ZIBELINE INTERNATIONAL™ PUBLISHING

ISSN: 2773-6202 (Online)
CODEN: JTIOCC

Journal of Technology & Innovation (JTIN)

DOI: http://doi.org/10.26480/jtin.01.2024.30.34

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RESEARCH ARTICLE

FARMERS' KNOWLEDGE AND PERCEPTION ON MAJOR INSECT PESTS OF RICE AND ITS MANAGEMENT PRACTICES IN PYUTHAN, NEPAL

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ARTICLE DETAILS

Article History:

Received 15 April 2024
Revised 23 May 2024
Accepted 28 June 2024
Available online 01 July 2024

ABSTRACT

This study was conducted in 2023 to know the Farmers knowledge and perception on insect pest of rice and its management practices in Pyuthan, Nepal. In this study, district 4 wards of Pyuthan municipality under PMAMP rice zone were purposively selected to assess the insect pests prevailing in rice field and storage and methods used for their management. Primary data were collected by the use of pretested interview questionnaires from 80 respondents, selected at random. The data were processed and analyzed by using descriptive statistics through MS-excel and SPSS. The analyses showed that the main insects prevailing in the field were rice leaf folder and rice yellow stem borer. Similarly rice moth and rice weevil were dominant in storage condition. Two months stage was found to be the most severe in terms of insect pest susceptibility. Majority of respondents used chemical methods for insect management with pesticide from agro-vets which was ranked first in terms of effectiveness. Most respondents followed the advice of Agro-vets for insect management and pesticide estimation and had limited idea about hazards of pesticide. Improper dose estimation was prevalent in many farmers. Most of the respondents had not received any training on insect management and no one had practiced IPM methods in their field. Knowledge about IPM and its adoption in field is found very negligible hence FFS should be conducted and demonstration trial should be conducted in farmers' field with their active participation.

KEYWORDS

Rice, Farmer's Perception, Pyuthan, IPM

1. INTRODUCTION

Agriculture sector is the backbone of the Nepalese economy. 65.6% of Nepalese people depend on agriculture as a primary occupation. Only more than half of the calories consumed by Nepalese people come from rice (Kharel et al., 2018: Gadal et al., 2019). In Nepal, rice ranks first based on both area and production (MoALD, 2023). Rice was cultivated in 1,477,378 ha with a total production of 5,130,625 mt and productivity of 3.47 mt/ha (MoALD, 2023). In 2022, Paddy production for Nepal was 5.13mt. About 89.11 % of the rice production occurs in main season and 10.88% in spring season (MoALD, 2023).

Insect pests are one of the main problems restricting rice production, contributing to both quantity and quality losses. Insects of over 100 species are regarded as pests in rice production systems worldwide, yet only around 20 of those species seriously harm the economy (Pathak and Khan, 1994). Major pests are those that frequently result in extremely noticeable economic loss, while minor pests include those insects that are frequently encountered yet only cause small damage (Ali et al., 2021). In general, the losses (pre- and post-harvest) due to pests have been estimated to be 15-20% (Neupane, 1995). Due to their tendency to lower yields and increase production and storage expenses, insect pests result in both quantitative and qualitative losses (Neupane et al., 2020a). At the time of sowing until harvest and, the majority of rice plant components are vulnerable to pest assault (Ane and Hussain, 2016). Moreover, the spread of rice pests like the brown plant hopper, rice gundhi bug, and yellow stem borer has resulted in significant losses in rice production due to farmers' preference for sensitive varieties, heavy reliance on chemical fertilizers, use of tainted seeds and unhygienic farming practices (Pathak and Khan, 1994). Insects like Rice gandhi bug (*Leptocorisa acuta*), Rice hispa (*Dicladispa armigera*), Mealybug (*Ripersia oryzae*), Plant hoppers (*Nephotettix apicalis, Sogatella fercifera* and *Ceeadela spectra*), Yellow stem borer (*Scirpophaga incertulas)* and Armyworm (*Mythimna seprata*) to be found invasive in the rice field (Chiran Adhikari et al., 2018). The common insect pests on rice are *Sitophilus oryzae* (Rice weevil), *Oryzaephilus surinamensis* (Saw-toothed grain beetle), *Tribolium castaneum* (Red flour beetle), and *Plodia interpunctella* (Indian meal moth). *Sitophilus oryzae*, a bug that can devour whole grains, may be the main pest in storage products. As *O. surinamensis* and *T. castaneum* feed on the previously cultivated grain, they serve as secondary pests (Zulaikha, 2018). Similar to this, farmers in this area use chemical pesticides carelessly since they are uninformed of the proper management procedures to control these insect pests. There is minimal awareness among farmers of the new management techniques for the main insect pests (Bhandari et al., 2019). The haphazard application of chemical pesticides has also eliminated beneficial insects. To control insect pests safely, effectively and sustainably, strategies encouraging biological control are currently demanded (Lou et al., 2013).

2. METHODOLOGY

The study was conducted in Pyuthan municipality, rice zone implemented area. A total 80 samples were taken from 2500 rice growing farmers from software Rao soft. Simple random sampling was done for the selection of farm households. Data were obtained by sampling 80 rice farmers of Pyuthan municipality. Different wards of Pyuthan municipality were considered as a sampling location. 30 farmers from ward no 8, 20 farmers from ward no 7, 15 farmers from ward no 2 and 15 farmers from ward no 4 were taken as samples. The qualitative and quantitative data collected

Quick Response Code	Access this article online	
	Website: www.jtin.com.my	**DOI:** 10.26480/jtin.01.2024.30.34

Cite The Article: Miraj Paudel, Aruna Paudel, Ramesh Upreti (2024). Farmers' Knowledge And Perception On Major Insect Pests Of Rice And Its Management Practices In Pyuthan Rice Zone, Pyuthan. *Journal of Technology & Innovation, 4(1): 30-34.*

from the field were first coded and entered into MS-Excel. Data entry and analysis and it's for the result verification were done by using computer software packages like the Statistical Package for Social Science (SPSS), Microsoft Excel (2019). Indexing was done by forced ranking technique using formula (Jack Welch, 1980):

$$I_{imp} = \sum \frac{SiFi}{N} \quad (I_{imp} = 0 < I < 1)$$

I_{imp} = Index of importance

Si = scale value at i^{th} priority

Fi =frequency of i^{th} priority

N = total number of observation

3. Results And Discussion

3.1 Socio demographic characteristics

The research was conducted on a community where 61.25% were female, 16.25% of the respondents were illiterate and 87.5% of the respondents were involved in agriculture. The majority of the respondents i.e., 48.75% were of the age group 40 to 59. The average years of rice farming experience was found to be 40 years. Among the respondents only 8.75% had land holding more than 16 ropani with the average land holding being 8.9 ropani. Whereas, 100%, 96.25%, 60% respondents have access to electricity, communication and internet, respectively. 38.75% of farmers were found to be self-sufficient in food supply for more than 12 months and the irrigation system mainly composed of irrigation channel drawn from Jumrikhola River. Similarly, 86.25% farmers followed rice-wheat cropping pattern while 8.75% farmers cultivated rice wheat maize cultivation. Very few i.e. 2.5% farmers followed spring rice-main season rice-wheat and rice-soya bean cropping pattern. 46.25% of respondents store rice in storage Bin (Traditional Bhakari). The average rice productivity was found to be 3.34 mt per hectare with 43.75% respondents confirming their yield from 2.5 to 5 ton per hectare. 20% farmer responded that their yield was more than 5 ton per hectare while 36.25% had yield less than 2.5 ton per hectare. Similarly, for main season, Shankhar variety was the variety of choice for all the rice zone farmers while Hardinath and Sukkha dhan was the variety of choice in case of spring season rice.

3.2 Insect prevailing in the survey area

From the study, it was found that 80% of the respondents could recognize the insects prevailing in their field whereas 20% farmers could not recognize the insects. There was also the misconception of brown spot of rice as the cause of insects. The data of insects from non-recognizing farmers was taken by examining the diagnostic damage symptoms on the rice plant.

From the data it was found that majority of the respondents concluded that major insect prevailing in their rice field were Rice leaf folder *Cnaphalocrocis medinalis* (Lepidoptera: Crambidae), and Yellow Rice Stem Borer, *Scirpophaga incertulas* (Lepidoptera: Pyralidae). Similarly, some farmers also reported the presence of Brown Plant Hopper *Nilaparvata lugens* (Hemiptera: Delphacidae), Green Leaf Hopper *Nephotettix nigropictus* (Hemiptera, Cicadeliidae), and Gundhi bug *Leptocorisa oratoria* (Hemiptera, Alydidae).

Similarly, respondent farmers mostly reported Rice Grass Hopper, *Hieroglyphus banian* (Orthoptera: Acrididae), and Rice Caseworm *Parapoynx stagnalis* (Lepidoptera: crambidae) as their minor pest. Rice Hispa *Dicladispa armigera* (Coleoptera : Crysomelidae) and White Rice Stem Borer *Scirpophaga innotata* (Lepidoptera: Pyralidae) were also reported as minor pest in their field.

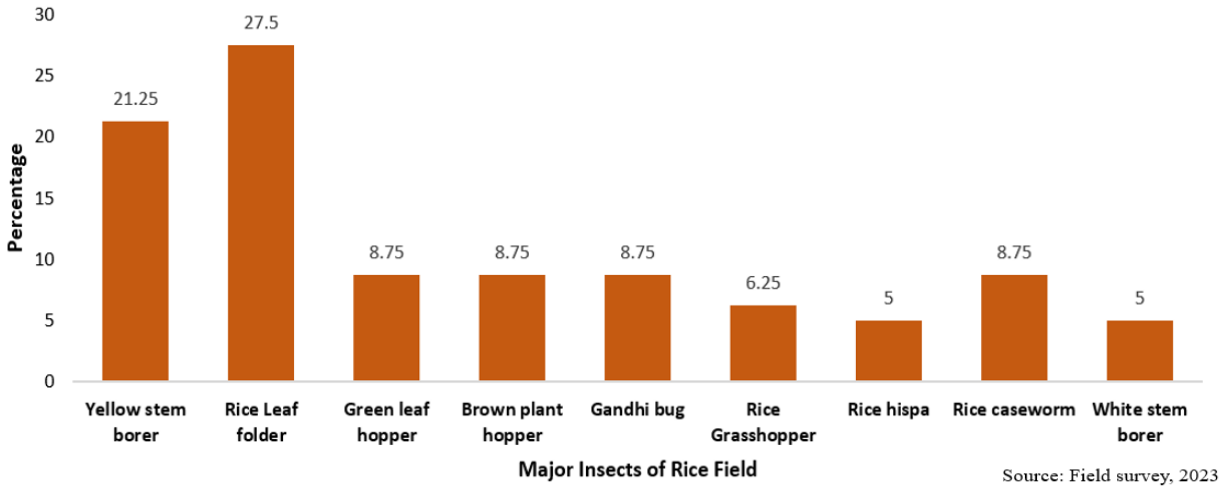

Figure 1: Insects in the field

3.3 Insects in storage

In the storage condition, Rice weevil and Rice Moth (Corcyra: Cephalonica; Lepidoptera; Gelechiidae) (52.5%) was the major problem in most of the respondent's storage condition followed by *Sitotroga cerealella, Sitophilus spp.* (Angoumois grain moth also commonly known as "rice grain moth". Few farmers also reported termites (*Microtermes anandi)* (Isoptera; Termitidae) in their storage room in damp places. 23.75% of farmers had no insect in their storage house.

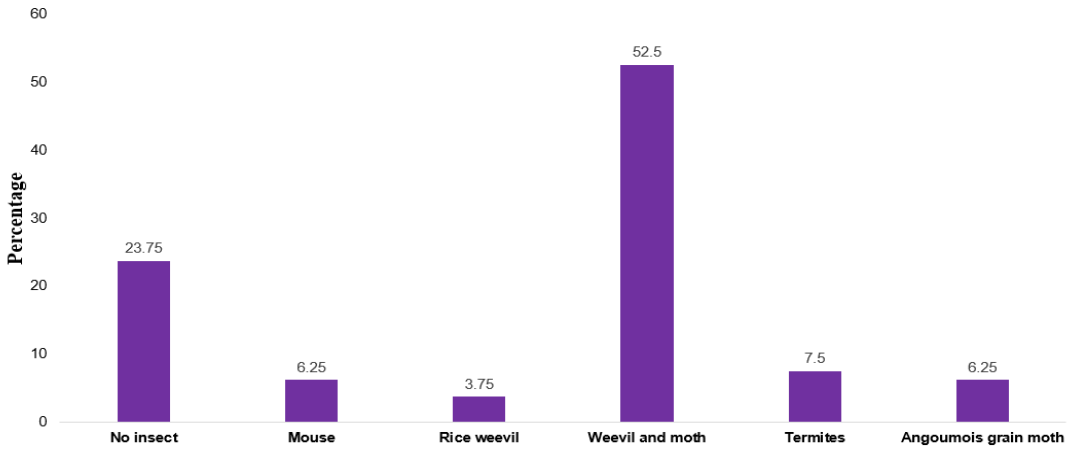

Figure 2: Insects in the storage

3.4 Ranking of growth stages to insect severity

From the data of insect damage severity with growth stage, the different growth stages of rice were ranked. The 2-months stage of rice was found to be most severe by insect damage followed by 1-month stage. The seedling stage was found to be ranked last. The high rank of 2-month stage corresponds to the major insect prevailing which was found to be Rice Leaf Folder folds leaf longitudinally and larva remains inside and scrap green tissue of the leaf which later become white and dry which reduces panicle initiation in later stage and Rice yellow stem borer which attacks at panicle initiation and shows high damage during milking stage of grain filling phase causing chaffy grain of rice.

Table 1: Ranking of growth stages to insect severity

Growth stage	0.2	0.4	0.6	0.8	1.0	Total	Index	Rank
Seedling stage	23	21	12	16	8	41	0.512	5th
1-month stage	8	15	22	17	18	52.4	0.655	2nd
2-months stage	5	11	25	27	12	54	0.675	1st
Harvest stage	8	22	24	24	2	46	0.575	4th
Post-harvest stage	19	10	20	18	13	47.2	0.590	3rd

Source: Field Survey, 2023

3.5 Management practices of insects

3.5.1 Methods of insect pest management

From the data it was found that the majority of the respondent farmers (73.75%) practiced chemical methods for management of insects in the field as it gave quick results. Similarly, it was found that use of biological pesticide (Jhol-Mol and other biological formulations) was carried out by only 33.75% farmers and Mechanical methods of pest control was carried out by only 16.25% farmers. Similarly, none of the farmers had adopted any integrated management practices (IPM) in the field for insect management. The main pesticide used was Nagraj-505 (Chlorpyriphos 50% and Cypermethrin 5% EC) which is a non-systemic and contact as well as stomach poison with yellow pesticide label and Metacide which is a biological formulation of *Metarhizium anisopliae* and for storage rice majority of respondents use Chelphos tablets.

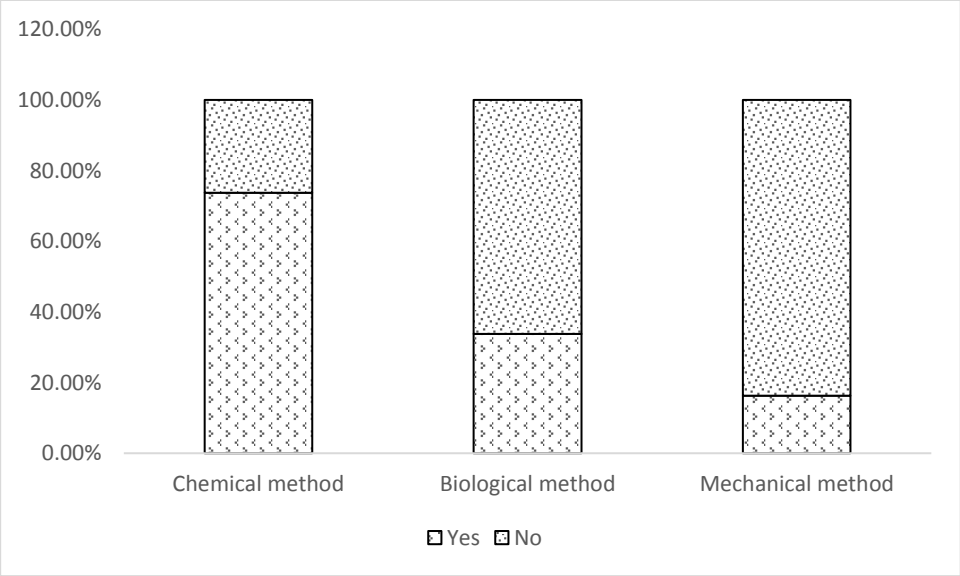

Figure 3: Management practices in field

3.5.2 Indigenous methods for insect management

From the data it was found that the majority of the farmers (60%) had not practiced any conventional methods and they relied totally on chemical methods for insect management while 40% farmers had been practicing some conventional methods along with chemical, biological or mechanical methods of pest management. Out of 40% respondents who practiced indigenous methods they had been using stick of *Ziziphus mauritiana* fruit with thorns which they sweep in the field to throw Leaf Folder and Caseworm in watery field so that they die.

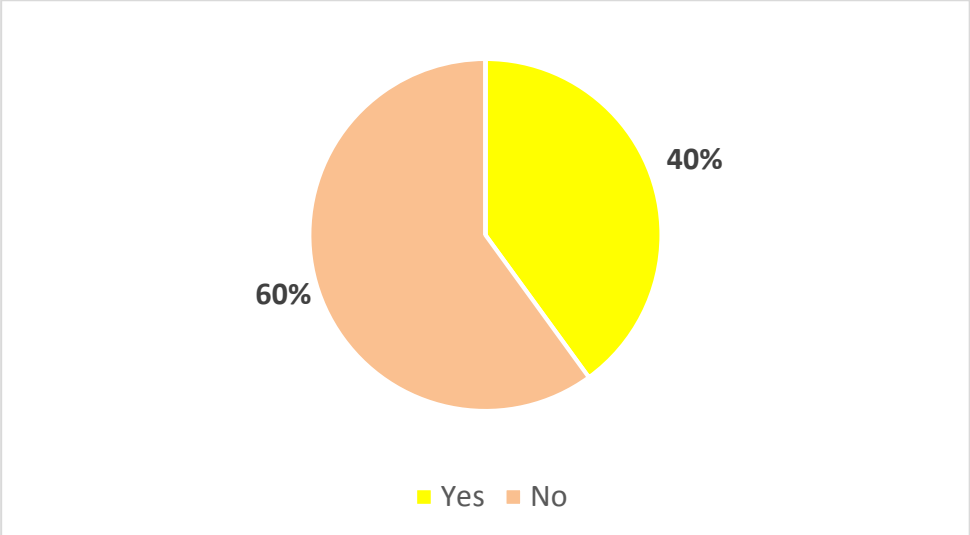

Figure 4: Indigenous methods for insect management

3.5.3 Ranking of effectiveness of different methods of insect pest control

The study identified the different management practices and ranked them according to their effectiveness from the data obtained from the respondents. The chemical method of control was ranked first which must be because of the immediate effect on insect population control followed by biological control while cultural control was ranked last probably because of the slow effect on population control. The innovative method was known only by few farmers which includes use of traps and poison baits.

Table 2: Ranking of effectiveness of different methods of insect pest control

Control method	0.2	0.4	0.6	0.8	1.0	Total	Index	Rank
Chemical	0	0	0	10	70	78	0.975	1st
Biological	0	5	38	29	8	56	0.700	2nd
Mechanical	1	15	34	20	0	42.6	0.532	3rd
Cultural	51	28	1	0	0	22	0.275	5th
Innovative	27	33	8	12	0	33	0.412	4th

Source: Field Survey, 2023

3.5.4 Farmer's common practices of pesticides use and sources

Regarding the purchase of pesticides by the respondent farmers, 88% of the total respondents purchased chemical from the Agro-vet of Nepal, and 12% used the pesticide purchased from neighbors. There was provision of co-operatives to sell pesticide but it was mostly limited to the members of co-operatives.

With regard to source of advice for insect management in rice field, most of the rice cultivating farmers (66.25%) followed the advice of agro-vet and the least 23.5% of farmers took the advice of PMAMP, PIU Pyuthan while 10% farmers took the advice from asking to their neighbors.

3.5.5 Knowledge on pesticide effects and safety measures

Most of the rice cultivators of the Survey area used pesticide to manage pests in their field. Most of the farmers (75%) were well known about the harmful effect of the pesticides on human health and environment and also understood about bio pesticides available in the market while 25% of the farmers knew pesticide causes harm to health but were not informed on the effects on human health. With regard to use of bio-pesticides, they refused to use it because of its slow impact.

All the farmers used masks for safety precaution for pesticide spray but only 22.5% farmers used covering clothes and only 10% farmers used glasses for protection.15% of the farmers were found using gloves along with masks for safety measures.

The farmers who knew about the harmful effects of pesticides could only tell about the effects on human health and environment. Majority of respondents could say skin cancer as health hazards while some said respiratory illness, headache eye problem and minority farmers could tell of blood cancer. Some of the environment hazard cause due to harmful effects of pesticide are migration of bees.

3.6 Farmer's perception

3.6.1 Farmer's perception on pesticide importance

Chemical pesticides were frequently employed by farmers in the study region in their fields because they provided immediate effects and they depended entirely on chemical pesticides for bug and folder control in the field. Apart from the use of chemical methods, very few farmers used Jhol-Mol, and Metacide for pest management along with chemical methods. Pesticides have been increasingly popular in the field in recent years, owing to their rapid reaction.

The study showed that 50% farmers perceived they couldn't stop using pesticides in their field and storage conditions while 31.25% farmers used them as a supplement with other techniques and only 18.75% farmers believed although they used pesticides in their field, they aren't important and can switch to other methods without observing any drop in productivity.

From the data it was found that 75% of respondents had not heard about IPM practices while only 25% farmers had heard about IPM. Of the respondents who had an idea about IPM only 27.83% farmers had known about it while 72.17% farmers who had heard about IPM hadn't known about it. The main reason being not adopting IPM practices can be related to less information about IPM as the training for insect pest management was found to be minimal. Similarly, delay action of IPM practices can be the main reason for its less adoption as IPM works to control the population below economic threshold instead of completely eradicating the insect pests from the field and storage conditions.

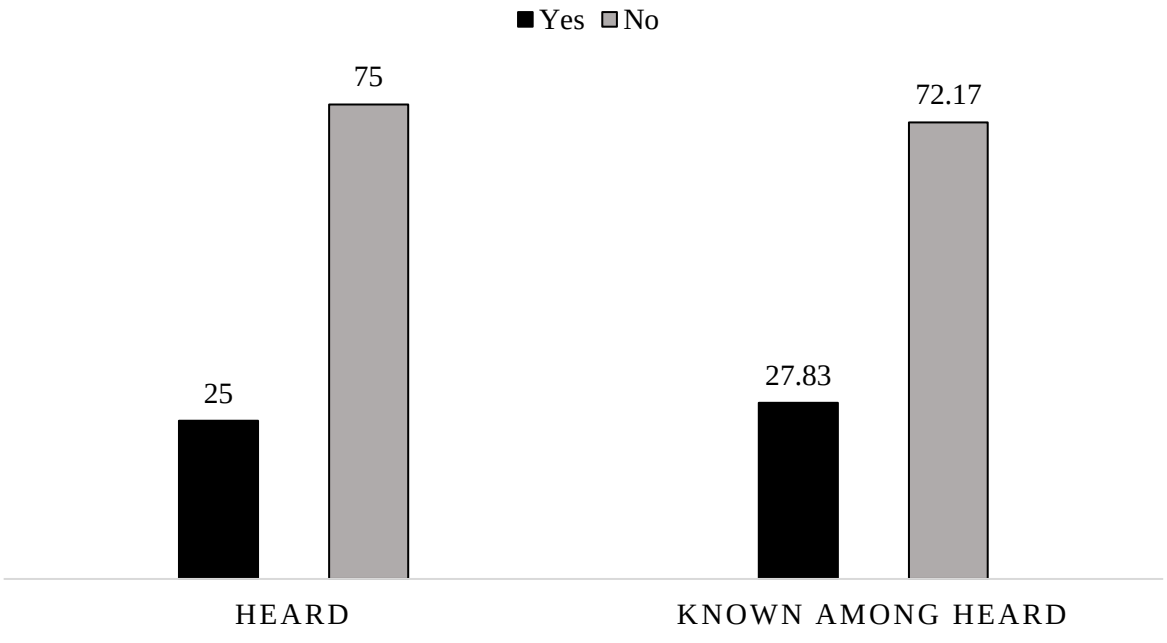

Figure 5: Distribution of respondents by knowledge on IPM

4. Conclusion

Based on the experiences gained from the present investigation, the following conclusions were made which could be considered for pursuing future research in the field with improvement in present insect management practices.

The survey revealed that very few respondents had high school education but the majority of them were involved in agriculture with majority of the age group between 40 to 59. This points out the fact that farmers are not in touch with the modern farming and insect management approaches similarly they were also unaware and reluctant to adopt IPM strategy.

The major insect pest in the rice field were found to be rice leaf folder and rice yellow stem borer in field while major storage pest were Rice Moth and Rice Weevil . Majority of the respondents found insect infestation to be increasing in recent years. Approaches for pest control during the high severity growth stage of 2-month and post-harvest control should be improved. Majority of the respondents adopted chemical methods for management while only a few choose botanical, mechanical and conventional methods along with the chemical pesticides. More than two-third of the respondents were ignorant towards the hazards of irrational use of chemical pesticide and a very few of them were using proper precautionary measures for pesticide application. Few farmers did self-random improper dosage estimations. Less than one fourth of the respondents had any idea about the IPM approach and none of them practiced it in the field, this calls for immediate steps forward from the concerned authorities to take necessary measures to change the perception of the farmers towards irrational use of chemical pesticide.

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