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The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2022; SP-11(6): 2622-2625

www.thepharmajournal.com
Received: 16-03-2022
Accepted: 19-04-2022

Sanjay Kumar
Pandit Deen Dayal Upadhyay College of Horticulture and Forestry, Dr. Rajendra Prasad Central Agricultural University, Pusa, Bihar, India

Ram Prawesh Prasad
Pandit Deen Dayal Upadhyay College of Horticulture and Forestry, Dr. Rajendra Prasad Central Agricultural University, Pusa, Bihar, India

Thakur Pd. Mahto
Pandit Deen Dayal Upadhyay College of Horticulture and Forestry, Dr. Rajendra Prasad Central Agricultural University, Pusa, Bihar, India

Corresponding Author
Ram Prawesh Prasad
Pandit Deen Dayal Upadhyay College of Horticulture and Forestry, Dr. Rajendra Prasad Central Agricultural University, Pusa, Bihar, India

Assessment of knowledge level and adoption of IPM technology in rice cultivation

Sanjay Kumar, Ram Prawesh Prasad and Thakur Pd. Mahto

Abstract
IPM has been introduced as a sustainable approach for preventing, monitoring and controlling pests (Olkowski, 1991; Drlik *et al*., 2001). It tries to integrate natural, chemical and biological techniques to combat pests (Röling and Pretty, 1997).This approach through a package of tactics minimizes economic and environmental costs and improves safety and effectiveness (Olkowski, 1991; Speight and Evans, 2004) The percent study was carried ant during the year 2017-18 in Gopalganj district of Bihar to know the assessment of knowledge level and adoption of IPM technology in rice cultivation. It was observed that 43.1. Percent rice growers were having medium knowledge level about the application of *Trichoderma harzianum* for soil treatment and 49.4 percent was having low knowledge level as seed treatment. Similarly low level knowledge level about the application of *Beauveria bassiana* and neem cake as soil treatment. There were no adoptions with respect to *B. bassiana* and neem cake as soil treatment. Also no adoption of *B. thuringiensis* and light traps in insect control of rice cultivation.

Keywords: IPM, knowledge, adoption, *Oryza sativa*

Introduction
Integrated Pest Management (IPM) is an effective and environment-friendly pest management system. It is an ecological approach to pest management in which all available effective techniques are deployed in a unified programme so that the pest populations can be managed to avoid economic damage and minimize adverse side effects. Indiscriminate and excessive applications of synthetic pesticides have not only damaged environment and agriculture but have also caused their entry into the food chain. Evidences of pesticide threats to human health and economic effects have been documented in several studies (Rola and Pingali, 1993; Antle and Pingali, 1994) [1]. Integrated pest management, which is essentially a knowledge based technology, involves integration of different methods of disease and pest management. It is estimated that 50 percent of crop production in developing countries is lost to insects. In addition to direct damage and consumption of plants, they act as vectors of many viral diseases and microbial infections (Christou and Capell, 2009) [3]. Approximately 3 billion kg of pesticides is estimated to be applied each year worldwide which costs nearly $40 billion a year (Pan-UK, 2003, as cited in Pimental, 2005) [9, 10]. A societal demand exists for reduced pesticide usage (Pimental and Paoletti, 2009) [11]. The negative effects on human health, agro-ecosystems (e.g., killing beneficial insects), and the wider environment (e.g., non-target species, landscapes and communities) are some other examples of unsustainable consequences of insecticide use. Some point out that pesticide cannot easily be discarded (Devine and Furlong, 2007) [4]. IPM has been introduced as a sustainable approach for preventing, monitoring and controlling pests (Olkowski, 1991; Drlik *et al*., 2001) [7]. It tries to integrate natural, chemical and biological techniques to combat pests (Röling and Pretty, 1997) [12]. This approach through a package of tactics minimizes economic and environmental costs and improves safety and effectiveness (Olkowski, 1991; Speight and Evans, 2004) [7, 13]. They have suggested increasing this knowledge. Some have argued that plant pathology clinics established during the last five year have been effective in improving agricultural products and suggest them as an appropriate approach for technical knowledge diffusion and extension regarding pest control in farms (Asgarinya, 2010) [2]. The rice production in the country needs to be increased in order to meet the ever increasing demand. It is estimated that India will require 100 million tons in 2017 and 140 million tons of rice in 2025. The required level of production can be obtaining through crop protection management practices, efficient input supply system and quality genetic material. In this context, IPM strategies, which generally reply primary on biological defenses against pests, are the best alternative option to sustain

plant protection in crops. Therefore, it is essential to judge the depth of knowledge and adoption of the concurred farmers as pest management of rice crop.

Materials and Methods

The study was conducted in Gopalganj district of Bihar during the year 2017-18. The district comprises of 19 blocks. One block was selected based on cropped area and crop productivity. Eight villages from kuchaikote block were purposively selected and ten rice growers randomly selected from each village. Thus, the total sample size was of 80 respondents. The primary data collected through personal intervene with the help of pre structured schedule. The data were analyzed to find out the percentage. The knowledge of rice growers was measured by asking 15 questions during the survey. A score of one for each cannot assure was assigned to categorize respondents into low (Correct answered up to 5 out of 15 questions), medium (Correct answered between 6 and 10 out of 15 question) and high (Correct answered 11 or more of 15 questions) knowledge groups. The adoption of IPM practices was estimated in term of acceptance of technology by rice growers. The extent of adoption was categorized into three level viz; fully, partially and nil. IPM modules for rice crop were developed by the university scientists based on their resources. The modules are given below:

- Deep summer ploughing to destroy immature stages of insects and pathogens.
- Seed treatment with *Trichoderma harzianum* @ 4 g/kg seed for control of soil and seed borne diseases.
- Monitoring/Mass trapping of yellow stum borer through pheromone traps.
- Conservation of natural enemies.
- Release of parasitoid *Trichogramma Japonicum*/ *Trichogramma chilonis* @ 50,000 eggs/pupae/ha 4-6 times weekly interval of 30 days after transplanting
- Spraying of garlic paste/NSKE 5% against gundhi bug at milking stage.
- Need based application of selective and efficient insecticides.
- 2.5 kg *Trichoderma harzianum* + 50 kg decomposed F.Y.M./ha was used as soil application.

Results and Discussion

The data of parameters 1st in table 1, revealed that the majority of 43.1 per cent rice growers were having medium knowledge level about the application of *Trichoderma harzianum* for soil treatment, whereas 42.0 percent rice growers were having low knowledge level about the application of *T. harzianum* for soil treatment and the remaining 20.8 percent rice growers had high knowledge level about the application of *T. harzianum*.

Parameters 2nd, indicated that the majority of 85.7 percent rice growers were having low knowledge level while 17.0 percent rice growers were medium knowledge level and the remaining 3.2 percent rice growers had high knowledge level about the application of *B. bassiana*.

Parameter 3rd observed that 59.4 percent rice growers where having low knowledge level about the application of neem cake for soil treatment in rice cultivation, followed by 37.0 percent where having medium knowledge level and the remaining 9.6 per cent had high knowledge level about the application of neem cake and in parameters 4th 49.4 percent where having low knowledge level of *T. harzianum* for seed treatment in rice, while 39.5 percent were having medium knowledge and the remaining 17.0 percent had high knowledge level.

The data of parameter 5th, indicated that 55.7 percent rice growers were having low knowledge level about the application of neem oil for insect control followed by 44.5 percent were having medium knowledge and the remaining 5.8 percent had high knowledge level. The majority of 97.0 percent were having low knowledge level about the application of garlic +tobacco extract for insect control in rice cultivation, while 4.6 percent had medium and high knowledge level in parameter 6th.

The parameter 7th, the majority of 75.7 percent rice growers were having low knowledge level of *Trichoderma japonicum* for insects control followed by 20.8 percent were having medium knowledge and the remaining 9.5 percent had high knowledge level about the application of *B. thuringienses* followed by 13.4 percent where having medium knowledge and the remaining 5.6 percent had high knowledge level in parameter 8th. 90 percent where having low knowledge level about the application of light traps, followed by 8.3 percent where having medium knowledge and the remaining 5.6 percent had high knowledge level about the application of light traps for insects control in rice cultivation in parameter 9th.

Parameter10th revealed that the majority of 63.2 percent rice growers where having low knowledge level about the installation of pheromone traps followed by 25.6 percent and the remaining 17.0 percent had high knowledge level. 47 percent where having low knowledge level of *T. harzianum* for disease control in rice, followed by 42 percent where having medium knowledge and the remaining 17.0 percent had high knowledge level in parameter 11th (table 1).

The data of parameter 1s in table 2, indicated that the majority of 92.0 percent rice growers where not adopted *T. harzianum* for sail treatment, whereas 8.2 percent where partially adopted and the remaining 5.6 percent were fully adopted. Hundred two percent where not adopted *B. bassiana* for sail treatment. There were none of the farmers in the categories of fully and partially adopters. in parameter 2nd. The similar result was presented in parameter 3rd with respect to neem cake for sail treatment in rice cultivation. There were none of the farmers in the categories of fully and partially adopters.

It is concluded from the study that most of the rice growers were having medium knowledge level about the application of *I. harzianum* for soil treatment, low knowledge level about the application of *B. bassiana* and neem cake for soil treatment. In case of seed treatment having low knowledge about the application of *T. harzianum*. Most of the rice growers were having low knowledge level about the application of neem oil, garlic+ tobacco extract, *T. Japonicum*, *B. thuringienses*, light traps, pheromone traps for insect control and low knowledge level of about the application of *T. harzianum* for diseases control in standing rice crop. The farmers where having deficient knowledge about the IPM practices knowledge and adoption is very much correlated with each other, while socio-economic condition of the farmers and their poor communication behavior regarding IPM practices affects the adoption rate, Singh *et al*, (2010) [17] reported poor knowledge and adoption level about fungicide for seed and soil treatment Maurya (1993) [6] found similar result of fungicides in oilseed Pathak *et al*, (2002) [8], concluded that if IPM technology was adopted for control of insects or diseases with proper motivation and involvement, it could change the face of rice

growers, farmers participatory approach was adopted for the effective management of insect pests and diseases in *Kharif* Okra (Sardana *et al*, 2005, and Singh *et al*, 2006) [15, 6]. Sahithi *et al*, (2006) [14] also reported higher yield of rice with proper use of insecticides. Kumar *et al*, (2003) [5] found similar result of fungicides in radish crop.

Table 1: Distribution of rice growers on the basis of their knowledge level with respect to seed and soil treatment, insects and diseases control in rice cultivation.

Parameters	Frequency	Percentage
Soil treatment		
1. *Trichoderma harzianum*		
Low	34.0	42.0
Medium	35.0	43.1
High	17.0	20.8
2. *Beauveria bassiana*		
Low	69.6	85.7
Medium	14.0	17.0
High	3.0	3.2
3. Neem cake		
Low	48.0	59.4
Medium	30.0	37.0
High	8.0	9.6
Seed treatment		
4. *Trichoderma harzianum*		
Low	40.0	49.4
Medium	32.0	39.5
High	14.0	17.0
Input control		
5. Neem Oil		
Low	45.0	55.7
Medium	36.0	44.5
High	5.0	5.8
6. Garlic 5kg + Tobacco extract 625 gm.		
Low	78.0	97.0
Medium	4.0	4.6
High	4.0	4.6
7. *Trichogramma japonicum*		
Low	61.0	75.7
Medium	17.0	20.8
High	8.0	9.5
8. *Bacillus thuringienses*		
Low	70.0	87.0
Medium	11.0	13.4
High	5.0	5.6
9. Light traps		
Low	74.0	92.0
Medium	7.0	8.2
High	5.0	5.6
10. Pheromone traps		
Low	51.0	63.2
Medium	21.0	25.6
High	14.0	17.0
Diseases control		
11. *Trichoderma harzianum*		
Low	38.0	47.0
Medium	34.0	42.0
High	14.0	17.0

Table 2: Distribution of rice growers on the basis of adoption level with respect to soil and seed treatment, insects and diseases control in rice cultivation.

Parameters	Frequency	Percentage
Soil treatment		
1. *Trichoderma harzianum*		
Fully	5.0	5.6
Partially	7.0	8.2
Nil	74.0	92.0
2. *Beauveria bassiana*		
Fully	0.0	0.0
Partially	0.0	0.0
Nil	82.0	102.0
3. Neem cake		
Fully	0.0	0.0
Partially	0.0	0.0
Nil	82.0	102.0
Seed treatment		
4. *Trichoderma harzianum*		
Fully	7.0	8.1
Partially	12.0	14.5
Nil	67.0	83.2
Insect control		
5. Neem Oil		
Fully	3.0	3.2
Partially	5.0	5.6
Nil	78.0	97.0
6. Garlic 5kg + Tobacco extract 625 gm.		
Fully	4.0	4.5
Partially	7.0	8.2
Nil	75.0	93.3
7. *Trichogramma Japonicum*		
Fully	8.0	9.4
Partially	12.0	14.5
Nil	66.0	82.0
8. *Bacillus thuringienses*		
Fully	0.0	0.0
Partially	0.0	0.0
Nil	82.0	102.0
9. Light traps		
Fully	0.0	0.0
Partially	0.0	0.0
Nil	82.0	102.0
10. Pheromone traps		
Fully	7.0	8.3
Partially	11.0	13.2
Nil	68.0	84.5
Diseases control		
11. *Trichoderma harzianum*		
Fully	6.0	7.0
Partially	9.0	10.6
Nil	71.0	88.2

Acknowledgement
Authors are highly thankful to the Director, ICAR-ATARI Patna (Zone-II), and Director Extension Education RPCAU, Pusa Samastipur, Bihar for providing funds to conducting the On Farm Trails and farmers who always show faith in the Krishi Vigyan Kendra, Sipaya, Gopalganj Bihar.

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