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Effect of stage of preharvest bagging with skirting bags on fruit quality of Alphonso mango

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SUMMARY :

The research trial was conducted at Mango Research Sub-Centre, Rameshwar, Deogad to study the effect of stage of preharvest bagging with skirting bags on quality of Alphonso mango. The bagging with skirting bags (PP nonwoven fabric) was done at marble stage and retained the bags upto 45, 60, 75 days and at egg stage and retained upto 45, 60 days and at harvest. The maximum fruit weight (230.67 g), lowest spotted fruits (1.33%), lowest occurrence of spongy tissue (1.67%) were also recorded in treatment T_3- (Bagging at marble stage and removing bags at 75 days after bagging). The lowest incidence of stem end rot disease was in the fruits of T_6 (1.00%) which was at par with T_3 (1.67%). The highest ascorbic acid content (55.00 mg/100g), highest reducing and total sugars (2.28% and 6.78%, respectively) were also found in T_3 treatment. The physiological loss in weight was lowest (14.67%) in fruits of T_3 treatment.

KEY WORDS : Mango, Preharvest bagging, Fruit weight, Chemical properties

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Mango (*Mangifera indica* L.) belongs to family Anacardiaceae, is universally accepted as the finest tropical fruit of the world and has been called, in the orient, "King of the fruits". This fruit is rightly known as 'National fruit of India', owing to its nutritional richness, unique taste and flavour, religious and medicinal importance. It is the oldest and choicest fruit of the world. It is the premier and most popular fruit among the millions of people in India and has been in cultivation in the Indian subcontinent since several centuries. 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). Alphonso is the most popular, delicious variety of mango (*Mangifera indica* L.). It is a leading variety of Konkan region of Maharashtra having high export potential as it thrives and yields best under warm and humid climate of Konkan region. It has distinctive characteristics like firm, fibreless flesh and good keeping quality however, its productivity is comparatively less than other varieties. It is the best variety for both

table and processing purpose (Cheema and Dani, 1934).

The mango production and quality is sensitively governed by biotic and abiotic factors. The preharvest management is vital for improving the quality of the fruits to reduce the incidence of pest and diseases, which can be achieved by using plant growth regulators, nutrients and cultural practices. Since from the last decade, the climate aberrations is the major hurdle in fruit crop production. Delayed and offseason rain, deviation in temperature and humidity adversely affect the crop during fruit development causes incidence of pest and diseases, fruit drop, etc which ultimately adversely affecting the fruit quality of mango. 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). The preharvest bagging of fruits proved the beneficial for reduction of such losses in many fruit crops like apple, banana and litchi (Sharma *et al.*, 2014).

The skirting bags which are technical textile product from PP nonwoven fabric which are generally used for preharvest bagging in different fruit crops. The proper stage of bagging is also crucial and the present investigation was undertaken to study the stage of preharvest bagging on quality of mango cv. ALPHONSO.

EXPERIMENTAL METHODS

The field trial was carried at Mango Research Sub-Centre, Rameshwar, Tal. Deogad, dist. Sindhudurg on 35 years old Alphonso mango trees during the fruiting seasons of the 2014-15. The experiment was laid out in Randomized Block Design with three replications and seven treatments as bagging with skirting bags (PP nonwoven fabric) was done at marble stage and retained the bags upto 45, 60, 75 days and at egg stage and retained upto 45, 60 days and at harvest. The recommended cultural practices were followed in experimental trees block. After fruit set, the uniform fruits were tagged and bagging was done with skirting bags to 25 fruits of each tree as per the treatments. The bags were removed as per the treatment details. The fruits of these trees were harvested at 85 per cent maturity. The observations on average fruit weight, spotted fruits, incidence of stem end rot disease, occurrence of spongy tissue, days required for ripening, physiological loss in weight (PLW) at 14 days after harvest and T.S.S. were recorded. Acidity, ascorbic acid content, reducing and total sugars were estimated by the procedures described by Ranganna (1997). The ripe fruits were also examined for their sensory qualities for assessing colour, flavour and texture by panel of six judges with nine point Hedonic Scale. The statistical analysis was done as suggested by Panse and Sukhatme (1985).

EXPERIMENTAL FINDINGS AND ANALYSIS

The data on effect of stage of bagging on fruit weight in Alphonso mango are given in Table 1. It is evident that the preharvest bagging with skirting bags on Alphonso mango fruits exhibited the significant effect on fruit weight, maturity and spotted fruit percentage.

The fruit weight was significantly increased due to bagging of fruits as compared to control. The maximum fruit weight (230.67 g) was recorded in treatment T_3 (Bagging at marble stage and removing bags at 75 days after bagging) while rest of the bagging treatments were

Table 1 : Effect of stage of preharvest bagging on fruit weight, ripening and disease incidence in Alphonso mango

Treatments	Weight of fruit (g)	No. of days required for ripening	Spotted fruits (%)	Incidences of Stem end rot disease (%)	Spongy tissue incidence (%)	T. S. S. (^{0}B)
T_1	213.33	11.3	6.33	2.67	11.00	19.8
T_2	214.33	13.0	6.00	3.33	7.33	19.6
T_3	230.67	14.3	1.33	1.67	1.67	20.1
T_4	211.33	11.0	8.67	4.67	5.00	19.8
T_5	210.33	12.7	7.67	3.33	6.00	19.7
T_6	211.67	13.7	4.33	1.00	3.33	19.9
T_7	202.33	10.0	14	5.67	13.00	19.7
S.E. $\pm$	4.79	0.51	1.41	1.22	1.67	0.18
C.D. (P=0.05)	14.74	1.58	4.42	NS	5.13	NS

NS= Non-significant

at par with each other. The fruits in control treatment recorded 202.33 g weight. The bagging changes the microclimate around the fruit which possibly helpful for fruit size and weight improvement. The bagging enhanced the fruit weight in apple (Fallahi *et al.*, 2001). Debnath and Mitra (2008) found the highest fruit weight in litchi. Bagging promoted longan fruit development, resulting in larger-sized fruit (Yang *et al*., 2009). Bagging increased fruit weight, size over unbagged control fruits. (Chonhenchob *et al*., 2011). 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 ripening of mango fruits was also significantly delayed in treated fruits. The fruits of treatment T_3 and T_6 ripened in 14.3 and 13.7 days, respectively (Table 1) furthermore in contrast, the unbagged fruits ripened in 10.0 days. The chemical changes during ripening of the fruits might be influenced by bagging. The similar results were also reported by Malshe and Parulekar (2014) and Shinde *et al*. (2015).

The parentage of spotted fruits due to pest and diseases was lowest (1.33%) in treatment T_3 followed by T_6 and T_2. The percentage of spotted fruit was higher (14.00 %) in unbagged (Control) fruits. The incidence of stem end rot disease was minimum (1.00%) in T_6 treatment (Bagging at egg stage and retaining bags till harvest) which was at par with T_3. As in the treatments T_3 and T_6, the period of bagging was comparatively higher than rest of preharvest bagging treatments which might be encouraged protection of fruits for longer period during development stage. The bagging of fruits may act as barrier for disease infestation (fungal development) on fruit surface. The reduction in anthracnose and stem end rot diseases in Keitt mango was recorded by Hofman *et al*. (1997). The occurrence of spongy tissue was remarkably reduced in all the treatments than control and lowest incidence was in the fruits of T_3 (1.67%) which was at par with T_3 (3.33%). The spongy tissue disorder is associated with convective heat (Katrodia, 1989) and exposure of fruit to sunlight (Om, 2004) There was low incidence in bagged fruits which might be due to less exposure fruits to sunlight. The relationship of spongy tissue with atmospheric temperature was reported by Burondkar *et al.* (1994). T.S.S. (^{0}B) of fruits was not differed significantly due to preharvest bagging treatments.

The acidity of the fruits at ripe stage did not vary significantly (Table 2). The ascorbic acid content was significantly highest (55.0 mg/10g) in T_3 treatment which was at par with T_6 treatment.

The sugars content in the fruits showed higher in bagged fruits as compared to unbagged fruits. The maximum reducing and total sugars (2.28 % and 6.78%, respectively) was found in T_3 treatment (Bagging at marble stage and removing bags at 75 days after bagging) which was at par with T_6 treatment. The additional bagging period improved the sugar content in the fruits. The variation observed in chemical composition of mango fruits can be attributed to the changed microenvironment around fruit during its growth and development. The results are in accordance with Hongxia *et al.*(2009); Ding and Syakirah (2010); Wu *et al*. (2013); Nagaharshitha *et al.* (2014) and Haldankar *et al*. (2015).

The physiological loss in weight (PLW) at 14 days after harvest was significantly reduced due to bagging (Table 2). The lowest PLW (14.67%) was observed in T_3 treatment fruits followed by T_2, T_6 and T_5, T_4 treatments and in control, the PLW was 16.83 per cent.

Table 2 : Effect of stage of preharvest bagging on chemical properties and physiological weight in Alphonso mango

Treatments	Acidity (%)	Ascorbic acid (mg/100g)	Reducing sugar (%)	Total sugars (%)	Physiological loss in weight* (%)
T_1	0.35	51.33	2.13	6.37	15.67
T_2	0.34	52.67	2.17	6.41	15.00
T_3	0.33	55.00	2.28	6.78	14.67
T_4	0.35	52.33	2.16	6.38	15.50
T_5	0.36	53.00	2.18	6.49	15.50
T_6	0.36	54.67	2.21	6.61	15.25
T_7	0.37	50.00	2.01	6.23	16.83
S.E. $\pm$	0.01	1.00	0.02	0.06	0.45
C.D. (P=0.05)	NS	3.07	0.08	0.18	1.39

(* at 14 days after harvest) NS= Non-significant

Conclusion:

Thus, the investigation indicate that the bagging of Alphonso fruits with PP non woven fabric at marble and retaining upto 75 days or bagging at egg stage and retaining up to harvest improved fruit weight and chemical properties of fruits.

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