EFFECT OFPRE-HARVEST FRUIT BAGGING ON THE PHYSICAL QUALITIES, SHELF LIFE AND YIELD OF LITCHI (*Litchi chinensis*)

ABSTRACT

The experiment on "Effect onYield and Quality of Litchi (*Litchi chinensis*) byPre-Harvest fruit bagging" was conducted at the Experimental Farm, Department of Horticulture, Assam Agricultural University, Jorhat During 2021-2022. The experiment was laid out in Randomized Block Design (RBD) with seven (7) treatments and three (3) replications. The treatments taken under the study were Control (T_1), Non-woven Red (T_2), Non-woven Blue (T_3), Non-woven White (T_4) Non-woven Green (T_5), Non-woven Yellow (T_6) and Polypropylene (T_7). The maximum fruit weight (17.81g), fruit volume (20.00cc), fruit breadth (3.16cm), fruit length (3.56cm), aril weight (14.28g), peel weight (2.31g) and yield (0.44kg/bunch) were recorded in T_4 (Non-woven White). Sun burn (8%) and fruit cracking (5.66%) percentage was observed lowest in T_4. During storage, highest shelf life was observed in T_4 *i.e.* 10.50 days. Thus, it can be concluded that all the bags studied in the present experiment were found to be good both in qualitative and quantitative characters and also increased shelf life. But the most superior one among the selected bags was non-woven white bag in terms of morphologicall and shelf life characteristics.

Keywords: Fruit bagging, litchi, yield, quality

Introduction

Litchi (*Litchi chinensis*Sonn.), which belongs to the family Sapindaceaeand sub- family Nepheleae is one of the most important economically valued sub-tropical evergreen fruit crops and originated from China (Menzel, 2002). Litchi fruit has two species, one is *Litchi philippinensis* and another is *Litchi chinensis*. *Litchi philippinensis* is a wild type plant grown in some part of Philippines and are mainly used as rootstock for litchi cultivation.

Although litchi is originated from china, but now a days litchi is commercially grown in USA, Madagascar, South Africa, Australia, Israel, India, Philippines, Thailand, Indonesia ,Taiwan, Vietnam, Pakistan, and Brazil (Menzel, 2001). During 18th Century, *Litchi chinensis* was introduced in India and has adapted well to the Eastern India, *i.e.*Chhattisgarh, Punjab, Bihar, Uttar Pradesh, Jharkhand , Uttarakhand, West Bengal, Himachal Pradesh and Tripura. India ranks 2nd in litchi production after China (Nath *et al* 2018).

Materials and Methods

Litchi (*Litchi chinensis*) cv. 'Piyaji' was selected for the study. The seven treatment comprised of different coloured ofnon-woven bagging materials (Non-woven Red, Non-woven Blue, Non-woven White, Non-woven Green, Non-woven yellow and Polypropylene) with one un-bagged were selected. Bagging for each treatment was distributed equally in three directions and different height of tree canopy to avoid possible influence on treatment effects. Fruits bagged and non-bagged(control) fruits were harvested at commercial mature stage. Parameters like fruit weight, fruit volume, fruit breadth, fruit length, aril weight, peel weight, yield, shelf life, pericarp sunburn and fruit cracking percentage were evaluated. Data were analysed statistically by adopting RBD. The level of significance for different variables was tested at 5% value of significance.

Results and Discussion

The data presented in Table 1 fruit length was significantly influenced by the bagging treatments. The fruit length under different treatments were control (3.10cm), Non-woven Red (3.36cm), Non-woven Blue (3.40cm), Non-woven White (3.56cm), Non-woven Green (3.30cm), Non-woven yellow (3.43cm) and Polypropylene (3.53cm). Highest fruit length of 3.56cm was recorded in white non-woven bagged fruits followed by polypropylene bagged fruits (3.53cm) whereas, the lowest fruit length of 3.10cm was observed in un-bagged fruits. Increased fruit length in bagged fruits might be due to rapid cell division and expansion under favourable micro-climate. The results obtained are endorsed with the findings of Debnath andMitra (2008) and Senanan*et al*. (2011) in litchi.

Fruit breadth under different treatments were (Control) 2.70cm, (Non-woven Red) 2.86cm, (Non-woven Blue) 2.80cm, (Non-woven White) 3.16cm, (Non- woven Green) 3.06cm, (Non-woven Yellow) 3.03cm and (Polypropylene) 3.13cm. The highest fruit breadth of 3.16cm was found in Non-woven White which was statistically at par with Polypropylene 3.13cm and Non-woven Green 3.06cm and lowest was found in Control *i.e*. 2.70cm. Earlier studies made by several workers also have similar findings like Debnath andMitra (2008) and Senanan*et al*. (2011) in litchi , Ghalib *et al*. (1988), El- Kassas *et al*. (1995), Harhash and Al-Obeed (2010), Kassem *et al*. (2011) and Mostafa *et al*. (2014) in datepalm.

The maximum fruit weight (17.81g) was recorded when fruits were bagged with white non-woven bags whereas the minimum fruit weight (14.09g) was noticed when fruits were not bagged. Similar findings were observed by Fumuro and Gamo (2001) in persimmon and Debnath and Mitra (2008) in litchi fruits. This trend in fruit weight might be attributed due to the favourable microclimate created inside the bags which increased accumulation of assimilates leading to maximum fruit weight.

The data presented in Table 1, shows that fruits bagged with white non-woven bags had higher fruit volume (20.00 cc) while it was found lowest (14.33 cc) in unbagged fruits. Similar results have been obtained by Daniells and Farell (1992) who reported that the higher fruit volume in banana fruits might be due to higher humidity and appropriate microclimate inside the bags, which results in proper growth and development of fruits.

Maximum value (14.28g) of fruit aril weight was obtained when fruits were bagged with white non-woven bags while the minimum fruit aril weight (9.73g) was observed in unbagged fruits. Similar results were obtained by Zhou et al. (2012) in Canarium album, El-Kassas et al. (1995), El-Shazly (1999)in date palm fruits.

Table1 Fruit length, Fruit breadth, Fruit volume and Fruit Weight

Treatment	Fruit length (cm)	Fruit breadth (cm)	Fruit volume (cc)	Fruit weight (g)
T1 (Control)	3.10	2.70	14.33	14.09
T2 (Non-woven Red)	3.36	2.86	15.66	15.11
T3 (Non-woven Blue)	3.40	2.80	17.33	15.02
T4 (Non-woven White)	3.56	3.16	20.00	17.81
T5 (Non- woven Green)	3.30	3.06	16.00	14.90
T6 (Non-woven Yellow)	3.43	3.03	16.67	14.76
T7 (Polypropylene)	3.53	3.13	18.67	16.39
S.Ed (±)	0.05	0.04	1.12	0.14
CD (P=0.05)	0.01	0.13	2.45	0.32

Maximum peel weight was observed in Non-woven White *i.e.* 2.31g which was statistically at par with Non-woven Red (2.23g), Polypropylene (2.12g), Non-woven Yellow (2.08g), Non-Woven Blue (2.06g), Non-woven Green (1.98g). Minimum peel weight was recorded in T_1 (Control) *i.e.* 1.37g.Harhash& Al-Obeed (2010) reported that bagging treatment could lead to modifying nutrients and phytochrome metabolism in fruits during development which lead to the thicker skin in bagged fruits.

Table2 Peel weight, Aril weight and Yield

Treatment	Peel weight (g)	Aril weight (g)	Yield (Kg/Bagging)
T1 (Control)	1.37	9.73	0.35
T2 (Non-woven Red)	2.23	11.08	0.38
T3 (Non-woven Blue)	2.06	11.88	0.37
T4 (Non-woven White)	2.31	14.28	0.44
T5 (Non- woven Green)	1.98	13.19	0.37
T6 (Non-woven Yellow)	2.08	12.70	0.37
T7 (Polypropylene)	2.12	12.09	0.41
S.Ed (±)	0.17	0.69	0.09
CD (P=0.05)	0.38	1.53	0.01

The maximum fruit yield of 0.44kg was found in non-woven white bagged fruits followed by polypropylene (0.41kg), whereas minimum yield of 0.35kg was found in control *i.e.* un-bagged fruits. Earlier studies made by several workers also have similar findings like Harhash& Al-Obeed (2010) and Kassem *et al.* (2011) in date palm, Abdel Gawad-Nehad *et al.* (2017) in mango and Senanan*et al.* (2011) in litchi.

Minimum fruit cracking (5.66%) was observed in fruits with white non-woven bags and maximum observed in control group (11%). The declining trend in fruit cracking may have resulted due to reduced moisture stress inside the bags (Sanyal *et al.*, 1990). Similar finding had been reported by Son and Kim (2010) and Li Juan *et al.* (2003) in grape, Yang *et al.* (2009) in longan fruit, Ma *et al.* (2009) in peach and Abd El- Rhaman (2010) in pomegranate.

The least sunburn percentage of 8% was observed in fruits bagged with white non-woven bags and maximum sunburn percentage (14%) was found in un-bagged fruits. The reduction in pericarp sunburn inside the bagged fruits might be due to protection of fruits from direct sunlight during hot and scorching summer. These results are in conformity with the findings of Hong and Zhengming (2001) as they found bagging protected the navel orange from sunburn.

Table 3 Sunburn, Fruit Cracking and Shelf life

Treatment	Sun burn %	Fruit cracking %	Shelf life (Days)
T1 (Control)	14.00	11.00	8.06
T2 (Non-woven Red)	11.00	9.00	9.03
T3 (Non-woven Blue)	10.00	7.00	9.50
T4 (Non-woven White)	8.00	5.66	10.50
T5 (Non- woven Green)	12.00	9.00	9.17
T6 (Non-woven Yellow)	11.66	7.33	9.03

T7 (Polypropylene)	12.00	7.66	9.83
S.Ed (±)	1.05	1.21	0.27
CD (P=0.05)	2.32	2.66	0.60

Bagging also influence the shelf life of litchi fruit. The fruits harvested from the non-woven white bags had highest shelf life of 10.50 days as the fruits from the bags were always dry, healthy and had no insect and disease infestation, less susceptible to decay %. Modified microenvironment around the fruits delayed the ripening in bagged fruits as compared to un-bagged ones resulting in the improvement in shelf life of litchi fruit. Similar results were also reported by Akter *et al.* (2020) in mango.

CONCLUSION

From the above discussion, it can be concluded that both the qualitative and quantitative parameters of litchi fruits were enhanced at the time of harvest and also during the storage period by pre-harvest fruit bagging using various bagging materials. However bagging of litchi fruits with white non-woven bags may be recommended to enhance the physicaland physiological parameters of litchi fruits which can fetch high remuneration to the growers of litchi.

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