Economic Affairs, Vol. 67, No. 01(Spl.), pp. 65-69, February 2022
DOI: 10.46852/0424-2513.1.2022.12

AESSRA

Research Paper

Economic Analysis of Bagging in Litchi Fruit: A Feasibility Estimation from Jammu Region

Varun Pal Singh[1], Kiran Kour[1], Parshant Bakshi[1], Anil Bhat[2*], Sarabdeep Kour[3] and Deepji Bhat[1]

[1]Division of Fruit Science, Sher-e-Kashmir University of Agricultural Sciences and Technology of Jammu, J&K. India
[2]Division of Agricultural Economics and ABM, Sher-e-Kashmir University of Agricultural Sciences and Technology of Jammu, J&K. India
[3]Division of Soil Science and Agricultural Chemistry, Sher-e-Kashmir University of Agricultural Sciences and Technology of Jammu, J&K. India

*Corresponding author: drbhatanil@gmail.com (**ORCID ID:** 0000-0002-4806-9467)

Received: 15-10-2021 **Revised:** 25-12-2021 **Accepted:** 25-01-2022

ABSTRACT

The present investigation was carried out at Fruit Nursery, Department of Horticulture, Marallia (Miran Sihab), Jammu during the year 2019-2020. Considering the importance of Dehradun cultivar in Jammu region, the present investigation was under taken to study the effect of different type of bags with the objective to work out the economic feasibility of bagging. The experiment was conducted on twenty year old mature litchi trees cv. Dehradun during the year 2019-2020. Trees planted in square system at 10-meter distance of uniform size, vigour and maintained under uniform cultural practice were selected. The 24 treatment combinations were used comprised of seven different bagging materials with one control (un-bagged) at three different time period of bagging (20 days after fruit set and 40 days after fruit set). Pink polypropylene bagging with highest gross returns, net returns and added returns in all the experiments was found to be most effective type of bagging. The net returns and cost benefit ratio was worked out based on added returns and added cost of bagging. The bagging technique was found to be highly economically viable for adoption in commercial cultivation with a highest cost benefit ratio of 1:2.84, 1:3.56 and 1:3.74, respectively after 20 days, 30 days and 40 days of fruit set due to pink polypropylene bagging. Therefore, on the basis of technical feasibility and economic viability, litchi cultivation must be promoted for export purpose.

HIGHLIGHTS

- Per tree cost incurred for bagging on litchi revealed that there is variation in the total cost of different types of bagging.
- The bagging technique was found to be highly economically viable for adoption in commercial cultivation with a highest cost benefit ratio of 1:2.84, 1:3.56 and 1:3.74, respectively after 20 days, 30 days and 40 days of fruit set due to pink polypropylene bagging.

Keywords: Bagging, litchi, benefit-cost ratio

India is second largest producer of litchi in the world after China. In India, it is mainly grown in Bihar, West Bengal, Uttar Pradesh, Punjab, Jammu &Kashmir and Uttrakhand, where it has a prominent position both in terms of production and productivity. In India, litchi is grown on 92,000 hectares of land with a production of 686,000 metric tons (Anonymous, 2018a) whereas, in Jammu region

How to cite this article: Singh, V.P., Kour, K., Bakshi, P., Bhat, A, Kour, S. and Bhat, D. (2022). Economic Analysis of Bagging in Litchi Fruit: A Feasibility Estimation from Jammu Region. *Economic Affairs*, **67**(01 Spl.): 65-69.

Source of Support: None; **Conflict of Interest:** None

litchi is grown on 938 hectares of land with a production of 1964 metric tons (Anonymous, 2018b).

In recent years, the climatic aberrations such as sudden rise in the temperature and humidity, abnormal rains especially during fruit development are often experienced. It not only affects the external appearance of the fruit but also aggravates the pest physiological disorders which further added in the losses. The affected fruits gain poor price in the market and such fruits are also rejected for processing. It causes serious economic loss to litchi growers. To prevent the losses caused by biotic and abiotic factors, several good agricultural practices (GAP) are becoming popular throughout the world. Of several such alternatives pre-harvest fruit bagging has emerged as one of the best approaches in different parts of the world. It is a physical protection technique commonly applied to many fruits, which not only improves fruit visual quality by promoting fruit coloration but also enhances internal fruit quality. Bagging is commonly applied to many fruits for improving quality, colouration (Huang *et al*. 2009 and Sharma *et al*. 2014) protection from pests, extreme environmental conditions, and pesticide residues (Xu *et al*. 2010).

Considering the importance of Dehradun cultivar in Jammu region, efforts are required to provide technological support through research and developmental programmes for the promotion of production and improved quality fruit for local marketing as well as export. Hence, the present investigation was under taken to study the effect of different type of bags with the objective to work out the economic feasibility of bagging.

MATERIAL AND METHODS

The experiment was conducted on twenty year old mature litchi trees cv. Dehradun at Fruit nursery, Department of Horticulture, Marallia (Miran sahib) during the year 2019-2020. Trees planted in square system at 10-meter distance of uniform size , vigour and maintained under uniform cultural practice were selected. The 24 treatment combinations were used comprised of seven different bagging materials (News paper bag, Muslin cloth bag, White butter paper bag, Laminated brown paper bag, White polypropylene bag and Pink polypropylene bag) with one control (un-bagged) at three different time period of bagging (20 days after fruit set and 40 days after fruit set).

Yield

Total number of fruits in each tree per replication were counted. The counting was made two to three times for minimizing the count error. The fruits harvested from each tree were weighed on electronic balance. The crop load removed from the tree during harvesting season was recorded as yield per tree and expressed in kg/tree.

Economic Analysis

Gross returns

Gross returns from litchi fruit crop per tree were obtained by multiplying the yield of litchi fruits and the price per kg obtained by the farmers.

Added returns

Added returns from litchi fruit crop per tree were obtained by deducting gross returns obtained by unbagged litchi (control) from gross returns obtained by different bagging materials.

Added cost

Added cost per tree was obtained by calculating cost incurred for different types of bagging on litchi during the treatment period.

Net returns

Net returns were calculated by deducting added cost of bagging from added returns.

Net returns = Added returns – Added cost

Cost Benefit Ratio (return per rupee)

The cost benefit ratio (C-B ratio) of an investment is the ratio of the value of all cash inflows to the cash outflows during the treatment period. It can be estimated as follows

$$\text{BCR} = B_t / C_t$$

where,

B_t = Added returns in timet

C_t = Added cost in timet

RESULTS AND DISCUSSION

The cost incurred for application of inputs and different types of bagging materials on litchiis presented in Table 1. The table revealed that highest expenditure of ₹ 984.37 per tree was incurred in pink and white polypropylene bagging whereas lowest of 474.37 per tree was incurred in newspaper bagging. Price per bag varies from ₹ 0.75 to ₹ 5.00 and it was found that newspaper bag was having a lowest price of ₹ 0.75 per bag whereas both white polypropylene and pink polypropylene bags were having highest price of ₹ 5.00 per bag. Per tree expenditure incurred on fertilizer application (₹ 29.37), labour (₹ 325.00) and miscellaneous charges (₹ 30.00) was found to be same in all the treatments. Table 1 representing per tree cost incurred for bagging on litchi revealed that there is variation in the total cost of different types of bagging which is due to the variation in prices of the bags depending upon the quality.

Table 2 represents cost-benefit ratio analysis of bagging in litchi fruit after 20 days of fruit set. The table revealed that average yield per tree due to the different types of bagging on litchi varies from 52.10 kg using newspaper bagging to 72.03 kg using pink polypropylene bagging. Unbagged fruits were having yield of 49.94 kg per tree. Per tree gross returns and net returns were found highest in case of pink polypropylene bagging with a value of ₹ 5042.10 and ₹ 1810.43, respectively. The net returns were worked out based on added returns and added cost of bagging. Per tree added returns due to bagging on litchi were also found highest i.e., ₹ 2794.80 in case of pink poly propylene bagging followed by white propylene bagging with ₹ 2659.00. Cost Benefit ratio 1:2.84 was found to be highest in pink polypropylene bagging and lowest of 1:1.20 was found in laminated brown paper bagging. The bagging technique was found to be highly economically viable for adoption in commercial cultivation.

Table 1: Estimated incurred input costs and bagging materials utilized (₹/tree)

Items / Input cost on bagging	Quantity (no.)	Price/ bag (₹)	Amount (₹)	Labour charges			Fertilizer cost	Miscellaneous charges (₹)	Total cost of bagging (Added Cost) (₹)
				Time of bagging/ tree (in hours)	Rate/ labour /day (₹)	Amount (₹)			
Brown Paper Bag	120	1.00	120.00	8	325.00	325.00	29.00	30.00	504.00
Newspaper Bag	120	0.75	90.00	8	325.00	325.00	29.00	30.00	474.00
Muslin Cloth Bag	120	3.00	360.00	8	325.00	325.00	29.00	30.00	744.00
White Butter Paper Bag	120	2.00	240.00	8	325.00	325.00	29.00	30.00	624.00
Laminated brown paper bag	120	3.00	360.00	8	325.00	325.00	29.00	30.00	744.00
White polypropylene bag	120	5.00	600.00	8	325.00	325.00	29.00	30.00	984.00
Pink polypropylene bag	120	5.00	600.00	8	325.00	325.00	29.00	30.00	984.00
Control (unbagged)	0	0.00	0.00	0	0.00	0.00	0.00	00.00	0.00

Table 2: Cost Benefit ratio analysis of bagging in litchi produce after 20 days fruit set (₹/tree)

Items / Input cost on bagging	Average yield (kg/ tree)	Rate/kg (₹)	Gross returns (₹)	Returns from unbagged litchi (control) (₹)	Added returns (₹)	Net returns (Added return – added cost) (₹)	B-C Ratio
Brown Paper Bag	57.05	55.00	3137.75	2247.30	890.45	386.08	1.77
Newspaper Bag	52.10	55.00	2865.50	2247.30	618.20	143.83	1.30
Muslin Cloth Bag	65.14	60.00	3908.40	2247.30	1661.10	916.73	2.23
White Butter Paper Bag	61.02	55.00	3356.10	2247.30	1108.80	484.43	1.78
Laminated brown paper Bag	57.04	55.00	3137.20	2247.30	889.90	145.53	1.20
White polypropylene bag	70.09	70.00	4906.30	2247.30	2659.00	1674.63	2.70
Pink polypropylene bag	72.03	70.00	5042.10	2247.30	2794.80	1810.43	2.84
Control (unbagged)	49.94	45.00	2247.30	2247.30	0.00	0.00	

Table 3: Cost Benefit ratio analysis of bagging in litchi produce after 40 days fruit set (₹/tree)

Items / Input cost on bagging	Average yield (kg/tree)	Rate/kg (₹)	Gross returns (₹)	Returns from unbagged litchi (control) (₹)	Added returns (₹)	Net returns (Added return – added cost) (₹)	B:C ratio
Brown Paper Bag	61.60	60.00	3696.00	2622.50	1073.50	569.13	2.13
Newspaper Bag	55.22	60.00	3313.20	2622.50	690.70	216.33	1.46
Muslin Cloth Bag	70.82	70.00	4957.40	2622.50	2334.90	1590.53	3.14
White Butter Paper Bag	68.50	55.00	3767.50	2622.50	1145.00	520.63	1.83
Laminated brown paper bag	61.90	70.00	4333.00	2622.50	1710.50	966.13	2.30
White polypropylene bag	75.10	80.00	6008.00	2622.50	3385.50	2401.13	3.44
Pink polypropylene bag	78.81	80.00	6304.80	2622.50	3682.30	2697.93	3.74
Control (unbagged)	52.45	50.00	2622.50	2622.50	0.00		

Table 3 represents cost-benefit ratio analysis of bagging in litchi fruit after 40 days of fruit set. The table revealed that average yield per tree due to the different types of bagging on litchi varies from 55.22 kg from newspaper bagging to 78.81 kg from pink polypropylene bagging. Unbagged fruits were having yield of 52.45 kg per tree. Per tree gross returns and net returns were found highest in case of pink polypropylene bagging with a value of ₹ 6304.80 and ₹ 2697.93, respectively. Per tree added returns due to bagging on litchi were also found highest i.e., ₹ 3682.30 in case of pink polypropylene bagging followed by white propylene bagging with ₹ 3385.50. Cost Benefit ratio 1:3.74 was found to be highest in pink polypropylene bagging and lowest of 1:1.46 in newspaper bagging.

Table 2, 3 and 4 clearly represent the positive effect of different types of bagging on litchi which can be seen from the increase in per tree yield of litchi. Pink polypropylene bagging with highest gross returns, net returns and added returns in all the experiments was found to be most effective type of bagging. It was revealed from the tables that gross returns, net returns and added returns increases with the increase in time of fruit setting. The study analyzed the effect of bagging in a particular time period on litchi fruit, therefore, added returns and added costs were calculated to get the best results. The net returns and cost benefit ratio was worked out based on added returns and added cost of bagging. The bagging technique was found to be highly economically viable for adoption in commercial cultivation with a highest cost benefit ratio of 1:2.84, 1:3.56 and 1:3.74, respectively after 20 days, 30 days and 40 days of fruit set due to pink polypropylene bagging. These results are in conformity with the findings of Amarante *et al.* (2002) which reported that bagging of pear fruits with micro- perforated polythene bags 30 days after full bloom increased the percentage of fruits for export purposes from 27.2 to 63.2 percent increasing the quality of fruits. Shah *et al*. (2020) also reported highest (3.88) benefit: cost ratio was obtained when the fruits were bagged 30 days before the harvest with white polypropylene bags having 5 per cent perforation. As per Sharma *et al.* (2014), bagging is a physical protection method which not only improves the appearance and colour of the fruits but also modifies the micro-environment for fruit development, which results in increasing the market value of the fruits.

CONCLUSION

The bagging technique was found to be highly economically viable for adoption in commercial cultivation with a highest cost benefit ratio of 1:2.84, 1:3.56 and 1:3.74, respectively after 20 days, 30 days and 40 days of fruit set due to pink polypropylene bagging. From the present study, it can be concluded that among the different bagging materials, pink polypropylene bags when bagged 40 days after fruit set is found to be superior for enhancing the quality and other parameters of litchi fruits. Bagging with pink polypropylene bags also resulted in maximum net returns and highest B- C ratio. Thus, from the present investigation, it can be concluded that for improving the colour, quality and other parameters of litchi fruit cv. Dehradun bagging with pink polypropylene bags in combinations with 40 days after fruit set is the most suitable and economically

feasible material.

REFERENCES

Amarante, C., Banks, N.H. and Max, S. 2002. Effect of pre-harvest bagging on fruit quality and postharvest physiology of pears (*Pyrus communis*). *New Zealand J. of Crop and Horti. Sci.*, **30**(2): 99–107.

Anonymous, 2018a. Districts-wise/kind wise estimated area and production and major horticulture crops J&K. Department of horticulture, Talab Tillo, Jammu.

Anonymous, 2018b. Crop wise area and production of Horticulture crops. Ministry of Agriculture & Farmers Welfare, Department of Agriculture (Horticulture Statistics at a Glance):15.

Huang, X.M., Wang, H.C., Li, J., Yin, J., Yuan, W., Lu, J. and Huang, H.B. 2005. An overview of calcium role in lychee fruit cracking. *Acta Horticulturae,* **665**: 231-240.

Huang, C., Yu, B., Teng, Y., Sub, J., Shu, Q., Cheng, Z. and Zeng, L. 2009. Effects of fruit bagging on colouring and related physiology and qualities of red Chinese sand pears during fruit maturation. *Scientia Horticulturae*, **121**(2): 149–158.

Jiang, Y.M., Wang, Y., Song, L., Liu, H., Lichter, A., Kerdchoechuen, O., Joyce, D.C. and Shi. J. 2006. Postharvest characteristics and handling of litchi fruit-An overview. *Austral J. Experim. Agric.,* **46**(12): 1541- 1556.

Marisa, M.W. 2006. Ascorbic acid and mineral composition of longan (*Dimocarpus longan),* lychee (*Litchi chinensis)* and rambutan (*Nephelium lappaceum*) cultivars grown in Hawaii. *J. Food Composition Analysis,* **19**: 655-663.

Paul, R.E., Chen, J.N., Huang, J.H., Cheng, G. and Go, F. 1984. Litchi growth and compositional changes during fruit development. *J. Am. Soc. for Horticul. Sci.*, **109**(6): 817-821.

Sauco, and Menini, U.G. 1989. Litchi cultivation. In *FAO Plant Production and protection paper,* Food and Agriculture organization of the United Nations, **83**: 136.

Shah, G., Chand, S., Srivastava, R., Kumar, R. and Sharma, R. 2020. Effect of pre harvest fruit bagging on the physico-chemical properties of litchi (*Litchi chinensis* Sonn.) cv. rose scented. *J. Pharmacognosy and Phytochem.,* **9**(1): 1812-1819.

Sharma, R.R., Reddy, S.V.R. and Jhalegar, M.J. 2014. Pre-harvest fruit bagging: a useful approach for plant protection and improved post harvest fruit quality. *The J. Horticultural Sci. Biotech.,* **89**(2): 101-113.

Wall, M.M. 2006. Ascorbic acid and mineral composition of longan (*Dimocarpus longan*), lychee (*Litchi chinensis)* and rambuan (*Nephelium lappaceum*) cultivars grown in Hawaii. *J Food Compos. and Analy.,* **19**(6- 7): 655-663.

Xu, H.X., Chen, J.W. and Xie, M. 2010. Effect of different light transmittance paper bags on fruit quality and anti-oxidant capacity in loquat. *J. Sci. Food and Agric.*, **90**(11): 1783-1788.