ORIGINAL ARTICLE

Evaluation of various plant growth regulators in flower and fruit setting of litchi

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Abstract

Background: Huge economic loss of litchi was identified as a problem in Malda district of West Bengal in 2013-14. The loss of litchi is due to mainly litchi fruit drops. This problem occurs due to lack of growth regulators or absence of micronutrients which are responsible for flowering and fruiting such as naphthalene acetic acid (NAA), triacontanol, zinc, and boron. **Objective:** To solve this problem, we took up a trial during 2014-2015 at different locations in Malda district to assess the performance of different growth regulators to increase productivity of Litchi with four treatments and seven replication. **Materials and Methods:** The treatment was T1: Use of boron at 300 ppm + Zinc ethylenediaminetetraacetic acid at 1.5 g/L of water, T2: Triacontanol at 0.30 ppm, T3: NAA at 20 ppm, and T4: Farmers' practice: No use of growth regulators from the trial. **Result:** It was found from the experiment that the highest fruit weight was about 23.26 g by application of NAA at 20 ppm. **Conclusion:** It can be concluded that the performance of growth regulators play a positive role in the production of litchi. It further revealed that T3, i.e., use of NAA at 20 ppm recorded the highest yield of 121.0 q/ha and B/C ratio was 1.83.

Key words: Economic loss, growth regulator, litchi, naphthalene acetic acid

INTRODUCTION

Litchi chinensis Sonn. is the most important fruit of the Sapindaceae family and originates in southern China. Litchi was distributed to most of the subtropical regions of this world. In West Bengal, it is mainly grown in old alluvial zone such as Malda, Murshidabad, and Nadia district. However, it has not become a major horticultural crop because of the problem of low and irregular yields. Litchi produces many inflorescences with three flowering type male, female, and pseudohermaphrodite. Under normal conditions, each inflorescence bears 100 to 250 female flowers. Only a small percentage of these develop into mature fruit after massive flower and fruitlet dropping. Most of the flowers and fruitlets abscise during the 1st month after pollination.[1] The flowers and fruitlets were unfertilized due to failure of pollination or fertilization properly this may be responsible for the generally low productivity of Litchi. These were probably related to the internal imbalance of growth regulators and other physiological factors. For this reason, farmers can not get a good amount and better quality of fruits. Plant growth regulators (PGRs) are organic compounds other than nutrients supplying either energy or mineral elements that, in small amounts, promote, inhibit, or otherwise modify any physiological processes in plants. However, since most PGRs were synthetic compounds, there was always a danger of their removal from use. There were tremendous scope and potential of PGRs in litchi to increase the production by enhancing the female flower in the panicle and reducing the fruit drop. Both boron and zink deficiency result in growth inhibition, reduced flower induction, and fruit set as well as decreased fruit quality.[2] Chlorosis in sunlight exposed parts of field grown litchi plants were observed together with an absence

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of flowering and fruit set. Therefore, it was assumed that nutrient supply is involved in the process of flower induction. So keeping all the point in mind, an experiment was carried out for evaluation of various PGRs in the production of litchi.

MATERIALS AND METHODS

The experiment was conducted in farmers' field of Ratua block in Malda district, West Bengal, India during the year 2014-15 with variety Boombai. Geographically, experimental site situated at 23.5° North latitude, 89° East longitude having an average altitude of 9.75 m above mean sea level. The experimental site was located in sub-tropical humid climate with gangetic old alluvial soil, sandy clay loam texture, good water holding capacity, well drained, and with acidic to neutral reaction and moderate fertility status. The plants were 15-20 years old, uniform growth and vigor selected for the experiment. The single plant was considered as one unit. The experiment design was randomized block design with four treatments and seven replications. The treatments were:

T1: Use of boron at 300 ppm + zinc ethylenediaminetetraacetic acid at 1.5 g/L of water.
T2: Triacontanol at 0.30 ppm.
T3: Naphthalene acetic acid (NAA) at 20 ppm.
T4: Farmers' practice: No use of growth regulators.

PGRs were sprayed 3 times between October and December at monthly interval because this is the critical time for flower bud imitation. The spraying was done in early in the morning within at7-9 am by thoroughly wetting upper and lower surface of leaves and whole plant.

Data Collection and Statistical Analysis

The parameters studied during experimentation included growth parameters such as flower panicle imitation, and retention percentage, yield, and yield attributing parameters. The significance of different treatment of variation was tested by Fisher and Snedecor's *F*-test at a probability of 0.05%.

RESULTS AND DISCUSSION

Physical Parameters

Different PGRs treatment significantly increases the individuals' fruit growth and development. From this experiment, the highest fruit weight about 23.26 g by application of NAA at 20 ppm [Table 1]. Similar result observes by anonymous[3] who suggested that increase the litchi fruit size and quality following application of NAA.

Application of NAA consistently decreased inflorescence and fruitlet abscission significantly. The plant retains up to 75% inflorescence till date of fruit setting and reduces fruitlet drop also. The findings were line with the result found by anonymous.[4] It is also observed that NAA increase the inflorescence of the litchi plant.

Yield Parameters

Variations in yield were noticed among the treatments as affected by different growth regulators (Table 1). T3 recorded the highest yield (121.67 quintal/ha) followed by T4 (80 quintal/ha). The findings were line with the result found by anonymous[5,6] in guava and litchi.

Economic Analysis

Treatments	Cost of cultivation (Rs./ha)	Gross return (Rs./ha)	Net return (Rs./ha)	BC ratio
T1	81,500	143,200	61,700	1.76
T2	85,800	154,300	68,500	1.80
T3	93,300	171,000	77,700	1.83
T4	75,000	130,000	55,000	1.73

The economic assessment for the treatments was done on the basis of cost of cultivation, gross and net return, considering the cost of inputs and market price of the produce during the period of experimentation.

Table 1: Physical and Yield Parameters

Treatments	Inflorescence retention %	Fruit weight (g)	Yield (quintal/ha)	Increase % of yield
T1	56.33	20.74	87.00	8.75
T2	66.33	21.06	99.00	23.75
T3	74.66	23.26	121.67	51.50
T4	45.66	17.56	80.00	-
SEM (±)	1.310	0.384	0.354	-
CD (5%)	3.928	1.063	1.152	-

SEM: Standard error of mean

CONCLUSION

It can be concluded that the performance of growth regulators play a positive role in the production of litchi. It further revealed that T3, i.e., use of NAA at 20 ppm recorded the highest yield of 121.0 q/ha and BC ratio was 1.83. There were tremendous scope and potential of PGRs in litchi to increase the production by enhancing the female flower in the panicle and reducing the fruit drops.

REFERENCES

1. Stern RA, Gazit S. The reproductive biology of the lychee. In: Janick J, editor. Horticultural Reviews. Vol. 28. Ch. 8. USA: John Wiley and Sons, Inc., Publishing; 2003. p. 393-453.
2. Menzel CM, Simpson DR. Lychee nutrition: A review. Sci Hortic 1987;31:195-224.
3. Li JG, Huang XM, Huang HB. NAA sprays increased litchi fruit size and and micro nutrients on fruit set and quality of litchi. J South Chin Agric Univ 2004;25:10-2.
4. Das MC, Das RP. Response of some plant growth substance on fruit drop, fruit splitting and fruit physical parameters of lithi (*Litchi chinensis* Sonn). J Agric Sci Soc North East India 2001;14:1-4.
5. Dutta P, Banik AK. Influence on plant growth regulators on yield physico-chemical qualities and leaf mineral composition of sardar guava grown in red and lateritic tract of West Bengal. Hortic J 2006;19:356-77.
6. Sharma PS, Singh AK, Sharma RM. Effect of plant growth regulators (PGRs) its role. Indian J Hortic 2005;62:24-6.

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