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# Efficacy of pre-harvest treatments with different bagging techniques for bio-chemical improvement of guava

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**Abstract**
The investigation was carried out at Instructional cum Research Fruit Orchard, Department of Fruit Science, K.N.K. College of Horticulture, Mandsaur (MP), during November, 2019 to January, 2020. The treatments comprised of pre harvest spraying of $CaCl_2$, Ascorbic acid and bagging with Brown paper and yellow colour polythene to study with quality improvement of guava fruit. The experiment was laid out in randomized complete block design with three replications. Treatment $CaCl_2$ @ 2% with Brown paper ($T_{11}$) fruit bagging showed significant effects on different parameters studied. It was observed that the maximum acidity (0.57%) was recorded in treatment $T_0$ (control), while maximum total soluble solids ($^0$B) (11.50), TSS: acidity ratio (26.63), ascorbic acid content (192.39 mg/100 g pulp), pectin content (1.05 %), pH (4.73), Chlorophyll content in leaves (46.10 SPAD value) were recorded with the treatment $CaCl_2$ @ 2% with Brown paper ($T_{11}$).

**Keywords:** Calcium chloride, ascorbic acid, brown paper, yellow polythene bag, quality

## Introduction
Guava (*Psidium guajava* L.) is one of the important fruit cultivated in several tropical and subtropical countries of the world (Pathak, *et al.*, 2007) [9], it belongs to the family Myrtaceae, originated in Tropical America. It is also known as 'Apple of the tropics' or 'Poor man's apple'. Due to hardy nature of the guava fruit plant, it can withstand upto adverse climatic conditions and grows under a wide range of soil types from sandy loam to clay loam (Dhaliwal and Singla, 2002) [4]. In India, Guava is the fourth most important fruit crop in area and production after mango, banana and citrus with production of 42.36 lakh tonnes from an area of 2.76 lakh ha (NHB Database, 2018) [8]. It is an important fruit crop cultivated all over India, especially in the regions of Uttar Pradesh, Madhya Pradesh, Bihar, Maharashtra, West Bengal, Punjab, Chhattisgarh, Haryana, Karnataka, and Gujarat.
Guava fruit of variety Lucknow-49 is a selection from open pollinated population of Allahabad Safeda cultivar from Ganeshkhind, Pune (MH) and is also called as Sardar Guava. Trees are vigorous. The leaves are elliptical-ovate to oblong in shape. Fruits are roundish ovate in shape. Skin color is primrose-yellow. The pulp is whitish, very sweet and tasty with a TSS of 9.5 $^0$B and vitamin C content 130 mg/100 g. It has been observed that pectin content is higher in winter guava than the monsoon fruits (Salunke and Kadam, 1995) [14].
Pre-harvest calcium spray is one of the most important practices of new strategies applied in the integrated fruit production systems, improving fruit characteristics to minimize fungicides sprays towards the end of the harvest period, which in turn improves fruit resistance to brown rot (Conway *et al.*, 1994) [3]. Calcium spray during fruit development provides a safe mode of supplementing endogenous calcium to fresh fruits (Raese and Drake, 2000) [11]. Application of Ascorbic acid had many stimulating effects on growth and physiological activities of various plants (Abdou *et al.*, 2015) [2]. Ascorbic acid is a good antioxidant that keeps fruit from darkening and improves destruction of bacteria. Antioxidants are used instead of auxins for improving fruit growth, development and fruiting of trees (Maksoud *et al.*, 2009) [7].
Fruit bagging decreases the defects generated due to diseases and insects, and increased flesh firmness and flavour. The most important role of fruit bagging was to effectively protect fruits from physiological factors which led to the significant decrease of the total damaged, degenerative and defective fruits (13.7-33.3%), as compared with non-bagging fruits. Bagging is a physical protection technique used extensively in several fruit crops to improve skin colour which also reduce the incidence of disease, insect-pests, mechanical damage,

agrochemical residues on the fruit, and bird damage (Xu *et al.*, 2010) [15].

## Materials and Methods

The present investigation was conducted during the year 2019-2020 at the Instructional Cum Fruit Research Orchard, Department of Fruit Science, K.N.K College of Horticulture Mandsaur (M.P.). Single spraying of $CaCl_2$ and Ascorbic acid were done at 30 days before harvesting of the fruits. Bagging of fruits with Yellow polyethylene bags and Brown paper bags were done one month before harvesting of the fruits of guava fruits comprised of 21 treatments included control. Without spray and no fruit bagging (open fruit) was treated as control. The experiment was conducted in Randomized Complete Block Design (RCBD) with three replications. The fruits were wrapped with respective bagging materials as per the treatments. Single tree was considered as an experimental unit. Hand refractometer was used for determination of TSS in $^0$Brix. Acidity was estimated by simple acid–alkali titration method as described in A.O.A.C. in (1970) [1]. Value of Total Soluble Solids was divided by acidity percent to obtain TSS: acidity ratio. Ascorbic acid was estimated by Assay method given by Ranganna (1977) [16]. Estimation of pectin according to the methods of Kertesz (1951) [6]. The pH of fruit was determined by method suggested by Piper (1966) [10]. Chlorophyll content in leaves was estimated by using instrument SPAD-502 chlorophyll meter.

## Results and Discussion

Present study of pre-harvest treatments and bagging have considerable enhancement on the biochemical parameters of guava and the data regarding this is given in Tables 1. Application of $CaCl_2$ and Ascorbic acid along with bagging improves the fruit quality. Their application alone or in combination influenced significantly the chemical constituents of the fruit *viz*. TSS, ascorbic acid, TSS: acidity ratio, pectin content, pH and chlorophyll content in leaves over the control. The maximum acidity (0.57%) was in treatment $T_0$ (control), while maximum Total Soluble Solids (11.50 $^0$B), maximum ascorbic acid content (192.39 mg), maximum TSS: acidity ratio (26.63), maximum pectin content (1.05%), maximum pH (4.73) and maximum chlorophyll content in leaves (46.10) with the application of $T_{11}$ ($CaCl_2$ @ 2% with Brown paper) at harvest were significantly superior to (control) $T_0$.

The improvement in various chemical characteristics is due to application of chemical combination treatment beneficially affected in increasing the various contains of fruits hence quality improvement reflected in chemical characters of fruit. Guava responds well to the application of calcium, hence $CaCl_2$ application improves, fruit character and chemical composition through rapid transformation of plant nutrients along with Ascorbic acid application of different concentrations which has stimulating effects over quality parameters of the fruit. Similar findings were also reported by many scientists. Same time in bagging (Brown paper and Yellow polyethylene) enhanced much better chemical composition with the induction of growth hormones, due to which sufficient movement of water and nutrients which finally responsible for growth and development in qualitative way of fruits and other bio-chemical characters. The present findings are in accordance with the results reported by Rahman *et al*. (2018) [12] and Islam *et al* (2019) [5].

**Table 1:** Effect of pre-harvest treatments and bagging on quality parameters of guava fruit.

| Treatments | | TSS ($^0$B) | Acidity | TSS: acidity ratio | Ascorbic acid (mg/100 g pulp) | Pectin (%) | pH | Chlorophyll (SPAD) |
|---|---|---|---|---|---|---|---|---|
| $T_0$ | Control | 8.61 | 0.57 | 15.22 | 149.33 | 0.76 | 3.55 | 30.20 |
| $T_1$ | $CaCl_2$ @ 1% | 9.53 | 0.40 | 17.67 | 157.22 | 0.82 | 3.92 | 39.20 |
| $T_2$ | $CaCl_2$ @ 1.5% | 9.53 | 0.43 | 21.55 | 164.04 | 0.91 | 4.01 | 39.57 |
| $T_3$ | $CaCl_2$ @ 2% | 10.62 | 0.47 | 24.35 | 168.30 | 0.93 | 4.04 | 39.77 |
| $T_4$ | Ascorbic acid @ 200ppm | 9.78 | 0.45 | 19.20 | 148.57 | 0.78 | 3.79 | 37.90 |
| $T_5$ | Ascorbic acid @ 300 ppm | 8.69 | 0.43 | 19.74 | 146.53 | 0.85 | 4.01 | 36.57 |
| $T_6$ | Ascorbic acid @ 400 ppm | 9.61 | 0.44 | 21.07 | 154.05 | 0.85 | 4.05 | 39.03 |
| $T_7$ | Bagging with Brown paper | 10.33 | 0.46 | 21.43 | 191.45 | 1.02 | 4.07 | 41.33 |
| $T_8$ | Bagging with Yellow polyethylene | 10.00 | 0.49 | 20.49 | 183.84 | 0.97 | 3.88 | 39.13 |
| $T_9$ | $CaCl_2$ @ 1% with Brown paper | 10.39 | 0.33 | 22.47 | 166.85 | 0.99 | 4.10 | 44.47 |
| $T_{10}$ | $CaCl_2$ @ 1.5% with Brown paper | 10.29 | 0.43 | 25.84 | 187.74 | 0.99 | 4.15 | 41.27 |
| $T_{11}$ | $CaCl_2$ @ 2% with Brown paper | 11.50 | 0.47 | 26.63 | 192.39 | 1.05 | 4.73 | 46.10 |
| $T_{12}$ | Ascorbic acid @ 200 ppm with Brown paper | 10.28 | 0.47 | 20.77 | 182.76 | 0.99 | 4.38 | 35.50 |
| $T_{13}$ | Ascorbic acid @ 300 ppm with Brown paper | 10.22 | 0.46 | 26.33 | 188.28 | 0.92 | 3.88 | 35.17 |
| $T_{14}$ | Ascorbic acid @ 400 ppm with Brown paper | 9.28 | 0.43 | 24.78 | 159.00 | 0.97 | 4.05 | 37.03 |
| $T_{15}$ | $CaCl_2$ @ 1% with Yellow polyethylene | 9.66 | 0.48 | 23.79 | 154.75 | 1.03 | 4.05 | 33.50 |
| $T_{16}$ | $CaCl_2$ @ 1.5% with Yellow polyethylene | 10.50 | 0.41 | 26.23 | 180.13 | 0.91 | 4.07 | 36.70 |
| $T_{17}$ | $CaCl_2$ @ 2% with Yellow polyethylene | 10.22 | 0.37 | 26.47 | 188.16 | 0.97 | 4.11 | 36.13 |
| $T_{18}$ | Ascorbic acid @ 200 ppm with Yellow polyethylene | 9.62 | 0.41 | 23.72 | 172.59 | 0.95 | 4.00 | 38.27 |
| $T_{19}$ | Ascorbic acid @ 300 ppm with Yellow polyethylene | 9.61 | 0.41 | 23.53 | 163.63 | 0.93 | 4.12 | 36.17 |
| $T_{20}$ | Ascorbic acid @ 400 ppm with Yellow polyethylene | 9.70 | 0.41 | 24.55 | 162.79 | 0.92 | 4.07 | 35.97 |
| S.Em. ± | | 0.24 | 0.02 | 0.89 | 3.31 | 0.03 | 0.08 | 0.67 |
| C.D. at 5% | | 0.68 | 0.06 | 2.54 | 9.47 | 0.08 | 0.23 | 1.91 |

## Conclusion

All the pre harvest treatments were found better than control in improving fruit quality while the pre harvest treatment of $CaCl_2$ @ 2% with Brown paper was found superior to increase the fruit quality than all other treatments. This treatment was found to have very low spots and no infestation. Hence it should be practiced in guava crop to produce fruits with good quality.

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