

# Documentation of Indigenous Knowledge of Pest Control for Paddy Cultivation in Murshidabad District of West Bengal

Ali Ahammad Taher Hasan\*<sup>1</sup> and Sabuj Kumar Chaudhuri<sup>2</sup>

<sup>1</sup>Kabi Nazrul College, Murarai, Birbhum, West Bengal, India

<sup>2</sup>Department of Library and Information Science, Calcutta University, Kolkata, West Bengal, India

\*Corresponding author: aathlibrarian@gmail.com (ORCID ID: 0000-0002-3666-7558 / 0000-0001-7785-8994)

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## ABSTRACT

This study aims at documentation of Indigenous Knowledge of plant protection in paddy and their practice among the farmers in Mursidabad district of West Bengal. This study was conducted in sixteen Community Development Blocks in the said district. Old and experienced farmers from the villages were randomly selected and interviewed for data collection. The farmers and the villages were purposively and randomly selected and interviewed. A total number of 14 Indigenous Knowledge have been found. Mostly the old farmers still use their knowledge for pest control in paddy, while the young farmers generally rely on the chemical pesticides that are readily available in the market. They are more concerned with production and not the hazards caused by the use of pesticides. As the young generation of farmers are not interested in the traditional knowledge, they are likely to be forgotten very soon after the death of these old farmers. So, these traditional knowledge should be properly documented.

## Highlights

- ① In Murshidabad 14 indigenous knowledge of pest control in paddy farming have been identified.
- ② Mostly the old farmers still use these traditional knowledge of pest control in paddy.
- ③ But the young generation is not interested in ITKs.
- ④ Scientific documentation and promotion of these knowledge is a must lest they are lost forever

**Keywords:** Indigenous Knowledge, Plant protection, pest control, chemical pesticides, sustainable development

India lives on agriculture and agriculture proves to be the lynchpin for the development of Indian economy. According to the latest update on June 2017, India's GDP from agriculture reached an all time high of 5468.54 INR billion which is nearly 18% of India's gross GDP. But insect pests in agriculture is one of the major concerns in Indian agriculture, in fact for agriculture throughout the world. India suffers an annual loss of approximately US\$42.6 million because of insect pests (Singh T.V.K. *et al.* 2014). As it has been previously stated that agriculture plays an important role in Indian economy, pesticides also play a very important role in ensuring food security for more than 1.27 billion population.

In 1966 the green revolution had started. Since then the use of external inputs like chemical fertilizers and synthetic pesticides in agriculture increased more than hundred times (Bhardwaj, Tulsi, Sharma, J.P, 2013). This increased, injudicious and indiscriminate use of pesticides has resulted in tremendous loss to environment and human health. Pesticides adversely affect the microorganisms in soil responsible for nitrification (Das, Arunava *et al.* 2015). Now pesticides are found to be the common contaminants in the biosphere. Along with the target, pesticides also affect beneficial soil microorganisms, natural enemies to insect pests, fish, birds and other wildlife. There is always the risk of the contamination of river, lakes, ponds and



even the public water supply. Even the produces i.e., the crops are not free of contamination because these crops retain some amount of toxins even after the harvesting is done. These crops act as the slow poison for us both human beings and animals. When we consume such produces we fall prey to several diseases like fatigue, brain disorder, skin diseases, blood disorder, liver and kidney damage, nausea, reproductive damage, breathing problems and cancer. Farmers who come in direct contact to the pesticides at the time of using or spraying pesticides are at the greatest risk because there is every possibility of absorbing toxic level directly into their bodies. For example in a research conducted by Centre for Science and Environment (CSE) at the agricultural heartland of Punjab, alarmingly high level of pesticides in blood samples of farmers of Mahi Nangal, Jajjal, Balloh and Dher were found (Menon, Ramesh 2005). It was also found that pesticide DDE residues in those blood samples were 35 times higher than in blood samples drawn by Centre for Disease Control and Prevention. US<sup>6</sup>CSE found six-thirteen pesticides virtually in all blood samples collected from the above mentioned villages of Bhatinda and Roper in Punjab. Some of the common pesticides they found in blood samples were HCH, Aldrin, DDT, Monocrotophos, Endosulfan, Malathion etc (Menon, Ramesh 2005). More recently The Indian Express reported that in Yavatmal 18 died and over 800 farmers were hospitalized due to pesticide contamination. According to a doctor on duty, "The damage has been caused by excessive inhalation of organophosphate and organochloride groups of insecticides, which first enter the fat below the skin, and then the blood. Patients have to be treated with Atropin drug which causes psychosis and patients have to be tied to the bed if they become restive." (Deshpande, Vivek, 2017).

So, the current trend of using pesticides is not sustainable at all. Here lies the importance of Indigenous Knowledge of the farmers which is eco-friendly and a key to long term sustainability because farmers mainly use indigenous ecological or biological resources for pest control. On the other hand existing methods of pest control using chemical pesticides have marginal impact on the productivity of the resource poor small-holder farmers who constitute the major segment of

agriculture in India, especially in West Bengal. The pesticides available in the market are so costly that the smallholder farmers profit next to nothing after leaving the cost of pesticides and fertilizers. In this situation traditional knowledge of pest management accrued over generations may be extremely helpful and profitable for the concerned farmers and the environment and in short for the whole world.

### **Traditional knowledge**

From the very beginning of human civilization human beings have developed a knowledge base to satisfy his daily needs. He invented the fire and wheel and never looked back. Inventions came one after another and after each invention the wheel of human civilization is rolling faster and faster. In course of time we have set aside our great ancestor's knowledge based on their close proximity with nature, insights, beliefs and practices. They accrued those knowledge over generations through trial and error methods and implemented them to satisfy their needs. We identify their knowledge as 'Traditional Knowledge', 'Indigenous Knowledge', 'Folk Knowledge' and 'Local Knowledge'. It is the social capital of the indigenous people and the main asset to invest in their struggle for existence in the world where there are intrusion of modern technologies and development concept in all walks of life (Senanayake S.G.J.N. 2006).

In Oxford English Dictionary "indigenous" means "belonging to a place, native". So, Indigenous Knowledge may be defined as the knowledge belonging to a particular geographical area.

IK is "unique, traditional and local knowledge existing within and developed around specific conditions of women and men indigenous to particular geographical area" (Grenier 2009).

Traditional Knowledge belongs to indigenous people of different geographical area of the world with their own language, culture, tradition, belief, folklore, rites and rituals (Chhetry and Belbehari 2009).

Warren and Cashman (1988) explained IK as "the sum of experience and knowledge within a given group that form the basis or decision making related to familiar and unfamiliar challenges and problems".



| Types            | Insects Name             | What It Does   |
|------------------|--------------------------|--|
| Borer Pests      | Yellow Stem Borer        | It is a deep water rice pest. It damages the plants from seedling to the maturity stage. It causes deadhearts or drying and whiteheads of the central tiller at vegetative and reproductive stages respectively. |
|                  | Gall midge or Gall fly   | When it attacks the plant the central shoot takes the shape of a tube. The growth of the plant is stunted and the seed heads are not developed.  |
|                  | Green Leaf Hopper        | Growth is stunted and vigor reduced, leaves turn yellow-orange, plant withers or dies completely.  |
| Sucking Pests    | White leaf Hopper        | Leaves and plants turn yellowish, growth is retarded. It indirectly causes Tungro  |
|                  | Brown Plant Hopper       | Found in rainfed and irrigated wetland environment. Causes hopperburn. Also responsible for Rice Ragged Stunt and Rice Grassy Stunt diseases.  |
|                  | Earhead Bug (Gundhi bug) | Damages the developing grains by sucking out the content at the milking stage resulting in empty or unfilled grains and discolored grains.   |
|                  | Thrips                   | Curling and discoloration of leaves. Leaf tip withers causing unfilled grains at panicle stage.  |
| Defoliator Pests | Leaf roller              | Attacks seedlings and young plants. Lives on green matter of the tender leaves, leaves turn white. Prevents photosynthesis.  |
|                  | Caseworm                 | Cuts off the tip of the leaves at right angles.  |
|                  | Swarming caterpillar     | Cuts off the leaf tips, leaf margins and even the plants at the base.  |
|                  | Hispa                    | Found in rainfed and irrigated wetland environment. Scrapes green matter of the upper surface of the leaf causing white streaks on the leaves. Ultimately the leaves dry up.                                     |
| Non insect pests | Blue Beetle              | Scrapes green matter of the leaves.  |
|                  | Rat                      | Chops young seedlings, cuts the plant panicles as they feed on the developing grains. Water is not retained in the field because of the burrow made by the rats.   |
|                  | Crab                     | Cuts seedling at ground level. Water drains away through a series of burrow made by the crabs.   |

## Insect Pests in Paddy

Rice is attacked by more than 100 species of insects and more than 40 diseases of fungal, bacterial and viral origin are responsible for low yield of rice throughout the globe (Singh, Prakash *et al.* 2014). The commonly found pests are classified as Borer Pests, Sucking Pests, Defoliator Pests, and Non-insect Pests.

## MATERIALS AND METHODS

### Study area

Murshidabad district of West Bengal lies between 23°43'N and 24°52'N latitude and 87°49'E and 88°44'E longitude with HQ at Berhampur. Agriculture is the primary occupation of the people here and Paddy is their predominant crop. The study was conducted in sixteen Community Development Blocks of Murshidabad namely Khargram, Kandi, Barwan, Bharatpur I, Bharatpur II, Sagardighi, Raghunathganj I, Raghunathganj II,

Domkal, Lalgola, Nabagram, Samserganj, Suti I, Suti II, Murshidabad-Jiaganj and Farakka during kharif season in 2016 -2017.

### Details of study

The study was conducted among 140 farmers of the said sixteen Community Development Blocks. Respondents were divided into three age groups of up to 30 years, 31 to 50 years and 51 years and above for a comparative analysis of the use of chemical methods of pest control and traditional methods of pest control in paddy fields. All the information were recorded in a structured questionnaire.

### Data analysis

Identified Traditional Knowledge (TK) regarding pest control have been categorized in three groups namely during storage of seeds, during raising nursery and in the main field and the rationality behind each TK have been given in Table 1 and in Table 2 percentage distribution of respondents



according to the extent of use of Traditional Knowledge of Pest Control age wise has been analyzed.

## RESULTS AND DISCUSSION

### Identified TKs and their rationality

Table 1 Fourteen ITKs relating to pest control in paddy once practiced and still being practiced in the study area have been identified. These are presented in the following table.

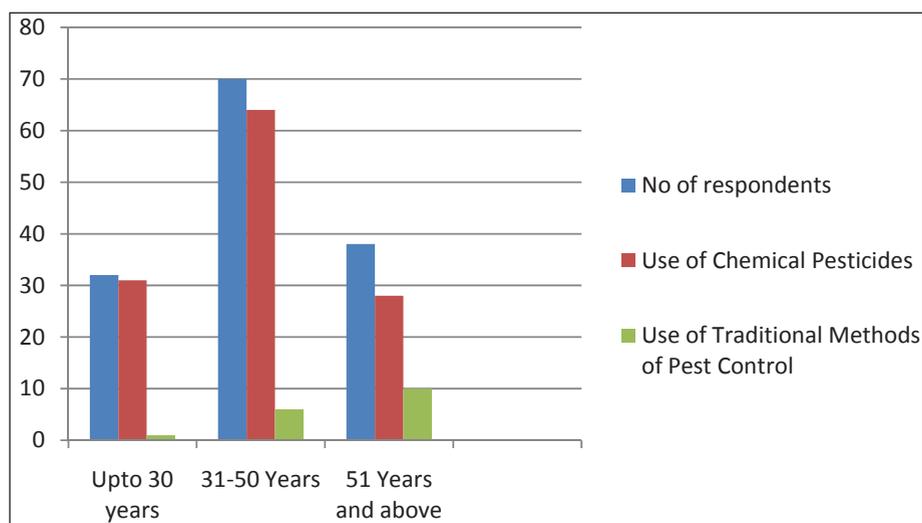
Table 2 shows that out of 140 respondents 121(86.428%) use chemical pesticides, while only 19 (13.572%) use Traditional methods of pest control in their paddy fields. Farmers in the age group of up to 30 years and 31-50 years heavily rely on chemical pesticides. But farmers in the age group of 51 years and above still try to use their own knowledge of pest control though the percentage is only 26.315%. The above data is presented in the following figure (Fig. 1).

**Table 1**

| Sl. No.                                 | Identified ITKs   | Rationality   |
|---|---|---|
| <b>During storage of seeds</b>          |   |   |
| 1                                       | Often seeds are stored in earthen pots.   | Earthen pots protect seeds from moisture and attack of non insect pest like rats.                                       |
| 2                                       | Nishinda leaves or neem leaves are placed with the stored seeds   | Nishinda has toxic effect. Neem is also known to have insect repellent property.  |
| <b>B Pest Control in Nursery</b>        |   |   |
| 1                                       | Application of silica or dust mixed with kerosene in the nursery  | It drives away paddy leaf roller  |
| 2                                       | Use of pieces of cloths or polythene tied in a rope and hanged crisscross over the nursery to drive away birds  | Polythene pieces make sound and birds get scared.   |
| 3                                       | Placing scare crow in the nursery   | Birds take the scare crow for a man and fear to come close to the nursery   |
| Sl. No.                                 | Identified ITKs   | Rationality   |
| 4                                       | Use of discarded audio or video tapes over the nursery  | The audio tape is very light and with little wind it makes sound enough to drive away birds                             |
| 5                                       | Use of net around and over the nursery  | Non insect pest like birds and goats cannot reach the nursery   |
| 6                                       | Often people having land adjacent to their home use that land as a nursery for better care. But Birds like hen, duck etc. eat up the seeds. So in the nursery they place an empty can tied up with a bamboo and a long rope, which can be pulled by everyone at home from young to old every now and then to make some noise. | The sound thus made drives away birds.  |
| <b>C Pest Control in the Main Field</b> |   |   |
| 1                                       | Use of neem leaves during the preparation of the main field   | Neem leaves fertile the land and its bitter taste drives away some insects at the onset of the cultivation.             |
| 2                                       | Spraying cow dung slurry in the field adjacent to villages  | Cows and goats etc. do not touch paddy plants because of the foul smell of the cow dung slurry.                         |
| 3                                       | Application of kerosene in standing water of the paddy field  | It drives away Hispa probably because of the odor of the kerosene oil.  |
| 4                                       | Application of the dilution of Neem leaves, garlic and 'khaini'(Nicotiana tabacum)  | Generally farmers use this dilution to prevent paddy pests attack. This is a precautionary measure.                     |
| 5                                       | Burning straw, rejected tyres, or cloths dripped in kerosene  | It kills nocturnal insects especially 'gundhi' bug. Insects are attracted by fire and hence they jump into it.          |
| 6                                       | Placing branches of tree in the paddy field   | Prey birds come and perch on the branch placed in the field and catch rats. Thus paddy field is saved from the rodents. |

**Table 2:** Percentage distribution of respondents according to extent of use of Traditional Knowledge of Pest Control age wise

|                    |            |                     |                    |                  |
|--------------------|------------|---------------------|--------------------|------------------|
| Upto 30 years      | 32         | 31(96.875%)         | 3(3.125%)          | 32               |
| 31-50 years        | 70         | 64(91.428%)         | 6(8.572%)          | 70               |
| 51 years and above | 38         | 28(73.685%)         | 10(26.315%)        | 38               |
| <b>Total</b>       | <b>140</b> | <b>121(86.428%)</b> | <b>19(13.572%)</b> | <b>140(100%)</b> |

**Fig. 1:** Age wise comparison of the use of chemical pesticides for controlling pests and the traditional methods of pest control

## CONCLUSION

The documented indigenous knowledge of pest control in paddy cultivation should be promoted as an alternative to pesticides among the young generation of farmers for the sake of sustainable development of agriculture. As it has been noticed that mostly the old farmers are interested and it is only them who utilize this knowledge which is likely to be forgotten very soon after their death. So, all the available TK in agriculture should be preserved, documented and promoted. This may serve as the ready reference for agricultural scientists for further research for developing eco friendly, economically viable and sustainable agricultural technology.

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