Effect of Bagging on Chemical Properties of Mango (*Mangifera indica* L.) cv. Alphonso

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Abstract

An experiment was conducted to study the effect of bagging on growth and development of mango (*Mangifera indica* L.) cv. Alphonso in the year 2012 from March to June, undertaken in Randomized Block Design. Mango fruits were subjected to six types of bagging treatments with 3 replications at 60 days after fruit set. Results showed that the chemical parameters such as Moisture content, acidity, TSS, reducing, non-reducing sugars and β carotene were not significantly varied due to bagging. Further the total sugars in fruits of muslin cloth and scurting bags were improved at ripe stage over control. The sensory quality in fruits of scurting and muslin cloth bags was improved over control.

Keywords: Alphonso; Bagging; Chemical properties; Sensory evaluation

Introduction

Mango is the most important fruit crop of India. It's delicious taste, exceedingly acceptable flavor, pleasing color and exemplary nutritive value made it 'National fruit of India' and is known as 'King of fruits'. Konkan region of Maharashtra accounts for about 10 per cent of the total area under mango in the country, out of which almost 90 per cent area is covered by the single cultivar "Alphonso", which is locally called as '*Hapus*'. It thrives and yields best under warm and humid climate of konkan region. It is specially preferred for export because of its optimum size and shape, attractive golden yellow skin and flesh colour, exemplary flavour and good keeping quality. It is the best variety for both table and processing purpose [1]. In India, as Alphonso is mostly consumed as a table fruit, its external appearance is an important parameter. Attractive fruits fetch premium rate in the market. There are various approaches to improve external appearance of fruit. Bagging of fruit is one of the novel ways among these various means. Bagging is the covering of individual fruit with specially designed paper or cloth bags. Bagging protects fruits from pests, fungal infections, diseases, mechanical damage, reduces spraying of insecticides, and provides an estimate of harvestable fruits per tree. Bagging of fruits is done to prevent damage occurring due to bruises, wounds, scars also diseases, pest attack and to produce cleaner fruit skin with attractive color. In mango, bagging also helps to prevent fruit fly attack and fungal disease incidence. Pre-harvest bagging has shown improvement in the quality of fruits. Further, in recent years the unfavorable climate is often experienced in the Konkan region of Maharashtra which spoil the external appearance of fruit. Thus bagging can be helpful under such conditions. Pre-harvest bagging possess prospectus in Alphonso mango, which is not much attempted and hence, the present study was conducted to study the effect of bagging on chemical properties of mango cv. Alphonso.

Materials and Methods

The experiment was conducted in the year 2012 in the Indo Israel plot, Department of Horticulture, College of Agriculture Dapoli, Dist. Ratnagiri. The soil of experimental plot is red lateritic with uniform depth with good drainage conditions having pH ranging from 5.6 to 6.5. The place, Dapoli represents more or less tropical climate having 78% humidity throughout the year with minimum 18.5°C and maximum 30.8°C temperature and an average precipitation of 3,500 mm, distributed mainly during four months from June to September. The experiment was arranged in Randomized block design and each treatment was replicated three times and 20 fruits were taken per treatment per replication. Treatment details are as follows: T_1- Brown paper bag, T_2- Newspaper bag, T_3- Butter paper bag, T_4- Plastic bag, T_5- Muslin cloth bag, T_6- Scurting bag and T_7- control. Perforations were made on all bags except for scurting and muslin cloth bags for proper ventilation required for fruit development. Egg sized fruits were selected for bagging. In case of more than two fruits in a cluster, the smaller underdeveloped, deformed fruits, spotted fruits were removed by secator and only 1-2 healthy fruits were bagged. 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 of chemical parameters were taken at harvest and ripe stages. Sensory score was also recorded at ripe stage. 4 fruits were selected randomly and analyzed to determine the fruit chemical composition (moisture content, TSS, acidity, ascorbic acid, β carotene, reducing, non-reducing and total sugars) at harvest and ripe stages according to A.O.A.C [2]. The data obtained was analyzed statistically as per the method suggested by Panse and Sukhatme [3]. The standard error of mean (S.Em.) was worked out and the critical difference (C.D.) at 5 per cent was calculated whenever the results were found significant.

Results and Discussion

When chemical parameters from the Table 1 are seen, it was observed that moisture content was not significantly affected by bagging at harvest and at ripe stages. However, the highest moisture content was observed in the treatment T_4 (82.10%), whereas the lowest was observed in the treatment T_2 (80.46%),at ripe stage the highest moisture content was observed in the treatment T_6 (81.00%) and the lowest in the treatment T_2 (79.10%). Light is found to effect the quality of fruits [4].

Treatment	Moisture content(%)		TSS(oB)		Acidity(%)		Ascorbic acid(mg/100 gm)		Reducing sugars(%)		Non reducing sugars(%)		Total sugars(%)		β carotene(μg/100 g of pulp)	
	At harvest	At ripe	At harvest	At ripe	At harvest	At ripe	At harvest	At ripe	At harvest	At ripe	At harvest	At ripe	At harvest	At ripe	At harvest	At ripe
T1 (Brown paper bag)	81.63	79.70	8.22	14.64	3.65	0.39	78.20	52.77	1.82	3.82	1.08	9.98	2.90	13.80	304.40	11132.00
T2 (News paper bag)	80.46	79.10	8.17	15.96	3.65	0.41	78.11	52.00	1.80	3.85	1.11	10.1	2.90	13.96	303.63	11114.67
T3 (Butter paper bag)	80.63	80.43	8.19	15.47	3.69	0.39	78.97	52.20	1.82	3.86	1.14	10.04	2.95	13.90	306.00	11426.00
T4 (Plastic bag)	82.10	80.83	8.27	15.87	3.63	0.40	79.43	52.00	1.85	3.92	1.17	10.18	3.02	14.10	318.73	11864.33
T5(Muslin cloth bag)	81.90	80.73	8.34	15.18	3.62	0.38	78.87	52.80	1.87	3.93	1.2	10.32	3.07	14.25	312.53	11588.00
T6 (Scurting bag)	81.60	81.00	8.36	15.43	3.63	0.39	78.91	54.90	1.86	3.95	1.21	10.32	3.07	14.27	315.87	11834.33
T7 (control)	81.10	80.80	8.37	15.45	3.61	0.40	78.98	54.17	1.88	3.95	1.19	10.29	3.07	14.24	318.60	11880.00
Range	80.46-82.1	79.10-81	8.17-8.37	14.64-15.96	3.61-3.69	0.38-0.41	78.11-79.43	52-54.9	1.80-1.88	3.82-3.95	1.08-1.21	9.98-10.32	2.9-3.07	13.8-14.27	303.63-318.73	11114.67-11880
Mean	81.35	80.37	8.27	15.43	3.64	0.39	78.78	52.98	1.84	3.9	1.16	10.18	3.00	14.07	311.4	11548.48
S. Em ±	0.566	0.504	0.054	0.34	0.021	0.013	0.122	0.842	0.013	0.05	0.019	0.107	0.023	0.103	1.426	358.38
C. D. at 5%	NS	NS	NS	NS	NS	NS	0.376	NS	0.04	NS	0.058	NS	0.073	0.319	4.396	NS

Table 1: Effect of bagging on physico chemical properties of mango cv. Alphonso.

These results are in line with results obtained by Ding and Syakirah [5] in mango fruit. TSS was not varied significantly due to bagging at harvest and at ripe stages. At harvest, the highest TSS was observed in T_7 (8.37°B), whereas the lowest was observed in T_2 (8.17°B). At ripe stage, the highest TSS was noticed in T_2 (15.96°B).

The lowest was noticed in T_1 (14.64°B). Similarly there was non-significant variation between different treatments in acidity (%) of Alphonso mango fruits at harvest and at ripe stages. At harvest, the highest acidity (%) was observed in the treatment T_3 (3.69%) whereas the lowest was recorded in the treatment T_7 (3.61%). At ripe stage, the highest acidity (%) was noticed in T_2 (0.41%). The lowest was recorded in T_5 (0.38 %). At harvest, ascorbic acid was significantly varied. It was the highest in the treatment T_4 (79.43 mg/100 g) which was significantly superior to all other treatments. The lowest was noticed in T_2 (78.11 mg/100 g). At ripe stage there was non-significant variation in ascorbic acid content between different treatments. However, the highest ascorbic acid content was noticed in the treatment T_6 (54.90 mg/100 g) whereas the lowest ascorbic acid
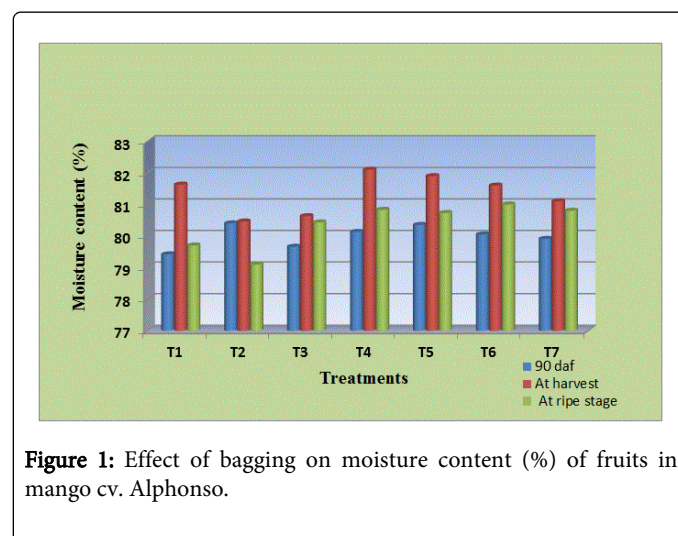

Figure 1: Effect of bagging on moisture content (%) of fruits in mango cv. Alphonso.
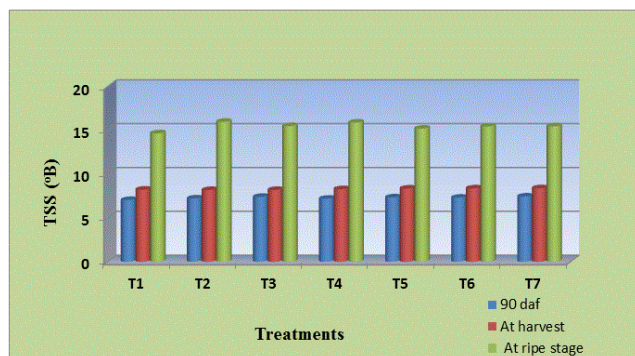
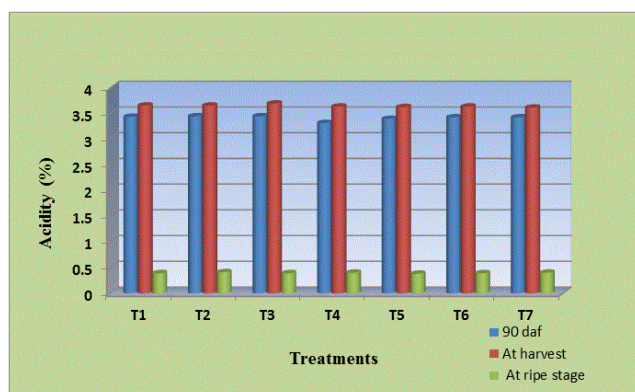**Figure 2:** Effect of bagging on TSS (°B) of fruits in mango cv. Alphonso.

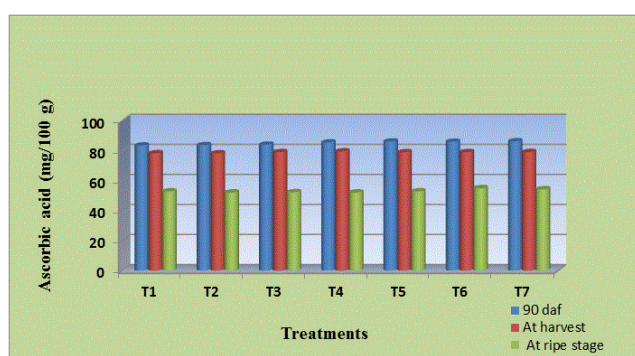**Figure 3:** Effect of bagging on acidity (%) of fruits in mango cv. Alphonso.

Figure 4: Effect of bagging on ascorbic acid (mg/100 g) content of fruits in mango cv. Alphonso.

content was found in T_2 and T_4 (52 mg/100 g) treatments. At harvest stage, the reducing sugar (Figures 1-5) was significantly varied.

The highest reducing sugar was in the treatment T_7 (1.88%). The lowest reducing sugar was noticed in the treatment T_2 (1.80%). At ripe stage there was non-significant variation between different treatments

in reducing sugars. However, the highest was noticed in the treatments T_6 (3.95%) and T_7 (3.95%). The lowest was noticed in the treatment T_1 (3.82%). Harhash and Al-obeed [6] reported in date palm that highest reducing sugars was in blue color bag (27.69%) compared to control (23.33%). Non reducing sugars were significantly varied due to bagging at harvest stage. At harvest stage, the non-reducing sugars (%) were the highest in the treatment T_6 (1.21%). It was the lowest in the treatment T_1 (1.08%). At ripe stage, non-reducing sugars was not significantly varied. The highest was noticed in treatments T_5 and T_6 (10.32%). The lowest non reducing sugars were observed in the treatment T_1 (9.98%). Harhash and Al-Obeed [6] reported that date palm fruit bagged with blue paper bag showed the highest non reducing sugars (33.95%) as compared to control (30.67%).
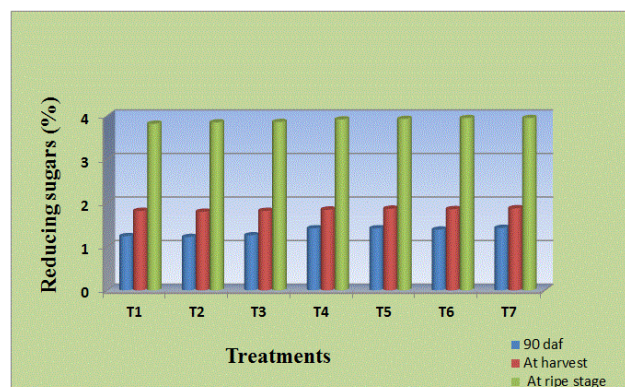

Figure 5: Effect of bagging on reducing sugars (%) of fruits in mango cv. Alphonso.

At harvest and at ripe stages the total sugars was significantly varied. At harvest it was the highest in treatments T_5, T_6, T_7 (3.07%). It was the lowest in treatments T_1 and T_2 (2.9%). At ripe stage, the total sugars were the highest in the treatment T_6 (14.27%). It was the lowest in the treatment T_1 (13.80%). Earlier, Harhash and Al-obeed [6] reported that date palm fruit bagged with blue color bag showed the highest total sugars (61.64%) as compared to control (54%).At harvest, the β–carotene was significantly varied. It was the highest in the treatment T_4 (318.73 μg) and the lowest in the treatment T_2 (303.63 μg).

Treatments	Sensory score for			Average score
	Colour	Flavor	Texture	
T1 (Brown paper bag)	7.14	6.94	7.04	7.04
T2 (Newspaper bag)	7.34	7.21	7.34	7.30
T3 (Butter paper bag)	7.00	7.15	7.00	7.05
T4 (Plastic bag)	7.50	7.40	7.56	7.49
T5 (Muslin cloth bag)	8.20	7.54	7.40	7.71
T6 (Scurting bag)	7.60	8.30	7.24	7.71

T7 (control)	7.40	7.40	7.10	7.30
Range	7.00-8.20	6.94-8.30	7.00-7.56	7.04-7.71
Mean	7.45	7.42	7.24	7.37
S. Em ±	0.101	0.131	0.134	0.156
C. D. at 5%	0.312	0.404	NS	0.481

Table 2: Effect of bagging on sensory evaluation in fruits of mango cv. Alphonso.

Figure 6: Effect of bagging on non-reducing sugars (%) of fruits in mango cv. Alphonso.
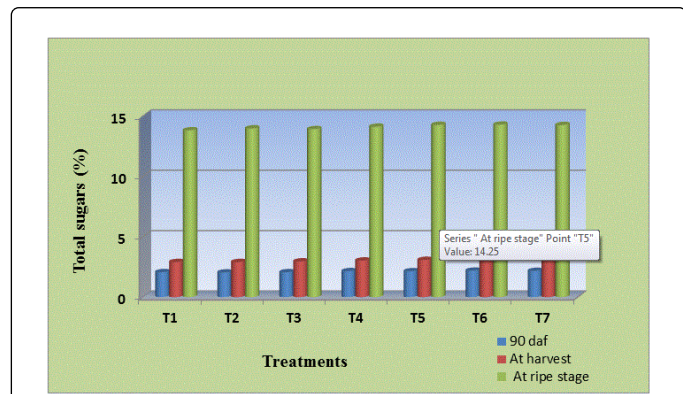
Figure 7: Effect of bagging on total sugars (%) of fruits in mango cv. Alphonso.

At ripe stage the variation noticed between different treatments for β–carotene was non-significant. The highest β–carotene was recorded in the treatment T_7 (11880 µg). The lowest β–carotene was noticed in the treatment T_2 (11114.67 µg). While observing the color of the bagged fruits from the Table 2, it was observed that all the treatments showed the class of 'Like moderately' except the treatment T_5. Fruits bagged with the treatment T_5 had the fruits in the class of 'Like very much'. While comparing the sensory score of flavor (Figures 6-9), all the treatments having the same class i.e. 'Like moderately' class except

the treatment T_6. Fruits of the treatment T_6 showed the highest score and it was in the class of 'Like very much'. Similar to that of color, the sensory score of the texture was around 7 in all the treatments. Thus it indicated that texture of the fruits was in the class of 'Like moderately'.
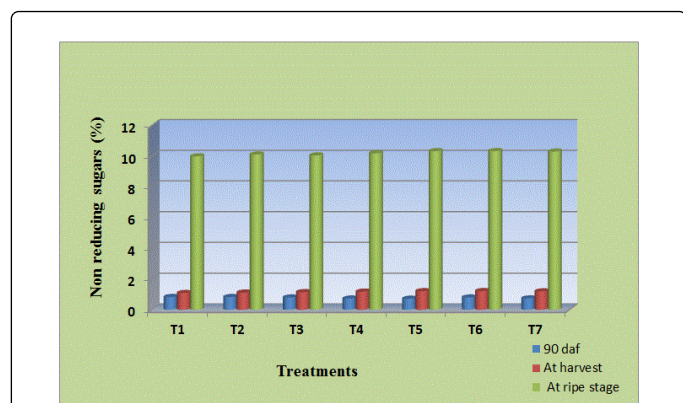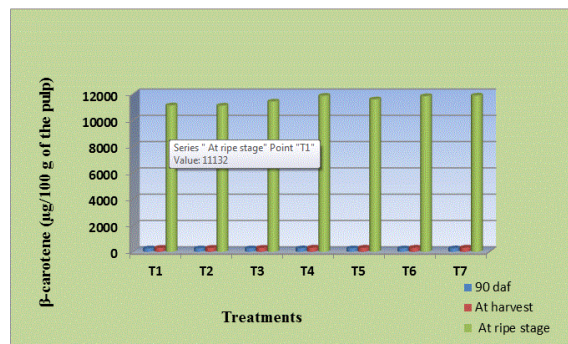

Figure 8: Effect of bagging on β-carotene (µg/100 g of pulp) of fruits in mango cv. Alphonso.
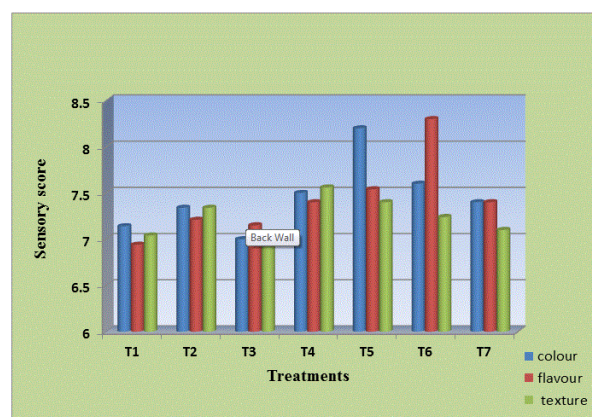

Figure 9: Effect of bagging on sensory score of fruits in mango cv. Alphonso.

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