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Shabbir Patel
Consultant, Centre of Excellence in Agriculture Extension Policy, PPP, National Institute of Agricultural Extension Management (MANAGE), Hyderabad, Telangana, India

Mahantesh Shirur
Deputy Director, Centre of Excellence in Agriculture Extension Policy, PPP, National Institute of Agricultural Extension Management (MANAGE), Hyderabad, Telangana, India

Corresponding Author
Shabbir Patel
Consultant, Centre of Excellence in Agriculture Extension Policy, PPP, National Institute of Agricultural Extension Management (MANAGE), Hyderabad, Telangana, India

Study on impact of training programme on integrated pest management

Shabbir Patel and Mahantesh Shirur

Abstract
Integrated pest management (IPM) is an effective and cost efficient alternative to the use of chemical based pest management. Hence, imparting knowledge on modern technologies to the farmers has become one of the most important mandate of the extension system of India. The present study was conducted on evaluating the effectiveness of trainings on Integrated Pest Management (IPM). Two variables namely, respondent's socio economic status and their knowledge levels about the IPM practices learned in training programme were measured by a structured interview schedule to study outcome of the training. The impact was evaluated by knowing the adoption status of IPM practices by the trainees, the problems faced by them in adoption of these practice. Adoption status of IPM practices was studied to know the impact of training programmes. It is indicated that 80 per cent of the trainees had adopted IPM. Whereas, 12 percent did not adopt and 8 per cent discontinued. The major problems faced by the respondents for non-adaptability of IPM practices revealed in the study are available of pheromone traps & EPF, labour workload in sowing on intercrops etc, identification of specific pest in field and fear in increase of pest population if not sprayed. The study supports IPM as a method to reduce pesticide use and potential exposure and to improve pesticide-related among trainees.

Keywords: Adoption, knowledge, training, impact, IPM, pre-evaluation & post evaluation

Introduction
Inspired by the Green Revolution, the Indian government has endeavoured since the mid-1960s to increase food crop production by promoting an intensive agricultural technology. This intensified program is characterized by the use of high-yielding varieties, as well as a greater use of chemical inputs, including insecticides. Insect pests, diseases and weeds inflict enormous losses to the potential agricultural production. Anecdotal evidences also indicate rise in the losses, despite increasing use of chemical pesticides. At the same time, there is a rising public concern about the potential adverse effects of chemical pesticides on the human health, environment and biodiversity. These negative externalities, though, cannot be eliminated altogether, their intensity can be minimized through development, dissemination and promotion of alternative technologies such as biopesticides and bioagents as well as good agronomic practices rather relying solely on chemical pesticides (Atwal, 1986) [1]. India has a vast flora and fauna that have the potential for developing into commercial technologies.
The heavy use of insecticides has given rise to negative externalities, particularly for the environment (Pretty and Hine, 2005) [10] and human health (Kishi, 2005) [4]. Kishi *et al.* (1995) [5], Murphy *et al.* (1999) [7] and Pawukir and Mariyono (2002) [8] empirically showed that farmers had manifested the signs and symptoms of insecticide intoxication after spraying. These negative externalities constituted the important reason why the Indonesian government waived its subsidy for insecticides and at the same time introduced the integrated pest management (IPM) technology. One of the expected outcomes of this policy was the reduction in pesticide use. The declining trend in pesticide use in agriculture during the 1990s can be attributed to central government's fiscal policy and technological developments in pest management. During 1990s, taxes were raised on pesticides and phasing out of subsidies was initiated. Programmes on training of both the extension workers and farmers in the Integrated Pest Management (IPM) were started throughout the country (Dhaliwal and Arora, 1996) [3].
Imparting knowledge on modern technology to the farmers has become one of the most important mandate of the extension system of India. Therefore, national institutes which are well established and approachable extension units of extension system of India, available in almost all the districts of India are directed to organize training programmes to impart knowledge on the present agriculture aspects.

The present study was aimed out by giving training to 50 trainees on the IPM concepts of the important tools and concepts of IPM for important crops and pests. Evaluation of these training programmes is needed for the knowing its utility and effectiveness offered to the community (Astoth, 1991; Birthal, 2003) [2] and also for further improvement of the training programme. Evaluation also helps to answer the questions on accountability, effectiveness, relevance and strategies about the training programmes (Suvedi, 2011) [13]. Technology transfer methods such as short term training, small group discussions and IPM field days will impart the knowledge to adapt and disseminate the technology. The objective of the present study is to increase the knowledge on the IPM practices while improving production efficiency of the growers. Farm level adaption of these practices will have a wide range of impact on knowledge levels which need to be evaluated. Rigours impact studies on the IPM programmes are limited. Present study mainly concentrated on integrated pest management and its knowledge on the trainees.

Materials and Methods

This study was conducted at MANAGE, Hyderabad of Telangana. A sample of 25 active trainees participated in training of IPM were selected. Two variables namely, respondents socio economic status and their knowledge levels about the IPM practices learned in training programme were measured by a structured interview schedule to study outcome of the training. The impact was evaluated by knowing the adoption status of IPM practices by the trainees, the problems faced by them in adoption of these practice.

For evaluating socio economic profile of trainees, 7 criteria *viz.*, age, gender, marital status, education, family background, annual income and mass media participation were considered. To evaluate knowledge test, pre and post training knowledge scores of the respondents with respect to knowledge on IPM practices were evaluated. To evaluate adoption status, relative position of a respondent regarding adoption, non-adoption and discontinuation with IPM practices was taken. The data regarding adoption status and problems faced in adoption was taken through telephone and personal contact.

Evaluation was done based on the tool developed by Kay Rockwell (1999) and followed by Nagaraj *et al.* (2017) [6] and Dharminder singh and Singh (2016). Socio economic profile of the respondents was evaluated using simple statistical tool *viz.*, frequency and percentage. Knowledge test of participants regarding different sub components of IPM practices was evaluated by conducting pre and posttest. Pretest was conducted to know how much the trainees have knowledge on various aspects of IPM practices. Similarly, after completion of training post evaluation was performed in order to assess the knowledge gained by the trainees. Pre and post evaluation test was conducted for the participants using structured questionnaire. One and zero score was assigned for the correct and incorrect responses respectively and the maximum attainable score is 20 and converted in percentage. Overall knowledge gain of the respondents and its significance was calculated by using paired t-test. Adoption status, problems faced in adoption of IPM practices was evaluated using simple statistical tool *viz.*, frequency and percentage.

Results and Discussion

Out of 30 participants, a sample of 25 trainees actively participated in the training were selected. The distribution of respondents based on socio economic profile is given in Table 1. (N= 25). From table 1, it is inferred that a typical trainee was medium aged (31.-50 years) married males. Majority of the education of the respondents were above matriculation (52.8%) from urban background and majority were from non-agriculture with high mass media participation (75.9%). Further, majority of the trainees participated in the study were from urban areas (73.1%) and rest were from the rural (26.9%) background family.

Knowledge gain by trainees

Pre and post evaluation test was conducted for the participants by using 25 structured questions (0.8 marks/question). One and zero score was assigned for the correct and incorrect responses respectively and the maximum attainable score is 20. The gain in knowledge was reflected in terms of difference between number of trainees giving correct responses before and after the training programme. Paired t-test was applied to measure the impact of training with respect to their overall knowledge level of the trainees. The data in table 2 pertains to pre and post training mean knowledge scores of the respondents with respect to various IPM practices. The pre training mean knowledge score of various practices ranged from 0 to 5 out of 20 and that of post training mean knowledge score of various practices ranged from 13 to 19 out of 20. It can be seen that more number of trainees were able to give correct response regarding various IPM practices after attending the training programme.

Overall knowledge gain by trainees

From table 2, the arithmetic mean of pre-training test was 1.52 and increased to 16.32 after training. The t values of difference between pre and post training mean knowledge score of all the practices of IPM were significant (p<0.01). Post evaluation scores of gain in overall knowledge about various practices indicate 55-90% improvement in their knowledge. The results showed that, prior to the training, the trainees were less aware with respect to their knowledge and understanding about the IPM aspects. But after the training, there is significant increase in the knowledge level of trainees. All the trainees had positive change in the level of knowledge after the training.

Adoption status

Adoption status of IPM was studied to know the impact of training programmes and was measured in terms of continued adopters, discontinued and non-adopters. From the table 3, it is indicated that 75 percent of the trainees had adopted IPM where as 10 percent did not adopt. From Tale 4, it is clearly observed that various problems faced by farmers were timely available of natural enemies, available of pheromone traps & EPF, labour workload in sowing on intercrops etc, identification of specific pest in field and fear in increase of pest population if not sprayed. The present results confirm the findings of reviews by Vanden Berg and Jiggins (2007) [14] and Pretty and Bharucha (2015) [10], which showed that IPM are effective at reducing agricultural pesticide use, though not always at increasing crop yields and profits. The structure of agrochemical market also suggests a similar level of adoption; biopesticides share only 2 percent of the agrochemical market in India (Saxena, 2001; Birthal, 2003) [12, 2]. There could be a number of technological, social, economic, institutional and policy factors restricting large scale adoption of IPM. Generally, the farmers adopt those components that show immediate effect, and are easily available. Biopesticides comprise a major component of IPM. Most of the biopesticides are host-specific, slow in action and have short shelf-life. Besides, application of some of the components is labour intensive compared to conventional chemical control (Birthal *et al.*, 2003) [2]. In other words, farmers are risk averse and such technological characteristics create an apprehension among the farming about their efficacy to control pests.

Table 1: Socio economic profile of the respondents participated in the training (N=25)

		Frequency	Percentage
1	**Age**		
	Young (< 30 years)	2	6.6
	Medium (31-50 years)	21	69.3
	Old (> 50 years)	7	23.1
2	**Gender**		
	Male	11	36.3
	Female	19	62.7
3	**Marital Status**		
	Married	29	95.7
	Unmarried	1	3.3
4	**Education**		
	Illiterate and Primary	5	16.5
	Upto Matriculation	9	29.7
	Above matriculation	16	52.8
5	**Family Background**		
	Rural	8	26.9
	Urban	22	73.1
6	**Family occupation**		
	Agriculture	2	6.6
	Other	28	92.4
7	**Mass media participation**		
	Low	2	6.6
	Medium	5	16.5
	High	23	75.9

Table 2: Gain in knowledge after acquiring training with respect to different aspects

Sl. No.	Particulars	Pre evaluation score out of 20	Post evaluation score out of 20	Improvement in Knowledge Score out of 20
1	Exploitation of natural enemies to manage crop pest	3 (15)	17 (85)	14 (70)
2	Mycorrhiza	2(10)	18 (90)	16 (80)
3	The vermin based liquid growth promoter	1 (5)	17 (85)	16 (80)
4	Ecological engineering concept in plant health Management is to control	1 (5)	19 (95)	18 (90)
5	Earthy smell of soil is due to	0 (0)	15 (75)	15 (75)
6	The trap used for monitoring the specific crop pest in the field is	0 (0)	18 (90)	18 (90)
7	The fungal bio-pesticide used in insect-pest management	0 (0)	14 (70)	14 (70)
8	Codex is an ………………………………organization	0 (0)	17 (85)	17 (85)
9	Bio security encompasses risks posed to -	1 (5)	16 (80)	15 (75)
10	The repellent crp for nematode management	0 (0)	18 (90)	18 (90)
11	AESA stands for________________	0 (0)	15 (75)	15 (75)
12	Food safety parameters used in pesticide residue analysis are	1 (5)	18 (90)	17 (85)
13	Substandard Pesticide means a pesticide whose ……… do not meet the minimum quality standard	2 (10)	13 (65)	11 (55)
14	An example for entomopathogenic nematode	0 (0)	14 (70)	14 (70)
15	The laboratory host used for mass production of bio-control agents	0 (0)	15 (75)	15 (75)
16	FAW invasive pest from	2 (10)	18 (90)	16 (80)
17	Which one of the following is true army worm?	3 (15)	16 (80)	13 (65)
18	Which one of the following is pink stem borer?	2 (10)	17 (85)	15 (75)
19	Which one of the following insecticides has ovicidal action?	1 (5)	19 (95)	18 (90)
20	Identification of FAW larvae	4 (20)	15 (75)	11 (55)
21	Fall armyworm belongs to the order	0 (0)	13 (65)	13 (65)
22	Number of pheromone traps used for monitoring FAW in one acre	4 (20)	17 (85)	12 (60)
23	Which one of the followings crops is most preferred by FAW	4 (20)	18 (90)	14 (70)
24	How many larval in stars are there FAW life cycle?	3 (15)	16 (80)	13 (65)
25	FAW larvae generally pupates in	3 (15)	15 (75)	12 (60)
Mean		1.52	16.32	
N		25	25	
Standard Deviation		1.53	1.77	
t value		31.59		

Table 3: Adoption of IPM strategies by the trainees

Category	Frequency (n)	Percentage (%)
Continued adopters	20	80
Discontinued	3	12
Non adopters	2	8

Table 4: Problem faced in adoption of IPM strategies

Problem	Continued adopters (%) (n1=20)	Discontinued (n2=3)	Non adopters (n3=2)
Timely Available of natural enemies	7 (35.00)	0	1 (50)
Available of pheremone traps & EPF	3 (15.00)	0	0
Labour workload in sowing on intercrops etc	4 (20.00)	0	0
Identification of specific pest in field	4 (20.00)	1 (33.33)	0
Fear in increase of pest population if not sprayed	2 (10.00)	2 (66.67)	1 (50)

Conclusion

Unlike many other technologies that require only limited information and delivery for adoption, IPM is akin to a new technology and knowledge intensive. Its effective implementation requires extension workers to have a sound understanding of the characteristics of the technology, its target host and relationship with natural enemies, and its method of application before the technology is delivered to the farmers. Lack of understanding of any of these would adversely affect its adoption. It was concluded that to increase adoption of IPM strategies, it is necessary to increase farmer awareness and knowledge concerning environmental pollution that could be mitigated with the successful implementation of these techniques. It is important to improve farmer's pest management practices through examining current strategies and building upon pre-existing knowledge**.** The extension workers should act more as a collaborator, consultant, and facilitator in dissemination of the knowledge, with the farmer playing a more active role.

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