

Original Research Article

<https://doi.org/10.20546/ijcmas.2017.610.284>

Pesticide Use in Cereals: An Analysis of Farmers' Perception and Knowledge in Jammu District

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ABSTRACT

In agriculture, the use of pesticide has been the dominant form of pest management since the 1950s to kill pest organisms including insects, weeds, fungi and nematodes. In recent times, use of pesticides in rice and wheat cultivation has increased rapidly and this scenario contributes significantly towards adverse effects on human health, environment and on overall bio-diversity as these two crops are among the major food crops grown in India and study area. Keeping this in view a study was undertaken in R.S. Pura tehsil of Jammu district of Jammu and Kashmir with the objective to analyze the farmer's perception and knowledge regarding pesticide use in two major cereal crops i.e. rice and wheat grown in Jammu district. Eight villages from the selected tehsil were randomly selected and a list of 20 farmers growing rice and wheat was prepared for each village. Eight farmers out of 20 were then randomly selected from each village thus comprising a sample of 64 respondents for final study. The gain in terms of increased yield with herbicide use, as observed by farmers was reported to be 3.0q/ha, and 2.0q/ha in rice and wheat, respectively. The gain with use of insecticides was found to be 0.50 q/ha for rice. Farmers were found to be well aware about ill effects of pesticides and ready to use alternatives carrying less hazards, if found equally effective. Farmers had good knowledge about name and dosages of different herbicides used in rice and wheat crop but lack knowledge about different insecticides and fungicides used in these crops because of its less use in both these important cereal crops.

Keywords

Pesticides,
Perception,
Knowledge,
Productivity.

Article Info

Accepted:
21 September 2017
Available Online:
10 October 2017

Introduction

Pesticides are an integral part of present Indian agriculture which has shifted its course from sustenance to commercial character. This has resulted in exposing cereal crops to regular use of pesticides even in remote districts of the country. However, cereals now are also exposed to pesticide use. Indian pesticide market is the 12th largest in the

world and stands first in Asian continent. India produces 90,000 metric tonnes of pesticides in a year with over 400 million acres under cultivation and over 60 % of the country population depends upon agriculture as well as the country's economy mainly depends on the agriculture (Jana, 2013). The use of pesticides in cereals emphasized the

importance of technical knowledge that farmers must acquire to reduce the negative effects of pesticides on different natural resources such as soil, water, environment as well on human health. Adequate knowledge of pesticide use is must on the part of farmers for promoting its rational use for sustainable agriculture. Indiscriminate use of pesticides has led to many problems like adverse effects on parasites, predators and pollinators, toxic residues, resurgence of treated population of pests, development of resistance in insects to insecticides, environmental population etc. (Lal, 2001). Pesticides pose serious threats to both human health and the environment. However, farmers and agricultural scientists have now to deal with a paradox: due to a rapidly-growing population and to the lack of availability of new farmland, it will be necessary to continue to increase crop yields in the future (Foley *et al.*, 2011). On the other hand, it is necessary to reduce the harmful effect of pesticides on human health and on the environment (Ensirnk *et al.*, *et al.*, 2013).

Several studies have shown that exposure to pesticides poses serious threats to human health of both professional (especially farmers) and rural populations (Elbaz, 2009). Rice crop plays a significant role in livelihood of people of J&K. It is the staple food and second important crop of the state (Trag and Rather, 2013). In Jammu division rice is grown on an area of 116.000 ha and wheat on an area of 247.000ha. (DES, 2013-14). In J&K pesticide use by weight (a.i) has increased exponentially from 142 MT 90.155kg/ha) in 1994-95 to 1711 MT (2.410 kg/ha) in 2011-12 (Directorate of Plant Protection Quarantine and Storage, GOI) which is an increase of 1105% with a slope of 217.5tonnes/year ($R^2=0.69$) (Peshin *et al.*, 2014). Further knowledge of the farming community about different agricultural technologies including plant protection technology plays a crucial role in judicious use of different pesticides. Knowledge of the

recommended technologies is a pre-requisite to adoption process. The basic input for achieving higher productivity in the assimilation of technological knowledge is one of the important components of behaviour. Knowledge of the technology is the basic requirement as it gives impetus to adopt a technology. Thus a study was undertaken to analyze farmer's perception and knowledge about pesticide use in two major cereal crops grown in Jammu district.

Materials and Methods

R.S. Pura tehsil of Jammu district is an agricultural active tehsil was purposively selected for conducting the present study with the objective to assess the extent of pesticide use in cereals particularly rice and wheat and for assessing the perception and knowledge of farmers regarding pesticide use. Eight villages from the selected tehsil were randomly selected and a list of 20 farmers was prepared for each village. Eight farmers out of 20 were then randomly selected from each village thus comprising a sample of 64 respondents and data were collected on pre-structured schedule framed for the present study in the year 2014-15. The recommended plant protection technology regarding dosages of different pesticides used in the cultivation of rice and wheat crop of SKUAST-Jammu for the study area is as follows in table 1. Thereafter comparison was made between actually used dosages by farmers and recommended level of dosages of different pesticides in rice and wheat crop. The data collected were put to tabulation and percentages were calculated for deriving the conclusion. Further the average land holding size of the respondent farmers taken for assessing their perception and knowledge about different plant protection chemicals was 1.34 ha. Knowledge of farmers was assessed regarding names and dosages of different herbicides, insecticides and fungicides used in production of rice and wheat crop only.

Results and Discussion

Descriptive statistics of respondent farmers

Data presented in table 2 show descriptive statistics of important socio-personal variables of respondent farmers. Average age of respondent farmers was 55.04 years with S.D of 12.82. Average number of years of education completed was 9 years which indicates medium level of educational status of sampled farmers. Average land holding size of farmers was 1.34 ha with standard deviation of 1.04 which is higher than state average land holding size of 0.76ha. Average farming experience was 33.25 years, average number of source of information utilized by the respondent farmers was almost two and also average distance of almost 2km from the nearest pesticide retailer shops which indicates the presence of good input facilities in the study area.

Frequency of herbicide use pattern in rice and wheat crop n=64 (Multiple response)

Post emergence herbicides used by the farmers in both rice and wheat crop respectively as analyzed in table 3. The frequency of spraying herbicides was higher in rice as compared to wheat as 39 % of farmers reported to use weedicide spray twice for controlling both pre-emergence and post emergence weeds thus reflecting the menace of weed problem hampering the production of rice crop. 77% and 72% of farmers used recommended dosages of herbicides in rice and wheat crop.

Adoption status of fungicides, insecticides and storage pesticides in rice and wheat crop

Analysis of data given in table 4 shows that 31% and 53% of farmers used fungicides as seed treatment in wheat and rice crop

respectively. 23 % and 41% farmers in study used fungicides only once where as 20% and 22% farmers used fungicides two time during different stages of crop growth for protecting their crops from attack of different diseases. Only 8% farmers used insecticide in rice crop and all of them applied less than the recommended dosages (Rates of recommended dosages is given in table 1).

Effect of pesticide use on average yield of rice and wheat crops as perceived by farmers

Data presented in table 5 reveals the physical benefits arising out of pesticide use in rice and wheat crop, as perceived by the respondents in the study area. The gain in terms of increased yield with herbicide use, as observed by farmers was found to be 9.35q/ha & 9.0q/ha paddy and wheat respectively.

The gain with use of insecticides was found to be 0.50q/ha for rice crop. The gain in yield with use of fungicides was found to be 1.0 q/ha for rice and wheat respectively. The gain in yield with use of rodenticides was found to be 0.80q/ha & 1.00 q/ha for basmati rice, and wheat respectively. Farmers were of view that store pests cause damage to the tune of 5% of total stored wheat in absence of its use in wheat crop and with the use of storage pesticides they save their stored wheat from this damage. India's 30 % potential crop yield is damaged by the attack of insect-pests, diseases, weeds and rodents (Jana, 2013). The change in yield in rice and wheat crop with and without use of different pesticide as reported by the farmers was based on their experience of farming. Farmers in study area reported that sometimes they fail to apply different pesticides in some cropped area in both rice and wheat crop due to lack of certain conditions such as proper moisture in the field, adverse weather conditions etc. required for the application of different pesticides and

this situation provides them an opportunity to quantify and compare the yield of pesticides used and non-pesticides used fields and on this basis different yield figures of rice and wheat crop were calculated for the present study as shown in table 5.

Further productivity data particularly of basmati paddy of herbicides used and non -

used farmer’s fields put to statistical analysis by applying paired two sampled independent t-test which gave t-value equal to-43.21 and p-value equal to 0.000 which suggests that there is significant impact of herbicides use on productivity of paddy crop. In case of wheat crop also there is significant impact of herbicides on the productivity of wheat crop as indicated by p-value which is 0.000.

Table.1 Recommended plant protection technology

S.No	Name of pesticides		Recommended dosages	
			Paddy	Wheat
1.	Fungicide Technical name Carboxin or carbondiazem for seed treatment Propiconazole, Tebuconazole, Mancozeb	Trade name Thiram Tilt	- - -	2gms/kg of seed 0.1% 0.25%
2.	Insecticide Imidachloropid200SL for seed treatment Lindane6G(soil treatment) Aluminum phosphide for Field rats as fumigants Zinc phosphide			25kg/ha Two tablets of 0.6g/burrow or 3g/burrow 25gms mixed with 1kg wheat or gram or maize flour with vegetable oil and gur (1:40).5-6 pellets per burrow.
3.	Herbicides(post emergence)s Broad leaf weeds Amine salt Ethyl ester of 2,4-D Monocot weeds Isoproton For both monocot & Dicot Control of Phalaris minor (sitti) Metribuzine (if not controlled by isoproton)			0.75kg a.i/ha 0.5kg a.i/ha 0.75kg a.i/ha 0.75kg a.i+2,4-D of ethyl ester @500ml/ha 200gms a.i/ha in 500-600 l of water

Table.2 Descriptive statistics of respondent farmers

S.No	Parameters	Descriptive statistics
1	Average age (in years)	55.04 (± 12.82)
2	Average schooling years (in years)	9.93(±3.23)
3.	Average land holding size (ha)	1.34(±1.04)
4.	Average farming experience (in years)	33.25(±12.56)
5.	Average number of source of information	1.62(± 0.60)
6.	Average distance from nearby pesticide dealer outlet (in kms)	1.62 (±1.58)

Table.3 Frequency of herbicide use pattern in rice and wheat crop n=64 (Multiple response)

S.No	Particulars	Paddy (%age)	Wheat (%age)
1.	Pre-emergence herbicide	100 (After transplanting)	-
2.	Post emergence herbicides	39	100
3.	Frequency of spray		
	a) One time	100	100
	b) Two time	39-	--
4.	Higher dosages	8	16
	Under dosages	16	12
	Recommended dosages	77	72

Table.4 Adoption status of fungicides, insecticides and storage pesticides in rice and wheat crop

S.No	Particulars	Paddy (%age)	Wheat (%age)
1.	Fungicide		
	During seed treatment only	16	31
	During both seed treatment and in standing crop	8	12
	Only in standing crop	7	10
	Never applied	69	47
	Frequency		
	One time	23	41
	Two time	8	12
	More than recommended	28	10
	Less than recommended	22	17
	Recommended dosages	50	73
2.	Insecticide (Frequency of spray)		
	One time	8	-
	More than recommended	-	-
	Less than recommended	100	-
	Recommended dosages	-	-

Table.5 Effect of pesticide use on average yield of rice and wheat crops as perceived by farmers

Type of Pesticides	Crop wise average yield (q/ha)	
	Paddy (Basmati)	Wheat
Herbicides		
With use	29.78	24.79
Without use	20.43	15.79
Difference	9.35	9.00
t-value	-43.221	-30.03
p-value	0.000*	0.000*
Insecticides		
With use	25.00	Not used
Without use	24.50	
Fungicides		
With use	25.00	22.00
Without use	24.00	21.00
Rodenticides		
With use	26.00	22.00
Without use	25.20	21.00

Table.6 Perceived health hazards due to inadequate use of pesticides n=64 (Multiple response)

S.No.	Health Hazards	%age of farmers
1.	Skin irritation	62
2.	Headache	86
3.	Respiration problem	31
4.	Uneasiness	48
5.	Vomiting	16

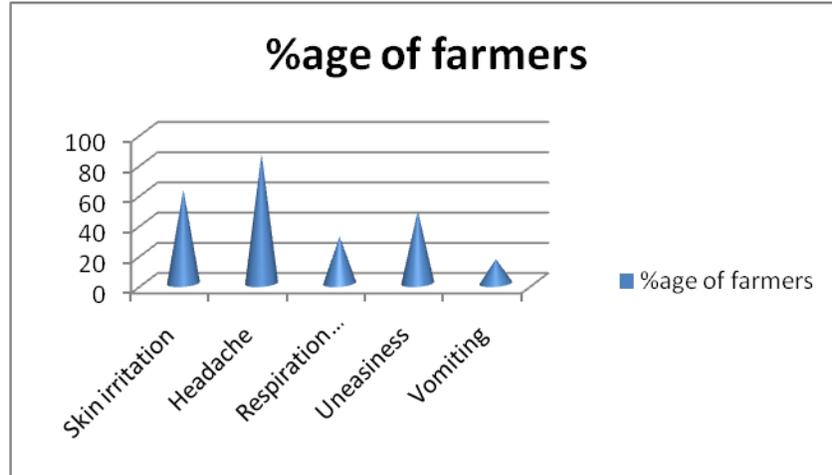
Table.7 Opinion of farmers regarding pesticide use in agriculture (Multiple responses)

S.No	Statements	% age of farmers
1.	Pesticides are crucial in absence of other alternatives to control pests.	94
2.	Want to reduce use of pesticides in agriculture	70
3.	Want to control pests by using combination of different methods	53
4.	Aware about ill effects of excessive use of pesticides	100

Table.8 Knowledge about different aspect of pesticide use in rice and wheat crop

Knowledge about	Paddy (n=64)	Wheat (n=64)
Name of herbicides	60(93.75)	52(81.25)
Dosages of herbicides	44(68.75)	40(62.5)
Name of Insecticides	7(10.93)	-
Dosages of insecticides	4(6.25)	-
Name of Fungicides	5(7.81)	15(23.43)
Dosages of fungicides	-	9(14.06)

Fig.1 Different health hazards perceived by farmers



Perceived health hazards due to inadequate use of pesticides n=64 (multiple response)

Analysis of data presented in table 6 depicts that number of farmers felt health problems in course of pesticide application. The major clinical symptoms observed by the respondent farmers include headache (86%) followed by skin irritation (62%). The symptoms like uneasiness, respiration problem and vomiting were also observed in 48%, 31% and 16% of respondents respectively. This shows that inappropriate use and handling of pesticide can cause serious health hazards. Jana (2013) reported the same health problems being faced by vegetable growers in using pesticides. Snelder *et al.*, (2008) also reported that the rapid increase in the application of pesticides has posed threats to the environment and adverse health effects on farmers.

Opinion of farmers regarding pesticide use in agriculture

Analysis of data given in table 7 shows that 100 % farmers were found to be well aware about ill effects of pesticides and ready to use alternatives carrying less hazards, if found equally effective. About 94% farmers

recognize pesticides as an integral part of their agricultural activities including cultivation of cereals. Further 53% of the farmers were also of the view that they want to control different pests limiting their successful crop cultivation by a combination of diverse means such as IPM, using traditional practices etc. Meena and Dudi (2014) also reported certain traditional practices for controlling different pests in wheat crop such as soaking wheat seeds in cow dung slurry, dusting of ash, tying white flags to scare rodents etc.

Knowledge about different aspect of pesticide use in rice and wheat crop

Knowledge about different pesticides used in paddy and wheat crop was analyzed in table 8 and it shows that farmers possessed fairly good knowledge about different herbicides used in paddy crop followed by wheat crop. 93.75% of sampled farmers had knowledge about names of different herbicides such as Butachlor, in wheat crop and among these only 68.75% had knowledge about different dosages of these herbicides. In case of wheat 81.25 % farmers had knowledge about different herbicides used in wheat crop and only 62.5% had correct knowledge about

dosages. Further very little knowledge possessed by the farmers regarding different insecticides and fungicides used in paddy and wheat crop. Data indicates that only 10.93 % and 7.81 % farmers had knowledge about names of different insecticides and fungicides to be used in paddy crop. Only 6.25% farmers had knowledge about dosages of insecticides and none of the farmers had knowledge about dosages of different fungicides used in paddy crop.

None of the sampled farmers had knowledge about name and dosages of insecticides used in wheat crop. As for as knowledge about different fungicides used in wheat crop is concerned 23.43% farmers had correct knowledge about name and 14.06 % had knowledge about correct dosages of fungicides used in wheat crop. Thus it is concluded that majority of the respondents had knowledge of the herbicides to be applied against weeds in paddy and wheat crop, so the adoption was also on the higher side. This finding is in conformity with the study conducted by Sheikh *et al.*, (2006) and Ragasa *et al.*, (2013).

It is concluded from the above study that herbicides are an indispensable part of cereal cultivation. Weed infestation has been reported to largely affect the yield of cereal crops mainly rice and wheat crop under study. Use of insecticides and fungicides is negligible in the cultivation of rice and wheat crop. Farmers had good knowledge about recommended dose of different herbicides but vice-versa in case of fungicides and insecticides. Further farmers are well aware about ill effects of inadequate use of pesticides on different natural resources and on human health also and ready to use alternatives carrying less hazards, if found equally effective. Thus it is suggested that a comprehensive approach like IPM should be promoted in the study area for checking

different type of pests in major cereal crops and for promoting rational use of pesticides for sustainable agriculture which may be less harmful for environment and bio-diversity. Farmer's knowledge should be enhanced through different means about different plant protection measures for better productivity. In this regard role of field extension functionaries becomes very critical. Literature on safe handling and use of pesticides in vernacular language should be developed and circulated among farming community. The present study can provide empirical feedback to plant protection scientists and agronomists regarding trend of use of different pesticides by the farmers in rice and wheat crop.

Acknowledgement

Authors highly acknowledge the concerned personnel of SKUAST-J, Agriculture Department, J&K who provided the secondary data and farmers of the study area who cooperated very cordially in providing primary field data for the present study.

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How to cite this article:

Rakesh Kumar, Pawan Kumar Sharma, P.S. Slathia and Nishi Sharma. 2017. Pesticide Use in Cereals: An Analysis of Farmers' Perception and Knowledge in Jammu District. *Int.J.Curr.Microbiol.App.Sci*. 6(10): 2411-2419. doi: <https://doi.org/10.20546/ijcmas.2017.610.284>