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Studies on the Effect of Bagging on Yield and Quality of Mango cv. Himsagar

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Abstract

The present experiment was carried out twice in a mango orchard situated in the village of Ghoragacha, Nadia, West Bengal (741 245), India during the months of March to June in the year 2019 and 2020 with twenty-one trees of mango cultivar himsagar comprising seven treatments viz. T_1: Non-woven yellow bag, T_2: Non-woven red bag, T_3: Non-woven Blue bag, T_4: Non-woven white bag, T_5: Non-woven green bag, T_6: Newspaper and T_7: Control was laid out in randomized block design with three replication. The result from the present experiment revealed that there were significant variation in fruit weight, fruit length, fruit diameter, fruit volume, fruit peel weight and fruit seed weight. Healthy bearer and productive mango trees were selected and the fruits when at pea stage were considered for bagging. After bagging in a different coloured paper bags and newspaper bags, stapled is done carefully to cover the fruits from the direct sunlight and also to avoid open space for entry of insects or rain, etc. The physical and chemical data were collected from both the year i.e., 2019 and 2020 and an average data were given. The highest fruit weight (256.00 g), highest fruit volume (224.38 ml), highest fruit length (89.68 mm), highest fruit diameter (57.15 cm) and highest fruit peel weight were observed in T_5 treatment, where non-woven green bags were used and highest fruit seed weight (57.15 cm) was observed in control. However, there were no such significant changes in terms of chemical properties of fruits.

Keywords: Bagging, himsagar, fruit, mango, non-woven, significant, treatments, weight

1. Introduction

Mango belongs to genus *Mangifera* and family Anacardiaceae, which consists of about 30 species and finds its origin in South-East Asia and Indo-Myanmar region (Patil et al., 2019). Humidity, rain and frost during flowering adversely affect the productivity of mango. Pre-harvest fruit bagging has become one of the best methods where individual fruit or fruit bunches are bagged on the tree for a certain periods to get the desired fruits. Such techniques are commonly applied in fruit crops like mango (Jakhar and Pathak, 2016; Haldankar et al., 2015; Wu et al., 2009; Nagaharshita et al., 2014; Islam et al., 2017), to enhance the market value by improving peel colour (Kim et al., 2010), Intermal fruit quality (Zhao et al., 2013), and to reduce diseases (Wang et al., 2013) and pest incidence (Del pino et al., 2021), skin sunburn (Muchui et al., 2010), increase shelf life (Hossain et al., 2020). Insect pollinators plays a critical role in mango production especially in major mango producing countries (Singh and Adhikary, 2021). Molecular markers such as RAPDS can be used for the identification of mango varieties (Goswami et al., 2022) The process of covering individual fruit using a specially designed paper or cloth bag is referred to as bagging, thereby protecting fruits from pests, fungal infections, fruit fly attack (Sarker et al., 2009), diseases, mechanical damage, reduces spraying of an insecticide and providing an estimate of harvestable fruits per tree. Bagging with brown paper bags lowers the incidence of insect infestation, least number of fruit drop, disease infection and maximum individual fruit weight (Chiangsin et al., 2016; Islam et al., 2023). Bagging doesn't affect the moisture content and total soluble solid did not show significant variation at harvest and at ripe stages. The total sugar varied significantly both in the harvest and ripe stages (Devalla et al., 2018). Bagging with brown paper bags was found most effective in

case of fruit retention, total sugar percentage, fruit weight, length and diameter (Afsar and Sultana, 2019; Ventura et al., 2022; Islam et al., 2023). Treatment of white paper bagging and black paper bagging delayed the production of sucrose and the decomposition of citric acid and increased the content of ascorbic acid (Wei et al., 2020). Bagging time and bagging of fruits in mango is very effective in improving fruit quality. Brown paper bag treatment is recommended for mango growers as it is cost effective for those who want to sell high quality fruit in the market (Faruq et al., 2021). Bagged fruit is free from mechanical injury, sunburn, bird damage, no cracks and free from agrochemical residues (Karar et al., 2019). Bagging with white bag significantly reduced carotenoids and chlorophyll content (Wu et al., 2013). Mango is the most important fruit crop of India, known for its delicious taste, exceedingly acceptable flavour, pleasant colour and exemplary nutritive value. Various approaches are adopted to improve the external appearance of fruit, which include bagging of fruit. Pre-harvest bagging demonstrated improvement in the quantity and quality of fruits. Further, in recent years, the gangetic alluvial zone of West Bengal has been experiencing unfavourable weather conditions, spoiling the external appearance of fruit, thus proving the importance of bagging. The present study was conducted to study the effect of bagging on yield and quality of mango cv. Himsagar, with the following objectives: To understand the advantages of bagging with respect to non-bagged fruits, To find the suitable bagging materials among the used treatments, To help enhance the quality of the produce

2. Materials and Methods

The present experiment was carried out in a mango orchard situated in the village of Ghoragacha, Nadia, West Bengal (741 245), India. The field is located at an elevation of 9.75 m above mean sea level with 23.0036 Latitude and 88.50755 Longitude. The experiment was conducted twice on twenty-one trees of mango cultivar Himsagar during the month of March-June 2019 and again during the same months of 2020. The seven number of treatments consist of different coloured materials for bagging viz., T_1: non-woven yellow, T_2: non-woven red, T_3: non-woven blue, T_4: non-woven white, T_5: non-woven green, T_6: newspaper and T_7: control. The treatments were laid out in a randomized block design with three replications. Healthy bearer and productive mango trees were selected and the fruits when at pea stage were considered for bagging. After bagging in a different coloured paper bags and newspaper bags, stapled is done carefully to cover the fruits from the direct sunlight and also to avoid open space for entry of insects or rain, etc. The data was analysed in statistical package for the social sciences software.

3. Results and Discussion

3.1. Physical parameters of fruit

The significant increase in fruit weight, volume, fruit length, fruit diameter and peel weight was recorded except seed weight which was non-significant. The highest fruit weight (256.00 g) was recorded in T_5 treatment, where the non-woven green bags were used and lowest fruit weight (233.00 g) was observed in T_7 treatment (control), where no bagging was used. In T_3 treatment (non-woven blue bags) a noticeable fruit weight (246.00 g) was obtained. The highest fruit volume (224.38 ml) was observed in T_5 treatment, where the non-woven green bags were used for bagging. The lowest (191.47 ml) was in T_2 treatment (non-woven red bags). The highest fruit length (89.68 mm) was observed in T_5 treatment, where the non-woven green bags were used and the lowest was in T_7 (control) followed by T_4 (79.687%) where white paper bag was used. Similar findings was observed by Ali et al., 2023; Faruq et al., 2021; Hossain et al., 2020. The highest fruit breadth (57.15 mm) was observed in T_5 treatment, where the non-woven green bags were used and the lowest (51.12 mm) was noticed in T_7 treatment (control), where no such bagging was done (Table 1). The highest fruit peel weight (52.90 g) was found in T_5 treatment, where the non-woven green bags were used and the lowest (40.25) was observed in T_7 (control) where no such bagging was done. The highest seed weight (40.61 g) was found in T_1 treatment where the non-woven yellow bags

Table 1: Physical parameters of fruit

Treatments	Fruit weight (g)	Fruit volume (ml)	Fruit length (mm)	Fruit diameter (mm)	Fruit peel weight (g)	Fruit seed weight (g)
Non-woven yellow	241.33	200.39	78.99	53.04	41.97	40.61
Non-woven red	240.00	191.47	78.73	52.62	42.38	35.58
Non-woven blue	246.00	200.22	80.42	51.82	40.43	38.53
Non-woven white	243.67	196.79	79.68	53.71	41.78	33.94
Non-woven green	256.00	224.38	89.68	57.15	52.90	35.07
Newspaper	238.00	202.76	81.09	52.17	42.17	36.93
Control	233.00	192.93	77.80	51.12	40.25	38.78
SEm±	2.25	6.28	2.12	1.06	2.11	1.89
LSD (*p*=0.05)	6.93	19.34	6.54	3.27	6.51	NS

were used and the lowest seed weight (33.94 g) was found in T_4 treatment where the non-woven white bags were used.

3.2. Chemical parameters of the fruit

There was no significant change in the fruit's chemical properties such as total soluble solid, fruit acidity, ascorbic acid, reducing sugar, non-reducing sugar and total sugar in terms of bagging with different materials (Devella et al., 2016). However, the highest total soluble solid (20.20°brix) was obtained from T_5 treatment, i.e., non-woven green and the lowest (19.73) was observed in T_4 treatment, i.e., non-woven white (Faruq et al., 2021; Hossain et al., 2020). The highest percentage of Titrable acidity (0.40%) was found in T_2 followed by T_4 (0.38%) treatment. The lowest Titrable acidity (0.29%) was obtained from T_5 treatment, i.e., non-woven green bags were used. Ascorbic acid was recorded highest (0.46%) under T_6 and T_7 treatment, i.e., newspaper and control practices and the lowest (0.37%) was obtained from T_1 treatment, i.e., non-woven yellow. Reducing sugar was obtained highest (3.72%) in T_4 followed by T_2 treatment, i.e., non-woven red. The lowest (3.33%) reducing sugar was found in T_2 treatment, i.e., non-oven red followed by T_6 where newspaper was used (Devalla et al., 2016). Non reducing sugar was found highest (9.11%) in T_2 treatment and the lowest (8.67%) was observed in T_3 treatment, i.e., non-woven blue. Total sugar was obtained highest (12.30%) in T_2 treatment, i.e., non-woven red and lowest (11.57%) was observed in T_5 treatment, where the non-woven green bags were used (Table 2).

Table 2: Chemical parameters of fruit

Treatments	TSS (°Brix)	Titrable acidity (%)	Ascorbic acid (mg 100^{-1})	Reducing sugar (%)	Non reducing sugar (%)	Total sugar (%)
Non-woven yellow	20.04	0.37	0.37	3.34	8.79	11.93
Non-woven red	20.18	0.40	0.42	3.59	9.11	12.30
Non-woven blue	20.15	0.35	0.38	3.33	8.64	12.15
Non-woven white	19.73	0.38	0.40	3.72	8.47	11.71
Non-woven green	20.20	0.29	0.39	3.48	8.93	11.57
Newspaper	20.06	0.36	0.46	3.47	8.98	11.65
Control	20.22	0.30	0.46	3.48	8.82	12.26
SEm±	0.14	0.04	0.04	0.15	0.23	0.39
LSD (*p*=0.05)	NS	NS	NS	NS	NS	NS

4. Conclusion

The non-woven green bags were beneficial in getting the highest fruit size and weight which will lead to higher yield and quality of the fruits. The result showed the positive effect in terms of using different bagging materials and further research is needed to set the protocol of bagging such as to determine the variation of the total yield of the plant with use of different bagging materials and stages of bagging of mango fruits that shows the best results.

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