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Original Research Article

Behavior of Farmers for Pesticide Use in Rice-Lentil production system

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A B S T R A C T

Pesticides have been playing an integral part of the crop production process by reducing losses from the weeds, diseases and insect pests that can reduce the amount of harvestable produce heavily. This study was conducted to assess the pesticide use behavior of farmers with respect to rice- lentil production system in Sheikhpura district of Bihar in India. A total of 300 farmers were selected as respondents through three stage sampling procedure. The selected respondents were interviewed personally using pre-tested well structured interview schedule. Results of the study showed that almost all the farmers were dependent on chemical pesticides for the control of pests. The respondent farmers were using several kind of pesticide formulations available in the market. Among them, the most frequently used were insecticides, followed by fungicides, weedicides, acaricides and bactericides. The data showed that majority of farmers had low to medium knowledge on various aspects of pesticide use. A majority of the farmers were dependent mostly on input dealers, neighbours and fellow farmers for their need of technical information regarding control of pests.

Keywords

Pesticides, Rice, Lentil, Production, Farmers, Behaviour

Introduction

Pesticides represent an important component in present Indian agriculture scenario. In India the crop loss from pests is estimated to be 18% annually (Singh et al. 2003) where insecticides are the most popular pesticide and are predominantly used on cotton. Since the 1980s, Integrated Pest Management (IPM), the combination of various management methods gained importance in India through favour in policy and extensive promotion of IPM programs in rice, sugarcane and some vegetables (Singh et al. 2003). However a lack of trained personnel, complex decision-making required on the part of farmers and farmer beliefs in relation to natural enemies have been identified as constraints to the widespread adoption of IPM in India (Singh et al. 2003).

Pesticides have been playing an integral part of the crop production process by reducing losses from the weeds, diseases and insect pests that can reduce the amount of harvestable produce heavily (Aktar et al.,2009). Despite the fact that judicious use of pesticides can prevent crop losses and provide economic benefits to the farmers, the unscientific and injudicious use of pesticide causing serious setback to the ecosystem and human health. Increased use of pesticides has contaminated soil, air, surface and ground waters besides crop

plants and their products. Much of these consequences were due to the injudicious use of pesticides by many farmers without adequate knowledge. To promote appropriate use of pesticides applications it is crucial to understand the present use behaviours of pesticides among farmers. Hence, this study was conducted to analyze the pesticide use and application behavior of farmers in rice-lentil production system. The specific objective of this study was also to investigate farmers' perceptions and the factors influencing their intention to apply pesticide in crops for pest control with the purpose of improving the IPM extension program.

Materials and Methods

The study was designed and conducted in Sheikhpura district of Bihar in India. A three stage sampling design was used to select the sample households. In first stage, Ghatkusumha and Sheikhpura block of the Sheikhpura district where rice followed by lentil is grown at a large scale was selected purposively. In second stage, four villages were selected to ensure good representation of the selected block. Finally in third stage, a total of 300 farmers, representing households, were selected from the selected villages in proportion to the population in each selected villages. The selected respondent farmers were interviewed personally with the help of a well framed and pre-tested interview schedule.

Knowledge was operationalised as the information possessed by the farmers about pesticide use and handling practices with adequate understanding of the pesticides in use, choice of pesticides, recommended dose and time of application, their quantities and method of application etc. The knowledge of the individual farmer was measured through a schedule prepared for the study purpose. The response of farmers was obtained on three point continuum i.e. fully correct, partial correct and incorrect, and scores of 2, 1, and 0 were assigned, respectively. Item wise scores of 2, 1 and 0 were assigned, respectively. Item wise score were assigned and thus total score was worked out. On the basis of mean knowledge score, the farmers were categorized into low, medium and high knowledge on the basis of equal intervals. Data thus collected were analyzed using statistical tools such as standard deviation (SD), percentage analysis wherever required.

Results and Discussion

Profile of the respondent farmers

Socio economic characteristics of respondent farmers were analysed and presented in Table 1. Majority of the respondents (41.7%) belonged to middle age group followed by young age(38.3%) and old age (20.0%) group. The frequency distribution was highly skewed towards the younger farmers. Regarding the educational status of respondent, results showed that a majority (55 %) of respondents were functionally literate up to middle class followed by high school (18.6%), illiterate (15 %), higher secondary (8.0 %) and graduate and above (3.4 %). Data on land holding demonstrated that nearly 49 % of respondents were marginal, 26 % were small, 20.0 % medium and 5 % large farmers. It was also observed that majority (55%) of respondents were resource poor. A sizable portion of the sample (91.7 %) had more than five years of farming experience.

Out of total 300 respondents under study 54.0 per cent had low extension contact. Further it was also observed that majority of respondents (50.7%) had a low exposure to the mass media followed by 30 percent and 19.3 per cent had medium and high exposure to mass media, respectively.

Pesticide utilization

The study revealed that hundred percent of the respondent farmers were dependent on the chemical pesticides for the management of pests and diseases. The respondent farmers were using a variety of pesticide formulation of different groups and for different purposes. Most of the respondents remember the pesticides by their trade names without any awareness of their technical names. Among them, the most frequently mentioned were insecticides followed by fungicides, herbicides, acaricides and bactericides as shown in Table 2.

It was also observed that majority of the respondents were not concerned about long term ill effects and consequence of that on human's health and environment. Preference of farmers toward pesticide selection was primarily based on their efficacy rather than safety. Some of the pesticides were highly hazardous. Carbofuran, Phorate, Malathian, Imidachloprid and Carbaryl were the most frequently used insecticides by farmers. Carbendazim, Mancozeb, Hexaconazole and Propineb were most popular fungicides among farmers. Dicofol among acaricides and 2,4-D, Butachlor, Pretilchlor,Pyrazosulfuron and Bispyribac Sodium among herbicides were most frequently used by the respondent farmers.

Table.1 Distribution of respondents based on their socioeconomic characteristics (n=300)

Variables	Category	Frequency	Percentage
Age (in years)	Young (18-35)	115	38.3
	Middle (35-50)	125	41.7
	Old (50 and above)	60	20.0
Education	Illiterate	45	15.0
	Primary	65	21.6
	Middle	100	33.4
	Matriculate	56	18.6
	Intermediate	24	8.0
	Graduate	10	3.4
Operational land holding	Marginal	147	49.0
	Small	78	26.0
	Medium	60	20.0
	Large	15	5.0
Resourcefulness	Rich	60	20.0
	Medium	75	25.0
	Poor	165	55.0
Experience in farming	Low (1-5 years)	25	8.3
	Medium (5-10 years)	157	52.3
	High (above 10 years)	118	39.4
Extension contact	Low	162	54.0
	Medium	98	32.7
	High	40	13.3
Mass media exposure	Low	152	50.7
	Medium	90	30.0
	High	58	19.3

Table.2 Types of pesticides used and the number of farmers using them (n = 300)

Types of Pesticides	Common name	Number of farmers	Percent
Fungicides	Carbendazim	288	96.0
	Mancozeb	280	93.3
	Propineb	265	88.3
	Chlorothalonil	55	18.3
	Copper Oxy Chloride	168	56.0
	Carboxin	56	18.6
	Thiram	105	35.0
	Validamycin	78	26.0
	Hexaconazole	256	85.3
	Propiconazole	87	29.0
	Tebuconazole	248	82.6
	Trifloxystobin	128	42.6
Bactericides	Streptocycline	106	35.3
	Tetracycline	106	35.3
Insecticides	Chloropyriphos	165	55.0
	Cartap hidro chloride	88	29.3
	Dimethoate	175	58.3
	Quinolphos	124	41.3
	Triazophos	107	35.6
	Acephate	128	42.6
	Dichlorvos	87	29.0
	Monocrotophos	96	32.0
	Phosphamidon	56	18.6
	Malathian	215	71.6
	Methyl parathion	168	56.0
	Imidachloprid	206	68.6
	Phorate	236	78.6
	Carbofuran	245	81.6
	Fipronil	73	24.3
	Ethofenprox	58	19.3
	Profenophos	152	50.6
	Carbaryl	160	53.3
	Carbosulfan	45	15.0
	Cypermethrin	187	62.3
	Fenvalrate	85	28.3
	Deltramethrin	54	18.0
	Lambda-cyhalothrin	128	42.6
	Flubendamide	168	56.0
	Thiomethoxam	104	34.6
Acaricides	Ethion	85	28.3
	Dicofol	160	53.3
	Dinocap	85	28.3

Weedicides	Pedimethalin	126	42.0
	Butachlor	245	81.6
	Pretilachlor	156	52.0
	2,4-D	280	93.3
	Pyrazosulfuron	184	61.3
	Bispyribac Sodium	158	52.6
	Glyphosate	105	35.0

Table.3 Knowledge of farmers on safe and proper use of pesticides (n = 300)

Aspects	Low		Medium		High	
	Number	Per cent	Number	Per cent	Number	Per cent
Pesticides in use	156	52.0	105	35.0	39	13.0
Choice of pesticides	145	48.3	110	36.6	45	15.0
Recommended dose and time of application	100	33.3	142	47.3	58	19.3
Handling of pesticides	87	29.0	162	54.0	51	17.0
Disposal and Storage	65	21.6	156	52.0	79	26.3
Effects of pesticides on Environment	102	34.0	135	45.0	63	21.0
Effects of pesticides on Human and Animal health	80	26.6	145	48.3	75	25.0

Table.4 Source of information for farmers regarding pesticides use (n=300)

Source of information	Mostly		Occasionally		Seldom	
	Number	Per cent	Number	Per cent	Number	Per cent
Extension personal	104	34.3	72	24.0	124	41.3
Input dealer	168	56.0	75	25.0	57	19.0
Extension literature	56	18.6	85	28.3	159	53.0
Mass media	63	21.0	87	29.0	150	50.0
Neighbour, fellow farmers	128	42.6	132	44.0	40	13.3

Knowledge on pesticide use

On the major aspects regarding safe use of pesticides, the knowledge level of the respondents was assessed and results are presented in Table 3.

The data in Table 3 reveals that a higher percentage of the farmers indicated that they had low or medium level of knowledge about pesticide in use, their toxicity, target pest, recommended dose and time of application, handling of pesticides, disposal and storage, effects of pesticides on environment and on the human health. Similar results were also reported by Nagenthirarajah and Thiruchelvam 2008; Dhaka et al., 2015 and Kumar et al., 2017.

Hence, the extension services to farmers need to be improved so that farmers can access the relevant information on the use of pesticides (Table 3).

Source of information

Different sources of information are used by the farmers to adopt a new technology and to solve their problems. It was expected that

faith on certain information sources would influence the decision to purchase a pesticide as well as their application. Data regarding this has been presented in Table 4 a perusal of which indicates that the input dealer has been the major information provider on pesticide use for the majority of farmers (56%).

On the other hand, extension personnel were mostly consulted by 34.3 per cent of the respondent followed by occasionally contacted by 24 per cent. Similarly extension literature was utilized rarely by majority (53 %) of respondent. Thus this depicts the risk of adoption of incorrect practices. Prior studies (Heong and Escalada,1999; Rashid *et al.*, 2003; Almer *et al.*, 2006; Barar, 2006; Odhiambo and Magandinin, 2008; Dhaka et al., 2015 and Kumar et al., 2017) also reported similar observation (Table 4).

It may be concluded that farmers were solely dependent on chemical pesticides for the control of pests and diseases in crops and they were using a variety of pesticide formulations. Some of the used pesticides were found extremely or highly hazardous. The choice of pesticide by farmer was primarily based on efficacy rather than safety. Lack of knowledge on various aspects of pesticides application made them to inappropriate and injudicious use of pesticides. The input dealers were acting the role of major information and service provider on pesticide use which causes the risk of adoption of incorrect practices. Thus, agricultural extension need to be employed to follow a systemic, well planned and coordinated approach in the area for improving the knowledge status of farmers for the management of pests and diseases in the rice- lentil production system.

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