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Adoption of IPM practices by brinjal growers

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Abstract

The present study was undertaken to assess the adoption of Integrated Pest Management (IPM) practices among brinjal growers in Nagpur district of Maharashtra. The findings revealed that the adoption of different IPM practices varied across cultural, mechanical, biorational and chemical methods. A majority of the respondents (61.67%) had a medium level of adoption of IPM practices, followed by 25.00 per cent with a high level and 13.33 per cent with a low level of adoption. Education, area under brinjal cultivation, experience in brinjal cultivation, social participation and risk orientation were found to have a positive and significant relationship with IPM adoption. Income from brinjal, sources of irrigation, sources of information, economic motivation and knowledge of IPM practices showed a positive and highly significant relationship with adoption. The major constraints faced by the growers were fluctuating market rates for brinjal (77.50%), high wages of labour (75.83%) and high cost of IPM inputs (71.67%). Non-availability of university-recommended seeds and biocontrol agents were also important constraints. The study highlights the need for strengthening technical guidance, extension education, training and awareness programmes to promote the adoption of recommended IPM practices among brinjal growers.

Keywords: Adoption, IPM practices, brinjal growers

Introduction

Vegetables are regarded as "protective supplement food" since they are rich in vitamins, minerals, and vital amino acids that are necessary for human metabolic systems to work normally. Vegetables are therefore a crucial part of a balanced diet and are needed to maintaining excellent health. In the subtropics and tropics, brinjal (*Solanum melongena* L.) is a widely cultivated vegetable crop. One of the main obstacles to raising the brinjal crop's potential output is insect pest infestation. The crop can be attacked by a variety of insect pests and diseases at different stages with variable degrees of damage, which results in significant losses by lowering the potential yield and output quality. Farmers with small land holdings and resources are compelled to practice monoculture and intensive farming because to the profitable returns from brinjal, which also makes it more difficult for different insect pests and pathogens to survive from season to season.

Tripathi *et al* (2024) ^[7] indicated that, one of the most popular vegetables grown in tropical and subtropical areas, including India, which is one of the world's biggest growers, is brinjal

(*Solanum melongena*), also referred to as aubergine. Brinjal is prized for its nutritional qualities and range of culinary uses. In addition to causing direct harm, biotic stress insect pests were the main cause of vegetable production problems in India. Additionally, they serve as vectors for a number of viral illnesses, and the typical yield loss from major insect pests ranges from 33 to 40%.

Methodology

The present study was conducted in Nagpur district of Maharashtra State. Nagpur district was purposively selected for the study due to its significant area under vegetable and brinjal cultivation. Out of the fourteen tahsils of Nagpur district, Saoner, Kalmeshwar, and Mauda tahsils were purposively selected based on the larger area under brinjal cultivation. From each selected tahsil, five villages having a maximum number of brinjal growers were selected purposively. The number of respondents from each village was determined according to the availability of brinjal growers by using proportionate random sampling. Thus, a total sample of 120 brinjal growers was selected for the

present investigation. The collected data were further classified, tabulated, analyzed, and interpreted using appropriate statistical tools.

Adoption of integrated pest management practices by the brinjal growers

One of the objectives of this study was to study the adoption

of integrated pest management practices by brinjal growers. Adoption shows the present state of actual use of integrated pest management practices of brinjal crop by the farmers. Adoption of various integrated pest management practices related to brinjal growing by the respondents were further ascertained and practice wise information have been reported in Table 1.

Table 1: Distribution of respondents according to adoption about Integrated Pest Management practices by brinjal growers

Sl.	Integrated Pest Management Practices	Adoption (n=120)		
		Complete adoption	Partial adoption	No adoption
1	Cultural practices	Freq. (%)	Freq. (%)	Freq. (%)
a	Plant spacing (75cm X 60cm /75cm X 75cm/ 90cm X75cm)	103 (85.83)	17 (14.17)	00 (00.00)
b	Use of recommended varieties (Aruna, AKLB- 9)	04 (03.33)	28 (23.33)	88 (73.33)
c	Seed treatment (Use of <i>Trichoderma viridi</i> @4gm /kg or Carbendazium@2gm/kg of seed in case of nursery sowing)	30 (25.00)	28 (23.33)	62 (51.67)
d	Removal of crop residue from the field	43 (35.83)	60 (50.00)	17 (14.17)
e	Fertilizer dose (100:50:50 split application in half of the nitrogen after 30 days of transplanting)	50 (41.67)	36 (30.00)	34 (28.33)
f	Use of green manure (sunhemp, dhaincha)	08 (06.67)	28 (23.33)	84 (70.00)
g	Crop rotation	95 (79.17)	25 (20.83)	00 (00.00)
2	Mechanical method			
a	Use yellow sticky traps to monitor and trap sucking pests like aphids, jassids and whiteflies	65 (54.17)	39 (32.50)	16 (13.33)
b	Use of 5 pheromone traps per ha. for monitoring and 20 pheromone traps per ha. for mass trapping with leucilure for fruit and shoot borer	74 (61.67)	30 (25.00)	16 (13.33)
c	Clipping of infested plant parts for shoot and fruit borer	37 (30.83)	64 (53.34)	19 (15.83)
d	Rogue out the little leaf affected plants from time to time	45 (37.50)	63 (52.50)	12 (10.00)
e	Mulching with polythene	77 (64.17)	12 (10.00)	31 (25.83)
3	Biorational method			
a	Use of plant products:			
	Neem oil (@2% at the early infestation stage of sucking pest or shoot and fruit borer)	24 (20.00)	46 (38.33)	50 (41.67)
	Neem Seed Extract (@ 5% for both Sucking pest and Shoot and Fruit Borer)	27 (22.50)	43 (35.83)	50 (41.67)
b	Use of biocontrol agent (Release parasitoids like <i>Trichogramma chilonis</i> 1.5 lakh egg per ha or Release of <i>chrysoperla carnea</i> @10000 eggs per ha for sucking pest management)	01 (00.83)	28 (23.33)	91 (75.83)
c	Using biopesticides such as Bacillus thuringiensis	02 (01.67)	50 (41.67)	68 (56.67)
4	Chemical method			
a	Soil application of granular insecticides in nursery beds during sowing of seeds	20 (16.67)	78 (65.00)	22 (18.33)
b	Seed treatment (Use of Carbendazium @3 gm/kg of seed at the time of nursery sowing or Thiamethoxam 30%WS 10 ml per kg of seeds)	47 (39.17)	13 (10.83)	60 (50.00)
c	Treatment of seedlings with insecticide before planting (Use of Chlorpyrifos 20%EC solution @ 10 ml per 10L water for dipping of root portion of seedling before planting in case, if Carbofuran 10 G is not applied in nursery beds.)	93 (77.50)	14 (11.67)	13 (10.83)
d	Spraying of insecticides			
	Management of sucking pests (Application Label claim insecticides after transplanting, Cypermethrin 25%EC 5ml in 1lit. of water)	84 (70.00)	22 (18.33)	14 (11.67)
	Management of shoot and fruit borer (Application of Azadirachtin 0.03% wsp 300 ppm, or Flubendiamide 20 WDG 7.5 gm/10 lit.)	96 (80.00)	16 (13.33)	08 (06.67)
	3. Economic Threshold Level for Shoot and Fruit borer (5 per cent shoot infestation or fruit damage per meter row length OR 10 moth catches per pheromone trap per day consecutively for three days)	15 (12.50)	57 (47.50)	48 (40.00)

The finding presented in Table 1, observed that, with respect to culture practices, highest proportion of respondents (85.83%) had complete adoption of plant spacing, near about three fourth respondents (73.33%) had no adoption and 23.33 per cent had partial adoption of recommended varieties, more than fifty percent respondents (51.67%) had no adoption, while 25.00 per cent and 23.33 per cent of respondents had complete and partial adoption of seed treatment respectively. Regarding removal of crop residue from the field 50.00 per cent of the respondents had partial adoption followed by 35.83 per cent had complete adoption. As far use of fertilizer does 41.67 per cent, 30.00 per cent and 28.33 per cent of respondents had complete, partial and no adoption respectively. It was noticed that, majority of respondents (70.00%) had no adoption of green manure (sunhemp, dhaincha) and 23.33 per cent of respondents had partial adoption. Regarding crop rotation majority of respondents (79.17%) had complete adoption and 20.83 per cent had partial adoption of crop rotation.

In respect of mechanical practices, more than half of respondents (54.17%) had complete adoption, and 32.50 per cent had partial adoption of used of yellow sticky trap to monitor and trap sucking pests like aphids, jassids and whiteflies. While 61.67 per cent and 25.00 per cent of respondents had complete and partial adoption respectively regarding use of 5 pheromone traps per ha. for monitoring and 20 pheromone traps per ha. for mass trapping with leucilure for fruit and shoot borer. Whereas more than half of respondents (53.34%) had partial adoption and 30.83 per cent had complete adoption of clipping of infested plant parts for shoot and fruit borer. It is also found that, 52.50 per cent and 37.50 per cent of respondents had partial and complete adoption respectively regarding rogue out the little leaf affected plants from time to time. Regarding mulching with polythene majority of the respondents (64.17%) had complete adoption and 25.83 per cent and 10.00 per cent of respondents had no adoption and partial adoption respectively.

It was observed that, in biorational method regarding use of plant product higher proportion of the respondents (41.67%) had no adoption, whereas 38.33 per cent and 20.00 per cent of the respondents had partial adoption and complete adoption of Neem oil @ 2% at the early infestation stage of sucking pest, shoot and fruit borer respectively. About neem seed extract @ 5% for both sucking pest and shoot and fruit borer is less than half of the respondents (41.67%) had no adoption and 35.83 per cent and 22.50 per cent of respondents had partial and complete adoption respectively. Regarding release parasitoids like *Trichogramma chilonis* 1.5 lakh egg per ha or release of *chrysoperla carnea* @10000 eggs per ha for sucking pest management majority of the respondents (75.83%) had no adoption and 23.33 per cent of the respondents had partial adoption. More than half of the respondents (56.67%) had no adoption, and 41.67 per cent of respondents had partial adoption regarding use of biopesticides such as *Bacillus thuringiensis*.

It was found that majority of respondents (65.00%) had partial adoption, and 18.33 per cent and 16.67 per cent of the respondents had no adoption, and complete adoption of Soil application of granular insecticides in nursery beds during

sowing of seeds respectively. While 50.00 per cent of the respondents had no adoption, and 39.17 per cent, and 10.83 per cent of respondents had complete and partial adoption of seed treatment Use of Carbendazium @3 gm/kg of seed at the time of nursery sowing or Thiamethoxam 30%WS 10 ml per kg of seeds respectively. In respect of treatment of seedlings with insecticide before planting highlighted that, more than three fourth of respondents (77.50%) had complete adoption, while 11.67 per cent and 10.83 per cent of the respondents were partial and no adoption in used of Chlorpyrifos 20%EC solution @ 10 ml per 10L water for dipping of root portion of seedling before planting in case, if Carbofuran 10 G is not applied in nursery beds respectively. It was observed that 70.00 per cent of respondents had complete adoption in spraying of insecticide (management of sucking pest) and 18.33 per cent of respondents had partial adoption, and 11.67 per cent had no adoption of Application label claim insecticides after transplanting, Cypermethrin 25%EC 5ml in 1lit. of water. Whereas majority of respondents (80.00%) had complete adoption of management of shoot and fruit borer, and 13.33 per cent of respondents had partial adoption application of Azadirachtin 0.03% wsp 300 ppm, or Flubendiamide 20 WDG 7.5 gm/10 lit. Regarding economic threshold level for shoot and fruit borer less than half of respondents (47.50%) were partial adoption, and 40.00 per cent had no adoption, and very less amount of respondents (12.50%) had complete adoption of 5% shoot infestation or fruit damage per meter row length OR 10 moth catches per pheromone trap per day consecutively for three days.

Table 2: Distribution of respondents according to their adoption level

Sl.	Adoption level	Respondents (n = 120)	
		Frequency	Percentage
1	Low	16	13.33
2	Medium	74	61.67
3	High	30	25.00
	Total	120	100
Mean = 56.67			

The findings presented in Table 2 shows that majority of respondents (61.67%) were found under medium category of adoption of integrated pest management practices, while 25.00 per cent of high level of adoption of IPM practices and 13.33 per cent of the respondents were found to low level of adoption of integrated pest management practices.

This finding is in conformity with the findings of Bansod *et al.* (2016) ^[1], Salunkhe and Chauhan (2017) ^[4] and Kamal *et al.* (2018) ^[2].

Relationship of personal, socio-economic, communicational and psychological characteristics of brinjal growers with their adoption of integrated pest management practices

The relationship of personal, socio-economic, communicational and psychological characteristics of brinjal growers with their adoption of integrated pest management practices has been presented in Table 3.

Table 3: Correlation between selected variables and adoption of integrated pest management practices (n = 120)

Sl.	Variables	Correlation coefficient (r)
1	Age	-0.0681 ^{NS}
2	Education	0.2033*
3	Land holding	0.0176 ^{NS}
4	Area under brinjal cultivation	0.1909*
5	Experience in brinjal cultivation	0.1870*
6	Income from brinjal	0.2358**
7	Annual income	0.0338 ^{NS}
8	Social participation	0.2113*
9	Sources of irrigation	0.2697**
10	Sources of information	0.2727**
11	Risk orientation	0.2128*
12	Economic motivation	0.2424**
13	Knowledge of IPM practices	0.4649**

** Significant at 1% level, * Significant at 5% level, NS – Non significant

It could be seen from Table 3, that the characteristics of respondents such as education, area under brinjal cultivation,

experience in brinjal cultivation, social participation, risk orientation, were positively significant at 5 per cent level of probability related to the adoption of integrated pest management practices in brinjal.

Income from brinjal, sources of irrigation, sources of information, economic motivation, knowledge of integrated pest management practices were positively and highly significant correlated at 1 per cent level of probability with the adoption of integrated pest management practices in brinjal.

The correlation analysis revealed that age is negatively non-significant and land holding, annual income was non-significant with the adoption of integrated pest management practices in brinjal crop.

This finding is similar to the findings of Bansod *et al.* (2016) [1], Singh *et al.* (2025) [6] and Kamal *et al.* (2018) [2].

Constraints faced by brinjal growers in adoption of integrated pest management practices

Table 4: Constraints faced by the brinjal growers

SI.	Constraints	Respondents (n = 120)		
		Frequency	Percentage	Rank
1	Non-availability of biocontrol agent parasitoids	80	66.67	V
2	High cost of IPM inputs	86	71.67	III
3	Weather conditions	58	48.33	VIII
4	High wages of labour	91	75.83	II
5	Fluctuating market rates for brinjal	93	77.50	I
6	Proper technical guidance	66	55.00	VII
7	Non-availability of university recommended seeds	83	69.17	IV
8	High incidence of insect pests and diseases on brinjal	71	59.17	VI

The data presented in Table 4 reveal the various constraints faced by brinjal growers in the adoption of integrated pest management practices. The most critical constraint reported was fluctuating market rates for brinjal (77.50%), ranked first, indicating that farmers suffer significant economic uncertainty due to a lack of fixed pricing or government support.

High wages of labour (75.83%) and High cost of IPM inputs (71.67%) ranked second and third, respectively. Farm labour has become increasingly expensive due to rising rural living costs, a shrinking labour pool, and the physical intensity of practices like manual weeding or localized pest monitoring. Integrated Pest Management (IPM) requires specialized, eco-friendly products like bio-pesticides, pheromone traps, and sticky boards, which are often more expensive or harder to source locally than traditional chemicals, these are the major constraints.

The fourth and fifth ranked constraints were non-availability of university recommended seeds (69.17%) and non-availability of biocontrol agent parasitoids (66.67%), local markets lack commercial availability and formal distribution channels for specialized parasitoids, and farmers may not have easy access to quality and recommended seeds in nearby markets. As a result, they may depend on locally available seeds or other varieties.

The high incidence of insect pests and diseases was ranked sixth (59.17%) brinjal is highly susceptible to several insect pests and diseases, particularly shoot and fruit borer. Severe infestation makes pest management difficult and increases

the cost and frequency of control measures. Lack of proper technical guidance was ranked seventh (55.00%); some farmers may not receive timely and adequate information regarding recommended IPM practices. Insufficient contact with extension personnel and limited training opportunities may affect adoption. Weather conditions were perceived as a constraint (48.33%) received the lowest rank, i.e., eighth due to fluctuation in weather temperature, climate, and rainfall affect brinjal cultivation.

Thus, the results show that economic instability, weather conditions, High cost of IPM inputs, High wages of labour, non-availability of biocontrol agent parasitoids, High incidence of insect pests and diseases on brinjal, Proper technical guidance, Non-availability of university recommended seeds remain the key constraints limiting brinjal productivity.

This finding is correlated with the findings of Kavipriya and Kumar (2021) [3].

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