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Effect of chemicals & bagging along with chemical attributes of rainy season guava (*Psidium guajava* Linn.) cv. Lucknow-49

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Abstract
The study was started from June 2017 to assess the "Effect of chemicals & baggingalong with cemical attributes of rainy season guava (P*sidium guajava* linn.) cv. lucknow-49" at the Main Experiment Station and Post Harvest Technology Laboratory of Horticulture, Narendra Deva University of Agriculture and Technology, Faizabad (U.P.). The fruits of rainy season or Ambe bahar guava crop are very poor in quality, having poor shelf life and numbers of fruits are infested with insect pests and diseases particularly fruit flies and anthracnose respectively. These problems occur due to prevalence of warm and humid condition in rainy season. To overcome these problems, the present investigation was formulated with nine pre-harvest treatments *viz*. T_1 ($CaCl_2$ @ 2%), T_2 (salicylic acid @ 3%), T_3 (polythene + $CaCl_2$ @ 2%), T_4 (polythene + salicylic acid @ 3%), T_5 (blue polythene + $CaCl_2$ @ 2%), T_6 (blue polythene + salicylic acid @ 3%), T_7 (violet polythene + $CaCl_2$ @ 2%), T_8 (violet polythene + salicylic acid @ 3%)and T_9 (Control). The treated fruits were harvested at ripe stage and stored at ambient condition. The result revealed that all pre harvest treatments found superior than control and the pre harvest treatment ofpolythene + salicylic acid@ 3 % proved the most efficient in improving fruit size and weight(length 5.37 cm and width 5.23 cm), weight (133 g), and treatment violet polythene + $CaCl_2$ @ 2% improve the bio-chemical quality, TSS (12.68 %), acidity (0.48 mg/100g), TSS: acid ratio (30.19 %), ascorbic acid (164.67 mg/100g), reducing sugar (5.20%), non reducing sugar (4.46%), total sugar (9.66%). violet polythene + salicylic acid, @ 3% proved the best in producing fruits having minimum spots (0.82%) and very less infestation along with more fruit firmness increased (9.51 kg/cm2). Application of violet polythene + $CaCl_2$ @ 2%followed by violet polythene + salicylic acid @ 3% give a better quality and economics return therefore, this pre-harvest treatment may be the option of crop regulation of guava crop.

Keywords: polythene, chemical, salicyclic acid, anthracnose

Introduction
Guava belongs (*Psidium guajava* Linn.) to the family Myrtaceae and genus Psidium. It is originated from Tropical America (Peru). It has been cultivated in India since early 17th century. Which has a tropical fruit but also grown well in sub- tropical conditions. Guava has been popularly known as "apple of tropics" it is most common and major fruit of India and considered the fifth most important fruit in area and production after mango, citrus, banana, and apple. India is one of the highest guava producing countries in the world with a production of 39.16 lakhtonnes from area 2.61 lakh ha and productivity of 13.7 MT/ha (NHB Database, 2016-17 and Maharashtra leads in total area under guava whereas, Uttar Pradesh is in 3rd position. District Allahabad has the reputation of growing the best guava in the country as well as in the world.

Polythene bagging reduces damage in guava fruits particularly in rainy season and also improves fruit quality. Fruit bagging with brown paper or news paper bag reduces the anthracnose disease in mango and various diseases of other fruit crops. Bagging is an effective eco-friendly and non-chemical method for the control of Pre and post harvest diseases and fruit fly infestation. It also improves the fruit quality, organoleptic quality in terms of appearance, uniform coloration, taste, flavour and overall acceptance at ripening and also prolongs the shelf life as reported in rainy season guava. These results indicate that bagging may produce spot free, attractive and high quality fruit at harvest and on ripening leading to export and better price for guava growers.

Calcium plays an important role in a number of physiological and biochemical processes concerning membrane structure, function and enzyme activities. It helps to retain fruit firmness, reduce respiration, decrease storage breakdown, rotting and browning. It helps in creating a protecting layer on fruit surface which protects against pathogens and insects.
Salicylic acid decrease ethylene production and inhibits cell wall and membrane degrading enzymes leading to decrease in the fruit softening rate. It affects AOX activity leading to decrease in the harmful effects of different post harvest oxidative stresses such as chilling injury, prevents fermentation, and maintains low respiration rates and decreases fruit ripening and senescence rates.

Materials & Methods

The experiment was conducted during the *kharif* season of 2016-17 in the guava orchard at Main Experiment Station of Horticulture and Post Harvest Technology Laboratory, Department of Post Harvest Technology, College of Horticulture & Forestry, Narendra Deva University of Agriculture and Technology, Kumarganj, Faizabad (U.P.) which is situated beside Faizabad- Raibarelli road about 42 km away from Faizabad headquarter and lies geographically at 26.47^0 N latitude, 82.12^0 E longitude and at altitude of 113.0 meter above mean sea level.

Experimental Details

The present experiment comprising nine different treatments involving spraying of chemicals and covering with different types of bags was carried out in Randomized block design with three replications.

Results & Discussion

Total Soluble Solids (TSS)

Progressive increase in total soluble solids was found from the data which is presented in table-1
It is evident from data that all the pre harvest treatments influenced TSS content in guava fruits significantly. The maximum TSS content 12.68% was recorded in fruits treated with violet polythene bag +$CaCl_2$followed bytreatment with violet polythene bag + salicylic acid 12.0%.the TSS content in all bagged fruits was found at par varying from 11.00 to 12.68 per-cent. The minimum TSS content of 7.36 % was noted in control (T_9).

Acidity (%)

The data pertaining to the effect of pre harvest treatments on acidity per cent of fruits is presented in table-1.
It was found that various pre harvest treatments influenced acidity content significantly. The maximum acidity content of 0.48 % was recorded when the plants were treated with blue polythene + salicylic acid, followed bytreatmentpolythene + salicylic acid 0.46% while, the minimum acid content of 0.33%was recorded in Control. Other pre harvest treatments showed higher acidity content compared to control (T_9).

TSS: Acidity ratio

TSS: Acidity ratio was found higher in all treatments than control as presented in table 1.
Maximum fruit TSS: acidity ratio 30.00was found in plants treated with violet polythene +$CaCl_2$ (T_7) followed by 29.33 treatments with blue polythene +$CaCl_2$. The minimum was found i.e. 22.35in control.

Table 1: Effect of pre harvest treatments on TSS, acidity and ascorbic acid content of fruits.

Treatments	TSS (%)	Acidity (mg/100g)	TSS: Acid ratio	Ascorbicacid (mg/100g)
T_1- $CaCl_2$ @ 2 %	08.28	0.36	23.00	148.33
T_2- Salicylic acid @ 3%	08.00	0.34	23.52	146.34
T_3- Polythene+$CaCl_2$ @ 2%	11.20	0.42	26.67	156.00
T_4- polythene+ Salicylic acid @ 3%	11.00	0.46	23.33	161.34
T_5- Blue polythene+$CaCl_2$ @ 2%	11.73	0.40	29.33	150.66
T_6- Blue polythene +Salicylic acid@3%	11.48	0.48	23.91	162.33
T_7- Violet polythene+$CaCl_2$ @ 2%	12.68	0.42	30.19	164.67
T_8- Violet polythène +Salicylic acid @ 3%	12.00	0.43	27.91	160.6
T_9- Control	7.36	0.33	22.30	131.33
SEm±	0.65	0.01	0.95	1.15
CD at 5%	1.93	0.04	2.84	3.44

Ascorbic acid

Ascorbic acid content of fruits is varied significantly due to various pre harvest treatments as presented in Table1.
All the pre harvest treatments influenced ascorbic acid content in guava fruits significantly. The maximum ascorbic acid content of 164.67 mg/100gwas recorded when the plants were treated with violet polythene +$CaCl_2$followed by the treatment blue polythene + salicylic acid with ascorbic acid content of 162.33 mg/100g. The minimum ascorbic acid content 131.33 mg/100g was recorded in control.

Total sugars

The data pertaining to the effect of pre harvest treatments on total sugars per cent of fruits is presented in Table 2.
It is apparent from the data that all the treatments improved total sugars content in fruits. The treatment violet polythene + $CaCl_2$ recorded maximum total sugars content 9.66% followed by treatment blue polythene + $CaCl_2$ @ 2%. The minimum total sugar content of 5.95% was recorded in control.

Reducing sugars

The data presented in table-2 showed the reducing sugar content of fruits affected by various pre harvest treatments.
It is found that all the pre harvest treatments improved reducing sugars content in fruits significantly. The treatment violet polythene + $CaCl_2$@ 2%recordedmaximumreducing sugars content of 5.2% followed by the pre harvest treatment violet polythene + salicylic acid 3% with 4.96 %. The minimum reducing sugar content of 3.24 %.was obtained in control.

Non-reducing sugar

The data pertaining to the effect of pre harvest treatments on reducing sugars per cent of fruit cv. Lucknow-49 is presented in table 2.

Table 2: Effect of pre harvest treatments on reducing sugars, non-reducing sugar and total sugars content of fruits.

Treatments	Reducing sugar (%)	Non-reducing sugars (%)	Total sugars (%)
T_1- $CaCl_2$ @ 2%	3.52	2.94	6.46
T_2- Salicylic acid @ 3%	3.48	2.93	6.41
T_3- Polythene+$CaCl_2$ @ 2%	4.57	3.92	8.49
T_4- polythene+ Salicylic acid @ 3%	4.52	3.90	8.42
T_5- Blue polythene+$CaCl_2$ @ 2%	4.87	4.18	9.50
T_6- Blue polythene +Salicylic acid @ 3%	4.62	3.95	8.58
T_7- Violet polythene+$CaCl_2$ @ 2%	5.20	4.46	9.66
T_8- Violet polythene +Salicylic acid @ 3%	4.96	4.25	9.21
T_9- Control	3.24	2.72	5.95
SEm+	0.04	0.04	0.08
CD at 5%	0.13	0.12	0.24

It is evident from the data that all the treatments improved non reducing sugar content in fruits. The pre harvest treatment with violet polythene + $CaCl_2$ @ 2 % recorded maximum non-reducing sugar content 4.46% followed by treatment violet polythene +salicylic acid 3% with 4.25% which was at par with it. The minimum non-reducing sugar content was obtained 2.74% in control.

Summary

Total soluble solids (TSS)

The present findings showed that all the pre harvest treatments significantly increased the TSS content of fruits over the control. The maximum TSS content was recorded in fruits treated with treatment ofViolet Polythene bag + $CaCl_2$ @ 2% (12.68%) followed by the fruits treated with treatment of violet polythene bag + salicylic acid @ 3% and the minimum TSS content was found in control (7.36%).

Total acidity

Rainy season guava are low in acid content because of leaching loss which cause very poor taste in fruits. It can be controlled by protecting fruits from such losses due to heavy rainy. results obtained in present investigation showed that the maximum acid content was noted in treatment of blue Polythene + salicylic acid @ 3%(0.48%) among all pre harvest treatments and minimum was found in control (0.33%)and thereafter decreased during the entire period of storage at room temperature.

TSS: Acidity Ratio

Increased TSS: Acidity ratio was found in all treatments during the present investigation. Highest TSS: acidity ratio 30.00 was found in violet polythene +$CaCl_2$ treatment followed by 29.33 in blue polythene + $CaCl_2$ treatment. Minimum was found in control i.e. 22.35 rainy season (more humid condition) is a major factor for decrease in TSS and acidity. TSS in every treatment found to be increased due to use of calcium sources and various bags as they protect fruits from harmful effect of high humidity condition. Acidity was found to increase in very less amount in all treatments.

Ascorbic Acid

The present findings showed that the maximum ascorbic acid content was recorded in pre harvest treatment of violet polythene + $CaCl_2$ @ 2% (164.67mg/100g) followed by the treatment blue polythene + salicylic acid (162.33mg/100g) whereas minimum ascorbic acid content was reported in control (131.33 mg/100g).

Total Sugars

Result obtained in present investigation proved that the pre harvest treatment of violet polythene + $CaCl_2$ @ 2% was found significantly superior in total sugars content (9.66%) over all the treatments while minimum total sugar content was observed in control (5.95%).

Reducing Sugars

Highest reducing sugar content was recorded in pre harvest treatment of Violet Polythene + $CaCl_2$ @2%(5.20%) while lowest was recorded in control (3.24%).

Non-reducing Sugars

Results of the present investigation revealed that the maximum non-reducing sugar content was recorded in pre harvest treatment of Violet Polythene + $CaCl_2$@ 2%(4.46%) while minimum was recorded in control (2.74%).

Conclusion

1. The pre harvest treatment of Violet polythène+ Salicylic acid @ 3% produced guava fruits having highest firmness, having minimum spots and very less disease pest infestation.
2. Violet polythene bag +$CaCl_2$ @ 2 %proved the best in producing fruits with high TSS, acidity, TSS: acid ratio and ascorbic acid content.
3. The treatment of violet polythene+$CaCl_2$ @ 2% was found to be best in producing guava fruits with high per cent of reducing sugars, non-reducing sugar and total sugars.
4. Attractive colour and fruits having best appearance was found in the treatment of blue polythene bag + $CaCl_2$ @ 2%.

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