



Recent Trends in Pest Management against Insect Pests of Litchi (*Litchi chinensis* Sonnerat)

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Recent Trends in Pest Management against Insect Pests of Litchi (*Litchi chinensis* Sonnerat) ABSTRACT Litchi (*Litchi chinensis* Sonn) is an excellent fruits of India. This fruit is attacked by Litchi mite (*Aceria litchii* Keifer), litchi fruit borer (*Conopomorpha cramerella* Snellen) and litchi leaf roller (*Dudua aprobola* Meyrick) and suffered with

Abstract :-

Litchi (*Litchi chinensis* Sonn) is an excellent fruits of India. This fruit is attacked by Litchi mite (*Aceria litchii* Keifer), litchi fruit borer (*Conopomorpha cramerella* Snellen) and litchi leaf roller (*Dudua aprobola* Meyrick) and suffered with serious damage. The litchi erineum mite is one of the most destructive pests of litchi in all litchi producing countries of the world. The litchi fruit borer (*Conopomorpha cramerella* Snellen) causes severe damage to litchi fruits and leaves. The Litchi leaf roller, (*Dudua aprobola* Meyer) is another noxious pest causing severe damage to litchi foliage. As the litchi fruits are mostly consumed in raw conditions, they are more vulnerable to contamination with plant protection chemicals thus the management strategy relies on bio-rational approaches to restrict the harmful effect of these pests by the means of integrating cultural, mechanical and by applying botanicals supported by need based application of insecticides (Sulphur 0.4 %, Kelthane 18.5 EC and Imidachloprid 17.8 SL).

Key Words :-

Litchi chinensis, *Conopomorpha cramerella*, *Aceria litchii*, *Dudua aprobola*, Pest Management.

Introduction :-

Litchi (*Litchi chinensis* Sonn.) has been acknowledged as one of the most precious fruits of the world. It is native to China. It is adapted to the warm sub tropics, performing

best in regions with brief cool, dry, frost free winters and long hot summers with high rainfall and humidity. Its cultivation is spread to other countries like, West Indies, Australia, Taiwan, South Africa, Florida, Indonesia, and Brazil. Today India is the second largest producer of litchi in the world after China, occupying an area of 92,000 ha and producing 6, 86,000 mt, annually (NHB, 2018) [1]. Since it requires precise climatic conditions, there are only few states namely, Bihar, West Bengal, Uttaranchal, Uttar Pradesh, Himachal Pradesh, Assam, Tripura, Pujab and Jharkhand growing the fruits commercially.

Litchi is a delicious, juicy fruit of excellent quality. The fruit has high sugar content ranging between 10 and 22 per cent owing to variation in cultivar and climatic conditions. Besides sugar, litchi contains 0.7 per cent protein, 0.3 per cent fat, 0.7 per cent minerals (particularly calcium and phosphorus), vitamin C (64 mg / 100 g pulp) and traces of Vitamin A and B.

There are more than 54 insect and mite pests known to attack litchi tree and its fruits but only a few, namely litchi mite (*Aceria litchii* Keifer), litchi fruit borer (*Conopomorpha cramerella* Snellen), litchi leaf roller (*Dudua aprobola* Meyrick) and bark eating caterpillar, *Indarbella* spp. cause serious damage to the crop in Bihar (Hameed *et al.*, 1999) [2]. The extent of damage to fruits ranges between 24 to 49 per cent (Sharma, 1985 and Ranjan *et al.*, 2003) [3, 4], while leaf infestation varies from 7.2 to 72.5 per cent due to the pests (Ranjan and Mukherjee, 2008) [5].

Major Insect Pests :-

1. Litchi mite (*Aceria litchii* Keifer) :

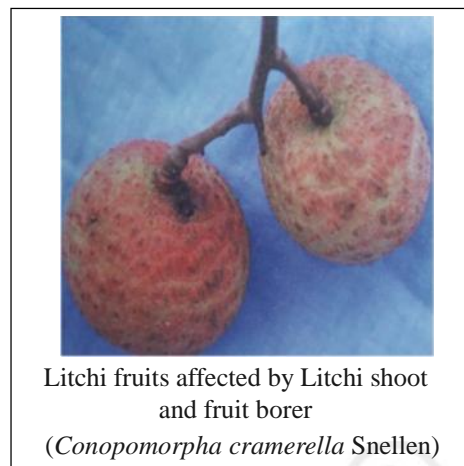
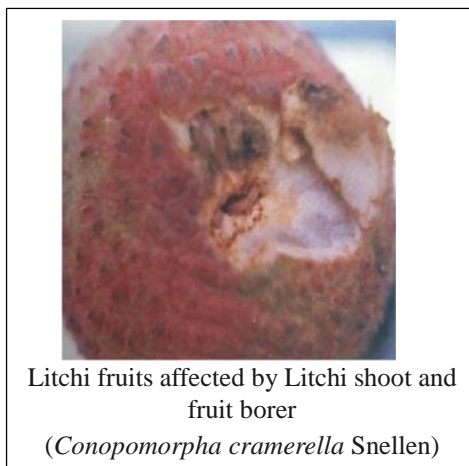


Insect pests of Litchi (*Litchi chinensis* Sonnerat)

The litchi erineum mite is one of the most destructive pests of litchi in all litchi producing countries of the world. The nymph and adults are similar in appearance, whitish in colour, four-legged and vermiform. Most eriophyd mites prefer warm and dry weather for their breeding. Both nymphs and adults damage the leaves, inflorescence and young developing fruits by puncturing and lacerating the tissues of the leaves with their stout rostrum and suck the cell sap. As a result of its feeding, under surface of the infested leaves show abnormal growth of epidermal cells in the form of hair – like velvety growth of chocolate brown colour. In some cases, the mites cause small galls or wart like swellings or depressions on the upper surface of the infested leaves. The attacked leaves become thick, curl, wither and ultimately fall off and the attacked leaf buds fail to bear flower or fruit (Lall and Raman, 1975) [6]. The litchi mite was found active on litchi trees from January to October and hibernated in adult stage under hairy growth from November to December with its peak incidence in April – May (Sharma *et al.*, 1986) [7].

2. Litchi fruit and shoot borer (*Conopomorpha cramerella* Snellen) :

The litchi fruit borer (*Conopomorpha cramerella* Snellen) causes severe damage to litchi fruits and leaves. The larvae of *C. cramerella* mine the young leaves, shoots and also bore the litchi fruits. The pest has now established itself as one of the major pests of litchi in India particularly in Bihar and Uttar Pradesh. The moths of this pest are active fliers, reddish - brown in colour, having characteristic long antennae. There are irregular zig- zag white patches on the fore-wings, fringed with long hairs. Dorsally, the abdomen shows black cross bands, while the ventral surface is brown. Newly hatched larvae are milky white, slender with



distinct light brown head and minute setae all over the body, whereas, full grown larvae are greenish – yellow in colour. The newly hatched larvae of litchi fruit borer mine into the newly emerged litchi leaves as leaf miner and then make a tunnel inside the tender shoots. Its activity is found as leaf miner during August to February, while during off- season (March – April) it restricts itself mainly on alternate hosts viz., kath jamun (*Zyzigium jambolana*) and chhota amaltash (*Cassia tora*) growing wildy around litchi orchards. When fruits appear during April – May, the larvae bore into the fruits and feed on their pulp. Infested fruits become unfit for domestic consumption as well as export. Its hidden infestation is often overlooked by the growers and the pest incidence is detected only when the infested plants start showing symptoms of damage by way of drying shoots. As a result, the litchi growers fail to take up suitable control measures against the pest in time, resulting in severe losses (Hameed *et al.*, 1999., Lall and Sharma, 1978)^[2, 8].

3. Litchi leaf roller (*Dudua aprobola* Meyreck) :



Litchi leaves affected by Litchi leaf roller
(*Dudua aprobola* Meyrick)

The litchi leaf roller, *Platyepplus aprobola* (Meyer) has been recorded in Bihar causing severe damage to litchi foliage around Muzaffarpur. It is a cosmopolitan pest and has been reported as the pest of several other fruit crops in Hawaii, South Africa, Australia and China. The incidence of leaf roller is found on litchi trees during July to February when new flush is available and its restricted breeding takes place during off-season (March to April) on alternate hosts such as kath-jamun (*Zizigium jambolana*) and chhota amaltash (*Cassia tora*) growing wildy in the vicinity of litchi orchards from March to July. The symptoms of leaf injury by the larvae are manifested through rolling of tender leaves and feeding inside. The leaf injured by the leaf roller varies between 16.70 to 71.60 per cent while tree infestation varies from 12.88 to 53.54 per cent during August to February. As a result of larval injuries, the infested twigs distort and wither. Litchi trees with severe infestation show very poor flowering, resulting into considerable reduction in crop yield (Lall and Mallik, 1976)^[9].

Some other pests like Bark-eating caterpillar (*Indarbella tetraonis*, Moore), leaf cutting weevil (*Mylocerus* species), litchi mealy bug (*Drosicha* species), aphids (*Toxoptera aurantii*), white flies (*Aleurocanthus husaini*) and thrips (*Dolichothrips indicus*) have been categorised as minor pests of litchi in Bihar (Hameed *et al.*, 1992)^[10].

Management Strategy :-

The pest management strategies for these pests were developed by several workers (Hameed *et al.*, 1999., Ranjan and Singh, 2003., Ranjan and Mukherjee, 2008), Sharma *et al.*, 1986., Lall and Mallik, 1976. and Mukherjee *et al.*, 2007 [2, 4, 5, 7, 9, and 11] of which some are based on ecological considerations. Those tactics are very effective even today but many of them rely on broad spectrum insecticides which are either banned or restricted. The world has already witnessed the impact of the indiscriminate use of the pesticides and chemicals to tackle the pest menace. Chemical pesticides have long term detrimental effects, leading to environmental degradation and elimination of natural parasitoids and predators. Several hundred insects and mite species have developed resistance to one or more chemical insecticides. The entire world today, is seemingly very health conscious and looking up to organic products that are considered to be free from any toxic residues of chemicals. The litchi fruits are mostly consumed in raw conditions, they are more vulnerable to contamination with plant protection chemicals. During the last two decades, there has been a significant sensitization of the global community on environmental conservation and food safety. As a consequence organic agriculture has emerged as a potential option to meet the global food demand. Though, the use of agrochemical seems to be inevitable yet there are opportunities in certain crops, particularly in fruit and vegetable crops where the organic crop protection strategy has a very good prospect. These harmful pests can be effectively managed by adopting following tactics :

1. Ploughing of orchards at least twice a year, according to need of orchards to destroy the harboring stages of several insects in plant residues / fallen leaves.
2. Pruning and destruction of affected twigs / leaves by burning in the month of July – August and September – October to restrict the multiplication and damage potential of litchi mite, fruit and shoot borer and leaf rollers.
3. Affected saplings should not be used for planting orchards.
4. Application of optimum doses of fertilizers and manures @ 60 Kg Compost, 3 Kg Urea, 2 Kg SSP, 1.5 Kg MOP per tree just after the first shower of rainfall in the month of July. In addition to this application of 5 Kg castor cake along with 2 kg of Neem or Karanj cake per tree can provide not only nutritional support but also protect the trees from attack of harmful insect pests.
5. Root zone application of 100 – 200 g Carbofuron per tree provide protection from the multiplication of litchi shoot and fruit borer during fruiting seasons.
6. Pest activity of litchi mite can be effectively managed by spraying of 0.4 per cent Sulphur / 18.5 EC Dicofol or Kelthane @ 3ml per liter of water during the month of September – October just after pruning of affected trees.
7. Spraying of Neem oil (2 ml / liter of water) / NSKE 4 % / Imidachloprid 17.8 SL @ 0.5 ml / liter of water twice at 10 days intervals during the months of August – September and just before the time fruit maturity stages provide effective protection to fruiting trees of litchi from the attack of litchi shoot & fruit borer as well as litchi leaf rollers.

Conclusion :-

The state of Bihar is blessed with highly diversified abundant bee-flora and favorable ecological conditions hence considered as a paradise of honey bee. Litchi is a highly cross pollinated crop with individual self sterile flower possessing nectar. The flowers of litchi are

one of the most preferred bee – flora and thus considered to be highly valuable for quality honey production in Bihar. The litchi honey produced in Bihar due to better taste and quality is always in great demand nationally and internationally. Many studies have shown significant increase up to 30 – 40 per cent in yield of litchi trees as a result of better pollination due to presence of bee hive or colonies in the orchards (Badiyala and Garg, 1990 and King *et al.*, 1989)^[12, 13]. Besides bees, several natural enemies are reported to feed on litchi pests and thereby keep the pest population level under check naturally. The mite species (*Amblyseius* and *Typhlodromus* species) reported to be predators of litchi mite, *A. litchi*. Likewise three other species (*Apanteles*, *Bracon* and *Mesochorus* species) of hymenopterous parasitoids have been reported to parasitize the larvae of litchi fruit borer, *C. cramerella*. Since the bees and these natural enemies are very sensitive to chemical pesticides, bio – rational approach for the pest management seems more appropriate. Global warming and climate change is now perceived to be the greatest threat to mankind in the 21st century. The natural variation in earth's climate might have caused enormous impact on the ecosystem. The geographical distribution, vigor, virulence and impact of insects and its pathogens may be influenced by these changes. Environmental instability and increased incidence of extreme weather may reduce the effectiveness of pesticides on targeted pests or result in more injury to non-target organisms. The incidence of sucking pests like, mites, thrips and hoppers may increase with the increasing temperatures. Overall, challenge to agriculture from pests probably will increase (Patterson *et al.*, 1999)^[14] and the litchi agro – ecosystem is no exception.

The recent changes in climatic conditions have started posing serious threat to litchi cultivation in the state. The information available on the subject so far is scanty and scattered. Thus, a compelling need to develop a comprehensive strategy was felt indispensable to tackle the pest menace of such an important fruit of the state. The present manuscript was prepared to update the information regarding major pests of litchi and their distribution pattern in Bihar particularly with reference to the impacts of weather factors on the pest activity. The most important objective was to develop a sustainable and bio rational pest management strategy for the major pests of litchi based on ecological considerations so that pest population can be kept under control on the one hand and the natural ecological balance be restored keeping the injury level below the economic threshold on the other.

References :-

1. NHB (National Horticulture Board), (2018) National Horticulture data base. www.nhb.gov.in.
2. Hameed, S. F., Sharma, D. D. and Agarwal, M. L. 1999. Studies on the management of litchi pests in Bihar. *R.AU Journal of Research*, 9 (1): 41 - 44.
3. Sharma, D. D. 1985. Major pests of litchi in Bihar. *Indian farming*, 35 (2): 25 – 26.
4. Ranjan, R. and Singh, P. P. (2003). Bio-efficacy of phytoproducts on the incidence of litchi shoot and fruit borer (*Conopomorpha cramerella* Snell) in Bihar. *Shashpa*, 10 (2): 167 – 169.
5. Ranjan, R. and Mukherjee, U. (2008). Influence of weather factors on the incidence of litchi shoot and fruit borer, *Conopomorpha cramerella* Snellen (*Lepidoptera: Gracillariidae*) in Bihar. *Pest Management in Horticultural Ecosystem*, 14 (2): 177 – 180.

6. Lall, B. S. and Rahman, M. F. (1975). *Studies on the bionomics and control of Erionose mite, Eriophyes litchi Keifer; Acarina: Eriophyidae, Pesticides, 9 (11): 49 – 54.*
7. Sharma, D. D., Singh, S. P. and Akhauri, R. K. (1986). *Relationship between the population of Aceria litchii Keifer on litchi and weather factors. Indian journal of Agricultural Sciences, 56 (1): 59 - 63.*
8. Lall, B. S. and Sharma, D. D. (1978). *Studies on the bionomics and control of the cacao moth, Acrocercops cramerella Snellen Lepidoptera: Gracillariidae, Pesticides, 12 (12): 40 – 42.*
9. Lall, B. S. and Mallik, S. N. (1976). *Bionomics and control of litchi leaf roller (Platyepela aprobola Meyrick) Lepidoptera: Tortricidae. Proceedings of the National Academy of Sciences, India, pp. 22 – 23.*
10. Hameed, S. F., Singh, P.P. and S.P (2001). *Pest In: Litchi. Botany, production and utilization (eds.) K. S. Chauhan, Kalyani Publishers, Ludhiana, pp. 194 - 208.*
11. Mukherjee, U., Ranjan, Rajeev., Ray, P. K. and Kumar, Rakesh, (2007). *Ecofriendly approaches to manage litchi mite, Aceria litchii Keifer in Bihar. Indian Journal of Horticulture, 64 (2): 319 – 221.*
12. Badiyala, S. D. and Garg, R. (1990). *Studies on the pollination and fruit production by Apis mellifera L. In seven cultivars of litchi (Litchi chinensis Sonn.), Indian Bee Journal. 52: 28 – 30.*
13. King, J., Exley, E. M. and Vithage, V, 1989. *Insect pollination for yield increases in lychee. Exotic Fruit Growers Association, Proceedings of 4th Australian Conference on Tree Fruit and Nut Crops, pp. 142 – 145.*
14. Patterson, D. T., Westbrook, J. K., Joyce R. J. V., Lingren, P. D., Rogasik, J. and Reilly, J. M. (1999) *Climate change: impacts on agriculture: weeds, insects and diseases. (Special issue), 43: 711 – 727.*
