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The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2023; 12(9): 3025-3027

www.thepharmajournal.com
Received: 08-06-2023
Accepted: 14-07-2023

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Effect of pre-harvest treatments and bagging on sensory parameters of guava (*Psidium guajava* L.) fruit Cv. G-27

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Abstract
The investigation was conducted in the field of Horticulture Research Orchard, Department of Horticulture, College of Agriculture, RVSKVV, Gwalior, MP, India during the two years of 2021-22 to 2022-23 with a pooled mean basis. The treatments comprised of pre-harvest spraying of Calcium chloride and calcium sulphate and bagging with Brown paper and polythene bags to study the sensory evaluation of guava fruits. The experiment laid out 15 different treatments in a randomized block design with three replications. Guava fruits were randomly collected and cleaned in tap water to remove surface dust and leaves before weighing and sorting. The study used the guava cultivar Gwalior-27. The sample was taken in cotton bag allotted a variety and then brought to the Horticulture departmental laboratory for analysis and then stored in a cool place until the measurement had been taken. Treatment $CaCl_2$ @ 2% with polyethylene bags (T_{14}) fruit bagging showed significant effects on different sensory parameters that were studied during the experiment. In terms of sensory evaluations, the highest values of a fruit taste (7.82, 7.86), fruit colour (7.74, 7.80), fruit texture (7.52, 7.59), fruit aroma (8.06, 8.13) and Overall acceptability (8.08, 8.23) influenced significantly and were recorded under the treatment T_{14} $CaCl_2$ @ 2% with polyethylene bags during 2021-22 and 2022-23, respectively.

Keywords: Guava, sensory evaluation, G-27, bagging

Introduction
Guava (*Psidium guajava* L.) is one of the important fruits cultivated in several tropical and subtropical countries of the world (Pathak *et al.*, 2007) [5], it belongs to the family Myrtaceae, which is originated in Tropical America. It is also known as 'Apple of the tropics' or 'Poor man's apple'. Due to the hardy nature of the guava fruit plant, it can withstand adverse climatic conditions and grows under a wide range of soil types from sandy loam to clay loam (Dhaliwal and Singla, 2002) [3]. Guava is considered as one of the exquisite, nutritionally valuable and remunerative crop. Guava fruits can be used in both fresh and processed forms. Guava is a rich source of vitamin C containing 2 to 5 times more than oranges. Gwalior-27 is a popular variety in northern Madhya Pradesh but the nutritional requirement of this variety has not been standardized so far. 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 fungicide sprays towards the end of the harvest period, which in turn improves fruit resistance to brown rot (Conway *et al.*, 1994) [2]. Calcium spray during fruit development provides a safe mode of supplementing endogenous calcium to fresh fruits (Raese and Drake, 2000) [7]. Bagging is a physical protection technique used extensively in several fruit crops to improve skin colour rich also reduces the incidence of disease, insect-pests, mechanical damage, agrochemical residues on the fruit, and bird damage (Xu *et al.*, 2010) [10].

Materials and Methods
The present investigation was conducted during the years 2021-2022 and 2022-23 with a pooled mean basis at the Horticulture Research Orchard, Department of Horticulture, College of Agriculture, RVSKVV, Gwalior, MP, India. Pre-harvest spraying of calcium chloride and calcium sulphate (1 or 2 percent) was done 45 days before the maturity of guava fruits. Bagging of fruits with Brown paper and polyethylene bags was done one month before harvesting of the fruits of guava fruits comprised 15 treatments including control.

Without spray and no fruit bagging (open fruit) was treated as a control. The experiment was conducted in Randomized Block Design (RBD) with three replications. The fruits were wrapped with respective bagging materials as per the treatments. A single tree was considered as an experimental unit. Fruit weight was measured by the electronic balance in grams. The guava fresh fruits were subjected to sensory evaluation by a panel of six judges. The fruits were evaluated for fruit taste, colour, texture, aroma and Overall acceptability was done using the Hedonic scale method of Peryam and Pilgrim (1957) [6]. The characters with mean scores of more out of 9 marks were considered acceptable.

Results and Discussion

The present study of pre-harvest treatments and bagging has considerable enhancement on sensory parameters *viz.*, fruit taste, fruit colour, fruit texture, fruit aroma and overall acceptability score after the organoleptic test of guava var. Gwalior-27 during 2021-22 and 2022-23 data is presented in Table. 1 and graphically depicted in Fig. 1. The data revealed that the different pre-harvest treatments *i.e.,* $CaSo_4$ or $CaCl_2$ (both 1 or 2% concentration) and bagging with brown paper or polythene bag had significant effects on sensory parameters *viz.*, fruit taste, fruit colour, fruit texture, fruit aroma and overall acceptability during both the years as well as pooled data of both the years. The data recorded of sensory parameters *viz.*, fruit taste (7.82, 7.86), fruit colour (7.74, 7.80), fruit texture (7.52, 7.59), fruit aroma (8.06, 8.13) and overall acceptability (8.08, 8.23) score after the organoleptic test of guava cultivar Gwalior-27 was found significantly higher under T_{14} $CaCl_2$ @ 2% with polyethylene bags during both the years 2021-22 and 2022-23, respectively) as compared to control. In the year 2021-22, The sensory parameters *viz.*, fruit taste, fruit colour, fruit texture, fruit aroma and overall acceptability score after the organoleptic test of guava were recorded as significantly higher under the pre-harvest spray of $CaSo_4$ (1 and 2% concentration) with bagging (brown paper or polythene bag) or alone *i.e.*, T_{12} ($CaSo_4$ @ 2% with polyethylene bags) as compared to T_{11} ($CaSo_4$ @ 1% with polyethylene bags), T_8 ($CaSo_4$ @ 2% with brown paper), T_7 ($CaSo_4$ @ 1% with brown paper), T_2 ($CaSo_4$ @ 2%) and T_1 ($CaSo_4$ @ 1%). The treatments T_{11} ($CaSo_4$ @ 1% with polyethylene bags) and T_7 ($CaSo_4$ @ 1% with brown paper) were at par with each other. It is evident from the data that the sensory parameters *viz.*, fruit taste, fruit colour, fruit texture, fruit aroma and overall acceptability score after the organoleptic test of guava were recorded significantly higher under the pre-harvest spray of $CaCl_2$ (1 and 2% concentration) with bagging (brown paper or polythene bag) or alone *i.e.*, T_{14} ($CaCl_2$ @ 2% with polyethylene bags) as compared to T_{13} ($CaCl_2$ @ 1% with polyethylene bags), T_9 ($CaCl_2$ @ 1% with brown paper), T_4 ($CaCl_2$ @ 2%) and T_3 ($CaCl_2$ @ 1%). The treatments T_{13} ($CaCl_2$ @ 1% with polyethylene bags) and T_9 ($CaCl_2$ @ 2% with brown paper) were at par with each other. The sensory parameters *viz.*, fruit taste, fruit colour, fruit texture, fruit aroma and overall acceptability score after the organoleptic test of guava were recorded significantly higher under T_6, bagging with polyethylene bags as compared to T_5, bagging with brown paper bags. The treatments T_{12} ($CaSo_4$ @ 2% with polyethylene bags) and T_{10} ($CaCl_2$ @ 2% with brown paper) or T_{10} ($CaCl_2$ @ 2% with brown paper) and T_8 ($CaSo_4$ @ 1% with brown paper) or T_{13} ($CaCl_2$@ 1% with polyethylene bags) and T_9 ($CaCl_2$ @ 1% with brown paper) or T_9 ($CaCl_2$ @ 1% with brown paper) and T_{11} ($CaSo_4$ @ 1% with polyethylene bags or T_{11} ($CaSo_4$ @ 1% with polyethylene bags) and T_7 ($CaSo_4$ @ 1% with brown paper) were at par with each other. Similar results were obtained in the year 2022-23 and also in the pooled analysis of data under both years. The present findings are in accordance with the results reported by Sarker *et al*. (2009) [8], Abbasi *et al.* (2014) [1], Islam *et al.* (2019) [4]. Fruits treated with $CaCl_2$ @ 2% and bagging with Brown paper were found significantly superior in the organoleptic test with the highest scores in terms of taste, colour, texture and aroma, respectively and rated as very good. Similarly, earlier workers have also reported that fruit bagging can improve fruit quality mainly by keeping fruit appearance and preferable uniform coloration of the fruit as reported by Sarker *et al*. (2009) [8] and Singh *et al*. (2017) [9].

Table 1: Effect of pre-harvest treatments and bagging on sensory parameters of guava fruit Cv. G-27.

S. No.	Fruit taste			Fruit colour			Fruit texture			Fruit aroma			Over all acceptability		
	2021-22	2022-23	Pooled	2021-22	2022-23	Pooled	2021-22	2022-23	Pooled	2021-22	2022-23	Pooled	2021-22	2022-23	Pooled
T_0	6.38	6.41	6.40	6.22	6.25	6.24	6.32	6.34	6.33	6.41	6.43	6.42	6.88	6.93	6.91
T_1	6.88	6.92	6.90	6.75	6.79	6.77	6.74	6.78	6.76	6.99	7.03	7.01	7.30	7.39	7.34
T_2	7.10	7.14	7.12	6.98	7.03	7.00	6.92	6.97	6.94	7.24	7.28	7.26	7.48	7.58	7.53
T_3	6.96	6.99	6.97	6.83	6.87	6.85	6.80	6.84	6.82	7.07	7.11	7.09	7.36	7.45	7.41
T_4	7.16	7.19	7.18	7.04	7.09	7.06	6.97	7.02	6.99	7.30	7.35	7.32	7.53	7.63	7.58
T_5	6.67	6.70	6.68	6.52	6.56	6.54	6.56	6.59	6.58	6.74	6.77	6.76	7.12	7.19	7.16
T_6	6.81	6.85	6.83	6.68	6.72	6.70	6.68	6.72	6.70	6.91	6.94	6.92	7.24	7.32	7.28
T_7	7.30	7.34	7.32	7.19	7.24	7.22	7.09	7.14	7.11	7.47	7.52	7.49	7.65	7.76	7.71
T_8	7.55	7.58	7.57	7.45	7.51	7.48	7.29	7.35	7.32	7.75	7.81	7.78	7.85	7.98	7.92
T_9	7.40	7.44	7.42	7.30	7.35	7.32	7.17	7.23	7.20	7.58	7.64	7.61	7.73	7.85	7.79
T_{10}	7.68	7.72	7.70	7.59	7.65	7.62	7.40	7.47	7.43	7.90	7.96	7.93	7.96	8.10	8.03
T_{11}	7.37	7.41	7.39	7.27	7.32	7.29	7.15	7.20	7.18	7.55	7.60	7.58	7.71	7.83	7.77
T_{12}	7.62	7.66	7.64	7.53	7.58	7.56	7.35	7.42	7.38	7.83	7.89	7.86	7.91	8.05	7.98
T_{13}	7.46	7.50	7.48	7.36	7.41	7.39	7.22	7.28	7.25	7.65	7.71	7.68	7.78	7.91	7.84
T_{14}	7.82	7.86	7.84	7.74	7.80	7.77	7.52	7.59	7.56	8.06	8.13	8.10	8.08	8.23	8.16
S.E.(m) ±	0.013	0.013	0.009	0.013	0.013	0.009	0.012	0.012	0.009	0.013	0.013	0.009	0.013	0.014	0.010
C.D. (at 5%)	0.037	0.037	0.026	0.036	0.037	0.025	0.036	0.036	0.025	0.038	0.038	0.026	0.039	0.039	0.027

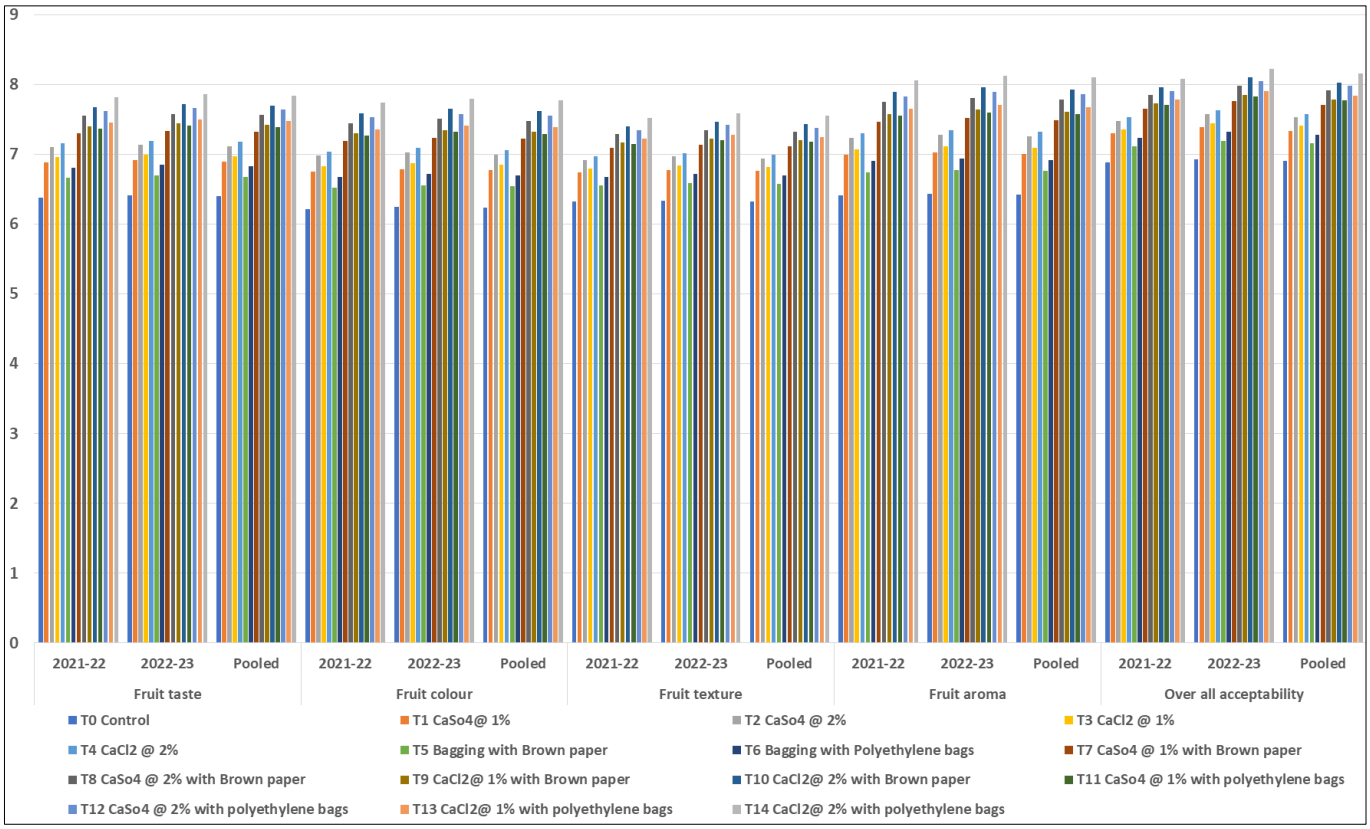

Fig 1: Effect of pre-harvest treatments and bagging on sensory parameters of guava fruit Cv. G-27

Conclusion

All the pre-harvest treatments with bagging were found better than the control in terms of sensory parameters *viz.*, fruit taste, fruit colour, fruit texture, fruit aroma and overall acceptability score after the organoleptic test of guava fruits Cv. Gwalior-27. while the pre-harvest treatment of T_{14} ($CaCl_2$ @ 2% with polyethylene bags) was found superior to maximum sensory parameters *viz.*, fruit taste, fruit colour, fruit texture, fruit aroma and overall acceptability score of guava fruits than all other treatments during 2021-22 and 2022-23 and pooled mean basis. This treatment was found to have very low spots and no infestation. Hence it should be practiced in the guava crop to produce fruits with minimum decline effect in sensory parameters *viz.*, fruit taste, fruit colour, fruit texture, fruit aroma of guava fruits.

Acknowledgment

With profound respect I am extremely thankful to Dr. A.K. Shukla, Hon'ble Vice Chancellor, R.V.S.K.V.V., Gwalior, Dr. S.K. Sharma, Director Instruction and Dr. D.H. Ranade, Dean Faculty of Agriculture R.V.S.K.V.V., Gwalior, M.P. With deepest sense of humility and gratefulness, I feel duly bound to express my heartfelt and sincere thanks to Dr. S.S. Tomar, Dean, College of Agriculture, Gwalior. The words at my dominion are really scarce to articulate my deep sense of appreciation to Dr. P.K.S. Gurjar, Scientist, Department of Horticulture, KVK, Morena.

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