

## EFFECT OF FRUIT BAGGING ON THE MANAGEMENT OF LITCHI FRUIT BORER



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### Abstract

An experiment was conducted at the Regional Agricultural Research Station, Bangladesh Agricultural Research Institute (BARI), Akbarpur, Moulvibazar, Bangladesh for controlling litchi fruit borer infestation at BARI Litchu-2 during February, 2018-July, 2020. In this experiment five types of different bagging materials viz., T<sub>1</sub>: perforated polythene bag, T<sub>2</sub>: brown paper bag, T<sub>3</sub>: white paper bag, T<sub>4</sub>: mosquito net bag and T<sub>5</sub>: control (no bag) were used. All the bagging materials showed protection against the fruit borer infestation over control. The maximum fruit borer infestation (30.21%) was recorded in control treatment while the minimum infestation (3.43%) was found at the brown paper bag. The highest fruit weight (19.30g) and the highest TSS (16.65%) were also found in the same treatment considering the fruit borer infestation, weight of fruit, size of fruit, aril weight and %TSS. Among the treatments, brown paper bag was found to be the best for the management of litchi fruit borer.

**Key words:** Litchi borer, Fruit bagging, Quality, Production.

### Introduction

Litchi (*Litchi chinensis* Sonn.) is an important subtropical evergreen fruit crop belongs to family Sapindaceae. It is known as queen of the fruit due to its attractive deep pink/red colour and flavoured juicy aril. It has high nutritive value and refreshing taste. (Singh *et al.* 2012). Apart from this direct consumption, litchi is also used to prepare various value added products. At present, the area under litchi cultivation is about 12780 hectares and production 80920 metric tones (BBS 2021). It is said that the centre of origin of this fruit is in China and from there it was introduced to Myanmar and India by the end of the 17<sup>th</sup> century (Goto 1960). In Bangladesh, the major litchi growing districts are Rajshahi, Pabna, Rangpur, Dinajpur, Panchagarh, Jashore, Tangail, Mymensingh, Kishoreganj, Chattogram and Rangamati. Several factors are responsible for this inconsistent trend of productivity. Among various factors, infestation of insect pests is a major constraint in successful and profitable cultivation of this fruit. Litchi is infested by various pests round the

year. About 11 major and minor pests have been reported in litchi (Hameed *et al.* 2001). Among the various insect pests, litchi fruit borer (*Conopomorpha sinensis* Bradley; Gracillariidae: Lepidoptera) is a serious threat to litchi production causing significant economic losses (Zhang *et al.* 2011, Sharma and Agrawal 1988, Bhatia *et al.* 2000). Litchi fruit borer is a major pest of litchi as it has several generations' right from initial stage to maturity (Kumar *et al.* 2011). Kumar and Kumar (2007) also reported 24-32% infestation of litchi fruit borer at harvest stage showing needs for systematic management of fruit borer. A huge quantity of litchi fruits may be lost due to the fruit borer infestation every year.

Parathion and Dimethoate were the most popular insecticides used by the farmers for controlling litchi fruit borers, however, such insecticides seem not suitable to be used on litchi due to their long residue property (Huang and Hung 1993). Schulte *et al.* 2007 reported that females of *C. sinensis* clearly prefer fruits over shoots for its oviposition. Bagging of fruits is done

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to prevent damage occurring due to bruises, wounds, scars, diseases, pest attack and to produce cleaner fruit skin with attractive colour (Akhtaruzzaman *et al.* 1999). Sharma *et al.* (2014) reported that pre-harvest bagging is a physical protection method which not only improves the visual quality of fruit by promoting skin coloration and reducing blemishes, but can also change the micro-environment for fruit development. Bags act as barrier for laying eggs on fruit surface (Uddin *et al.* 2019). Fruit bagging is proved as a cheapest and eco-friendly technology for exportable mango production (Uddin and Reza 2017). In Bangladesh, litchi harvesting started at rainy season for many varieties. Srivastava *et al.* (2017) reported that intermittent rains during litchi fruit growth and development might have created the congenial environment for borer survival.

So, proper management of this major pest is vital to the farmers for profitable cultivation of this crop. Although concepts like Integrated Pest Management, transgenic plants etc. are getting popularized day by day to protect the environment from various hazards, but still different insecticides are the first choice among the farmers especially when the infestation is severe. There was no research conducted on fruit bagging of litchi in Bangladesh, Therefore, considering all these important issues, the present study was undertaken to compare efficacy of different bagging materials for the management of litchi fruit borer.

### Materials and Methods

The present study was conducted at the experimental farm of Regional Agricultural Research Station, Akbarpur, Moulvibazar (latitude and longitude

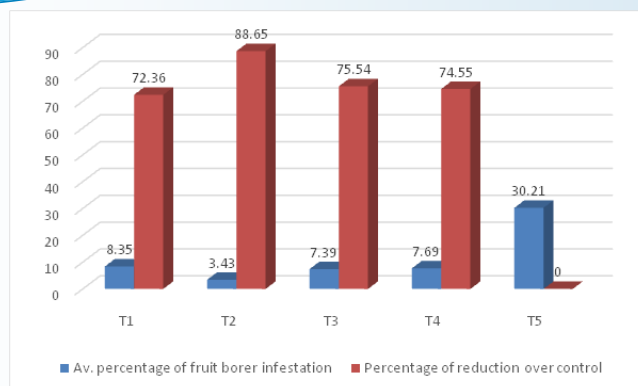
of 24° 41' N and 91° 75' E respectively at the altitude of 19.0 m) during February, 2018 to July, 2020. The experiment was laid out in randomized complete block design (RCBD) with five treatments viz., T<sub>1</sub>: perforated polythene bag, T<sub>2</sub>: brown paper bag, T<sub>3</sub>: white paper bag, T<sub>4</sub>: mosquito net bag, and T<sub>5</sub>: control (no bagging) with three replications. The variety BARI Litchu-2 trees were randomly selected, a tree was selected for each treatment and replication. Ten bunches were taken per treatment. Individual bunch of fruits were covered by different bags according to the treatments. The bag size was 35 cm x 25 cm. Fruit bagging was done at 45 days after fruit set. All management practices were done as and when necessary. Just prior to bagging one spray with the mixture of an insecticide (Ripcord @ 1 ml/L) and a fungicide (Carbendazim @ 1 g per litre) was done only target litchi fruits. For all the treatments, bagging was done in the second and third week of April (Table 1). Harvesting was done at proper maturity stage and observed at laboratory for their physico-chemical properties and organoleptic test. Data on flowering, fruit set, bagging, percent fruit damaged by litchi fruit borer, weight of fruit, fruit size, aril weight, stone weight, aril stone ratio and percent TSS are presented in Table 1 & 2. Data were analyzed statistically using the statistics 10 programme. Means were separated by Duncan's Multiple Range Test (DMRT).

### Results and Discussion

All the treatments significantly reduced the fruit borer infestation in comparison to control during the period of experimentation. For this variety, flowering was started in the first and second week of February and fruit set was completed in the second week of March (Table 1).

**Table 1. Flowering, fruit set and bagging time of BARI Litchu-2**

Treatment	Date of flowering			Date of fruit set			Date of bagging		
	2018	2019	2020	2018	2019	2020	2018	2019	2020
Perforated polythene bag (T <sub>1</sub> )	6.2.2018	8.2.19	10.2.20	8.3.18	11.3.19	13.3.20	13.4.18	15.4.19	17.4.20
Brown paper bag (T <sub>2</sub> )	6.2.2018	8.2.19	10.2.20	8.3.18	11.3.19	13.3.20	13.4.18	15.4.19	17.4.20
White paper bag (T <sub>3</sub> )	6.2.2018	8.2.19	10.2.20	8.3.18	11.3.19	13.3.20	13.4.18	15.4.19	17.4.20
Mosquito net bag (T <sub>4</sub> )	6.2.2018	8.2.19	10.2.20	8.3.18	11.3.19	13.3.20	13.4.18	15.4.19	17.4.20
Control (T <sub>5</sub> )	6.2.2018	8.2.19	10.2.20	8.3.18	11.3.19	13.3.20	13.4.18	15.4.19	17.4.20



**Fig. 1. Showing percentage of fruit borer infestation and percentage of reduction over control.**

The data in Figure 1 represents that the highest average fruit borer infestation (30.21 %) was recorded at T<sub>5</sub> (control) treatment followed by T<sub>1</sub> (perforated poly bag) and the lowest fruit borer infestation (3.43%) at treatment T<sub>2</sub>. This result confirmed with the findings of Hwang and Hung (1993) who reported that incasing

litchi fruits with nylon net-bag could completely prevent fruits from *C. sinensis* infestation and did not affect the growth of the fruit. The highest percentage (88.65%) of reduction over control was recorded at T<sub>2</sub> followed by T<sub>3</sub> (75.54%) and the lowest (72.36%) recorded at T<sub>1</sub> (Fig. 1).

**Table 2. Fruit yield and bio-chemical characteristics of the variety BARI Litchu-2**

Treatment	Ave. fruit wt. (g)	Fruit size (cm)		Peel weight (g)	Aril weight (g)	Stone weight (g)	Aril stone ratio	% TSS
		Length	Breadth					
Perforated polythene bag (T <sub>1</sub> )	13.5d	2.7d	2.93c	2.57c	8.27c	2.30d	3.59c	15.40d
Brown paper bag (T <sub>2</sub> )	19.30a	3.17a	3.4a	4.17a	10.93a	2.63c	4.22a	16.65a
White paper bag (T <sub>3</sub> )	17.17c	3.00b	3.10b	2.83c	10.6b	2.70b	3.92b	15.50c
Mosquito net bag (T <sub>4</sub> )	17.77b	3.1b	3.17b	3.17b	10.7b	2.90a	3.68c	15.67b
Control (T <sub>5</sub> )	12.83e	2.83c	2.82c	3.13d	6.43d	2.59c	2.61d	15.33d
CV (%)	2.5	3.28	3.25	2.89	5.97	2.64	6.38	6.42

The highest average fruit weight (19.30g) was recorded from treatment T<sub>2</sub> while the lowest fruit weight (12.83 g) was recorded at the control. All bagging treatments viz., perforated polythene bag, brown paper bag, white paper bag and mosquito net bag significantly improved physical parameters viz; weight of fruit, length of fruit and aril weight over unbagged control fruits. The highest percentage of TSS (16.65%) was recorded in the treatment T<sub>2</sub> followed by T<sub>4</sub> (15.67%), T<sub>3</sub> (15.50 %) and T<sub>1</sub> (15.40%) while the lowest from control

treatment. Litchi fruits bagged with perforated polythene bag was statistically identical to the control or no bagging treatment (Table 2).

### Conclusion

From the experimental results it was revealed that all bagging treatments performed better compared to untreated control. Considering the fruit borer infestation, weight of fruit, length of fruit, pulp weight and percent TSS bagging of litchi fruits with brown

paper bag was found effective for the control of litchi fruit borer among the four bagging techniques.

## Reference

- Akhtaruzzaman M, Alam M Z and Sardar M A. 1999. Suppressing fruit fly infestation by bagging cucumber at different days after anthesis. **Bangladesh. J. Entomol.** **9(1 & 2): 103-112.**
- BBS. 2021. **Statistical Year Book of Bangladesh 2021.** Bangladesh Bureau of Statistics, Statistics Division, Ministry of Planning, Government of the People's Republic of Bangladesh.pp. 163-164.
- Bhatia R, Sharma R and Agnihotri R P. 2000. Field evaluation of insecticides for the control of litchi fruit borer *Conopomorpha cramerella* (Lepidoptera: Gracillariidae) on litchi (*Litchi chinensis*) in Himachal Pradesh. **Indian J. Agric. Sci.** **70(5): 301-304.**
- Kumar K K and Kumar A. 2007. Managing fruit borer complex in Litchi. **Indian Hort.** **56(6): 22-23.**
- Kumar, V., A. kumar and V. Nath. 2011. Emerging pests and diseases of litchi (*Litchi chinensis* Sonn.) **Pest Manage Hort.Ecosys.** **17(1): 11-13.**
- Goto Y B. 1960. Lychee (litchi) and its processing, **Pacific Rim Food Conf., 1: 15-23.**
- Hameed S F, Singh P P, Singh S P. 2001. **Pest in litchi: Botany, Production and Utilisation** (Ed. Chauhan K S), Kalyani Publishers, Ludhiana, India.pp.194-208.
- Hwang J S and Hung C C. 1993. Control of the litchi fruit borer, *Conopomorpha sinensis* Bradly, with bagging method and insecticides.**Plant Protect. Bull.** **35(3): 225-238.**
- Zhang J Y, LiX, Jiang C, Meng F, Ma L, Wu SR. 2011. Influences of temperature and nutrition on the development and longevity of *Sympiesis sericeicornis* and *Apanteles theivora*. **J. Northwest A&F Univ Natl. Sci. Edu****39(6):154-160.**
- Schulte M J, Martin K and Sauerborn J. 2007. Biology and control of the fruit borer, *Conopomorphasinensis* Bradly, on litchi in northern Thailand. **Insect Sci.** **14(6): 525-529.**
- Sharma D D and Agrawal M L. 1988. Studies on the biology and immature stages of litchi fruit borer *Conopomorpha cramerella* (Snellen) (Lepidoptera: Gracillariidae). **J. Res. RajendraAgril. Univ.** **6(1& 2):84-87.**
- Sharma R R, Reddy, S V R and Jhalegar M. 2014. Pre-harvest fruit bagging: A useful approach for plant protection and improved post-harvest fruit quality: A review. **J. Hort. Sci. Biotech.** **89(2): 101-113.**
- Singh G V, Nath S D, Pandey P K, Ray and Singh H S. 2012. **The Litchi.** Food and Agricultural Organization of the United Nations, New Delhi. p. 219.
- Srivastava K, Pater R K, Kumar A, Pandet S D, Pandey P V R and Nath V. 2017. Integrated management of litchi fruit and shoot borer (*Conomorpha sinensis*) using insect growth regulators under subtropics of Bihar. **Indian J. Agril. Sci.** **87(11): 1515-18.**
- Uddin M S and Reza M H. 2017. A booklet on **Fruit bagging technology and exportable mango production.** Regional Horticulture Research Station, Bangladesh Agricultural Research Institute. p.16.
- Uddin M S, Reza M H, Islam M S, Islam M Z and Islam M M. (2019). Pre-harvest fruit bagging for sound and quality mango production. **Bangladesh J. Agric. Environ.** **15(1): 35-38.**