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Studies on effect of types of bag at egg stage on mango fruit (cv. ALPHONSO)

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ABSTRACT : Bagging of mango fruits prior to harvest is the best alternative to avoid adverse effect of recent changes in climate on fruit by causing physical damage. Bagging mango fruit was undertaken at Department of Horticulture, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli in summer, 2013 from March to June. The results indicated that various chemical parameters were affected significantly due to bagging. Treatment T₁ showed best performance for fruit retention (90.67 %), length (9.44 cm), weight (298.67 g) and pulp weight (223.88 g) of fruit. T₄ contributed best performance for days required for harvesting (55 DAB). Bagging had significant effect on mealy bug infestation. Thus, it is concluded that different types of bags influenced growth and development of mango fruit.

KEY WORDS : Alphonso, Bagging, Egg stage, Fruit weight, Mealy bug

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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 and Mukherjee, 1951). It has an intimate association with cultural, religious, aesthetic and economical life of Indians since time immemorial (Chattopadhyay and Nandi, 1976). Ripped mango fruits, besides being used for table purpose, also utilize to produce products like Squash, Syrup, Jam and Jellies (Anonymous, 1980). 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). Mango is established in Konkan on 1.85 lakh hectares of which about 90 per cent is occupied by 'Alphonso' (Haldankar *et al.*, 2013). 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). 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). Hence, studies on effect of types of bag on mango fruit cv. ALPHONSO.

RESEARCH METHODS

The experiment was set using a Completely Randomized Design (CRD). It was conducted in the Mango orchard of cv. ALPHONSO survey number 93, 94, 96 and 99, Department of Horticulture, College of Agriculture, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, Dist. Ratnagiri (M.S.) India. The soil of experimental plot was red lateritic with uniform depth and good drainage conditions. The Konkan region lies on the west coast of Maharashtra at 17°45' N latitude and 73°12' E longitude. It has an altitude of 240 m from the MSL. 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.

Observations recorded:

Length and diameter of fruit:

The length and diameter was measured with the help of Verniercaliper and expressed in centimeters (cm).

Fruit and pulp weight:

The weight of fruits and pulp was recorded by using monopan electronic balance and expressed in grams (g).

Pulp to stone ratio:

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.

Pest and disease incidence :

Each fruit was thoroughly examined on alternate days for any visible symptoms of spoilage, pest and

disease incidence during storage at ambient temperature conditions.

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).

Statistical analysis:

The statistical analysis was performed as per the Anova suggested by Panse and Sukhatme (1985). The "P" value of data was estimated by students paired t-test. Standard Deviation was calculated as per the procedure advocated by Rangaswamy (1995).

RESEARCH FINDINGS AND DISCUSSION

A non-significant variation was observed for fruit retention between the treatments. However, the maximum fruit retention was noticed in T₁ (90.67 %) followed by T₅ (89.33 %), T₈ and T₃ (88 %) (Table 1). Minimum fruit retention was found in T₄ (84 %). The results are in confirmation with Oosthuysen *et al.* (2007) in litchi, Debnath and Mitra (2008) in litchi and Chowdhury and Rahim (2009) 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).

The variation among different treatments for number of days required for harvesting was significant. Earliest

Table 1 : Effect of types of bag on fruit retention, days required for harvesting

Treatments	Fruit retention (%)	Days required for harvesting after bagging	Advance (+)/Delay (-) in maturity over control (days)	Infestation of mealy bug (%)
T ₁ (Newspaper bag)	90.67 (72.29)	61	-3	0.00
T ₂ (Brown paper bag)	86.67 (68.63)	61	-3	0.00
T ₃ (Scurting bag)	88.00 (69.91)	58	0	5.33 (13.34)
T ₄ (Polythene bag)	84.00 (66.53)	55	+3	0.00
T ₅ (Butter paper bag)	89.33 (71.82)	58	0	0.00
T ₆ (Muslin cloth bag)	86.67 (68.91)	58	0	5.67 (13.76)
T ₇ (Brown paper bag with polythene coating)	85.33 (67.81)	56	+2	0.00
T ₈ (control)	88.00 (69.91)	58	0	9.67 (18.11)
Range	67.81 -72.29			0 - 18.11
S.E. \pm	2.65	0.94		5.65
C.D. (P=0.05)	NS	2.84		0.25
P-value	0.7947	0.0049		0.76

Note: Figures in parenthesis are arcsin values

NS=Non-significant

harvesting was recorded in T₄ (55 days) followed by T₇ (56 days) whereas, late harvesting was noticed in T₁ and 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) in tomato, Debnath and Mitra (2008) in litchi, Chonhenchob (2011) in mango and Teixeira *et al.* (2011) in 'Fuji Suprema' apples.

All types of bags improved fruit length of mango at harvest though the effect was non-significant. Hwang *et*

Table 2 : Effect of types of bag on physical parameters of mango fruit cv. ALPHONSO

Treatments	Length of the fruit (cm)	Diameter of the fruit (cm)	Fresh weight of the fruit (g)	Pulp weight of the fruit (g)	Stone weight of the fruit (g)	Pulp to stone ratio
T ₁ (Newspaper bag)	9.44 (9.44±0.54)	8.04 (8.04±0.22)	298.67 (298.67±22.88)	223.88 (223.88±19.77)	44.1 (44.10±1.35)	4.27 (4.27±0.08)
T ₂ (Brown paper bag)	8.92 (8.92±0.18)	7.7 (7.7±0.15)	262.11 (262.11±11.19)	191.92 (191.92±2.32)	37.83 (37.83±0.76)	4.94 (4.94±0.57)
T ₃ (Scurting bag)	9.20 (9.20±0.40)	7.77 (7.77±0.23)	247 (247.00±11.59)	172.87 (172.87±9.30)	33 (33.00±1.32)	6.02 (6.02±0.12)
T ₄ (Polythene bag)	8.95 (8.95±0.40)	7.57 (7.57±0.26)	244 (244.00±6.66)	165.57 (165.57±2.86)	43.83 (43.83±3.55)	3.88 (3.88±0.15)
T ₅ (Butter paper bag)	9.01 (9.01±0.25)	8.1 (8.10±0.40)	261.11 (261.11±18.94)	186.21 (186.21±19.89)	40.5 (40.50±3.04)	4.73 (4.73±0.14)
T ₆ (Muslin cloth bag)	9.29 (9.29±0.18)	7.71 (7.71±0.14)	257.11 (257.11±19.63)	191.13 (191.13±11.70)	36 (36.00±3.12)	5.52 (5.52±0.08)
T ₇ (Brown paper bag with polythene coating)	8.77 (8.77±0.20)	7.45 (7.45±0.09)	242.44 (242.44±23.44)	173.63 (173.63±17.19)	39.17 (39.17±4.01)	4.61 (4.61±0.17)
T ₈ (Control)	8.61 (8.62±0.16)	7.3 (7.30±0.10)	250.78 (250.78±10.20)	179.55 (179.55±12.58)	40 (40.00±2.18)	4.58 (4.58±0.20)
Range	8.62-9.44	7.30 - 8.10	242.44 - 298.67	165.57 - 223.88	33.00 - 44.10	3.88 - 6.02
Mean	9.03	7.70	257.90	185.59	38.62	4.89
S.E. ±	0.17	0.10	9.90	7.84	1.64	0.11
C. D. (P=0.05)	NS	0.31	30.03	23.79	4.98	0.34
P-value	0.0618	0.00107	0.02611	0.003992	0.0043	0.0000010

NS=Non-significant

Table 3 : Effect of bagging on sensory evaluation of ripe fruits in mango cv. ALPHONSO

Treatments	Sensory score for			Average score
	Colour	Flavour	Texture	
T ₁ (News paper bag)	7.92	6.75	7.58	7.42
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)	8.08	8.25	7.58	7.97
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
Range	7.08-8.08	6.75-8.25	6.92-8.17	7.31-7.97
Mean	7.63	7.39	7.60	7.54
S.E. ±	0.32	0.39	0.32	0.21
C.D. (P=0.05)	0.96	NS	NS	NS

NS=Non-significant

al. (2004) reported that longitudinal and transverse diameter did not differ significantly in bagged fruits in 'Ruby' grape fruit. Senanan *et al.* (2011) noticed that bagging had no significant effect on fruit length in litchi cv. HONG HUAY.

Bagging had significant effect on fruit diameter at harvest. Among various types of bags, the T₅ (8.1 cm) and T₁ (8.04 cm) were better (Table 2). Xu *et al.* (2008) 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).

The performance of treatment T₁ was superior for fresh weight (298.67 g.) and pulp weight (223.88 g) of the fruit (Table 2). It was followed by rest of the treatments for fresh weight and pulp weight of the fruit and was significantly inferior to T₁. 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) observed the highest average fruit weight in bagged fruit of 'BC-2 Fuji' Apple as compared to non-bagged fruit. Debnath and Mitra (2008) found the highest fruit weight in NP bag as compared to control in litchi. Watanawan *et al.* (2008) noticed the highest fruit weight in 2-layer paper bag followed by paper bag as compared to control in mango cv. 'NAM DOK MAI'.

T₃ showed better performance for stone weight (33 g) and pulp to stone ratio (6.02) (Table 2). It was followed by T₆ for stone weight (5.52) and rest of the treatments for pulp to stone ratio was at par with each other.

Bagging improved micro climate around fruit and the improved micro climate 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) reported that bunch bagging in Barhee date palm cultivar improved flesh weight, seed weight, flesh to seed ratio over control.

The variation recorded for mealy bug infestation was significant. Fruits of T₁, T₂, T₄, T₅ and T₇ were free from mealy bug infestation. Treatment T₈ (18.11 %), T₃ (13.44 %), T₆ (13.77 %) showed mealy bug infestation (Table 1). Watanawan *et al.* (2008) also reported mealy bug infestation in bagged fruits.

While observing the colour of the bagged fruits, it was in the class of 'Like moderately' except the treatment T₆. Fruits bagged with the treatment T₆ had the fruits in

the class of 'Like very much'.

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'. While the fruits of the treatment T₁ showed lowest score and it was in the class of 'Like slightly'. Fruits of treatment T₅ gained more score and was in the class 'Like very much'. Whereas, the treatment T₇ fruits gained less score and was in the class 'Like slightly' (Table 3).

Conclusion:

The study has shown that newspaper bag (T₁) showed best performance for fruit retention, length, weight and pulp weight of fruit. Polythene bag (T₄) contributed best performance for days required for harvesting. Bagging had significant effect on mealy bug infestation. Thus, it was concluded that different types of bags influenced growth and development of mango fruit.

REFERENCES

- Amerine, M.A., Pangborn, R.M. and Rocssler, E.B. (1965). *Principles of sensory evaluation of food*. Academic Press, London.
- Anonymous (1980). Romance of mango. ICAR, pp. 45.
- Anonymous (2014). Area, production and productivity of mango in India. Indian Horticulture Database, pp. 95
- Awad, M.A. and Al-Qurashi, A.D. (2012). Gibberellic acid spray and bunch bagging increase bunch weight and improve fruit quality of 'Barhee' date palm cultivar under hot arid conditions. *Scientia Hort.*, **138**: 96-100.
- Bayogan, E.R.V., Campeon, R.T. and Esguerra, E.B. (2006). 'Carabao' mango harvest quality and production practices and problems of growers in Davao Oriental, Philippines. *ISHS Acta Hort.*, **699**: 103-109.
- Bose, T.K. (1985). *Fruits of India Tropical and Subtropical*. pp. 69-123.
- Chattopadhyay, N.C. and Nandi, B. (1976). Peroxidase and polyphenol-oxidase activity in malformed mango inflorescence caused by *Fusarium moniliforme*. *Biol Plant.*, **18**: 321-326.
- Chonhenchob, V. (2011). Preharvest bagging with wavelength-selective materials enhances development and quality of mango (*Mangifera indica* L.) cv. NAM DOK MAI. *J. Sci. Food & Agric.*, **91**(4): 664-671.
- Chowdhury, M.N.A. and Rahim, M.A. (2009). Integrated crop

management to control anthracnose (*Colletotrichum gloeosporioides*) of mango. *J. Agric. & Rural Development* (Gazipur), **7**(1/2): 115-120.

Debnath, S. and Mitra, S.K. (2008). Panicle bagging for maturity regulation quality improvement and fruit borer management in litchi (*Litchi chinensis*). *Acta Hort.*, **773**: 201-209.

Fallahi, E., Colt, W.M., Baird, C.R., Fallahi, B. and Chun, L.J. (2001). Influence of nitrogen and bagging on fruit quality and mineral concentrations of 'BC-2 Fuji' Apple. *Hort. Technol.*, **11**(3): 462-465.

Haldankar, P.M., Parulekar, Y.R., Haldavnekar, P.C., Pawar, C.D., Desai, V.S. and Pandey, V.S. (2013). Mango production technology. Dr. B.S. Konkan Krishi Vidyapeeth. Dapoli, Dist. RATNAGIRI, M.S. (INDIA).

Hwang, A.S., Huang, K.L. and Hsu, S.H. (2004). Effect of bagging with black paper on colouration and fruit quality of 'Ruby' Grapefruit. *J. Agric. Res. China*, **53**: 229-238.

Lei, W. and Kun, X. (2006). Effects of bag texture on microenvironment and fruit development of tomatoes. *China Veg.*, **1**: 15-18.

Mukherjee, S.K. (1951). The origin of mango. *Indian J. Genet.*, **2**: 49.

Oosthuysen, S.A. (2007). Effect of the time of bagging Wai Chee litchi (*Litchi chinensis*) fruit bunches after fruit-set on fruit appeal and the incidence of litchi moth infestation at harvest. *South African Litchi Growers' Association Yearbook*, **19**: 25-29.

Panse, V. G. and Sukhatme, P.V. (1985). *Statistical methods*

for agricultural workers. ICAR, New Delhi, INDIA.

Ranganna, S. (1977). *Manual of analysis of fruit and vegetable products.* Tata Mc. Graw-Hill Publishing Company Ltd., New Delhi: 201-208.

Rangaswamy, R. (1995). *Textbook of agricultural statistics* (2nd ed.). New Age International Publishers.

Senanan, C., Khamsee, Y., Manochai, P., Somboonwong, P. and Wongnanta, N. (2011). Effect of fruit bagging on postharvest quality of litchi cv. HONGHUAY. *J. Agric. Res. & Extension*, **28**(2): 11-18.

Sharma, R.R., Reddy, S.V.R., and Jhalegar, M.J. (2014). Preharvest fruit bagging a review. *J. Hort. Sci. & Biotechnol.*, **89**(2): 101-113.

Teixeira, R., Boff, M.I.C., Amarante, C.V.T. Do, Steffens, C.A. and Boff, P. (2011). Effects of fruit bagging on pests and diseases control and on quality and maturity of 'Fuji Suprema' apples. *Bragantia*, **70**(3):688-695.

Watanawan, A., Watanawan, C. and Jarunate, J. (2008). Bagging 'Nam Dok Mai #4' mango during development affects color and fruit quality. *Acta Hort.*, **787**: 325-330.

Xu, X.U., Chen, H.B., Huang, R.Y. and He, Y.J. (2008). Effects of bagging on fruit growth and quality of carambola. *Acta Hort.*, **773**: 195-200.

Yang, W.H., Zhu, X.C., Bu, J.H., Hu, G.B., Wang, H.C. and Huang, X.M. (2009). Effects of bagging on fruit development and quality in cross-winter off-season longan. *Scientia Hort.*, **120**: 194-200. <http://dx.doi.org/10.1016/j.scienta.2008.10.009>.

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