

Review on major pests of mulberry and its management protocol

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ABSTRACT

Sericulture is an emerging agro-based enterprise for small and marginal holding farmers having less capital investment. This enterprise involves two distinct activities viz., silkworm rearing and another important one is mulberry leaf production which decides productivity and profitability in sericulture. Mulberry plant have been found attacked by some major pests along with some natural enemies been observed in this locality. This results in severe economical losses to the sericulture farmers. Considering the farmers interest in adopting chemical measures in controlling the mulberry pests is affecting the silkworm rearing to large extent. Hence, a specific study on pest, seasonal attack, symptoms caused, their characteristic alongwith integrated management approach with special emphasis on bio-control measures needs to be popularized among farmers by intensified extension efforts.

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INTRODUCTION

In India at present the major host for domesticating silkworm is *Morus* as it exist both under natural and managed habitat easily. Anand Rao (2003) reported that Indian gene centre for *Morus* is very rich having a potential places of gene reserves for in-situ conservation of mulberry. Mulberry (*Morus* spp.) a evergreen perennial, luxuriant crop being a lonely natural silkworm feed can be cultivated in all soil types under both irrigated and unirrigated conditions. Mulberry quality leaf production plays a significant role in determining the production of raw silk cocoons. At present like other agriculture crops over 300 insect and non-insect species

of pests are known to infest mulberry in varying intensities during different stages of the crop and season (Naik, 1997). The important pests of mulberry are mealy bugs, leaf webber, thrips, Bihar hairy caterpillar, cutworm and termites (Carsai *et al.*, 2014). Also natural enemies like lady bird beetle, coccinellids and spiders were also found abundant in the mulberry field (Samuthiravelu *et al.*, 2010). But still as per studies conducted by Manjunath *et al.* (2003) the average incidence and loss in mulberry leaf yield caused by these pests is estimated to be 34.24 per cent and 4500 kg/ha /year, respectively.

Therefore, a integrated pest management (IPM) approach with minimum emphasis on chemical as these toxic molecules directly or indirectly influence the rearing

of silkworm alongwith their cocoon productivity and quality. Due to which maximum emphasis needs to be given on physical, mechanical and biological measures which should be popularized for controlling these mulberry pests. However, very less attention have been paid for assessing the sericulture farmer's perception and updating knowledge about the pests and their control measures. Hence, a study was conducted by some sericulture module students of Ratnai College of Agriculture, Akhuj during 2018-2019. They visited several mulberry plots of progressive sericulture farmers in the adjoining tahsils just to identify the major mulberry pests alongwith their natural enemies to understand the gap between available scientific knowledge regarding IPM strategies and its grass root implementation for sericulture farmers.

During the survey on different mulberry plots following major incidence of pests alongwith natural enemies was observed.

Pink mealy bug (*Maconellicoccus hirsutus*): are small soft bodied mulberry plant sap sucker insect pests considered as "hard to kill pest" with average life span of 23 to 35 days. About 250 eggs are laid by adult female in powder egg sac. Within 5-6 days incubation takes place and the nymph emerges whose body is covered with mealy substances and moults 2-3 times before reaching adult stage which later reproduce mostly partenogenetically.

Symptoms:

The colonizing nymph and adults mostly attacked the apical shoots due to which flattening and wrinkling of the shoots were observed. Later the leaf colour changed to green showing curly appearance resembling just like "bunchy top of banana" such symptoms is known as "Tukra disease" which was recorded mostly during summer months *i.e.*, late March to early June which resembled with the findings of Ghose (1972).

Management strategies:

- Clipping and destruction of affected tip portion in the early stage.
- Spray profenophos @ 2ml/lit immediately after pruning followed by second spray 15 DAS with dichlorvos @ 2 ml/lit along with azadirachtin 1000 ppm @ 1ml/lit showed effectiveness as per studies by Mahalingam *et al.* (2010).

- Gulsar Banu *et al.* (2010) studies recorded best results for acephate 700g a.i/ ha on mulberry mealy bugs.

- Avoid plantation of guava, pomegranate, grapes, okra, cotton etc., near mulberry field.

- Spraying with 10 per cent vitex plant extract showed good results at nymphal and adult stages (Maheswari and Govindaiah, 2017).

- Releasing of *Cryptolalmus montrouzieri* @.250adult beetles/ha or *Scymnas coecivora* @1000 adult beetles /ha.

Leaf roller or webber (*Diaphania pulverulentalis*): is emerging as an important devastating pest on local M₅, MR₂, S₃₆ and V₁ varieties of mulberry. Near the terminal apical leaf buds the adult female lays 120-150eggs which hatch within 2-3 days. Most damaging larval period ranged for 8-12 days after which it underwent pupation in the soil for 7-9 days. Later on adult survives for a period of 7-14 days mostly depending upon sex and showed the total life cycle of 19-24 days.

Symptoms:

During the survey there were certain foldings and webbings of leaves and tender shoots observed. Initially the larva webs the mulberry leaves and feeds voraciously inside the soft tissues skelotizing leaf symptom which resulted into stunting of apical shoots. Also severe effect has been seen in quality as well as yield of mulberry leaves. Mostly the active infestation period varied between July and December months.

Management strategies:

- Collection and destruction of larva manually.
- Collection and burning of dry webbed leaves and nearly weed harboring pupae.
- Installing light traps @ 2 traps /acre.
- Spraying of 0.076 per cent DDVP @ 1ml/lit on infested apical portion.
- Releasing of *Trichogramma chilonis* Ishii @ 5 tricho-card /acre 20 days after harvesting at an interval of 3 days.
- Release of pupal parasitoid *Tetrastichus howardii* Olliff @1lakh/crop acre in three equal splits also showed good results as per the findings of Saktivel *et al.*, 2012.
- Application of 25 per cent vitex plant extract showed good mortality on third instar leaf roller larvae (Maheswari and Govindaiah, 2017).

Thrips (*Pseudodendrothrips mori* Niwa): is another important pest now-a-days commonly observed on mulberry plant with an average size of 0.9 mm. Female lays 40-50 bean shaped yellow eggs mostly on ventral surface of the leaf. The incubation period was of 6-8 days after which a pale yellow colour nymph emerged causing severe damage. The adults survived for 15-18 days. In all the total life cycle required a period of 20-22 days.

Symptoms:

Mostly nymphal stage attack on the lower canopy and adult stage prefer the upper canopy (Mukhopadhyay, 2006). Both of them scrap the epidermal layer of the leaf causing wounds from which oozed cell sap was sucked. The infested leaves show white streaks or blotches which later become yellowish brown on maturity resulting in malformation of the plant. Similar symptoms were observed during the survey as the pest shows its maximum incidence in between March to May.

Management strategies:

- Spray strong jet of water to dislodge for washing out the pest.
- Apply two spray viz., 0.05 per cent dimethoate followed by 0.1 per cent DDVP in 0.5 per cent soap solution in 10 days interval.
- Spray mulberry crop with 0.02 per cent DDVP or Rogar 0.1 per cent keeping safe period of 8-10 days was also found effective (Hadimani *et al.*, 2006).
- *Neem* cake @ 80kg /acre in combination with *Chrysoperla zastrowi sillemi* alongwith dose of 0.1 per cent dimethoate 30 EC can be applied 10-15 days after pruning as was recommended (Dhahira Beevi *et al.*, 2014).
- 2 per cent *Neem* oil 60 EC followed by 0.03 per cent Thuja 30 also showed promising results (Subramanian, 2003).

Termite (*Odontotermes obesus*, *O. indicus*): commonly known as white ants were observed in few mulberry plots. These are socially polymorphic individuals which during swarming season take a nuptial flight alongwith queen and later settle down in soil making a cell or wood where repeated mating takes place. Later on within a short period the queen lays several thousand eggs which incubate in 24-90 days. The development of different castes

greatly vary on the basis of environmental factors. The worker was the only caste which caused damages.

Symptoms:

More frequent attack of workers was observed in red sandy loamy soil which starts from October and continued till onset of monsoon. Workers had the tendency of feeding on rootlets or bark of the young and old plants which resulted in drying or wilting of the total plant (Rajadurai and Shekhar, 2003).

Management strategies:

- Locate and destroy the termite colonies by eliminating the queen caste.
- Treat the termitoria by phorate 10G@50 g per mound.
- Before undertaking of mulberry plantation the soil should be treated with 5 per cent aldrin.
- Mulberry twigs before planting should be dipped in 0.1 per cent chloropyrifos.
- Around the mulberry plant zone whenever new roots were developed apply neem cake alongwith recommended dose of N:P:K.
- Apply 10G lindane @0.25 kg a.i/ha in field before transplanting of mulberry plant.

Natural enemies:

Also during the survey few natural enemies were observed in the plots of mulberry.

The lady bird beetle species observed during the survey was *Critolaemus montrouzieri* having the nature of devouring various stages of mealy bugs. They feed for nearly 20 days and later pupate for 7 to 9 days from which adult beetle emerges. Similar results observed by Samuthiravelu *et al.* (2010).

In some mulberry plots alongwith some sucking pests few species predatory spiders along with coccinellids were observed which might help to check the population of sucking as well as foliage feeder pests on mulberry (Lalitha *et al.*, 2015).

Conclusion:

The success of silkworm rearing mostly depends upon quality and quantity of mulberry leaves. A proper channel should be developed by extension agencies to motivate the sericulture farmers to accept and adopt the approved IPM strategies keeping emphasis on promotion

of eco-friendly bio-control measures.

REFERENCES

- Ananda Rao, A., Girish Naik, V., Tikander, A., Mukherjee, P. and Thangavelu, K. (1997).** Distribution and variation in mulberry germplasm *Indian J. Plant Genet. Resour.*, **10** (2): 233-242.
- Ananda Rao, A. (2003).** Conservation status of mulberry genetic resources in India. In: Sohn, K-W (Ed) *Conservation status of sericultural gemplasm resources in the World 1*, Food and Agricultural Organization of the United Nation (FAO), FAO Corporate Decument Repository, Romme 197 pp.
- Carasi, R.C., Telan, I.F. and Pera, B.V. (2014).** Bio-ecology of cutworm (*S. litura*) of mulberry. *Int. J. Sci. Res. Publ.*, **4**: 2250-3153.
- Dahira Beevi, N., Mahiba Melena, S., Thirunavukkarasu, T. and Chikkanna (2014).** Field evaluaqion of *Chrysoperla zastrowi sillemi* (Esben-Petersen) (Nuropteran: Chrysopidae) and neem cake for the management of thrips (*Pseudodendrothrips mori*) (Thripidae: Thysanoptera) on mulberry in Tamil Nadu. *Indian J. Seri.*, **53**(2) : 36-39.
- Ghose, S.K. (1972).** Biology of the mealybug *Maconellicoccus hirsutus* (Green) (Pseudococcidae: Hemiptera). *Indian Agric.*, **16** : 323-332.
- Gulsar Banu, J., Surulivelu, T., Amutha, M. and Gopalakrishnan, N. (2010).** Laboratory evaluation of insecticides and biopesticides against *Phenococcus solenopsis* and *Paracoccus marginatus* infesting cotton. *J. Biopesticides*. **3** (1): 343-346.
- Hadimani, D. K., Amarnatha, N., Manjula, G. and Narayansway, K. C. (2006).** Managemnet of mulberry thrips. *Indian silk.*, **45** (4) : 11-12.
- Lalitha, N., Kumar, M. V. S., Saha, A. K. and Kumar, S.N. (2015).** Report of papaya mealy bug, *Paracoccus marginatus* in mulberry in West Bengal. *Curr. Biotica.*, **9** (1): 82 - 85.
- Mahalingam, C.A., Suresh, S., Subramanian, S., Muruges, K. A., Mohanraj, P. and Shanmugam, R. (2010).** Papaya mealybug, *Paracoccus marginatus* - A new pest on mulberry, *Morus* spp., TNAU, Coimbatore. *Karnataka J. Agric. Sci.*, **23**(1): 182-183.
- Maheswari, M. and Govindaiah, G. (2017).** Evaluation of different plant extract for management of mealy bugs and leaf roller in mulberry field. *J. Entomol. & Zool.*, **5** (6): 2081-2085.
- Manjunath, D., Prasad, K.S. and Sidde Gowda, D.K. (2003).** Ecological approach for the management of mealy bug, *Maconellicoccus hirsutus* causing (Tukra) in mulberry. *Proc. Natl. Conf. Trop. Sericult. Global Competitiv.*, CSRTI, Mysore, India, 41.
- Mukhopadhyay, S.K. (2006).** Technologies for management of mulberry pest. *Proceedings of the Workshop on Appropriate Technologies for Mulberry Sericulture in Eastern and North Eastern India*, January 17-18, 2006, Berhampore, India, pp: 136-139.
- Naik, S. L. (1997).** Bioecology of thrips infesting mulberry. M.Sc. Thesis, University of Agricultural Sciences, Bangalore, Karnataka, India, 77pp.
- Rajadurai, S. and Shekar, M.A. (2003).** Management of termites (*Odontotermes* spp.) in mulberry. Proceedings of the National Conference on Tropical Sericulture, CSR and TI, Mysore, India .
- Saktivel, N., Kumaresan, P., Quadri, S. M. H., Ravikumar, J. and Balakrishna, R. (2012).** Adoption of intergrated pest management practices in sericulture: A case study in Tamil Nadu. *J. Biopest.*, **5** : 212-215.
- Samuthiravelu, P., Ravikumar, J., Qadri, S.M.H., Hemanthkumar, L. and Jayaraj, S. (2010).** Influence of abiotic factors on population dynamics of leaf webber *Diaphania pulverulentalis* and its natural enemies in mulberry. *J. Biopesticides*, **3**(1): 37-42.
- Subramanian, A. (2003).** Management of mulberry thrips *Pseudodendrothrips mori* (nawa) by chemical method. *Madras Agric. J.*, **90** (10-12): 746-748.

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