow, traced the origin of genus *Mangifera* from 60 million years old fossil compressions of carbonized mango leaves in the Palaeocene sediments near Damalgiri, West Garo Hills, Meghalaya [2]. India is acclaimed for its rich genetic diversity of mango and has the largest available germplasm wealth of about 1,300 varieties [3]. Nearly, 30 varieties of mango are commercially grown throughout the country [4].

The global market is witnessing an increase in demand, but the overlapping of harvesting season often results in market glut and consequently a sharp reduction in prices. This can be partially resolved by extending the period of availability. Presently, many local and hybrid cultivars *i.e.* Baramasi, Ratna, Neelum, Neelphonso *etc* flower two to three times in a year in the coastal climate of Valsad district of Gujarat. In such varieties, de-blossoming of seasonal flowers may lead to flowering in off season. The aim of the present study was to assess physico-chemical and other characteristics of off-season mango fruits. The emphasis of this study was on locally grown varieties in South Gujarat and understanding the agro-ecological dependence of varietal responses. It would help to identify suitable parents and potential mango varieties for further evaluation, conservation and utilization in mango improvement programmes.

2. MATERIALS AND METHODS

The present study was carried out at Agriculture Experimental Station, Paria NAU, Gujarat, India during the fruiting season of 2013-14 and 2014-

15. Paria is located 18 m above mean sea level; at a latitude and longitude of 20°26'32"N and 72°56'17"E. Ten year old healthy mango trees spaced at 10 × 10 m were selected for this study. The experiment was evaluated in a Randomized Block Design with factorial concept. The investigation comprised of four de-blossoming treatments *i.e.* foliar sprays of Naphthalene Acetic Acid (NAA) at 400 and 800 ppm, hand de-blossoming and untreated trees which served as control along with six varieties *i.e.* Amrapali, Baramasi, Neelphanso, Neelum, Ratna and Totapuri. Thus in all there were 24 treatment combinations which were replicated thrice. Varieties were selected according to their flowering behavior, late flowering habit and parentage of selected varieties. De-blossoming was done at full bloom stage for induction of off season flowering. Plants were maintained under uniform conditions as per the recommended package of practices of Navsari Agricultural University. Fully mature mango fruits were harvested and collected randomly (as and when the fruits matured on the tree). For the estimation of physical parameters during each season, five fruits were randomly selected from the harvested lot of each treatment, they were brought to the laboratory and utilized for observational study as per standard procedure and protocols. Average fruit weight was calculated using an electronic weighing machine whereas, fruit length and width were recorded using Vernier calipers. Fruit volume was estimated by water displacement method using a measuring cylinder. Significance differences among treatments were compared using the Fisher's analysis of variance at the 95 % probability level [5]. All differences reported were significant at $p \geq 0.05$ unless otherwise stated.

3. RESULTS AND DISCUSSION

3.1 Regular Season Fruiting

Fruits are used as major descriptors in the identification of different varieties in fruit crops [6]. Data indicated a significant variation amongst the selected six varieties for fruit weight, length, width and volume in regular fruiting season

during 2013-14 and 2014-15 (Table 1). Totapuri (V_6) recorded the maximum fruit weight (406.93 and 412.40 g), fruit length (13.23 and 13.26 cm), fruit width (8.56 and 8.42 cm) and fruit volume (401.59 and 407.85 ml) during 2013-14 and 2014-15, respectively.

While the lowest fruit weight (237.92 and 240.31 g), fruit width (5.93 and 6.02 cm) and fruit volume (232.55 and 235.00 ml) were noticed in Neelphonso (V_3). Whereas, the smallest fruit in term of fruit length (9.47 and 9.51 cm) was observed in Neelum (V_4) variety (Fig. 1). This variation can be attributed to the absorption and translocation pattern of photosynthates, genetic composition and environmental factors. Varietal differences for fruit weight and fruit volume has earlier been reported by Roshan et al. [7]; Rymbai et al. [8]; Patel et al. [9] and Hada and Singh [10]. While results on fruit length and fruit width find support from Bora et al. [11] and Kumar et al. [12].

3.2 Off Season Fruiting

There was a significant impact of hand de-blossoming on weight and volume of fruits during the off-season in 2013-14 and 2014-15. Higher fruit weight (305.04 and 306.29 g) and fruit

volume (299.81 and 301.02 ml) were recorded in fruits harvested from hand de-blossoming trees as compared to fruits from untreated trees during both years (Fig. 2). This improvement was mainly due to greater shifting of soluble assimilates to developing and active sink (*i.e.* fruit) in off-season. While, untreated trees showed lower fruit weight and fruit volume as compared to hand de-blossoming treatment. This may be due to scarcity of photosynthates or higher utilization of soluble assimilates in regular season. Oosthuysen and Jacobs [13] and Yeshitela et al. [14] found marginally higher fruit weight in hand de-blossomed treatments over untreated trees (control).

Significant differences were noticed in off season fruiting parameters of selected varieties during 2013-14 and 2014-15. Maximum fruit weight (334.90 and 338.73 g), fruit length (10.60 and 10.78 cm), fruit width (8.21 and 8.28 cm) and fruit volume (329.44 and 333.47 ml) was observed in Ratna (V_5). Whereas, lowest fruit weight (269.87 and 271.94 g), fruit length (8.46 and 8.49), fruit width (5.86 and 5.87 cm) and fruit volume (264.67 and 266.47 ml) was recorded in variety Neelphonso (V_3) during 2013-14 and 2014-15, respectively (Table 2).

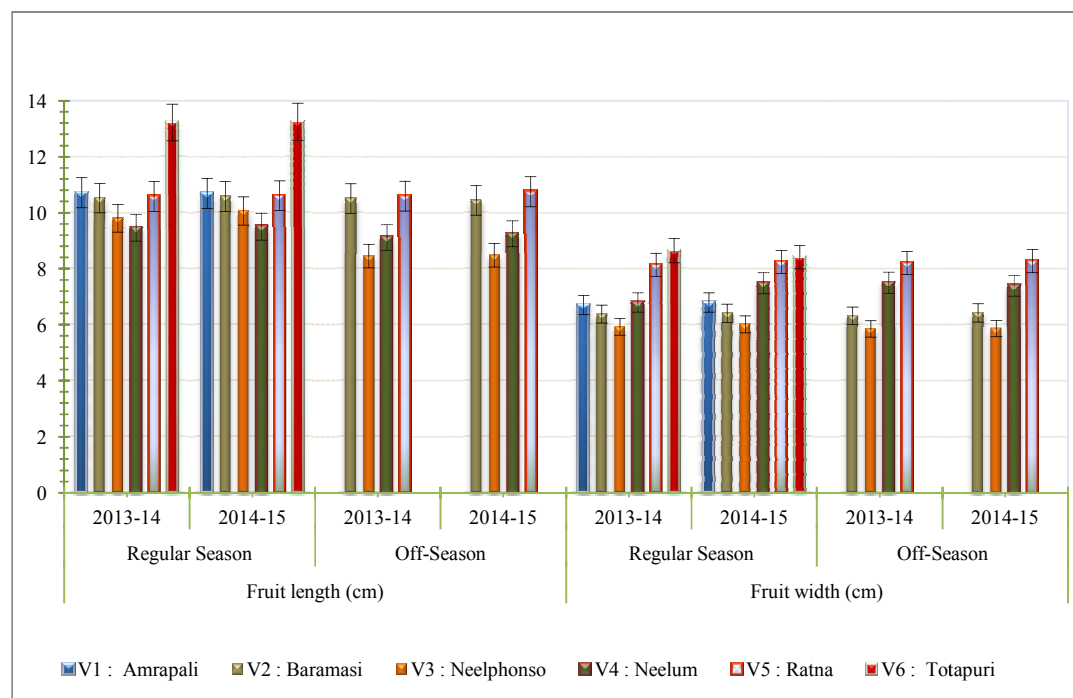


Fig. 1. Varietal and seasonal variation in selected mango varieties for fruit length and fruit width

Table 1. Fruiting traits of selected mango cultivars during the regular flowering season

Varieties	Fruit weight (g)		Fruit length (cm)		Fruit width (cm)		Fruit volume (ml)	
	2013-14	2014-15	2013-14	2014-15	2013-14	2014-15	2013-14	2014-15
V ₁ : Amrapali	248.77	264.84	10.72	10.70	6.72	6.80	243.20	259.87
V ₂ : Baramasi	270.90	278.21	10.53	10.59	6.39	6.42	266.19	273.25
V ₃ : Neelphonso	237.92	240.31	9.81	10.07	5.93	6.02	232.55	235.00
V ₄ : Neelum	265.49	275.26	9.47	9.51	6.80	7.49	260.42	270.14
V ₅ : Ratna	327.33	335.95	10.59	10.61	8.15	8.25	322.61	330.89
V ₆ : Totapuri	406.93	412.40	13.23	13.26	8.65	8.42	401.59	407.85
S.Em.±	7.503	10.197	0.268	0.287	0.324	0.249	7.540	10.217
C.D. at 5%	23.64	32.13	0.84	0.90	1.02	0.78	23.76	32.20

Table 2. Effect of de-blossoming on off season fruiting traits in selected mango varieties

Treatments	Fruit weight (g)		Fruit length (cm)		Fruit width (cm)		Fruit volume (ml)	
	2013-14	2014-15	2013-14	2014-15	2013-14	2014-15	2013-14	2014-15
De-blossoming ##								
T ₃ : Manually (hand de-blossoming)	305.04	306.29	9.76	9.80	7.07	7.10	299.81	301.02
T ₄ : Control	286.63	293.12	9.59	9.68	6.88	6.89	281.46	287.92
S.Em.±	4.10	4.23	0.11	0.11	0.11	0.12	4.10	4.22
C.D. at 5%	12.43	12.82	NS	NS	NS	NS	12.44	12.79
Varieties (V)#								
V ₂ : Baramasi	280.94	277.76	10.52	10.45	6.33	6.43	276.01	272.57
V ₃ : Neelphonso	269.87	271.94	8.46	8.49	5.86	5.87	264.67	266.47
V ₄ : Neelum	297.62	310.40	9.12	9.25	7.51	7.40	292.42	305.37
V ₅ : Ratna	334.90	338.73	10.60	10.76	8.21	8.28	329.44	333.47
S.Em.±	5.79	5.98	0.15	0.15	0.15	0.16	5.80	5.96
C.D. at 5%	17.57	18.14	0.46	0.47	0.45	0.49	17.59	18.09
Interaction effect (T×V)								
S.Em±	8.19	8.46	0.21	0.22	0.21	0.23	8.20	8.43
C.D. at 5%	NS	NS	NS	NS	NS	NS	NS	NS

(#) denotes removal of selected treatment and its combination from statistical analysis and data were analysed using remaining treatment combinations. # Amrapali (V₁) and Totapuri (V₆) did not flower in the off season after imposition of de-blossoming treatments ## Trees subjected to treatment T₁ (NAA-400 ppm) and T₂ (NAA-800 ppm) did not carry their fruits to maturity

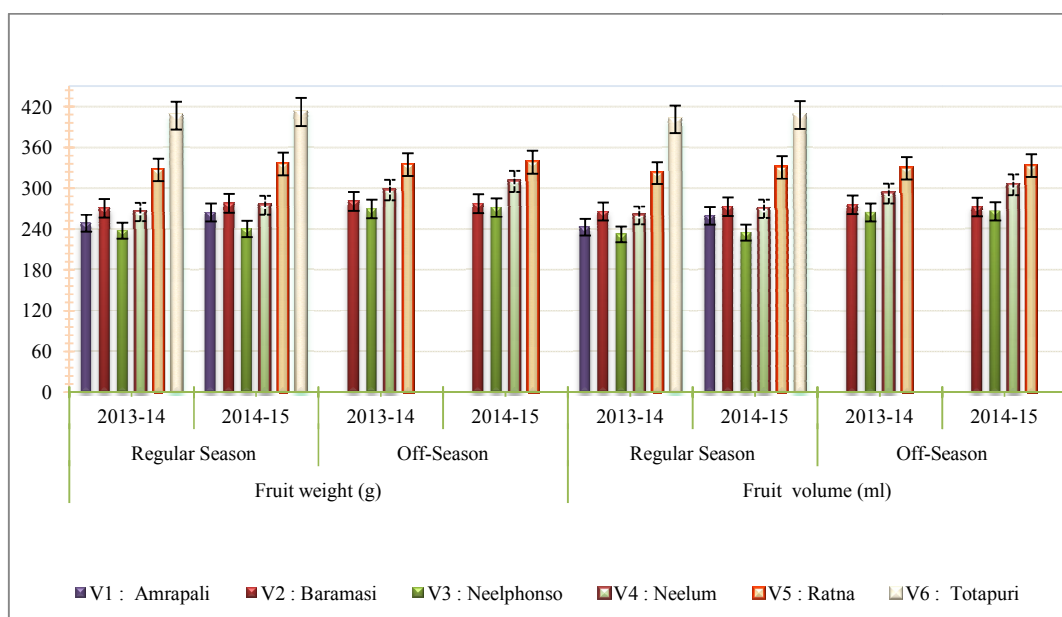


Fig. 2. Varietal and seasonal variation in selected mango varieties for fruit weight and fruit volume

With regard to fruit length variety Baramasi (V_3) was at par with Ratna cultivar (V_5). The reported variation in physical parameters may probably be due to the absorption and translocation pattern of photosynthates, environmental factors and inherent genetic variation among varieties. Varietal variation in fruit weight during off-season was observed by Kaviarasu and Vanilarasu [15] and Kaviarasu et al. [16]. Several workers have reported that mango cultivars differ in fruit length and width, according to their genetic make-up [17]. This finding on fruit length is in accordance with Kaviarasu et al. [16].

4. CONCLUSION

Based on the above investigation, it can be concluded that in the regular fruiting season, cultivar Totapuri showed the maximum fruit weight and fruit size. However, on de-blossoming at full bloom stage, cultivar Ratna recorded the highest fruit weight and size. Between the different de-blossoming techniques employed, hand-deblossoming proved best. This trial highlights the possibility of employing hand de-blossoming to regulate the fruiting time and physical traits in mango cultivars exhibiting off-season flowering in coastal climate of South Gujarat. These varieties can be further evaluated and used in mango breeding programmes, to

meet the demand of mango fruits during the off season.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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Peer-review history:

The peer review history for this paper can be accessed here:
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