

International Journal of Advanced Biochemistry Research



ISSN Print: 2617-4693
ISSN Online: 2617-4707
NAAS Rating (2026): 5.29
IJABR 2026; SP-10(9): 1300-1303
www.biochemjournal.com
Received: 21-07-2026
Accepted: 25-08-2026

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Adoption of pest management practices in Brinjal cultivation (*Solanum melongena* L.): A case study from Chengalpattu district, Tamil Nadu

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DOI: <https://www.doi.org/10.33545/26174693.2026.v10.i9Sp.10001>

Abstract

Brinjal (*Solanum melongena* L.) is one of the major vegetable crops grown in Tamil Nadu covering an area of 1288 ha with production of 24699 MT and productivity of 19.18 MT/ha. Brinjal cultivation dominates in Chengalpattu district occupying 219 ha with production of 2628 MT and productivity of 12 MT/ha (2024-25). The majority of vegetable growers apt to cultivate Brinjal as it fetches high price in nearby Chennai markets. During field visits, it was observed that the farmers were facing the problem pest infestations mainly caused by Borers, Jassids, Mealy bugs and Mites resulting in heavy yield losses (20 -80%) along with excess use of chemicals pesticides. These have become regular pests of the crop in Brinjal growing tracts, resulting in the qualitative and quantitative crop losses during its growing season. The present study aims to study the adoption pattern of pest management practices among the farmers and to create awareness on judicious use of pesticides along with ecofriendly approaches. it was noticed that, 36.25% of the farmers, adopted mechanical approaches of clipping borer affected shoots and removing little leaf affected plants. The reason for the same might be due non involvement of cost. Most of the farmers applied pesticide as suggested by input dealers (76%). Effectiveness of pheromone traps for borer control was less (3%) due to non-availability of traps and lures in local markets and lack of awareness on its usage. The yield (235.54 q/ha) and marketability of the produce was satisfactory in case of the farmers following effective pest management practices.

Keywords: Brinjal, borers, mealy bugs, mites, whiteflies, Jassids, IPM

Introduction

Brinjal (*Solanum melongena* L.) is grown throughout the year in Chengalpattu district of Tamil Nadu. The district is located in North-eastern Tamil Nadu. The Northeast Monsoon is the principal rainy season and provides the majority of annual rainfall, especially during October and November. Vegetable cultivation dominates as the district is located to Chennai and marketing of the produce is easier for the farmers. Among the Vegetable crop, Brinjal cultivation is preferred as the crop is suitable for both rainfed and irrigated conditions. The farmers particularly go for brinjal cultivation as there is a regular consumer demand, multiple harvests from a single planting, availability of nearby urban markets such as Chennai and Good income generation potential. The crop is prone to pest infestations viz borers (Shoot and Fruit borer) and sucking pests (Whiteflies, Jassids, Mealy bugs and Mites). These pests cause severe yield losses ranging from 20% to 80% reducing marketability. To overcome the pest attacks, the farmers are applying excessive and indiscriminate pesticide applications that ultimately increases cultivation costs in addition resulting in health hazards and environmental pollution. The farmers continue to follow chemical-intensive practices even though recommended pest management technologies of agricultural universities and extension agencies are available. Therefore, a detailed study on the adoption behaviour of brinjal growers regarding pest management practices is necessary to assess the present scenario and identify gaps in technology dissemination.

Tamil Nadu Veterinary and Animal Sciences University Krishi Vigyan Kendra at Chengalpattu district caters the needs of the farmers by providing training and technical guidance in pest management practices. Interventions in pest management practices are eco-friendly and economically viable to the farmers. In this context, a study was undertaken to examine adoption level of the recommended pest management practices among the brinjal

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growing farmers and constraints encountered in implementation. The results of the study are expected to contribute suitable extension approaches for effective pest management practices for sustainable development.

Materials and methods

The study was conducted in villages where brinjal is widely cultivated. Farmers in Palur, Thimmavarum, Vadagal, Anumanthapuram, Kotamedu, Mailai, Ottivakkam and Nerumbur villages belonging to Chengalpattu, Kattankulatur, Thiruporu and Thirukalukundram blocks of Chengalpattu district were identified for assessing the impact study with the following objectives:

1. To assess the extent of adoption of pest management practices.
2. To analyse constraints faced by farmers in adopting pest management practices.
3. To suggest measures for improving adoption.

KVK interventions included trainings on symptom and identifications of pest attack, integrated approaches in pest management practices, need based applications of fertilizers along with eco-friendly approaches, field demonstrations and advisory services during 2022-23 to 2024-25. Data on pest management practices followed by the farmers were collected by personal interview method with structured schedules that included Knowledge about pest management practices, Adoption of recommended pest management practices. Pest infestations identified by the farmers and control measures followed were recorded in the farmer's field of each village. In each village, 10 sample fields were selected to measure the pest management practices followed by the farmers before and after KVK interventions. Major Pest incidence in crop was recorded during crop stages (Borers, Jassids, Whiteflies, Hadda beetle and Mealybugs) in randomly selected 100 plants. The recommended practices considered included:

- Selection of resistant/tolerant varieties
- Seed treatment
- Field sanitation
- Crop rotation
- Installation of light traps, pheromone traps and sticky traps
- Mechanical destruction of infected shoots and fruits
- Biological control measures
- Recommended dosage and timing of pesticides
- Safe handling and storage of pesticides
- Use of protective equipment during spraying

Knowledge level was measured by score 1 or 0 based on their knowledge on the practices followed in cultivation. Practices followed before and adopted technologies after intervention were given scores of 1 or 0. The observations were analyzed with suitable statistical tools. The adoption level of pest management practices was measured for the above recommended 10 practices using an adoption index for the study.

$$\text{Impact on Adoption (\% change)} = \frac{(\text{No. of adopters after demo.} - \text{No. of adopters before demo})}{\text{No. of adopters before the demonstration}} \times 100$$

Results and Discussions

Knowledge of recommended pest management practices

The result showed that the majority of the farmers were able to identify pest damage symptom and followed summer ploughing before KVK interventions (Table 1). Out of all

practices, 9 of them showed statistically significant improvement after the intervention. The knowledge level of the farmers on natural enemies (22.5%) followed by seed treatment techniques and need based pesticide applications after interventions (18.75%) exhibited significant difference. The mean knowledge score showed increase from 3.12 before intervention to 4.65 after intervention, indicating an overall improvement following the KVK interventions. Knowledge of natural enemies increased by 22.50 percentage points, while knowledge of need-based pesticide application increased by 25.00 percentage points. Knowledge of neem cake/biopesticides and seed treatment increased by 18.75 percentage points each. The study is on par with observations by Kavipriya and Senthil (2021) reported the adoption rate was high for quality portray seedlings / certified seeds, summer ploughing followed by reduction in water during diseases incidence (98.33%), choice of varieties/hybrids, judicious nitrogen and phosphorous fertilizers applications (93.33%) and removal of crop residues and alternate crop plants (83.33%). Similar reports are given by Gautam *et al* (2017) ^[2] where IPM practices trained farmers showed better skills in pest incidences and low pesticide applications.

Using the Mean $\pm$ SD method, the majority of farmers had medium knowledge both before (77.5%) and after (57.5%) the intervention. The proportion of farmers with high knowledge increased from 16.2% to 22.5%. Sasane *et al* (2010) ^[12] reported that majority of brinjal farmers had knowledge on intercultural operations, varieties, spacing and plant protection methods.

Adoption of recommended pest management practices

All 10 IPM practices showed statistically significant increase in adoption after the intervention (Table 2). The highest increases were recorded for safe handling and storage of pesticides, use of protective equipment, installation of light/pheromone/sticky traps, mechanical destruction of infected shoots and fruits, field sanitation and crop rotation. Adoption of field sanitation increased from 56.25 to 73.75%, while crop rotation increased from 35.00 to 52.50%. Adoption of biological control measures remained comparatively low, increasing from 13.75 to 22.50%. This may be associated with difficulty in obtaining biological control inputs locally. The finding is consistent with the constraint reported by the farmers in the present study and with earlier reports emphasizing input availability as an important determinant of IPM adoption.

Bansod *et al* (2016) ^[1] reported that more than half of the farmers (64.14%) were included under medium category of adoption level of integrated pest management practices in brinjal. Rajashekar *et al* (2025) ^[9] demonstrated that IPM practices effectively reduced borer incidence in brinjal and improved yields and provided for sustainable brinjal pest management. Hasan and Islam 2025 ^[4] stated that the major barriers to adoption included the unavailability of IPM inputs (89.0%), lack of training (86.0%), easy access to chemical pesticides (86.0%). Mannan *et al*, 2021 ^[6] observed that 73.98% farmers applied insecticide without any protection measures. Meena and Mathur, 2024 evaluated the effectiveness of Pheromone trap in reducing shoot damage and fruit infestation with 53.03 percent protection and 51.34 percent protection over control respectively. Niranjana *et al.*, (2015) ^[8] observed pheromones traps with lures and biological inputs as main barriers for implementing the IPM practices leading to less adoption

among the farmers. Thapa (2017) ^[13] noted farmers adoption of IPM practices among Farmer Field School participants were less stating that training alone is not efficient for sustained adoption.

Training and repeated field-level emphasis need are important for complete adoption by the farmers.

Economics of production

Table 3, shows net returns was higher with BCR as 3.01 in recommended practices compared to farmer's practice. Higher income represents the potential economic effect of adopted practices. The percent brinjal yield increase was observed under improved production technology from 24.59 to 40.26 in study periods as recorded by Singh and Bisen in 2020. Similar studies were conducted by Rakibuzzaman *et al* (2023) ^[10] stated that the highest benefit cost ratio was 1.60 recorded from the treatment, Pheromone trap + *Trichogramma evanescens*. Halder *et al* (2022) ^[3], observed that IPM farmers registered higher IBCR of 4.61:1 and

4.86:1 during 2019-20 and 2020-21.

Constraints in adoption of pest management practices

Usage of pheromone traps, biological control measures and some preventive practices remained comparatively low. The major constraint identified was difficulty in obtaining traps, lures and biological control agents from local markets. Strengthening the availability of IPM inputs, providing repeated hands-on training and maintaining regular field-level technical support would help improve sustained adoption. The comparatively low adoption of pheromone traps and biological control measures observed in the study indicates the need to strengthen the supply chain for IPM inputs. Hasan and Islam (2025) ^[4] reported unavailability of IPM inputs and inadequate training as major constraints, while Niranjana *et al.* (2015) ^[8] identified non-availability of pheromone traps, lures and bioagents among the major biological constraints. Extension activities need should be emphasized to improve the recommended practices among Brinjal farmers in effective pest management practices.

Table 1: Knowledge level on Integrated Pest Management practices N=80

S.No.	Particulars	Before KVK intervention	After KVK intervention	Difference%	p-value	Significance
1	Knowledge about pest damage	60 (75)	64 (80)	5	0.343	ns
2	Insect pest identification	45 (56.25)	52 (65)	8.75	0.023	*
3	Summer ploughing	54 (67.5)	60 (75)	7.5	0.114	ns
4	Use of resistant varieties	12 (15)	22 (27.5)	12.5	0.004	***
5	Soil application with neem cake / biopesticides	11 (13.75)	26 (32.5)	18.75	< 0.001	***
6	Seed treatment techniques	22 (27.5)	37 (46.25)	18.75	< 0.001	***
7	Recommended dose of fertilizer application	7 (8.75)	15 (18.75)	10	0.013	*
8	Need based application of pesticides	10 (12.5)	30 (37.5)	25	< 0.001	***
9	Knowledge on natural enemies	5 (6.25)	23 (28.75)	22.5	< 0.001	***
10	Trap crops	13 (16.25)	22 (27.5)	11.25	0.008	**
11	Pheromone traps and lures	11 (13.75)	21 (26.25)	12.5	0.004	**
	Mean	3.12	4.65			
	SD	1.72	2.28			

Figures in parenthesis represent per cent

ns- Not significant improvement

*- Significant improvement

** - Significant improvement

***- Highly significant improvement

Before Intervention

Mean = 4.65, SD = 2.28

Low knowledge: Score < 2.37

Medium knowledge: Score 2.37 to 6.93

High knowledge: Score > 6.93

After Intervention

Mean = 3.12, SD = 1.72

Low knowledge: Score < 1.40 (Mean - SD)

Medium knowledge: Score 1.40 to 4.85

High knowledge: Score > 4.85 (Mean + SD)

Table 2: Adoption level N=80

S. No.	Recommended Practices	Before KVK intervention	After KVK intervention	Percent Gain in adoption level
1	Selection of resistant/tolerant varieties	12 (15)	24 (30)	15 **
2	Seed treatment techniques	22 (27.5)	31 (38.75)	11.25 **
3	Field sanitation	45 (56.25)	59 (73.75)	17.5 ***
4	Crop rotation	28 (35)	42 (52.5)	17.5 ***
5	Installation of light traps, pheromone traps and sticky traps	13 (16.25)	26 (32.5)	16.25 ***
6	Mechanical destruction of infected shoots and fruits	16 (20)	29 (36.25)	16.25 ***
7	Biological control measures	11 (13.75)	18 (22.5)	8.75 **
8	Recommended dosage and timing of pesticides	22 (27.5)	33 (41.25)	13.75 **
9	Safe handling and storage of pesticides	21 (26.25)	37 (46.25)	20 ***
10	Use of protective equipment during spraying	7 (8.75)	22 (27.5)	18.75 ***
	Mean (%)	197 (24.62)	321 (40.12)	15.5
	Mean adoption score	2.46	4.01	1.55
	Standard Deviation (SD)	1.6	1.96	

** Significant increase, *** Highly significant increase

Table 3: Economics of Production

S.No.	Particulars	Cost of cultivation Rs. /ha	Yield q/ha	Net returns Rs. /ha	BCR
1	Recommended practices	117400	235.54	353680	3.01
2	Farmer's practice	125500	221.04	272372	2.17

Conclusion

The study highlights that the farmer-oriented extension interventions can contribute to effective pest management and potentially improve the productivity and profitability of brinjal cultivation. Continuous support from extension functionaries and timely supply/linkage of IPM inputs, is recommended for sustainable pest management in Chengalpattu district.

Acknowledgment

The author would like to thank the ATARI, Hyderabad and TANUVAS, Chennai for support provided.

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