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Effect of Preharvest Fruit Bagging on Physical Parameters of different Guava Cultivars in Rainy Season Crop

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***Abstract*:** The present investigation was carried out to evaluate the effect of different bagging materials on the physical parameters of fruits from various guava cultivars *viz*. Hisar Safeda, Hisar Surkha, Allahabad Safeda and Shweta. The fruits were bagged immediately after fruit set with various coloured paper, polythene and cloth bags., the fruits bagged with blue polythene exhibited the maximum fruit weight, fruit length, fruit width and pulp weight as compared to control in fruits of Shweta. However, maximum specific gravity was observed in fruits of Hisar Safeda and Hisar Surkha as compared to the minimum in Shweta fruits. Hence, the fruits bagged with blue polythene, cotton cloth and green polythene were found promising in enhancing the physical parameters of various guava cultivars taken in the study.

***Keywords*:** Ascorbic acid, Cloth bags, Phytonutrients, Polythene bags, Hisar Safeda

Guava (*Psidium guajava* L.), a member of family *Myrtaceae*, widely grown in the tropical and subtropical regions of the world. Due to its wider adaptability in diverse agroclimatic regions, low cultivation cost, prolific bearing and being highly remunerative. Plants growth affected by many biotic and abiotic factors under field conditions . Fruits obtained during rainy season are of poor quality and highly infested by fruit fly (*Bactrocera correcta* Bezzi) along with the infection of anthracnose (*Colletotrichum gloeosporioides* Penz.) disease . Additionally, birds also damage the fruits which leads to heavy crop losses. To control fruit fly, practices such as, use pheromone traps, poison food traps botanicals, chemical insecticides, is very common among the growers. However, these practices are cumbersome, pocket draining and also imparts residue problems on fruits which is a major concern for the consumers. Therefore, the fruit bagging has appeared as a potential approach in current times. Growers from Japan, Australia, and China are commercially employing this practice for the production of apple, peach, pear, grape, loquat, etc. for the enhanced yields and improved quality of the fruits . During fruit bagging, individual fruit or fruit bunch is covered with a bag (such as, polythene bag, cloth bag, paper bags etc.) on the tree at a specific stage for a specific period. Bagging not only improves the visual appeal of fruits, however, also changes the microenvironment inside a bag and also acts as a physical barrier between fruit and environment, reducing the incidence of pests, diseases, physiological disorders and abrasions on fruits . Hence, the present study was conducted to observe the impact of preharvest fruit bagging on the rainy season crop with four guava cultivars with an aim to screen various bagging material to attain higher yields.

MATERIAL AND METHODS

Experimental site: The present study was carried out at the farms of Guava Demonstration Centre, Bhuna, Fatehabad, Haryana situated at 29° 32' latitude, 75° 42' longitudes and 222m above mean sea level. This area particularly represents a wide variation in average maximum and minimum temperatures. The temperature varied from 40 °C to 48 °C during summer to as low as to freezing point accompanied with chilling frost in winters. The approximate average rainfall was 450 mm, most of which received mainly during Southwest monsoon (July to September), while few showers also occur during December to February (western disturbances). The physiochemical analysis of fruits was done at CCS Haryana Agricultural University, Hisar.

Experimental details: The well-trained trees of 4 different cultivars *viz.* Hisar Safeda, Hisar Surkha, Allahabad Safeda and Shweta were selected for the experiment. All the selected trees were of same size and vigour with an age of 6 to 7 years old. The planting geometry was of 3 x 6 m on raised

bunds with drip irrigation facilities. Before experimental proceedings, selected trees were pruned and subjected to the recommended cultural practices such as, irrigation, fertilization, weeding, insect pest and disease management. fifteen uniform sized fruits were bagged immediately after fruit set each on three plants (replications) with different material as per treatment schedule (Table 1). Five fruits from each plant, such as,15 fruits (from 3 replications) were harvested from each cultivar for each treatment and subsequently analysed for different parameters as mentioned in next section. Harvesting time of fruits among the treatments was same, however, varied among cultivars. Treatments details are given in Table 1.

Evaluation of physical parameters: To assess the fruit weight (g), each selected fruit was weighed and the mean weight of fruits was calculated and expressed in gram. To measure fruit length/width (cm), the length and width were measured from the stalk end to the calyx end of fruits. Specific gravity of fruit was determined by dividing the weight of the fruits in the air to the volume of the fruits as obtained by water displacement method such as, rise in water level in the cylinder. Formula applied for calculation of specific gravity is given below:

$$\text{Specific gravity (g cm}^{-3}\text{)} = \frac{\text{Weight of fruit (g)}}{\text{Volume of water displaced by fruit (ml)}}$$

To measure the fruit weight, the fruit was peeled off, seeds from the pulp were removed and weighed balance for measuring pulp weight. Pulp weight was calculated by the following formula:

Pulp weight (g) = Initial weight of the fruit (g) – [Weight of the peel (g) + weight of the seeds]

Statistical analysis: The data was statistically analysed in Randomized Block Design using SPSS software (IBM, SPSS Inc., USA).

RESULTS AND DISCUSSION

Fruit weight: The maximum fruit weight (114.03 g) was in fruits wrapped with blue polythene bags, which was statistically at par with fruits bagged in cotton cloth and green polythene while control had the minimum weight (91.01 g), which was statistically at par with fruit bagged in white polythene and pink polythene (abTable 2). Among the cultivars, fruit weight was maximum (122.14 g) in fruits of Shweta, while the minimum (91.12 g) was in Hisar Surkha fruits, which was statistically at par with fruits of Allahabad Safeda. Increase in fruit weight might be due to the conducive effects of bagging such as, increased relative humidity and reduced water loss from the fruits . The physical protection of fruit from ultra violet rays as provided by bags results in the increased cell division and proper availability of photosynthates to the developing fruits might be a cause of increased fruit weight. However, increased weight of Shweta cultivar is owed to its genetic characteristics. These findings were also in a close agreement with and in bagged guava fruits.

Fruit length: The bagging significantly affected the fruit length and the maximum (6.91 cm) was in fruits bagged with blue polythene, which was statistically at par with fruits wrapped in cotton cloth and green polythene bags. The minimum fruit length (5.71 cm) was in control, which was statistically at par with fruit bagged with pink polythene. Among the cultivars, fruits of Shweta had the maximum fruit length (7.07 cm), while the minimum (5.95 cm) was in fruits of Hisar Surkha. Variability among the bag type (differences in the transmittance level and absorption in different spectral bands by different bag materials) plays a significant role in modification of microclimate in bags which might be a reason for increased fruit size also reported the maximum fruit weight in bagged guava fruits,

Fruit width: Fruit width was also affected significantly with the bagging treatments. Fruits bagged with blue polythene had the maximum fruit width (7.34 cm), which was statistically at par with fruits bagged in cotton cloth and green polythene, as compared to the minimum width (6.13 cm) observed in unbagged fruits, which was statistically at par with fruit wrapped in pink polythene bags. Among the cultivars, the maximum fruit width (7.46 cm) was in fruits of Shweta as compared to the minimum (6.38 cm) in Hisar Surkha fruits (Table 2). This might be due to different light intensity and temperature inside the bag developed due to colour and material of the bags resulted in increased weight and diameter by rapid cell division and expansion. Similar results were obtained by in bagged guava.

Pulp weight: The maximum pulp weight (98.60 g) was in fruits bagged with blue polythene, which was statistically at par with fruits wrapped in cotton cloth and green polythene bags. Control (unbagged fruits) had the minimum pulp weight (77.15 g), which was statistically at par with fruits bagged in pink polythene and white polythene. Cultivars have significant differences and the maximum pulp weight (103.92 g) was in fruits of Shweta as compared to the minimum (78.42 g) in fruits of Hisar Surkha, which was statistically at par with fruits of Allahabad Safeda. Pulp weight of fruits is correlated to the fruit weight and size. Bagging influences the light movement, provides optimum intensity and better quality light which had favorable effect on development of fruit pulp. The findings of present investigation corroborated with the findings of.

Specific gravity (g/cm^3): Treatment**s** does not significantly

Table 1. Effect of pre-harvest fruit bagging on fruit weight (g), length (cm) and width (cm) of different guava cultivars in rainy season crop (2019-20)

Sr. No.	Treatments	Fruit weight (g)					Fruit length (cm)					Fruit width (cm)				
		Hisar Safeda	Hisar Surkha	Allahabad Safeda	Shweta	Mean	Hisar Safeda	Hisar Surkha	Allahabad Safeda	Shweta	Mean	Hisar Safeda	Hisar Surkha	Allahabad Safeda	Shweta	Mean
T_1	White paper bag	93.78	84.45	89.05	119.48	96.69	5.76	5.58	5.85	6.97	6.04	6.16	6.01	6.33	7.36	6.47
T_2	Red paper bag	104.30	92.56	95.78	124.90	104.39	6.32	6.04	6.18	7.29	6.46	6.72	6.47	6.66	7.68	6.88
T_3	Yellow paper bag	102.15	90.12	94.06	125.23	102.89	6.28	5.88	6.07	7.35	6.40	6.68	6.31	6.55	7.74	6.82
T_4	Green paper bag	106.12	94.56	96.47	128.57	106.43	6.43	6.17	6.27	7.51	6.60	6.83	6.60	6.75	7.90	7.02
T_5	Blue paper bag	109.63	97.10	98.23	122.12	106.77	6.65	6.32	6.46	7.16	6.65	7.05	6.75	6.94	7.55	7.07
T_6	Brown paper bag	98.29	83.93	86.96	118.81	97.00	6.02	5.52	5.68	6.78	6.00	6.42	5.95	6.16	7.17	6.43
T_7	Newspaper bag	96.41	86.21	90.67	113.72	96.75	5.97	5.65	5.91	6.55	6.02	6.37	6.08	6.39	6.94	6.45
T_8	Transparent polythene bag	98.96	91.42	87.58	116.23	98.55	6.11	5.95	5.76	6.71	6.13	6.51	6.38	6.24	7.10	6.56
T_9	White polythene bag	95.63	87.34	85.36	115.32	95.91	5.89	5.71	5.59	6.62	5.95	6.29	6.14	6.07	7.01	6.38
T_{10}	Pink polythene bag	91.80	82.01	83.23	111.65	92.17	5.69	5.46	5.53	6.47	5.79	6.09	5.89	6.01	6.86	6.21
T_{11}	Yellow polythene bag	107.58	96.21	97.39	127.77	107.24	6.57	6.27	6.35	7.42	6.65	6.97	6.70	6.83	7.81	7.08
T_{12}	Green polythene bag	111.37	100.60	100.61	133.41	111.50	6.75	6.43	6.53	7.59	6.83	7.15	6.86	7.01	7.98	7.25
T_{13}	Blue polythene bag	114.21	101.97	104.70	135.24	114.03	6.83	6.54	6.61	7.67	6.91	7.23	6.97	7.09	8.06	7.34
T_{14}	Cotton cloth bag	113.76	99.13	102.45	131.10	111.61	6.78	6.48	6.58	7.63	6.87	7.18	6.91	7.06	8.02	7.29
T_{15}	Muslin cloth bag	100.20	89.76	92.89	120.59	100.86	6.19	5.76	5.99	7.08	6.26	6.59	6.19	6.47	7.47	6.68
T_{16}	Control (unbagged)	90.34	80.62	82.92	110.15	91.01	5.63	5.38	5.45	6.36	5.71	6.03	5.81	5.93	6.75	6.13
	Treatment Mean	102.16	91.12	93.02	122.14		6.24	5.95	6.05	7.07		6.64	6.38	6.53	7.46	
C.D. (p=0.05)		Treatments (T) = 4.92, Cultivars (C) = 2.46, T x C = NS					Treatments (T) = 0.13, Cultivars (C) = 0.07, T x C = NS					Treatments (T) = 0.14, Cultivars (C) = 0.07, T x C = NS				

Table 2. Effect of pre-harvest fruit bagging on pulp weight (g), specific gravity and organoleptic score of different guava cultivars in rainy season crop (2019-20)

Sr. No.	Pulp weight (g)					Specific gravity				
	Hisar Safeda	Hisar Surkha	Allahabad Safeda	Shweta	Mean	Hisar Safeda	Hisar Surkha	Allahabad Safeda	Shweta	Mean
T_1	79.49	72.05	75.79	101.28	82.15	0.98	0.97	0.96	0.95	0.96
T_2	88.43	79.40	82.16	105.89	88.97	0.99	0.99	0.98	0.96	0.98
T_3	86.60	77.30	80.68	106.17	87.69	0.99	0.98	0.97	0.97	0.98
T_4	89.97	81.11	82.75	109.00	90.71	0.99	0.99	0.98	0.97	0.98
T_5	94.28	84.48	85.46	105.02	92.31	1.00	1.00	0.98	0.96	0.98
T_6	83.33	72.00	74.59	100.73	82.66	1.00	0.97	0.96	0.94	0.97
T_7	81.29	73.55	77.36	95.89	82.02	0.98	0.98	0.97	0.93	0.96
T_8	83.90	78.42	75.13	98.54	84.00	0.99	0.99	0.96	0.95	0.97
T_9	80.64	74.52	72.83	97.24	81.31	0.98	0.98	0.95	0.94	0.96
T_{10}	77.41	69.97	71.01	94.14	78.13	0.98	0.97	0.95	0.93	0.96
T_{11}	92.52	83.70	84.73	109.90	92.71	0.99	0.99	0.98	0.97	0.98
T_{12}	95.78	87.52	87.53	114.73	96.39	1.00	1.00	0.99	0.98	0.99
T_{13}	98.22	88.71	91.14	116.31	98.60	1.02	1.02	0.99	0.98	1.00
T_{14}	97.83	86.24	89.13	112.75	96.49	1.02	1.02	0.99	0.98	1.00
T_{15}	84.95	77.00	79.68	102.24	85.97	0.99	0.98	0.97	0.95	0.97
T_{16}	76.17	68.78	70.75	92.88	77.15	0.98	0.97	0.95	0.93	0.96
Treatment mean	86.93	78.42	80.05	103.92		0.99	0.99	0.97	0.96	
CD (p=0.05)	Treatments (T) = 4.20, Cultivars (C) = 2.10, T x C = NS					Treatments (T) = NS, Cultivars (C) = 0.02, T x C = NS				

See Table 1 for treatment details

influence the specific gravity as compared to control. The specific gravity among the cultivars was maximum (0.99) in fruits of Hisar Safeda and Hisar Surkha, which was statistically at par with specific gravity of Allahabad Safeda fruits, while the minimum specific gravity (0.96) was in Shweta fruits. This might be due to more compact tissues developed under the bagging and hence there was a minimal increase in volume of fruits as compared to fruit weight resulting in the higher specific gravity. Similar results were obtained by in bagged guava.

CONCLUSION

The bagging with blue polythene, cotton cloth, and green polythene shows promising results for enhancing fruit length, weight, width, and pulp weight. Among the cultivars, Shweta fruits bagged with blue polythene, cotton cloth, and green polythene showed the most significant improvement in most fruit physical parameters. Overall, this study highlights the potential of preharvest bagging at the right developmental stage as a useful approach for improving both the quantity and quality of guava fruits.

AUTHOR CONTRIBUTION

MB, RKG: conceptualization, methodology, investigation, writing original draft preparation. AK, CV: reviewing and editing. B, MK, AK: reviewing the final draft and editing. All authors contributed to the article and approved the submitted version.

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