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Standardization of Pre-Harvest Management of Guava (*Psidium Guajava L.*) Cv. Allahabad Safeda with Special Reference to Fruit Bagging and Stage of Fruit Development

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Abstract

The present investigation was carried out on "Standardization of pre-harvest management of guava (*Psidium guajava L.*) cv. Allahabad Safeda with special reference to fruit bagging and stage of fruit development" with ten bagging treatments viz., Control-(T1), Muslin bag at 30 days after fruit setting-(T2), Muslin bag at 45 days after fruit setting-(T3), Muslin bag at 60 days after fruit setting-(T4),Cotton bag at 30 days after fruit setting-(T5), Cotton bag at 45 days after fruit setting-(T6), Cotton bag at 60 days after fruit setting-(T7), Non-woven white bag (NWB) at 30 days after fruit setting-(T8), NWB at 45 days after fruit setting -(T9), NWB at 60 days after fruit setting-(T10). All bagging materials were significantly effective in controlling fruit fly incidence, anthracnose disease, and improving physical attributes of fruits as compared to control, during rainy and winter season. White non-woven bags applied at 30 days after fruit setting had the maximum average fruit weight, lowered disease incidence and reduced the days to maturity, while white non-woven bags applied at 60 days after fruit setting had maximum fruit firmness. Cotton bags applied at 30 days after fruit setting prevented fruit fly incidence.

Keywords: Bagging, Cotton Bag, Fruit Fly, Muslin Bag, Non-Woven White Bag

Introduction

Guava (Psidium guajava L.) is the fifth most important commercial fruit crop of India, after mango, banana, citrus and grapes. Guava is termed as 'Apple of tropics' because its nutritive value is equivalent to that of apple [1]. In India it has an area coverage of 2,87,000 ha with an annual production of 4304(`000MT) [2]. Despite its adaptability and productivity, guava cultivation faces serious challenges from insect pests and diseases, particularly fruit flies and anthracnose, which significantly affect yield and market quality. Under North Indian conditions, guava produces two major crops annually one during the rainy season (July-August) and the other during winter (November–January). There are higher chances of pest infestation during the rainy season, especially fruit flies [Bactrocera dorsalis and Bactrocera zonata and anthracnose (Colletotrichum gloeosporioides Penz.) disease, which contribute to heavy economic losses for growers or farmers [3, 4]. In recent years, fruit bagging has emerged as an effective practice for controlling pests and diseases of fruits with an aim of minimizing use of pesticides to ensure worker safety, protect consumer health and reduce environmental impact [5]. Bagging of fruits act as a physical protection technique which is considered as an effective method to control the damage caused by pests like fruit fly, which are difficult to manage through other practices and is universally adopted to prevent fruit fly damage in many fruit crops [6]. In this practice, individual fruit or fruit bunches are covered with a bag on the tree for a specific period. Bagging of fruits not only reduces the incidence of disease, mechanical damage, sun burning of the fruits, and bird damage [7] but also enhances the cosmetic value of fruits by improving peel colour through the modification of microenvironment inside the bag [8, 9], which exhibits beneficial effects on both fruit size and internal fruit quality. The selection of bagging material and time of fruit bagging is of utmost importance for getting better results [10, 11]. Hence, the present investigation was conducted to evaluate the effect of pre-harvest bagging on pest, disease incidence and physical attributes of guava.

Materials and Methods

Experimental Site

The experiment was conducted at guava orchard, Khalsa College, Amritsar during the year 2024-25 from May to January. The experimental location came under Northwestern India, with broadly having hot semi-arid climate with a spell of monsoon. The average maximum and minimum daily temperature during experiment were around 44.5°C and 19.7°C, respectively. Annual rainfall was about 726.0 millimeters. The prevailing relative humidity ranged between 26 to 70% during present experiment.

Bagging Materials

Different bagging materials like muslin bags and cotton bags were prepared from muslin cloth (50 GSM) and cotton cloth (70 GSM), respectively. White non-woven bags (30 GSM) were ordered online from Vedant AGRIRISE, Maharashtra.

Experimental Details

For bagging, fruits were chosen from variety "Allahabad Safeda" at marble stage. The trees were around 10 years old with uniform statures. For 10 treatments and 3 replications, total 900 fruits were selected i.e from 30 plants ,30 fruits from each plant. Selected fruits had no trace of fungus/insect attacks, bruising, and mechanical damage and sunburns. Mature and uniform sized fresh fruits of guava cv. "Allahabad Safeda" were harvested manually from the field. Fruits were examined carefully for analysis of fruit fly and disease damage. All observations regarding physical parameters of fruits were recorded in Horticulture laboratory, Khalsa college, Amritsar under ambient storage conditions.

Evaluation Of Physical Parameters

Days to maturity were calculated from number of days taken by fruits to reach and attain its full maturity, size, shape, color, fla-

vor and other characteristics. Fruit firmness of randomly selected fruits was calculated by an instrument named as penetrometer Model – FT 327 by removing the peel about 1 cm and puncturing each fruit. It was expressed in kg/cm^2. For the analysis of average fruit weight, fruits from each replication were selected at random. Each fruit was weighed with electric balance and recorded in grams. The formula for average weight is given as:

Evaluation Of Fruit Fly and Disease Incidence

Fruits were closely examined for signs of fruit fly infestation and visible damage. Based on these observations, the extent infestation was calculated to evaluate the impact of each treatment on fruit fly by given formula:

Each fruit was carefully inspected for symptoms of anthracnose disease. The degree of disease incidence/damage was calculated to assess the impact of the treatments on fruits by given formula:

Statistical Analysis

The investigation was carried out in Randomized Block Design (RBD) using online software OPSTAT and off-line software XLSTAT v. 2022.1.2.1283

Results and Discussion

Days To Maturity

White non-woven bag applied at 30 days significantly reduced days to maturity, resulting in early maturity (84 days in rainy and 87 days in winter season). Maximum days (91 days in rainy and 94 days in winter) were taken by fruits developed under control (no bagging) (Table 1). It was evident that the use of bags at a relatively early stage of fruit development i.e., 30 days after fruit setting, always took lesser duration for reaching fruit maturity, whereas, when the crop was bagged at 60 days after fruit setting, it generally had longer duration for fruit maturity. It may be attributed to the fact that bagging at an early stage of fruit development could have maintained proper temperature and relative humidity surrounding the fruits in such a way that might have impact over ripening process of fruit in considerably beneficial manner, thus resulted into a bit of hurried fruit maturity of guava.

Fruit Firmness

Bagging with non-woven bags at 60 days exhibited the highest firmness (2.73 and 2.76 kg per cm^2), while lowest firmness (1.73 and 1.91 kg per cm^2) was observed under unbagged fruits during rainy and winter season, respectively (Table 1). This outcome over fruit firmness could be due to the fact that the use of non-woven white bag might conditioned the tissue of guava fruit during its development in such a way that it could maintain its turgidity in a much better way.

Average Fruit Weight

The highest average fruit weight was obtained with non-woven white bags applied at 30 days after fruit set (132.02 g in rainy and 175.95 g in winter) followed by cotton bags applied at 30 days after fruit setting (128.45 g in rainy and 171.33 g in winter) and muslin bags applied at 30 days (127.22 g in rainy and 166.51g in winter), while minimum was recorded under control (91.41g in rainy and 125.94 g in winter) (Table 1). Bagging at 30 days with all three materials (non-woven, cotton and muslin) after fruit setting was effective in increasing average fruit weight in both seasons. The application of fruit bagging during fruit development stage provided a protection from ultraviolet rays; as a result, the cell division in the fruits increased and proper availability of photosynthates to the fruits on the plant was ensured which led to improved fruit weight.

Table 1: Influence of Bagging Material Along with Stage of Fruit Bagging Over Yield Attributes Namely, Days to Maturity, Fruit Firmness (Kg Per Cm2), Average Fruit Weight(G) Of Guava Cv. Allahabad Safeda.

Parameters / Treatments	Days to maturity		Fruit firmness		Average fruit weight	
			(Kg per cm^2)		(g)	
	Rainy	Winter	Rainy	Winter	Rainy	Winter
T_1: No bagging of fruit at any stage (control)	91	94	1.73	1.91	91.41	125.94
T_2: Bagging with muslin bag (50 GSM) at 30 days after fruit setting	85	88	2.65	2.68	127.22	166.51
T_3: Bagging with muslin bag (50 GSM) at 45 days after fruit setting	86	90	2.66	2.69	120.44	151.87
T_4: Bagging with muslin bag (50 GSM) at 60 days after fruit setting	89	91	2.68	2.71	116.28	148.74
T_5: Bagging with cotton bag (70 GSM) at 30 days after fruit setting	85	88	2.58	2.6	128.45	171.33
T_6: Bagging with cotton bag (70 GSM) at45 days after fruit setting	86	90	2.62	2.64	120.87	155.87
T_7: Bagging with cotton bag (70 GSM) at 60 days after fruit setting	89	92	2.63	2.68	117.05	149.66
T_8: Bagging with non-woven white bag (30 GSM) at 30 days after fruit setting	84	87	2.69	2.71	132.02	175.95
T_9: Bagging with non-woven white bag (30 GSM) at 45 days after fruit setting	86	88	2.71	2.72	122.66	163.41
T_{10}: Bagging with non-woven white bag (30 GSM) at 60 days after fruit setting	88	90	2.73	2.76	118.51	151.99
S.Em. (±)	0.415	0.378	0.06	0.051	1.929	2.175
S.Ed.	0.606	0.553	0.088	0.075	2.821	3.18
C.D. at 5%	1.27	1.157	0.184	0.156	5.905	6.658

Fruit Fly Damage

Bagging at 30 days emerged as a pre-harvest management practice for reduction of fruit fly incidence at earliest phase of development stage. The maximum fruit fly damage was observed under control (92.45% in rainy and 89.51% in winter guava), while minimum was observed under bagging with cotton bags at 30 days after fruit setting (18.66% in rainy and 16.01% in winter) (Table 2). Bagged fruits had significantly less fruit fly damage as compared to unbagged fruits because bags acted as a physical barrier between the fruit flies and the fruit, hence, minimized the attack and losses to the fruit.

Disease Incidence

Fruits bagged with white non-woven bag at 30 days after fruit setting had minimum incidence of disease (19.19 % and 18.06% during rainy and winter season, respectively), whereas maximum disease incidence was observed under control (88.51% in rainy and 85.05% in winter) (Table 2). Bagging of fruits minimized the surface injuries, puncturing by fruit flies, and stimulate the production of ethylene, reduced softening which might be the cause of infection. Hence, bagging was significantly effective in controlling disease infestation.

Table 2: Influence of Bagging Material Along with Stage of Fruit Bagging Over Biological Stress-Oriented Characters of Guava Cv. Allahabad Safeda Namely, Fruit Fly Damage (%) And Disease Attack (%).

Treatments / Parameters	Fruit fly damage(%)		Disease attack (%)	
	Rainy	Winter	Rainy	Winter
T_1: No bagging of fruit at any stage (control)	92.45	89.51	88.51	85.05
T_2: Bagging with muslin bag (50 GSM) at 30 days after fruit setting	27.41	24.98	27.05	24.06
T_3: Bagging with muslin bag (50 GSM) at 45 days after fruit setting	30.51	28.05	28.01	26.15
T_4: Bagging with muslin bag (50 GSM) at 60 days after fruit setting	32.33	31.31	29.15	27.01
T_5: Bagging with cotton bag (70 GSM) at 30 days after fruit setting	18.66	16.01	28.22	25.14
T_6: Bagging with cotton bag (70 GSM) at 45 days after fruit setting	21.99	18.44	30.94	27.27
T_7: Bagging with cotton bag (70 GSM) at 60 days after fruit setting	24.06	22.22	33.05	29.61
T_8: Bagging with non-woven white bag (30 GSM) at 30 days after fruit setting	21.56	18.06	19.19	18.06
T_9: Bagging with non-woven white bag (30 GSM) at 45 days after fruit setting	26.95	22.48	20.05	19.62
T_{10}: Bagging with non-woven white bag (30 GSM) at 60 days after fruit setting	28.33	24.24	20.88	20.01
S.Em. (±)	2.516	2.127	2.191	2.537
S.Ed.	3.678	3.11	3.203	3.709
C.D. at 5%	7.701	6.511	6.707	7.766

Conclusion

From the experiment, it can be concluded that white non-woven bags applied at 30 days after fruit setting improved average fruit weight, prevented incidence of anthracnose disease and reduced days to maturity during both seasons. While non-woven white bags applied at 60 days improved fruit firmness. Cotton bags at 30 days after fruit setting reduced the fruit fly incidence.

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