



E-ISSN: 2320-7078

P-ISSN: 2349-6800

www.entomoljournal.com

JEZS 2020; 8(2): 1572-1574

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Received: 04-01-2020

Accepted: 06-02-2020

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A case study: Traditional methods of insect-pest and plant diseases management in Bundelkhand region of Madhya Pradesh

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Abstract

Indigenous technical knowledge refers to the local knowledge that is unique to a given culture or society. To identify the most popular ITK practices, 600 farmers interviewed in 108 villages in for districts of Bundelkhand region of Madhya Pradesh to share their experiences. Farmers of Chhatarpur district, treated ginger and turmeric seed by the solution of fresh cow dung (1 kg cow dung in 5 liter water) for the management of soil and seed borne disease and better germination. The farmers of betelvine growing area, applied sesame, mustard and neem cake for the control of soil-borne disease. The farmers of Sagar district treated 30 kg seed of chickpea with 05 gm Heeng (Asafoetida) + 200 gm Salt mixed in one liter of Butter milk (Whey) for the management of wilt disease of Chickpea. Seeds of pulses treated with cow urine for the protection of soil borne fungi and better growth.

One kg dried Chilli powder with equal quantity of garlic mixed with 200 liters of water is effective to control leaf defoliating insects, thrips, aphids and jassids. Management of insect pests of vegetable crops through *Nicotiana tabacum* (tobacco) + Onion extract specially thrips and white fly. Cultivation of coriander on the bunds of cauliflower and cabbage field is a popular practice in the Bundelkhand region for the management of DBM. Farmers make dusting of ash with Karosin (50 ml Karosin with 1 kg ash) over and around the vegetable crops like onion, okra, brinjal, tomato and cucumber to protect these crops with leaf defoliating insects, leaf miners, thrips, aphids and specially red pumpkin beetle. Farmers of Chhatarpur and Tikamgarh district, mixed used oil of tractor and engine oil with water and drench in soil to protect wheat and other crop from termite. Some farmers used to cultivation of marigold with solanaceous vegetable crops are effective to the management of bacterial wilt. Farmer of Tikamgarh district mixed neem leaves @ 4-5 kg / quintal and seed of Sitalfal @ 2-3 kg / quintal in stored wheat grains and mixed mustard oil or ash with pulses to protect from pulses beetle.

Keywords: ITK, Indigenous traditional knowledge

Introduction

Economically important agricultural, horticultural and ornamental crop plants are attacked by various insect pest and pathogens resulting crop losses. Presently, the most widely used control measures for suppressing the pest and pathogens is the use of pesticides. However, problem encountered, such as development of resistance by the insect pest and pathogen to the pesticides, and requirement of repeated applications, added to the increase cost of chemical have given impetus to alternative measures for control of insect-pest and plant disease. The application of chemicals for pest control leads to food poisoning, soil, water and environmental pollution. These chemicals create ecological imbalance and allow insect-pest to develop resistance. At these moments, an indigenous knowledge related to plant protection in agriculture would play vital role. The use of non-chemical methods for pest control and crop protection is already gaining importance in several countries including India. The integrated pest management strategies developed and promoted by the Governments is now based on the use of plants extracts. If an effort is made towards production of Indigenous Technical Knowledge (ITK) based products on cottage scale, it can be an economically viable option for sustainable development of eco-friendly pesticides/insecticides.

Indigenous technical knowledge refers to the local knowledge that is unique to a given culture or society. It is the basis for local-level decision-making in agriculture, natural resource management, health care, food preparation and several other activities in rural communities. This knowledge system is usually not found in written form and is transmitted from generation to generation through word of mouth.

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It includes concepts, belief and perception and usually found in various folk forms (Kareem, 2008) [4].

In the present agriculture scenario, insecticides, fungicides, herbicides, etc. are being used in large quantities in field crops, vegetables, and orchards. Due to the imbalanced and excessive use of chemicals on large scale, fields are becoming barren and infertile leading to decline in productivity. On the other hand, in the indigenous technique there is no or little use of chemicals because of the farmer's eco-friendly attitude; it is less expensive, has subsidiary benefits, results in less insect pest and disease incidence in crops, and leads to long-term sustainability of soil and crop productivity (Sundamari and Rangnathan, 2003) [9]. Therefore, realizing the importance of ITK, the popular ITK practices prevalent in Bundelkhand region of Madhya Pradesh in Central India have been documented.

Materials and Methods

The study was carried out in four districts of Bundelkhand region of Madhya Pradesh during 2014 to 2018. An interview schedule was developed to collect the information about different traditional methods that are performed to control insect pest and plant diseases. Some of the information regarding traditional methods of house hold pest control, especially of storage grains was collected from farmwomen. The interview taken from farmers and farmwomen during diagnostic field visit and Krishi Mahotsava programme of Govt. of Madhya Pradesh to the villages through meetings, group discussions, interaction with villagers (including elderly persons) and also exploring such knowledge by traveling in remote/interior areas in Chhatarpur, Sagar Tikamgarh and Panna districts. For the documentation most popular ITK practices, 600 farmers contacted in 108 villages to share their experiences. The most popular ITK practices for insect pest and disease management recorded as per methodology (Dubey *et al.*, 1993) [3]. All traditional knowledge is not indigenous but all indigenous knowledge is traditional.

Results and Discussion

ITKs used in the management of plant disease

- Farmers of Chhatarpur district, treated ginger and turmeric seed by the solution of fresh cow dung (1 kg cow dung in 5 liter water) for the management of soil and seed borne disease and better germination. Use of cow dung for dressing seeds, plastering cut ends of vegetative propagating units such as sugarcane setts, dressing wounds, sprinkling as a diluted suspension on plants and applying to soil has been indicated since the time of Kautilya (c. 300 BC). Cow dung have emulsifying properties, when it applies on seed, a thin dry layer of cow dung acts as blotting paper and readily absorbs moisture from the surrounding soil, which is to the advantage of the seed. The presence of bacteria in the cow dung residue contains cellulose; hemicellulose and pectin fermenters and these may antagonize potential pathogens ready to attack the seed (Nene, 2006) [8].
- The farmers of betelvine growing area, applied sesame, mustard and neem cake for the control of soil-borne disease i.e. Sclerotial wilt and root rot in betelvine. Farmers of Tikamgarh District used Neem cake and Karanj cake for the control of soil-borne disease and nematode in vegetables. The present ITK is supported by (Singh *et al.* 2010) [10].

- The farmers of Sagar district treated 30 kg seed of chickpea with 05 gm Heeng (Asafoetida) + 200 gm Salt mixed in one liter of Butter milk (Whey) for the management of wilt disease of Chickpea. Typical asafoetida contains about 40–64% resin, 25 % endogenous gum, 10–17% volatile oil, and 1.5-10 % ash. It is well known antimicrobial use since time immemorial. Butter milk also having number of beneficial bacteria and it helped in reducing harmful pathogens/ microbes in the soil. Application of salt slightly maintains the soil pH which may be reduced the harmful microbial population. Butter milk having antifungal properties (Nene, 2006) [8] and Asafoetida worked as biopesticide (Sridevi and Sridhar, 2006). [11]
- Some farmers used to cultivation of marigold with solanaceous vegetable crops are effective to the management of bacterial wilt. Seeds of pulses treated with cow urine for the protection of soil borne fungi and better growth. These ITKs are supported by the documentation of popular ITK at West Bengal (Shubhendu Roy *et al.* 2015) [13].

ITKs applied in the protection of insect pest in standing crops as well as storage

Pest control refers to the regulation or management of a species defined as a pest, usually because it is perceived to be harmful to a person's health, the ecology or the country. The following insect pest management were identified and documented as per information given by the farmers.

- One kg dried Chilli powder with equal quantity of garlic mixed with 200 liters of water is effective to control leaf defoliating insects, thrips, aphids and jassids. The biopesticidal properties of Chilli, garlic and Ginger also documented (Sridevi and Sridhar, 2006). [11]
- Management of insect pests of vegetable crops through *Nicotiana tabacum* (tobacco) + Onion extract specially thrips and white fly. For this purpose they used 500gm tobacco leaves and twigs are boiled in 10 liters of water for 30 min. After cooling, one 100 ml extract of Onion mixed with 150 liter of water for one acre area. Tobacco leaves having insecticidal properties (Rajput (2018). [9]
- Cultivation of coriander on the bunds of cauliflower and cabbage field is a popular practice in the Bundelkhand region. As per farmers view, the coriander crop helped in controlling of DBM and other defoliators. Such type of ITKs are also documented by Vivekanandan (1994) [11].
- Farmers of District Chhatarpur put petrol dipped cotton with wheat grains for the management of stored pest while Farmer of Tikamgarh district mixed neem leaves @ 4-5 kg / quintal and seed of Sitafal @ 2-3 kg / quintal in stored grains. Neem powder is commonly used for seed conservation and protection in Uttarkashi and Himalaya region (Mehta *et al.* 2012). [4]
- Pulse beetle is a key stored pest of pulses in Tikamgarh and Sagar district. Farmers of the districts, mixed mustard oil with pulses or ash or sand with pulses to protect from pulses beetle. Neem leaves also mixed with pulses and wheat for safe storage. Some farmer also placed Red pepper (*Capsicum* Sp.) and Salt (NaCl) in the bags of rice to protect the grains from stored grain pests. Eucalyptus wood ash is also added with paddy to protect seeds during storage in Tikamgarh district. Neem leaves and neem oil worked as protestant during storage of pulses in Maharashtra (Devanand and Kamala, 2017). [2]

Red pepper is also protecting grains from storage pest during storage (Nene, 2006)^[8].

- Farmers make dusting of ash with Karosin (50 ml Karosin with 1 kg ash) over and around the vegetable crops like onion, okra, brinjal, tomato and cucumber to protect these crops with leaf defoliating insects, leaf miners, thrips, aphids and specially red pumpkin beetle. It is the cheapest practice for small farmers in whole Bundelkhand region. Karosin works as repellent and ash acts as a detergent by which, chewing and sucking type of insects, find it difficult to chew plant parts due to deposition of ash. Ash is dusted on the germinated paddy nursery before the occurrence of heavy rain in Panna district. This practice prevents toppling of seedlings and also accumulation of seedlings on one side. Ash particles are hygroscopic; absorb moisture from insect eggs and spores; interfere with insect feeding; ash potassium interacts with surface fats potassium interacts with surface fats and thus useful in plant protection (Nene, 2006)^[8].
- Farmers of Chhatarpur and Tikamgarh district, mixed used oil of tractor and engine oil with water and drench in soil to protect wheat and other crop from termite. It makes a film near root zone and the crop protect from termite. Some farmers used cobs of maize as feed of termite and after sufficient population present in the cobs they burned these cobs. The farmers of all the districts treated seed by cow urine for the management of termite and wilt. Insecticidal and fungicidal properties of cow urine is well documented (Khanuja *et. al*, 2003)^[5].

Conclusions

Indigenous information systems are dynamic and are continually influenced by internal creativity and experimentation as well as by contact with external systems. ITKs are eco-friendly management of insect pest and plant diseases which will be widely accepted by the farmers. Every component of above ITKs are available at village level and also economic. The application of chemicals for pest control leads to food poisoning, soil, water and environmental pollution. These chemicals create ecological imbalance and allow insect-pest to develop resistance. At these moments, an indigenous knowledge related to insect pest control in agriculture would play vital role as per farmers view of Bundelkhand region.

Today, many ITK systems are at risk of becoming extinct because of the rapid changing natural environment and fast paced economic, political, and cultural changes. Many practices have vanished as they became inappropriate for new challenges. However, a number of practices disappear only because of intrusion of foreign technologies or development concepts that promise short-term gain or solution to problems without being capable of sustaining them. The indigenous technical knowledge (ITK) covers a wide range of subjects, viz. crop production, livestock rearing, natural resource management, food preparation, healthcare, insect pest management and many others. The integrated pest management strategies developed and promoted by the Governments is now based on the use of plants extracts. If an effort is made towards production of Indigenous Technical Knowledge (ITK) based products on cottage scale, it can be an economically viable option for sustainable development of eco-friendly pesticides/insecticides.

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