

## Effect of Bagging on Fruit Quality of Guava

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### Abstract

An investigation on improvement of quality of guava cv. Lalit fruits through bagging was carried out at Department Applied Plant Science, Babasaheb Bhimrao Ambedkar University, Lucknow, India during October 2012- March 2013. The area of experiment was dry and comes under subtropical area of central Uttar Pradesh. Various polyethylene covers with different colours i.e. silver, white, yellow, green, black and pink were included for the study and uncovered fruits were kept for the control. The results revealed that fruit bagging in general, improved the growth and quality development of guava fruits as compared to unbagging control. It was also observed that fruit size, weight and pulp content increased due to fruit covering. Fruit was found maximum in size under yellow polythene followed by white polythene while, black polythene showed maximum pulp percentage followed by green polythene. Fruit bagging also improved the fruit quality in terms of TSS, total sugars and TSS: acid ratio which were found maximum (14.25° Brix, 11.14% and 30.07, respectively) under yellow polythene but, maximum vitamin C (171.14 mg 100 g<sup>-1</sup>) content was recorded under white polythene. Among the various fruit covering materials bagging with yellow coloured polythene was found to be the best for overall improvement of physico-chemical quality of winter season guava cv. Lalit under subtropical climate of central Uttar Pradesh.

### 1. Introduction

Guava (*Psidium guajava* L.) belonging to family Myrtaceae, is the fifth most important fruit crop of India. It is a delicious and nutritious fruit rich in vitamin C (200-300 mg 100 g<sup>-1</sup> of pulp), calcium, mineral and phosphorus (Mittra and Sanyal, 2004). India shares 4% of the world production of guava producing 3.668 mt from 0.268 mha area with the productivity of 13.7 t ha<sup>-1</sup> (Anonymous, 2014). Guava is one of the most important highly productive fruit crops and grown commercially throughout sub-tropical and tropical regions of the world. Uttar Pradesh, Bihar, Rajasthan, Madhya Pradesh and Maharashtra are the major guava growing states in the country. However, Allahabad of Uttar Pradesh has the reputation of growing best quality guava fruits in the world (Maji, 2010). Guava is a climacteric fruit and excellent source of ascorbic acid i.e. vitamin C, dietary fiber, pectin and minerals. Guava fruits are used as fresh fruit as well as making jam, jelly, paste, toffees, candy etc. Guava fruits, leaves and roots are used for curing diarrhea, dysentery

and other traditional medicines (Patel et al., 2015). Guava is available in cheap rate and popularly known as 'apple of plains' and 'poor man's apple'. In north Indian agro-climate conditions guava flowers twice in a year-first in April-May for rainy season crop and then, September-October for winter season crop. Generally, fruit yield is more in rainy season crop as compared to winter season (Rathore and Singh, 1974; Singh et al., 2000a), but fruits of rainy season crop are insipid in taste and poor in quality (Maji, 2015) and more infestation of pests and diseases like fruit flies in comparison to winter season (Rawal and Ullasa, 1988). On the country, in winter season fruits are of superior quality and fetches high monetary returns (Singh et al., 2000b). Among the various methods, fruit covering has also been found to be beneficial to protect the attack. The guava moth is another pest that damages developing fruits. Although the adult moth does not cause damage, the larvae will tunnel into the fruit to feed. The larvae also will feed on the leaves, causing a ragged appearance that loses its attractiveness. Use of pre-harvest bagging was also mentioned by various workers (Kawit and



Siriwan, 2002; Patil, 2003; Kim et al., 2003; Fumuro and Gamo, 2001) who found better fruit growth and development under fruit covering than the open condition. Bin et al. (2006) observed the change in ethylene production rate due to bagging which early ripening was noted due to bagging by Singh et al. (2006). Ping et al. (2003) noticed the inhibition in synthesis of ethylene, carotenoids as flavonoides in guava fruits due to bagging. It was also reported that very attractive fruit weight can be available by pre-harvest bagging which enhance the export potentiality and better profit for growers.

Guava bagging materials included polyethylene (in various colour), kraft paper, aluminum foil and polyester. Most of bagging materials could protect gases and humidity exchange in some levels. Various packaging materials viz. black polythene, white polythene, tissue paper, brown paper, news paper etc., had been reported to use in different fruits e.g.-guava, apple, banana, mango etc. by various workers. Though few experiments have been carried out with principal aim to study the effect of bagging on fruit fly attack, several results also showed that fruit covering or bagging influenced the fruit growth and development i.e. maturity as well as quality parameters of guava fruits. Since, guava is very important fruit crop; the present investigation was undertaken at Babasaheb Bhimrao Ambedkar University, Lucknow with the objective to study the developmental physiology of guava fruits as influenced by pre harvest bagging.

## 2. Materials and Methods

Five year old guava trees cv. Lalit of uniform vigor and size were selected for study. All the trees were maintained under uniform cultural practices during the course of investigation. Three plants in each replication were selected for the investigation conducted during October 2012-March 2013. The fruits were covered with different coloured polyethylene bags (silver, white, yellow, green, black and pink coloured polythene) and it was applied in the month of October for winter season crop. Bagging was done after 15 days of fruit set. The bags were pinned holed (few) with small pins for aeration and gaseous exchange. The bags were tied along the fruits tightly and marked accordingly. The control fruits were kept uncovered in each replicated plants. The fruits were observed regularly and the selected fruits were analyzed for its physico-chemical qualities. The selected fruits from each replication were analyzed for morphological parameters like fruit weight, fruit size, pulp thickness and pulp weight, seed numbers etc. while TSS, titratable acidity, vitamin C content, sugars and TSS: Acid ratio were taken under consideration for analyzing quality parameters of guava fruits. The observed

data was analyzed statistically by using complete randomized design following the analysis of variance as demonstrated by Panse and Sukhatme (1985).

## 3. Results and Discussion

It is evident from the result (Table 1) that the treatment  $T_3$  (yellow polythene bagging) had better effect on weight of fruits among the different bagging of guava fruits showing the maximum fruits weight (197.46 g) which was 34.21% more than the control. The pre-harvest bagging of guava fruits with yellow coloured polythene ( $T_3$ ) also caused early maturity (data not shown). The observation was also supported by the work of Harach and Wanichkul (2006).

Fruit size i.e. length and diameter of fruits under the treatment  $T_3$  also found maximum among the different bagging of guava fruits under this study. The guava fruit under treatment  $T_3$  (bagging with yellow polythene) had the maximum length and diameter. Better fruit size under yellow color polythene might be due to good movement of light on guava fruits.

Similarly, the guava fruit under treatment  $T_3$  had the maximum fruit specific gravity. The fruits also showed the higher specific gravity in general that might be due to more compact tissues at under bagging and hence slight increase in intercellular spaces resulting into less increase in volume of fruits in comparison with the increase in fruit weight, which might increased the specific gravity of the fruit under yellow polythene (Maji, 2010).

It was also shown from Table 1 that the  $T_3$  had the better effect on pulp characters of fruits at different bagging. The guava fruit under treatment  $T_3$  showed the maximum fruit pulp thickness, pulp weight however fruit pulp % was maximum under  $T_5$  (Black polythene). Yellow colour polythene might enable very good light movement or allow the light intensity and or good quality light which had very good effect on development of fruit pulp. The better fruit pulp quality also improves the palatability and acceptability of guava fruits to the consumers. However, the guava fruit under treatment  $T_2$  (White polythene) also had the maximum fruit core weight.

Table 1 also indicated that the effect of bagging on number of seeds and weight of seeds fruit<sup>-1</sup> as influenced by various types of bagging. The guava fruits under treatment  $T_3$  had the maximum number of seeds but, the highest weight of 100 seeds fruit<sup>-1</sup> was under  $T_1$  (Silver polythene). The seed characters are also associated with the fruit growth and development. Seeds might influence the fruit growth and development, resulted fruits with superior quality as the fruits.



Table 1: Influences of bagging on fruits of guava

Treatment	Fruit weight (g)	Fruit length (cm)	Fruit diameter (cm)	Specific gravity (g cc <sup>-1</sup> )	Pulp thickness (cm)	Pulp % of fruits	Pulp weight (g)	No. of seeds fruits <sup>-1</sup>
T <sub>0</sub> -Control (without polyethylene bagging)	147.13	5.15	5.22	1.13	1.91	52.21	76.82	318.15
T <sub>1</sub> -Bagging with silver polyethylene	178.00	5.75	5.82	1.14	2.42	49.97	88.94	403.45
T <sub>2</sub> -Bagging with white polyethylene	186.50	5.86	6.20	1.19	2.46	47.94	89.41	407.75
T <sub>3</sub> -Bagging with yellow polyethylene	197.46	6.46	6.66	1.23	2.61	49.29	97.33	455.22
T <sub>4</sub> -Bagging with green polyethylene	166.92	5.89	5.90	1.14	2.17	55.10	91.97	385.47
T <sub>5</sub> -Bagging with black polyethylene	162.75	5.46	6.04	1.18	2.44	55.71	90.67	409.27
T <sub>6</sub> -Bagging with pink polyethylene	178.69	5.88	6.25	1.20	2.39	52.61	94.00	415.35
SEm±	0.347	0.347	0.224	0.032	0.190	0.670	4.097	35.801
CD (p=0.05)	1.407	0.722	0.466	0.066	0.396	1.708	8.521	74.453

The quality parameter of guava i.e. fruit TSS, total sugar, reducing sugar and non-reducing sugar was significantly influenced by different type of bagging (Table 2). Better improvement of TSS (14.25° Brix), total sugar (11.14%), reducing sugar (8.85%) and non-reducing sugar (2.45%) was observed in the treatment T<sub>3</sub> i.e. use of yellow polyethylene. The minimum TSS (9.8° Brix), total sugar (8.00%), reducing sugar (5.95%) and non-reducing sugar (2.05%) were observed in un-bagged control treatment T<sub>0</sub>.

Table 2 showed that the in general, bagging treatments had better effect on vitamin C content of guava fruits. The guava fruits under treatment T<sub>2</sub> had the highest vitamin C

(171.14 mg 100 g<sup>-1</sup>) followed by T<sub>3</sub>. The guava fruits under treatment T<sub>2</sub> also had the minimum acidity of guava fruits followed by T<sub>4</sub> and T<sub>3</sub>, but were statistically at par and the maximum acidity of guava fruits was observed in treatment T<sub>0</sub> (0.574%). However, the TSS: Acid ratio was found better in the fruits under the treatment T<sub>3</sub> among the various fruit bagging treatments under the study which clearly showed the better palatability or acceptability of guava fruits and ultimately improved the fruit quality. On the basis of general attractiveness and acceptability due to its fruit size, fruit weight and colour development (data not shown), it was seen that the fruits covered with yellow polythene (T<sub>3</sub>) were the

Table 2: Influences of bagging on chemical qualities of fruits of guava

Treatment	TSS (°Brix)	Total sugars (%)	Reducing sugar (%)	Non reducing sugar (%)	Vit. C (mg 100 g <sup>-1</sup> )	Acidity (%)	TSS: Acidity
T <sub>0</sub> - Control ( without bagging)	9.8	8.00	5.95	2.05	118.00	0.574	14.46
T <sub>1</sub> -Bagging with silver polyethylene	11.05	9.79	7.64	2.15	139.79	0.354	26.98
T <sub>2</sub> -Bagging with white polyethylene	11.15	10.90	8.69	2.05	171.14	0.329	29.33
T <sub>3</sub> -Bagging with yellow polyethylene	14.25	11.14	8.85	2.45	160.90	0.424	30.07
T <sub>4</sub> -Bagging with green polyethylene	13.45	10.43	8.3	2.13	150.43	0.414	28.86
T <sub>5</sub> -Bagging with black polyethylene	11.5	8.98	6.6	2.38	158.98	0.554	18.05
T <sub>6</sub> -Bagging with pink polyethylene	12.6	8.70	7.14	1.56	148.70	0.514	21.60
SEm±	0.353	0.451	0.441	0.167	0.951	0.311	0.559
CD (p=0.05)	0.735	0.938	1.131	0.348	3.938	NS	2.012

best.

The present study revealed that the application of bagging improved the fruit quality of guava in general as compared to control i.e. unbagged fruits in terms of physico-chemical quality. The bagging during the October month (15 days after fruit set) improved the physico-chemical quality of fruits by bagging with yellow polythene (T<sub>3</sub>).

#### 4. Conclusion

Fruit covering with yellow polythene bags may be suggested for bagging of guava fruits cv. Lalit for improving fruit qualities under Lucknow condition.

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