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Effect of size grading and packaging along with transportation during storage on quality of *Jamun* (*Syzygium cuminii* Skeels) fruits

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SUMMARY : The experiment was conducted in the month of June, 2009 at Department of Horticulture, B. A. College of Agriculture, Anand Agricultural University, Anand to justify the effect of size grading and packaging along with transportation on quality of *Jamun* fruits during storage. The graded fruits (grade A and B) were packed in different containers (Bamboo basket, CFB box and Wooden crates) with and without lining (Newspaper, Polyethylene and *Jamun* leaves) and transported for 200 km and then kept in room at ambient temperature for four days. The fruits were examined on daily basis for physiological loss in weight and spoilage loss. While, chemical parameters *viz.,* TSS, pH, acidity, ascorbic acid, reducing sugar and non reducing sugar were examined on 1st and 4th day of storage. The result revealed that grade A (16.00 to 22.00 g) fruits packed in CFB box having newspaper lining proved to be the best treatment than grade B (12.00 to 15.99 g) fruits as well as rest of the containers. The treatment effectively reduced physiological loss in weight and spoilage loss with minimum changes in chemical constituents than the rest of the treatments and hence can be used for post harvest management of *Jamun* fruits.

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The *Jamun* (*Syzygium cuminii* Skeels) is a nutritious fruit with a variety of uses. It is one of the most hardy fruit crops and can easily be grown in neglected and marshy areas, where other fruits plants cannot be grown successfully. The fruit is good source of iron, sugars, minerals, protein and carbohydrate etc. Fully ripened fruits are eaten as fresh fruit and can be processed into beverages like jelly, jam, squash, wine, vinegar and pickles. A little quantity of *Jamun* fruit's syrup is much useful for curing the diarrhea. *Jamun* seeds contain alkaloids like jambosin and glycoside, which reduce the diastatic conversion of starch in to sugars. Fruits are used as an effective medicine against diabetes, heart and liver trouble (Singh, 2001). Leaf extract of *Jamun* reduces the radiation induced DNA damage in the cultured human peripheral blood lymphocytes (Prince *et al.*, 2003). Therefore, the *Jamun* fruits are having high value in terms of therapeutic and nutrition.

There is a considerable variation exists in the quality of harvested fruit due to genetical, environmental and agronomic factors and therefore requires grading to get suitable returns from the market. Systematic grading coupled with the scientific packaging and storage reduces the post harvest losses and marketing costs substantially, which enables the producer to fetch a competitive price. *Jamun* should be graded on the weight basis to fetch better price in the market.

Adequate packaging protects the fruits from physiological, pathological and physical deterioration in the marketing channels and retains their attractiveness. *Jamun* fruits are highly perishable and are normally packed in bamboo baskets for transport to local market.

Therefore, an experiment was planned to study the effect of grading and packaging along with transportation on quality of *Jamun* fruits.

EXPERIMENTAL METHODS

The present investigation was carried out during June, 2009 at the P.G. Laboratory, Department of Horticulture,

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B. A. College of Agriculture, Anand Agricultural University, Anand. The experiment was laid out in Completely Randomized Block Design (Factorial) with three replications.

The healthy, undamaged and uniform size fruits were obtained from twenty year old *Jamun* tree cv. Paras. The fruits were graded on the basis of weight (Grade A- between 16.00 to 22.00 g and grade B- between 12.00 to 15.99 g). Graded fruits were kept in various packaging materials with or without lining materials and total sixteen treatments comprised of different grade, packaging and lining material were kept for the studies. The data recorded on physiological and biochemical parameters were analyzed statistically using of various techniques as described by Snedecor and Cochran (1980).

EXPERIMENTAL FINDINGS AND ANALYSIS

The experimental results revealed that the physiological and biochemical attributes were found to be the significantly influenced due to grading and packaging treatments on fruits. The packaging treatment on graded fruits significantly proved to be best treatment for reduction in physiological loss in weight, as well as spoilage loss and thereby useful in maintaining good balance between vitamin C and sugar contents of fruits during storage. Fruits treated with this treatment showed little change in TSS, pH and acidity content as compared to control.

The treatment of grade A fruits + CFB box with newspaper lining recorded significantly mean minimum physiological loss in weight (11.41%), spoilage loss (13.25%), TSS (14.82%), pH (4.32), reducing sugar (10.39%), non reducing sugar (1.05%) and total sugar (11.44%) over control (Table 1). This may be due to the role of corrugated fiberboard box, which provides appropriate atmosphere and ventilation inside the box resulting in enhanced storability of fruits (Yadav *et al.,* 2001). At the time of packaging, there is often a vapour pressure difference between the produce (fruit) and the package so that water is evaporated from the produce and is absorbed by packaging material (Baviskar *et al.*, 1995). Singh and Pathak (1988), Chelvan (1988), Pareek and Gupta (1988) and Ladania and Dhillon (1989) also recorded similar trends during storage of fruits. Among the fruits with different grades, the B grade fruits were

Table 1: Effect of size grading and packaging along with transportation during storage on quality of Jamun (*Syzygium cuminii* Skeels) fruits

Treatments	Physiological loss in weight (%)	Spoilage loss (%)	Total soluble solid	pH	Acidity (%)	Ascorbic acid (%)	Reducing sugar (%)	Non reducing sugar (%)	Total sugar (%)
T_1 (A+K)	19.84	31.29	17.03	4.68	0.64	22.11	10.99	1.41	12.39
T_2 (A+K+J)	17.91	22.16	16.78	4.57	0.63	25.30	10.77	1.35	12.11
T_3 (A+K+P)	16.92	21.67	16.28	4.57	0.62	27.07	10.72	1.35	12.06
T_4 (A+K+N)	14.73	19.33	16.18	4.52	0.61	27.28	10.72	1.29	12.00
T_5 (A+C+P)	12.57	14.13	15.70	4.33	0.60	30.70	10.57	1.06	11.62
T_6 (A+C+N)	11.41	13.25	14.82	4.32	0.60	31.61	10.39	1.05	11.44
T_7 (A+W+P)	13.69	16.74	16.15	4.50	0.61	27.20	10.62	1.10	11.71
T_8 (A+W+N)	13.62	16.26	16.03	4.45	0.61	27.59	10.60	1.07	11.67
T_9 (B+K)	23.37	33.93	17.62	4.85	0.60	21.39	11.57	1.54	13.10
T_{10} (B+K+J)	21.67	24.81	17.08	4.83	0.60	22.22	11.48	1.53	13.01
T_{11} (B+K+P)	19.17	24.40	16.42	4.82	0.59	26.66	11.12	1.52	12.63
T_{12} (B+K+N)	18.46	22.06	16.28	4.80	0.59	27.07	11.01	1.49	12.49
T_{13} (B+C+P)	13.97	15.65	16.07	4.73	0.55	28.83	10.86	1.45	12.30
T_{14} (B+C+N)	13.35	14.91	15.52	4.68	0.54	30.23	10.83	1.44	12.27
T_{15} (B+W+P)	15.99	17.93	16.15	4.77	0.59	28.21	10.94	1.47	12.41
T_{16} (B+W+N)	14.58	17.09	16.08	4.75	0.59	28.87	10.95	1.46	12.40
C.D. (P=0.05)									
Days(D)	0.05	0.05	0.02	0.01	0.00	0.05	0.02	0.00	0.02
Treatments(T)	0.10	0.10	0.07	0.03	0.00	0.15	0.05	0.01	0.05
DXT	0.21	0.20	0.09	0.04	0.01	0.21	0.07	0.01	0.07
C.V.%	2.19	1.71	1.00	1.66	1.79	1.34	1.11	1.88	1.03

Note: Grade A (Wt. of fruit: 16.00-22.0 g) Packaging = K- Bamboo basket Lining = J- Jamun leaves
Grade B (Wt. of fruit: 12.00-15.99 g) C- CFB Box, P- Polyethylene, W- Wooden crates, N- Newspaper

smaller in size and recorded faster rate of weight loss as compared to A grade fruits. Similarly Singh *et al*. (1989), Singh (2002) and Singh (2004) reported higher per cent of physiological loss in weight in smaller than the larger size fruits of mango. They concluded that smaller size fruits had thinner skin and more surface area, which resulted in rapid loss of water and facilitated gaseous exchange for enhancing respiration and ripening. The weight loss with advancement of storage period might be due to the loss of moisture and food substances due to the process of transpiration and respiration in *Aonla* (Singh *et al*., 2003 and Singh *et al.,* 2005). Increase in TSS during storage might be associated with the transformation of pectic substances, starch, hemi cellulose or other polysacharides in soluble sugar and also with the dehydration of fruits (Hoda *et al.*, 2000 and Singh *et al.*, 2003). The reduction in titratable acidity during storage might be associated with the conversion of organic acids into sugars and their derivatives or their utilization in respiration (Singh *et al.*, 2003 and Singh *et al.*, 2005). The treated fruits could maintain a lower level of acidity up to last day of storage. It might be due to reduced respiration rate in the later stage of storage as affected by different packing containers. Decline in acidity at faster rate under control could be associated with the higher rate of respiration, as acid forms the necessary substrate for this catabolic process in the fruits (Baviskar *et al.,* 1995).

Slow increase in sugars during storage in the treated fruits was due to less weight loss and thereby less dehydration of the fruits (Singh *et al.*, 2005). These findings are in close agreement with the findings of Ladania (2003). The change in sugar content during storage are very much related with TSS. An increase in sugars during storage was probably due to conversion of starch as well as polysaccharides in to soluble sugars and dehydration of fruits (Hoda *et al.*, 2000 and Singh *et al.*, 2003).

Similarly the mean maximum ascorbic acid content (31.61%) was recorded in CFB box with newspaper lining having grade A fruits, followed by CFB box with polythene lining having grade A fruits (30.70%), which were higher than the control. The mean minimum ascorbic acid content (21.39%) was recorded in control bamboo basket without any lining with grade B fruits. Vitamin C content varied in different size grades during the storage period. The higher amount of vitamin C was recorded in A grade in comparison to B grade fruits, which decreased consistently on prolonged storage period. These results are in the conformity of the work reported by Singh *et al*. (1989). The variation in decreasing trend in vitamin C might be due to different levels of oxidation in different grade of fruits. During storage, oxidizing enzymes like ascorbic acid oxidase, peroxidase, catalase and polyphenol oxidase might be causing decrease in ascorbic acid of the fruits (Singh *et al*., 2003).

From the above findings, it can be concluded that grade A fruits packed in CFB box having newspaper lining proved to be the best treatment than grade B fruits. Hence it can be used for the post harvest storage of *Jamun* fruits.

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