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Studies on effect of types of bag on mango fruit (Cv. Kesar) at egg stage

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Abstract

Pre harvest cultural practices has great impact on mango fruit growth and development, so the present study on effect of types of bag on mango fruit Cv. Kesar at egg stage was taken up at ASPEE, ARDF Farm, Village- Nare, Taluka- Wada, District-Palghar (Maharashtra), India in summer, 2014 from March to June. The fruits were bagged at egg stage (60 days from fruit set) with different types of bags which constituted the various treatments viz: T₁: Newspaper bag; T₂: Brown paper bag; T₃: Scurting bag; T₄: Polythene bag; T₅: Butter paper bag; T₆: Muslin cloth bag; T₇: Brown paper bag with polythene coating; T₈: control (no bagging). The results indicated that various physical parameters were affected significantly due to bagging. Fruits bagged with Newspaper bag (T₁) showed best performance for fruit retention (91.11%), While fruits bagged with Newspaper bag (T₁) and Brown paper bag (T₂) recorded maximum fruit length (12.78 and 12.29 cm), fruit weight (263.67 g and 248.22 g) and pulp weight (188.83 g and 179.76 g) respectively, T₄ contributed best performance for days required for harvesting (55 DAB). Bagging of mango fruits prior to harvest controlled mechanical damage caused by various factors, improved colour and other physical properties of fruit. Thus, it was concluded that different types of bags influenced growth and development of mango fruit and it is one of the best alternative to avoid adverse effect of recent changes in climate on fruit.

Keywords: Mango, Kesar, bagging, egg stage, fruit weight and mealy bug

1. Introduction

Mango (*Mangifera indica* L.) is the oldest and choicest fruit of the world. Mango is believed to be originated to South East Asia, Indo Burma region, in the foot hills of the Himalayas (Bose, 1985 & Mukherjee, 1951) [6, 15]. It has an intimate association with cultural, religious, aesthetic and economical life of Indians since time immemorial (Chattopadhyay, 1976) [7]. Riped mango fruits, besides being used for table purpose, also utilize to produce products like Squash, Syrup, Jam and Jellies (Anon. 1980) [2]. India ranks first in area and production by 18.43 million MT from about 2.52 million ha area with the productivity of 7.3 MT/ha (Anonymous, 2014) [3]. Pre-harvest bagging of fruits is done to prevent damage occurring due to bruises, wounds, scars, diseases, pest attack and to produce cleaner fruit skin with attractive colour (Bayogan *et al.*, 2006) [5]. Bagging increased fruit weight and peel colour development from green to yellow, due to less chlorophyll a and chlorophyll b. Regarding the fruit weight, 2-layer bagged fruit had the highest weight (Watanawan *et al.*, 2008) [22]. Hence, studies on effect of types of bag on mango fruit Cv. Kesar.

2. Material and methods

The experiment was set using a randomized block design (RBD). It was conducted in the Mango orchard ASPEE, ARDF Farm, Village- Nare, Taluka- Wada, District-Palghar (Maharashtra), India. Fruits of equal size were randomly selected and one set of 600 fruits bagged using different types of bag at 60 days after fruit set. Experiment was taken in 3 replications and 25 fruits were selected randomly per treatment and per replication. Treatments were T₁: Newspaper bag; T₂: Brown paper bag; T₃: Scurting bag; T₄: Polythene bag; T₅: Butter paper bag; T₆: Muslin cloth bag; T₇: Brown paper bag with polythene coating; T₈: control (un bagged). Perforations were made at the bottom of bag (≤ 4 mm) on all bags except for scurting and muslin cloth bags for proper ventilation required for fruit development. While bagging the brown paper bags, newspaper bags, butter paper bags and plastic bags were stapled properly, so that it will not fall down as well as there will not be open space for entry of insects or rain etc. The scurting and muslin cloth bags were tied with the help of thread.

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2.1 Observations recorded

The length and diameter was measured with the help of Vernier caliper and expressed in centimetres (cm). The weight of fruits and pulp was recorded by using monopan electronic balance and expressed in grams (g). Mango fruit pulp and stone of ripe fruit were separated and their weight was recorded in grams (g) and ratio of pulp weight to stone weight was calculated.

2.2 Sensory evaluation

The ripe fruits were examined for their sensory qualities for accessing the colour, flavour and texture when they were ripe. It was carried out by panel of 5 judges with 9 point Hedonic scale score (Amerine *et al.*, 1965) ^[1].

2.3 Statistical Analysis

The statistical analysis was performed as per the Anova suggested by Panse and Sukhatme (1997) ^[17]. The "P" value of data was estimated by students paired t-test. Standard Deviation was calculated as per the procedure advocated by Rangaswami (1995) ^[18].

3. Results and Discussion

From this study bagging of fruits of mango cv. Kesar, a significant variation was observed for fruit retention between the treatments. The maximum fruit retention was noticed in fruits bagged with News paper bag (T₁) 72.84% followed by Muslin cloth bag (T₆) 70.93%, Butter paper bag (T₅) 69.79% and scurting bag (T₃) 68.55% (Table 1). Minimum fruit retention was found in fruits bagged with polythene bag (T₄) 64.97%. The results are in confirmation with Oosthuysen *et al.* (2007) ^[16] in litchi, Debnath and Mithra (2008) ^[10] in litchi and Chowdhury and Rahim (2009) ^[9] in mango. The abiotic factors *viz.* temperature and humidity play critical role in fruit growth and development. Bagging on fruits alters the microenvironment around fruits (Sharma *et al.*, 2014) ^[20].

The variation among different treatments for number of days required for harvesting was significant. Earliest harvesting was recorded in fruits bagged with polythene bag (T₄) 55 days followed by Brown paper bag with polythene coating (T₇) 56 days whereas, late harvesting was noticed in Newspaper bag (T₁) and Brown paper bag (T₂) 61 days (Table 1). The warm temperature in plastic bags and brown paper bag with polythene coating as compared to control might have contributed for early harvesting. Harvesting of fruits in news paper bag and brown paper bag was delayed due to lower temperature and higher humidity than that of control. The advancement in harvesting of fruits bagged with polythene bags and delayed in harvesting of fruits bagged with newspaper was reported by Lei and Kun (2006) ^[14] in tomato, Debnath and Mithra (2008) ^[10] in litchi, Chonhenchob *et al.* (2011) ^[8] in mango and Teixeira *et al.* (2011) ^[21] in 'Fuji Suprema' apples.

Fruit length of mango cv. Kesar was increased significantly by bagging over control, News paper bag (T₁) recorded

highest fruit length 12.78 cm which was on par with Brown paper bag (T₂) 12.29 cm, Butter paper bag (T₅) 12.01 cm, Bsenrown paper bag (T₆) 11.62 cm and Scurting bag (T₃) 11.58 cm. The results are in conformation with Kassem *et al.*, (2011) ^[13] in Zaghoul, Awad and Al-Qurashi (2012) ^[4] in 'Barhee' of Date palm. Bagging had non-significant effect on fruit diameter at harvest. But, the fruits bagged with Newspaper bag (T₁) 7.70 cm, Muslin cloth bag (T₆) 7.37 cm, Butter paper bag (T₅) 7.10 cm and Scurting bag (T₃) 6.77 cm were better over Polythene bagged fruits (T₄) 6.04 cm and control fruits (T₈) 6.30 cm (Table 2). Xu *et al.* (2008) ^[23] reported that increase in fruit width due to bagging in carambola. Bagging promoted longan fruit development, resulting in larger-sized fruit (Yang *et al.*, 2009) ^[24].

Fruits bagged with Newspaper bag (T₁) and Brown paper bag (T₂) recorded fresh weight 263.67 g. and 248.22 g. pulp weight 188.88 g. and 179.76 g. respectively which was significantly superior over other treatments (Table 2). It was followed by rest of the treatments for fresh weight and pulp weight of the fruit. The days required for harvesting were greater in news paper bag and brown paper bag than control which might have helped to record more fruit weight in these treatments. Fallahi *et al.* (2001) ^[11] observed the highest average fruit weight in bagged fruit of 'BC-2 Fuji' Apple as compared to non-bagged fruit. Debnath and Mithra (2007) ^[10] found the highest fruit weight in NP bag as compared to control in litchi. Watanawan *et al.* (2008) ^[22] noticed the highest fruit weight in 2-layer paper bag followed by paper bag as compared to control in mango Cv. 'Nam Dok Mai'.

Bagging of fruits with Scurting bag and Muslin cloth bag has significantly improved pulp to stone ratio 6.21 and 6.52 respectively compared to control 7.58 (non-bagged). The improved micro climate around fruit, might have helped for improvement of fruit weight, pulp to stone ratio in some treatments. The fruits attained rapid maturity in polythene bag and Brown paper bag with polythene coating bag which might have resulted into less fruit weight. Awad and Al Qurashi (2012) ^[4] reported that bunch bagging in Barhee date palm cultivar improved flesh weight, seed weight, flesh to seed ratio over control.

While observing the colour of the bagged fruits, it was in the class of 'Like moderately' except the treatment T₁ (Newspaper bag). Fruits bagged with the treatment T₁ (Newspaper bag) had the fruits in the class of 'Like very much'. Senanan *et al.*, 2011 ^[19] reported improved fruit colour in litchi.

While comparing the sensory score of flavour, all the treatments having the same class i.e. 'Like moderately' class except the treatment T₆ and T₁. Fruits of the treatment T₆ showed highest score and it was in the class of 'Like very much'. Pre-harvest bagging with different types of bag did not change the sensory qualities of ripe fruits mango Cv. Kesar. Hwang *et al.*, (2004) ^[12] reported that bagging altered the peel colour with limited effect on major characteristics of fruit quality of Ruby grape fruit.

Table 1: Effect of types of bag on fruit retention, Days required for harvesting on mango Cv. Kesar

Treatment	Fruit retention (%)	Days required for harvesting after bagging	Advance (+)/ Delay (-) in maturity over control (days)
T ₁ (Newspaper bag)	91.11 (72.84)	61	-3
T ₂ (Brown paper bag)	86.33 (68.35)	61	-3
T ₃ (Scurting bag)	86.48 (68.55)	58	0
T ₄ (Polythene bag)	82.09 (64.97)	55	+3
T ₅ (Butter paper bag)	88.05 (69.79)	58	0
T ₆ (Muslin cloth bag)	89.16 (70.93)	58	0
T ₇ (Brown paper bag with polythene coating)	85.76 (67.89)	56	+2
T ₈ (control)	82.47 (65.25)	58	0
Mean	68.57	58.13	
S. Em ±	1.42	0.94	
C. D. at 5%	4.30	2.84	
CV	7.58	8.19	

Note: Figures in parenthesis are arc sin values

Table 2: Effect of types of bag on physical parameters of mango fruit Cv. Kesar

Treatment	Length of the fruit (cm)	Diameter of the fruit (cm)	Fresh weight of the fruit (g)	Pulp weight of the fruit (g)	Pulp to stone ratio
T ₁ (Newspaper bag)	12.78	7.70	263.67	188.83	7.73
T ₂ (Brown paper bag)	12.29	6.70	248.22	179.76	7.94
T ₃ (Scurting bag)	11.58	6.77	212.00	137.87	6.21
T ₄ (Polythene bag)	10.62	6.04	209.00	130.57	6.88
T ₅ (Butter paper bag)	12.01	7.10	226.11	151.21	7.27
T ₆ (Muslin cloth bag)	11.62	7.37	222.11	156.13	6.52
T ₇ (Brown paper bag with polythene coating)	11.44	6.45	207.44	138.63	7.61
T ₈ (control)	10.52	6.30	215.78	144.55	7.58
Mean	11.61	6.80	225.54	153.44	7.22
S. Em ±	0.40	0.44	11.70	8.87	0.25
C. D. at 5%	1.22	NS	35.50	26.89	0.77
CV	8.07	11.18	8.99	10.01	8.47

Table 3: Effect of bagging on sensory evaluation of ripe fruits in mango Cv. Kesar

Treatments	Sensory score for			Average score
	Colour	Flavour	Texture	
T ₁ (News paper bag)	8.08	7.75	7.58	7.80
T ₂ (Brown paper bag)	7.08	7.25	7.58	7.31
T ₃ (Scurting bag)	7.42	7.25	7.50	7.39
T ₄ (Polythene bag)	7.75	7.83	8.00	7.86
T ₅ (Butter paper bag)	7.75	7.00	8.17	7.64
T ₆ (Muslin cloth bag)	7.92	8.25	7.58	7.92
T ₇ (Brown paper bag with polythene coating)	7.58	7.50	6.92	7.33
T ₈ (Control)	7.42	7.25	7.50	7.54
Mean	7.63	7.51	7.60	7.54
S. Em ±	0.32	0.39	0.32	0.21
C. D. at 5%	0.96	NS	NS	NS

4. Conclusion

The study has shown fruits bagged with Newspaper bag (T₁) showed best performance for fruit retention (91.11%), While fruits bagged with Newspaper bag (T₁) and Brown paper bag (T₂) recorded maximum fruit length (12.78 and 12.29 cm), fruit weight (263.67 g and 248.22 g) and pulp weight (188.83 g and 179.76 g) respectively, T₄ contributed best performance for days required for harvesting (55 DAB). Bagging of mango fruits prior to harvest controlled mechanical damage caused by various factors, improved colour and other physical properties of fruit. Thus, it was concluded that different types of bags influenced growth and development of mango fruit and it is one of the best alternative to avoid adverse effect of recent changes in climate on fruit.

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