

## Original Research Article

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# Constraints faced by bivoltine sericulture farmers to manage pests and diseases in mulberry cultivation and silkworm rearing – An experimental study in Tamil Nadu



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## ABSTRACT

*The study aims to elucidate the constraints faced by sericulturists to pests and disease management in Tamil Nadu. An ex-post-facto research design was followed for the study conducted during 2022-2023 in purposively selected blocks of Erode, Tirupur and Coimbatore districts. Samples of 120 farmers were selected using a proportionate sampling procedure and information was gathered and analyzed by Garrette's ranking technique. The results of this study revealed majority of the sericulturists faced major constraints such as a lack of technical knowledge regarding the use of recommended IDM and IPM, high mortality of silkworms due to improper use of insecticides and fungicides, high cost of insecticides and fungicides and less availability of bio-control agents. In addition, suggestions given by respondents to overcome the constraints in adopting IDM and IPM were also recorded and ranked.*

**Keywords:** Bivoltine Sericulture farmers, constraints, pests and diseases management, suggestions, IPM, IDM.

## INTRODUCTION

The advancement of science and research in recent years has given rise to new technologies in agriculture and allied sectors including sericulture. The adoption of these technologies by the farmers has resulted in bringing out a new revolution in the field of sericulture, which is essentially requiring good extension support and timely transfer of technology for marketing in a remunerative enterprise [7].

In mulberry cultivation, the luxurious growth of mulberry attracts over 300 insects and non-insects pests [15]. as well as various soil-borne and air-borne infectious pathogens [12, 4]. Sericulture-practicing farmers adopt different methods like mechanical, physical, chemical, cultural and biological methods to control the major pests and diseases in mulberry field [17]. In silkworm rearing, the improper maintenance of environmental conditions and feeding of poor-quality of mulberry leaves induce various diseases to silkworms. Sericulture farmers' practice general disease preventive and control measures to manage silkworm diseases [1]. Following that, silkworms are severely attacked by tachinid parasitoids (larval-pupal stage) which also managed by various techniques, mainly by hyper-parasitoids [5].

The sericulturists are adopting different methods to overcome the biotic stress occurring in sericulture but not in an organized manner. Many times when the intensity of pests and diseases is severe or sudden outbreak chemical control might become must.

But this can be used in combination (as integrated management) to reduce its toxicity level on silkworms and environment. Appropriate method and time management practices are necessary for efficient protection of mulberry and silkworm thereby enhancing silk production. However, sericulturists faced many constraints to adopting the suitable control measures to manage the major pests and diseases in field level. Hence, this study helps to know about farmers' understanding, their queries and assist the sericulture department in promotion of technologies.

## MATERIALS AND METHODS

The study was conducted in sericulture-practicing districts namely Coimbatore, Erode and Tirupur. These districts were noted for production of silk through its soil characters and climatic conditions. To fix the sample, officials from the Department of sericulture and Central silk board – Regional Extension Centers were approached. Totally six blocks were selected and in each district two blocks such as Annur and Kinathukadavu in Coimbatore, Gobichettipalayam and Bhavani in Erode and Kudimangalam and Udumalpet in Tiruppur district were selected based on more area under mulberry cultivation. Two villages were randomly selected in each block. In the next stage, lists of farmers engaged in sericulture were collected with the help of state department of sericulture, and employed proportionate random sampling thus making a total of hundred and twenty farmers as respondents. Individual respondents were contacted in their farms with the prepared pretested interview schedule to elicit primary data through personal interviews during 2022 – 2023. To elucidate the constraints faced by the sericulturists the Garrett's ranking technique was used in this study.

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### Garrett's ranking technique

Garrett's ranking technique was adopted for documenting the respondents' perceptions and expert potentials of pests and disease management practices in sericulture at the same time to identify the constraints in pests and diseases management in the study area. Garrett's ranking is applied to rank a set of items or factors as perceived by the sample respondents based on their priority. The order of merit assigned by the respondents was converted into scores using the formula:

$$\text{Per cent position} = \frac{100 (R_{ij} - 0.5)}{N_i}$$

Where,

$R_{ij}$  = the rank of the  $i^{\text{th}}$  item by  $j^{\text{th}}$  individual and

$N_j$  = the number of items ranked by the  $j^{\text{th}}$  individual.

By referring the Garrett's table, per cent position estimated was converted into score. Then, for each factor, the scores of various respondents were added and the mean score was calculated. The factor with the highest mean score was considered to be the most important constraint. Thus, the mean score for each constraint was ranked by arranging them in descending order.

## RESULTS AND DISCUSSION

### I. Constraints faced by the respondents

There are certain constraints which respondents recognized while adopting IPM & IDM in mulberry cultivation and silkworm rearing were presented in Table 1. Garrett's ranking technique was used to rank the constraints.

It could be concluded from Table 1 that the major constraint faced by the respondents was the lack of technical knowledge regarding the use of recommended IDM practices (Rank I), this finding was in line with [12] followed by high silkworm mortality due to residual effect of fungicides and pesticides (Rank II). Similarly based on the respondents' reports, frequent and high incidence of pest and diseases in sericulture was ranked as III.

Following High cost of insecticides and fungicides ranked as IV this constraint in line with [13] who reported that among the constraints expressed by the farmers of mulberry sericulture, high input cost ranked first followed by lack of irrigation facilities according to the responses obtained from mulberry sericulturists.

From our study, lack of availability of biological control agents on time was ranked as V. This finding was in line with [12], followed by lack of knowledge about identification of pests and diseases ranked as VI, There are no biocontrol agents for some new potential pests like Giant African snail and May-June beetle (Rank VII), following that unavailability of insecticides and fungicides on time was ranked as VIII.

Non-effectiveness of recommended IPM and IDM practices in controlling some of the pests and diseases in sericulture was ranked as IX and this finding was overlapped with [8] studied the constraints experienced by the sericulturists on IPM practices. The results also showed one or more components of the recommended IPM practices were expensive, unavailable and inefficient which made the farmers hard to adopt the technology.

Lack of technical knowledge might be due to the fact of relatively less number of extension officials to the number of farmers

available, which affects delivering of the technical knowledge at correct time to all the sericulture farmers. This finding matched with [11] who studied on constraints for SMS service of the *mKisan* portal as perceived by the farmers the results revealed that no direct contact with the scientists and experts to sericulture farmers in Murshidabad district of West Bengal.

The second most imperative constraint was the sensitivity of silkworms to fungicides & pesticides. The silkworm, *B. mori* L. have been domesticated for more than thousands of years thus had least resistance to insecticides and other agrochemicals. Hence, silk production was reduced by more than 30 per cent annually because of insecticide poisoning [2]. [16] found that the insecticides like lambda-cyhalothrin and emamectin benzoate were highly toxic to silkworms even after 30 days after spray. [6] reported that application of the fungicides to mulberry plants increased silkworm mortality up to threefold and significantly reduced the economic parameters like the size of the cocoons spun by silkworms and raw silk production is reduced. In addition, the improper use of room disinfectants and slight increase of agrochemicals application than recommended level will lead to high level of mortality of silkworms. According to [10] the application of insecticides with high toxicity and prolonged residual effects in mulberry gardens should be restricted because of their hazardous effect on silkworms. However, repeated applications of selective low persistent chemicals like DDVP turned ineffective due to development of resistance in the pests.

Sericulture industry often experiencing high incidence of pests and diseases and also the invasion of new/ secondary pest due to the resistance of older chemicals. Since silkworms are sensitive to chemical pesticides and fungicides immediate control of pest and diseases through chemicals is not advisable. The cost of insecticides and fungicides is also high and still increasing day-by-day. So the farmers need alternative low cost methods and inputs as well. During 2010-11 to 2015-16 the maximum increase in domestic prices of the following pesticides profenofos (by 63%), DDVP (by 58%) and Chlorpyrifos (by 51%) were noted [14].

Bio control agents' mass production activity was found to be poor as well as their availability to the farmers. Hence, they could not able to get the biocontrol agents at correct time. In Tamil Nadu 25,237 farmers are practicing sericulture but only few govt. agriculture institutions and KVK's supplying bio control agents which cannot meet over the actual demand of sericulturists. Hence, the awareness of biocontrol agents, their mass production techniques and their supply are crucial for healthy silkworm rearing.

Some farmers lack knowledge and found difficulties in the identification of pests and diseases which showed the need of specific training in this aspect. They are also in the need of door delivery of inputs to take appropriate management to control pest and disease at appropriate time. The respondents need training to differentiate the major foliar diseases of mulberry which deteriorates mulberry leaf quality to carry out necessary actions. Feeding of those diseased leaves or improperly treated leaves to silkworms which adversely affects the growth and development in addition reduced the marketing quality of cocoon [3].

**Table 1. Constraints faced by the sericulturists during the adoption of integrated pests and diseases management**

S. No	Particulars	Score	Rank
1.	Lack of technical knowledge regarding the use of recommended IPM and IDM practices	83.34	I
2.	High silkworm mortality due to residual effect of fungicides and pesticides	75.0	II
3.	Frequent and high incidence of pest and disease in sericulture	70.84	III
4.	High cost of insecticides and fungicides	66.67	IV
5.	Lack of availability of biological control agents on time	63.34	V
6.	Lack of knowledge about identification of pests and diseases	58.34	VI
7.	No biocontrol agents for some pests	50.0	VII
8.	Unavailability of insecticides and fungicides on time	33.34	VIII
9.	Non-effectiveness of recommended IPM & IDM practices in controlling some of the pests and diseases	16.67	IX

**II. Sericulture farmers' suggestions to overcome the constraints faced by them while adopting pests and diseases management**  
 Sericulture farmers had many constraints while following the IPM and IDM of pests and diseases management during mulberry leaves and cocoon production. These constraints might be resolved by the farmers' suggestions. The suggestions given by the respondents to overcome the constraints are presented in Table 2.

It could be observed from Table 2 that, majority (66.67 %) of the respondents suggested giving training to unemployed rural youth for the establishment of bio control units. Since the silkworms are sensitive to chemicals and if the biocontrol agents were supplied in time, more no. of farmers could be benefited by using the parasitoids and predators to control the pest and diseases in both mulberry and silkworm. Nearly half of the (45.83 %) respondents suggested to create awareness about identification of pest and diseases at field level. This could help them to adopt proper IPM or IDM practices. Thirty-three point three four per cent suggested special emphasis should be given to train the farmers about the predators and parasitoids against pests and diseases of mulberry and silkworm.

**Table 2. Suggestions enlisted by sericulture farmers to overcome the constraints**

S. No	Farmers suggestions	No. of respondents	In percentage
1.	Give training to unemployed rural youth for the establishment of bio control units and ensure timely supply of this biocontrol agents	80.00	66.67
2.	To create awareness to farmers about the identification of pests and diseases at the field level	55.00	45.83
3.	Special emphasis should be given to training the farmers about the predators and parasitoids against pests and diseases of mulberry and silkworm	40.00	33.34

**CONCLUSION**

The state of Tamil Nadu forms a significant bivoltine sericulture belt of our country, having the potential to meet the demand for high-quality graded raw silk of international standard. Tremendous effects are made by the state department of sericulture with the collaboration of Central Silk Board from time to time for the silk industry upliftment. They focused on resolving the major constraints in integrated pest and disease management in sericulture, thus resulted in positive trend. Further to eradicate the above mentioned constraints a comprehensive extension policy and schemes can be adopted which should aim at increasing productivity as well as profitability of sericulture activities in future.

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