

Constraints in Adopting Biological Based Pest Management Strategies

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ABSTRACT

Biological control of insect pests is a “viable alternative” to insecticides with an aim to suppress the pest populations below economic injury levels and is the need of the hour. The key biological based management strategies include erection of pheromone traps for mass trapping/monitoring the incidence of moths (adults) of insect pests; conservation of natural enemies like predators/parasitoids in crop ecosystem; augmentation and inundative release of bio-agents like parasitoids and predators against the targeted pests; and application of bio-rational or “reduced risk” insecticides that effectively controls the insect pests and non toxic to other organisms with meager environment risk. Many research findings had strongly witnessed the biological pest management as superior method in suppressing the pest infestation levels in almost all crops, but the success rate is not substantial at farmer’s level. In order to assess the constraints in adopting biological methods and restraints in low success rate of these methods in suppressing the insect pests an explorative research study was conducted for a period of two successive years *i.e.*, 2020-2021 and 2021-22. A total of ten mandals in Krishna district of Andhra Pradesh was selected for the study wherein biological based management strategies are being practiced by the farmers. From each mandal three villages were randomly selected and from each mandal ten farmers were chosen for personal interview to document the constrains in adopting bio-control methods. The methodologies being practiced by farmers were also recorded. The results inferred that among the various restraints, non availability of bio-control agents/materials at market level (63%), adopting the methods at improper time (59%) and lack of knowledge on pest behavior/ecology (55%) are the major influencing factors for low success rate of biological control at farmer’s level. It can be accomplished from the present study that adoption levels of biological pest management strategies at farmers are to be strengthened by conducting regular training programmes, result demonstrations, front line demonstrations and also by encouraging farmers through some incentives and certifications of the harvested organic produce.

Key words: Constraints, Biocontrol, Pheromone traps, Tricho cards, Success rate, Farmers level

Introduction

The biological based pest management strategies are pioneering and sustainable way to control the targeted insect pests as they don’t leave any residues and has no deleterious health risks on humans or other organisms. If bio-control pest management

was implemented following importation strategy (introducing new natural enemies and establishing a permanent population) it will provide a permanent pest control with favourable cost benefit ratio (Nazir *et al.*, 2020). Biological pest management is the need of the hour to reduce pesticide usage by developing innovative cropping systems to ensure the

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sustainability of agricultural production (Adrien *et al.*, 2010). The cost benefit ratio for classical biological control is highly favourable (1:250) and for augmentative control is similar to that of insecticides (1:2–1:5), with much lower development costs. For the past 120 years, more than 5000 introductions of approximately 2000 non-native bio control agents had registered successful control against arthropod pests in 196 countries or islands with remarkably few environmental risks (Bale, 2008). Natural enemies such as predatory arthropods and especially parasitic wasps (parasitoids) are very effective resulting in significant suppression of targeted pest populations (Hajek and Eilenberg, 2018). Adoption of biological control for the pest management predates the modern pesticide era and bio-control agents are considered as viable alternatives to pesticides. Many researchers/scientists/ecologists had confirmed and justified the significance of biological based pest management strategies in view of pest suppression and an environmental feasible technology as a holistic and sustainable approach in integrated pest management system for different crops. However, the adoption level of these biological strategies globally remain modest and inconsistent (Gur and You, 2016). The practice of biological based methods in pest management by farmers at field level found substantial with low success rate. The information on farmers existing level of knowledge, their attitudes and practices in extent of adopting biological practices in cultivation and identifying the constraints/restraints faced by them in practicing the recommended scientific biocontrol measures in various crops are necessary and needed. The information will aid in planning government policies or revalidating the technologies with respect to molecular era or designing new methodologies to encourage farmers and create awareness on present discussing issue. Hence, the present study is undertaken to highlight the importance of precise description of biological based pest management strategies and to discuss the constraints/restraints in adopting them and the motives behind the low success rate of biological pest management at farmer's level.

Materials and Methods

A primary survey was conducted in ten mandals (Jaggayapeta, Nandigama, G.Konduru, Ibrahimpatnam, Vijayawada (R), Gannavaram, Kankipadu, Vuyyuru, Pamarru and Machilipatnam)

of Krishna and NTR districts of Andhra Pradesh where in biological based pest management strategies were being adopted by farmers since a decade. From each mandal three villages were randomly selected and from each mandal ten farmers were chosen for personal interview to document the methodologies and also restraints/ constrains in adopting bio-control methods. Mainly paddy, cotton, chilli, maize and sugarcane growing villages were randomly selected and survey was executed during two successive years 2020-2021 and 2021-22 by exploratory research design methodology. A personal interview was made for each selected farmer and their responses with regards to adoption levels of biological based pest management practices in various crops and constraints in adoption and farmers perceived opinions were recorded. The recorded data was subjected to suitable statistical analysis and the results were documented.

Results and Discussion

A total of 300 farmers were interviewed personally in around surveyed 30 villages comprising of 10 mandals of Krishna district and recorded constraints faced by them in adopting biological pest management strategies in various crops. Accordingly the frequency and per cent of responses of the farmers were calculated and ranked (Table 1).

Among the various constraints articulated by the farmers, first rank was occupied for the reason of non availability of bio-control agents (BCAs) at market level followed by the rationale adoption of the methods at improper time (rank II) and lack of knowledge on pest ecology (rank III). Majority of the farmers expressed that BCAs are neither commercially available nor at the near situate of their village to procure them. This is the major issue to be considered as even though the farmers are interested to adopt biological based pest management strategies the BCAs are not at their reach to purchase even on cost basis. Moreover the potency of these BCAs may be limited if procured through transport or from distant places as BCAs possess short life span and if exposed to outside environment (temperature/moisture fluctuations) for longer period they lose their effectiveness. The success in installing pheromone traps or releasing egg parasitoids (tricho cards) duly rely on pest behavior and ecology. The pheromone traps are to be erected when the pest is at adult stage and tricho cards are to be released when the pest is

at egg stage. This methodology is not being practiced among farmers due to lack of knowledge on pest nature and behavior, leading to low success rate of biological pest management.

Farmers are not viewing interest in adopting these biological techniques as there is no immediate visible results on pest suppression (rank IV), farmers have nil knowledge on the natural enemies available in their own field fauna (rank V), even they are not aware on the significance of pheromone traps and tricho cards (rank VI) and farmers initially can't afford these biological based technologies as they are cost ineffective (rank VII).

Most of the farmers assume tenant farming and desires to attend instant management practices rather than adopting long term effective methods like bio-control aspects for pest management. Farmers are not aware of existing predators and parasitoids in their crops and their role in pest suppression; they are also unaware of conservation of natural enemies and indiscriminately using pesticides in combinations with over lethal doses.

Farmers are really ignorant of the mechanism or benefits of erecting pheromone traps or releasing tricho cards. Skill in erection of traps at proper height, changing of lure at regular intervals and placing the tricho cards on lower side of the leaves *etc.* are also not known to the farmers.

Farmers had no idea on available sources (shops/dealers) from where they can purchase BCAs/materials (rank VIII) which is the major drawback for implementing biological strategies. Non availability of quality control measures for BCAs is another constraint expressed by farmers (rank IX) as deception is increasing in marketing pertaining to bio products for pest management. Farmers also intimated that

timely guidance on BCA usage is lacking and needs training programmes from expertise Scientists/departmental officials to ensure the desired results.

The bio-control agents or bio-products possess meager viability and timely usage is inevitable to reap success in implementation of biological based pest management strategies. There is no quality control station or assessments by officials in relation to production, mass multiplication and commercialization of these bio-agents.

Keeping in view the documented constraints as expressed by the farmers, it can be suggested that Government/ agricultural department has to strengthen some initiatives like providing incentives to farmers who are adopting biological methods for pest control, supplying quality based BCAs/materials on subsidy basis, regularly conducting method demonstrations, group discussions and training programmes to encourage and impart knowledge to farmers on pest ecology, significance of BCAs/materials, conservation of natural enemies fauna and also systematize hands on trainings programmes to improve the farmers skill in adopting the bio-control based techniques.

Similar studies by Bhalekar *et al.* (2013) also pronounced that it is necessary to assess the existing level of knowledge and extent of adoption of bio-control practices for pest management to identify the constraints faced by the farmers in adoption of bio-control practices and in their studies majority of respondents (69.33%) had medium constraints in adoption of biological pest management practices followed by low constraints category (18.00%). Lack of knowledge, lack of skill and non availability of inputs are considered as major constraints in adoption of IPM practices by IPM trained rice growers of

Table 1. Constraints expressed by farmers in implementing biological based pest management strategies

(n=300)

Constraints	Response of the farmers		Rank
	Frequency	Per cent	
1 Non availability of BCAs at market level	189	63	I
2 Adoption of the methods at improper time	177	59	II
3 Cost ineffective	141	47	VII
4 Non availability of quality control measures for BCAs	114	38	IX
5 Lack of knowledge on existing natural enemies in their own field fauna	153	51	V
6 No idea on available sources for purchase of BCAs	126	42	VIII
7 Lack of knowledge on pest ecology	165	55	III
8 Lack of awareness on significance of pheromone traps/tricho cards	147	49	VI
9 No immediate visible results on pest suppression	162	54	IV
10 Lack of sufficient timely guidance on BCA	102	34	X

Jammu division (Kumar, 2012).

The development and registration of biological agents as an alternative is a more recent movement to hike the success rate of biological pest management (Falahzadah, 2020). Bale *et al.*, 2008 also emphasized the importance of biological based pest management and stated that future success is strongly dependent on a greater level of investment in research and development by governments and related organizations that are committed to a reduced reliance on chemical control. Singh *et al.* (2009) also documented the constraints in implementing IPM technologies and stated that to promote greater IPM implementation, special emphasis is necessary to generate increased awareness and transfer technology to farmers through demonstrations and training both to extension personnel and farmers.

Conclusion

From the present study it was inferred that farmers are facing constraints in implementing biological pest management techniques especially non availability of quality bio-control agents/materials in time, lack of knowledge and skill in adopting these technologies. These constraints can be rectified by involvement of Government agencies /agriculture department or other related organizations through strategies *viz.*, providing incentives to farmers, quality check on BCAs/materials and conducting demonstration units/ hands on trainings for farmers at village level.

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