Indigenous Technical Knowledge of Tribal Farmers about Pest Management in Crop Production

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Abstract

The paper presents data on a study conducted in four villages of two blocks of tribal dominated Dumkadistrict of Jharkhand, India. The study having objectives of documenting and appraising the indigenous technical knowledge (ITK) about pest management in crop production used the interview schedule, observation and informal group discussion methods. Two categories of respondentsi.e100 Farmers and 30 Scientists constituted thesample size. Findings indicated that altogether eight ITKs were found to be practiced by the farmers. All eight ITKs were reported to be having scientific rationale with explanations given by the scientist respondents. Four ITKs out of eight were put before the respondents for studying their perception on selected four attributes i.e productivity, stability, sustainability and equitability. All four ITKS were perceived to be effective and useful by both the categories of respondents.

Keywords: Indigenous People, Tribal People, Tribal Farmers, Indegenous Technical Knowledge, Pest Management, Crop Production, Jharkhand, India.

Introduction

Farmers especially the resource poor Farmers are engaged continuously in experimenting, adapting and innovating new knowledge. They are profession specialists' in survival, but their skill and knowledge have not yet been recognised. Indigenous technical knowledge (ITK) based management practices are adopted by farmers to avoid or minimize adverse effects arising from vagaries of weather or from incidence of pests and diseases in crops and livestock production. The farmers knowledge, inventions and experimentation have long been undervalued and therefore, farmers and scientists should be partners in the real

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and full sense of that work in the research and extension processes. Keeping this in view, a study was conducted to document and appraise the ITK's about pest management in crop production with the objectives of exploring scientific rationale and perceptions of farmers and scientists on the selected ITK's.

Methodology

The study was conducted in purposively selected Dumka district of Jharkand, where the tribal population is dominant and traditional agricultural practices are prominent in comparison to other districts of the state. Data were collected from four randomly selected villages (two agriculturally progressive and two less progressive) ofJarmundi and Jama blocks of the district in the year 2019. The sample consisted of randomly selected 100 farmer respondents. Apart from farmer respondents, 30 scientists from different disciplines of headquartersof Brisa Agricultural University, Ranchi and Zonal Agricultural Research Station, Dumka were selected randomly, who constituted the second category of respondents. Scientist respondents were selected for seeking their perception on selected attributes of the ITKs. The scientist respondents were also asked for scientific rationality.

A combination of data collection tools viz., interview schedule, audio-visual recording and organization of village level workshop were employed. Data were collected through personal interview, observation and in-depth informal discussion with the farmer respondents. The perception of farmer respondents. The perception of farmer respondents on selected attributes of selected ITKs were measured with the help of a well-structured and pretested schedule developed for this purpose. The responses were obtained between 5 and point rating scale for the selected practices on four attributes namely, productivity, stability, sustainability and equitability. The points on the rating scale were "strongly agree", agree, undecided, disagree and strongly disagree by giving scores of 5,4,3,2, and 1, respectively. The weighted mean scores of the individual practices were then calculated. The practices which were assigned mean scores above 3.5, between 2.5 to 3.5, and below 2.5 were considered to be high, medium and low respectively for their corresponding attributes. Altogether there were eight statements in the scale with maximum obtainable score of 40 statements and minimum obtainable score of 8.

Findings and Discussion

Profile of farmer respondents

Majority of the farmer respondents were young in age(42%) belonging to scheduled tribes community (65%) having education from primary to middle school level (76%) with marginal and small size of holdings (76%) and agriculture as their main occupation (87%) and belonging to medium socio-economic status (87%).

Profile of Scientist respondents

Majority of the scientist respondents were men (94.59 %), middle aged (70.27 %), having designations of Associate Professor/ Senior Scientists/Programme Coordinator (56.75 %) involved in research and extension (94.59 %) with experience of 10-15 years in ITK-related work (56.75 %).

Indigenous Technical Knowledge for Pest Management

An attempt was made in this section to identify and document indigenous technical knowledge about pest management along with their farming situations and scientific rationale.

Table:1 Frequency Distribution of Respondents by their use of Indigenous Technical Knowledge about Pest Management along with the Farming Situations and their Scientific Rationale

Sl. No	Indigenous technical Knowledge	ITK followed by respondents			Farming Situation	Scientific Rationale
		Agriculturally Progressive Villages (n=50)	Agriculturally Less Progressive Villages (n=50)	Pooled (n=100)		
1.	Paddy Case worm (Nymphula depunctalis) is controlled by cow dung ash mixed with water to form a concentrate solution in which kerosene oil @1.5 litre per 10 litre solution) is mixed and then sprayed on the crop with the help of a broom	9(18.0)	17(34.0)	26(26.0)	Medium and low land rice fields having water during tillering stage	Kerosene Oil is a petro-chemical, which is toxic for the insects, it acts on respiratory organs causing suffocation and cow dung ash acts as abrasive causing physical injury to the insects.

Sl. No	Indigenous technical Knowledge	ITK followed by respondents			Farming Situation	Scientific Rationale
		Agriculturally Progressive Villages (n=50)	Agriculturally Less Progressive Villages (n=50)	Pooled (n=100)		
2.	Sinduar (Vitexnegundo) leaves are boiled in water (@1 kg leaves per 5 litre of water for 0.6 acre) and the cool decoction is sprayed on the plants with help of a broom to control paddy case worm (Nymphulade punctalis)	6 (12.0)	14 (28.0)	20 (20.0)	Medium and low land rice fields having water during tillering stage	The chemical extracted from sinduar leaves act as intoxicant on the insect.
3.	In Solanaceous vegetables (tomato, brinjal and chillies) tobacco leaf soaked water @ 150g tobacco leaf in eight litres of water) is sprayed in fields with the help of a broom to check stem borer (Helicover paarmigera)	10.(20.0)	40(80.0)	50(50.0)	Up, Medium & low land under rainfed situation.	Tobacco contains an alkaliod i.e nicotine which possesses insecticidal property.

Sl. No	Indigenous technical Knowledge	ITK followed by respondents			Farming Situation	Scientific Rationale
		Agriculturally Progressive Villages (n=50)	Agriculturally Less Progressive Villages (n=50)	Pooled (n=100)		
4.	Cow dung ash is broadcast and crop is irrigated to prevent potatoes from frost	13(26.0)	21(42.0)	34(34.0)	Up & Medium land potato field	Cow dung ash is used to absorb moisture and irrigation helps to maintain optimum temperature, which reduces the chance of frost attack
5.	Paddy caseworm (Nymphulade punctalis) is controlled by cow or buffalo urine through its spray in the field with the help of a broom	3(6.0)	4(8.0)	7(7.0)	Medium and low land rice fields during tillering stage.	Urine contains uric acid which had toxic effect on insects.
6.	During panicle initiation stage in rice cropgundhi bug is controlled by lightening up fire along the bunds	7(14.0)	9(18.0)	(16.0)	Medium and low land rice fields during tillering stage.	This is a physical means to control the insects. The insects get attracted towards light which are burnt and died.

Sl. No	Indigenous technical Knowledge	ITK followed by respondents			Farming Situation	Scientific Rationale
		Agriculturally Progressive Villages (n=50)	Agriculturally Less Progressive Villages (n=50)	Pooled (n=100)		
7.	During initiation stage in rice crop bug is controlled by moving straw of jute rope dipped in kerosene oil by two persons holding each end of the rope at both sides of the fiels,	6 (12.0)	11(22.0)	17(17.0)	Medium and low land rice fields during tillering stage.	This is a Mechanical control to check the insect pest. Rope is used to physically dislodge the insects from the plants and kerosene oil acts as poison on insects.
8.	Maize crop is protected from insect pests by growing sun hemp along the field from the four sides	4(8.0)	6(12.0)	10(10.0)	Up and Mediuml and under rainfed situation.	Sun hemp acts as a trap crop. This is a biological method to control insect pest. Sun hemp acts as an alternate host and protects the main crop from infestation.

Figures in parentheses indicate percentages

Altogether 8 number of indigenous technical knowledges (ITKs) were reported to be practiced by the farmers. The data presented in Table 1 revealsthat control measure listed at Sl.no 1 was used for protecting rice crop from paddy caseworm (Nymphuladepunctalise) as reported by 25 percent of the respondents. In this practice,cow dung ash is mixed with water to form a concentrate solution in which kerosine oil @ 1.5 litre/10 litre solution is mixed and then sprayed on rice crop with the help of a broom which protects the plants from caseworm.

The associated rationale is that kerosene oil is a petro chemical which is toxic for the insects. It acts on respiratory organs causing suffocation and cow dung ash acts as abrasive causing injury to the insects.

Another method for controlling paddy caseworm was spraying of cool decoction of Sinduar (Vitexnegundo) prepared with boiled water @ 1kg leaves per 5 litres of water for 0.6 acer as adopted by 20% of the respondents. The chemical extracted from sinduar leaves acts as intoxicant on the insect.

The findings further reveal another measure used for protecting the vegetable crops (tomato, brinjal and chillies) from stem borer (Helicoverpaarmigera) as reported by 50 percent of the respondents. In this practice farmers use to spray tobacco leaf soaked water @ 150g tobacco leaves in 8 liters of water in field with the help of abroom to cheek stem borer tobacco contains nicotine which possesses insecticidal property.

Another important control measure was found to be used to prevent potato frost as reported by 34 percent of the respondents. In this practice cow dung ash is broadcast in the field and crop is irrigated. Cow dung ash is used to absorb moisture and irrigation helps to maintain optimum temperature, which reduces the chance of frost attack.

It was also revealed that for controlling caseworm in paddy cowor buffalo urine is sprayed in standing rice fields with the help of a broom. Urine contains uric acid which has toxic effect on insects. However, this practise was found to be used by a very low percentage of the respondents (7%).

Gundhi bug (Leptocorisaacuta) is one of the major pest problem in rice. For controllinggundhibug, farmers(16%) use to burn discarded rubber tyre holding in their hands and moving along the field. Gundhi bugs are attracted towards the burning tyres and get burnt. For controlling gundhibug another measure was also used by the farmers (17%). In this practice farmers through a straw or jute made rope dipped in kerosene oil use to physically dislodge the insects. Two persons are required tohold the rope at both the end at both sides of the field and move simultaneously. Kerosene oil in this process acts as poison for insects.The findings further revealed that for controlling insect pest in maize crop from pests, sunhempis intercropped/mixed cropped with maize or grown along with the boundaries of the maize field. Sunhempacts as a trap crop or alternate host. This is a biological method to control the insect pests.

The analysis for the use of indigenous practices for controlling insect pests revealed that the farmers were using such methods, which were low cost and compatible to components of their farming systems and household internal resources.

Farmers and Scientists Perception of ITK about Pest Management

An attempt was made in this section to explore farmers and scientists perception of the ITK about insect pest management. In the present study perception refers to the mental perceptional evaluation by a respondent about designed attributes of the selected indigenous agricultural technologies. For this analysis only four ITKs were selected which were being practiced by more than 20 percent of the farmers.

The weighted mean scores assigned by the farmers and scientist respondents with respect to the four attributes of selected indigenous technical knowledge about pest management have been presented in Table 2.

Table 2: Farmers and Scientist Perception of Selected ITK's about pest management on their selected Attributes.

Sl. No	Indigenous Technical Knowledge	Perceptionscores on the Selected attributes							
		Productivity		Stability		Sustainability		Equitability	
		Farmer	Scientist	Farmer	Scientist	Farmer	Scientist	Farmer	Scientist
1.	Paddy caseworm (Nymphuladepunctalis) is controlled by cow dung ash mixed with water to form a concentrate solution in which kerosene oil (@ 1.5 litre / 10 litre Solution) is mixed and then sprayed on crop with the help of a broom	3.32	3.61	3.44	3.52	3.71	3.44	3.33	1.42

Sl. No	Indigenous Technical Knowledge	Perceptionscores on the Selected attributes							
		Productivity		Stability		Sustainability		Equitability	
		Farmer	Scientist	Farmer	Scientist	Farmer	Scientist	Farmer	Scientist
2.	Sinduar (Vitexnegundo) leaves are boiled in water (@ 1 kg leaves per 5 litre of water for 0.6 acer) and the cool decoction is sprayed on the crop with the help of a broom to control rice case worm (Nymphulade punctalis)	3.52	1.51	3.54	1.62	3.40	1.71	3.34	3.44
3.	In Solanaceous vegetables (tomato, brinjal and chilli) tobacco leaf soaked water @ 1.50 g tobacco leaves in eight litres of water) is sprayed in field with the help of a broom to check stem borer (Helicoverpaarmigera)	3.63	1.42	3.42	1.44	3.90	1.42	3.33	3.11
4.	Cow dung ash is broadcast and crop Is irrigated to prevent potatoes' from frost	3.62	4.61	3.44	3.30	3.30	3.60	3.34	4.62

Note: Above 3.5 : high; 3.5-2.5 : medium and < 2.5 : low perception

Table 2 shows that ITK listed at Sl.no 4 i.e "application of cow dung ash to protect potato from frost" was rated to be high in productivity by both the categories of respondents wt.mean score above 3.5 and ITK listed Sl.no 2 and 3 i.e "spraying of decoction of

sinduar leaves for controlling paddy caseworm and spraying of tobacco leaf soaked water in solanaceous vegetables to check stem borer" were rated as highly productive by the farmer respondents, where as the two practices were rated as less productive by the scientist respondents. (wt. mean scores below 2.5). But in respect of ITK at Sl.no 1 i.e spraying of cow dung ash and kerosene oil for checking caseworm in paddy", scientists perceived it as highly productive and farmers perceived it of medium productivity.

On stability criteria there were wide variations between perceptions of both the categories of respondents. ITK listed in sl.no 2 was rated by the farmers as of higher stability and ITKs listed as Sl.no 1 was rated by the scientists as of higher stability. Rest of the ITK's mentioned in the table were rated as of medium stability by the farmers and scientists rated two of them (Sl.no 2and 3) as of low stability.

Similarly with respect to sustainability ITK's listed at Sl.no 1 and 3 were rated by the farmers as highly sustainable and only one ITK (Sl.No 4) was rated to be of medium sustainability by the scientists.

In case of equitability only one technology (Sl.no.4) was rated to be highly equitable by the scientist respondents (wt.mean score above 3.5) and technology listed at Sl.No 2 and 3 were rated to be of medium equitability by both the categories of respondents. ITK mentioned at Sl.No 1 was rated less equitable by the scientists as they perceived that kerosene oil, an important ingredient of the ITK was not easily available to resource poor farmers, even for lighting their lamps whereas, it was perceived as of medium equitability by the farmer respondents themselves.

Conclusion

Altogether eight number of ITKs were found to be practiced by about 20-50 per cent of the farmers. Out of eight ITKs, four were selected for eliciting farmer's and Scientist's perception for selected attributes viz; productivity, stability, sustainability and equitability. Application of cow dung ash to protect potato from frost was rated to be highly productive by both the categories of respondents (weighted mean score > 3.5). On stability criteria there were wide variations between perceptions of both the categories of respondents.

Similarly with respect to sustainability of ITKs the two ITKs , namely tobacco soaked water for controlling stem borer in solanaceous vegetables and another as referred above were rated high sustainable by the farmer respondents. In case of equitability criteria, only one technology i.e "Cow dung ash is broad cast in potato crop followed by irrigation prevent frost" was rated to be highly equitable weighted mean score (>3.5) by both the categories of respondents. This implies that the Agriculture research system is required to test and validate the referred ITKs in order to explore their efficacy and potentiality. This will be helpful to the Scientists in generation of low-cost, need-based, location-specific and eco-friendly appropriate technologies to make them more readily acceptable to the farmers.

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