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ARTICLE

INSECT PEST MANAGEMENT AGAINST RICE BUG LEPTOCORISA USING TRADITIONAL METHODS

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Abstract

Agricultural crops are susceptible to attack by several insect pests. In recent years, easily degradable botanical pesticides are a significant alternative method adopted to minimize or replace the use of synthetic pesticides as an effective controlling measure. The secondary metabolites are used as Plant Based Insecticides (PBI) or botanicals in a defensive manner from time innumerable in the world. This Indigenous Traditional Knowledge is gaining increasing attention now a day. About 2400 plant species have been reported to possess pesticidal properties. The rice bug, *Leptocorisa spp* (Insecta: Hemiptera: Alydidae, commonly called as 'chazhi' belongs to the family *Alydidae*, is a serious pest of many crop plants especially rice. Heavy infestation of this pest can result in total loss of the crop. In India, the pest has been reported to cause 10 to 40 per cent yield loss. Research conducted all over the world shows that bioactive compounds from medicinal plants are a potent molecule for the management of *Leptocorisa*. More than twenty plant based traditional knowledge have been identified from the rural and tribal community of India, which they are using against this pest from generations. The present review is to shed light on the current status of indigenous traditional knowledge amalgamating with scientific studies for the effective management of the serious pest-*Leptocorisa*.
Keywords: Botanicals; Indigenous traditional knowledge; *Leptocorisa*; Pest management

Introduction

Agricultural crops are attacked by many insects and pests. Due to higher dose and repeated frequency of application, every year one million people suffer from pesticide poisoning[1]. Therefore, it has now become necessary to search for the alternative means of pest control, which can minimize the use of synthetic pesticides. Integrated Pest Management (IPM), emphasizes the growth of a healthy crop with the least possible disruption to agro-ecosystems and encourages natural pest control mechanisms. Plant based insecticides (PBI) or botanicals are the important alternatives to minimize or replace the use of synthetic pesticides. The basic knowledge about many valuable plants comes from our ancestors. Indigenous Traditional Knowledge is the knowledge that we inherited from our ancestors, unique to a culture, society and environment. Since, well documented information on ITK is often not available; the knowledge is transferred from one generation to next generation. Traditional wisdom offers solution to many of the problems posed by the pests.

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The rice bug, *Leptocorisa* spp also known as gundhi bug,ear head bug or commonly called in Kerala as "Chazhi," is a serious pest of rice. These bugs are usually seen feeding on the foliage and flowers of leguminous and graminaceous crops. It is a reported pest of economic significance (Schaefer and Panizzi, 2000). There are six *Leptocorisa* species. Of the various species of rice bug responsible for damage to the paddy crop in India, *Leptocorisa acuta* and *Leptocorisa oratorius* are serious pest in different states of India including our state Kerala. Heavy infestation of this pest can result in total loss of the crop. In India, the pest has been reported to cause 10 to 40 % yield loss (Israel and Rao, 1954) and sometimes complete loss .Rice, being an important crop, research have been conducted worldwide to find out natural plant protection compounds against this pest. Most of these studies were based on the information and knowledge gained from indigenously inherited pest control techniques practiced by local communities worldwide. There is abundant knowledge and practices of the tribal communities in crop protection, which need to be tapped for the present and future agriculture practices. Some plant based insecticides have been screened against rice ear head bugs and many researches have reported their relative efficacy. Medicinal plants and techniques used by different indigenous societies as insect repellents or insecticides against *Leptocorisa* are appraised individually and evidences from available scientific literatures were reported to prove its efficiency in this review.

Results and Discussion

Indigenous Traditional Practices Against Rice Bug

In ancient literatures use of various herbal plants; Sesame, Mustard, Bidanga or Vidinga (Embelia ribes), Neem, Mahuwa (*Madhuca longifolia*), milk, hairs, nails and horns,etc. had been mentioned for disease and pest management. The use of herbals as sprays, also been mentioned that functioned as insecticides. For example, powdered preparations from bark of some trees e.g. Amaltas (*Casia fistula*), Arishtha (*Sapindus emarginatus*), Karanj (*Pongamia pinnata*), Satavana (Alstonia scholaris), Neem (*Azadirachta indica*), Bidanga (*Embelia ribes*), Sowa (*Anethum sowa*),Vasa (*Adhatoda vasica*) etc. having insecticidal property were used (S L Choudhary and Y L Nene,2016). The most popular of botanicals used by local communities from very old time are Pyrethrum, Derris, and Neem. Farmers have made their own insecticide based on extraction of oil from the kernel or other parts of the neem tree, *Azadirachta indica* from very old days. Seshagiri Rao (1959) stated that Pyrethrum and Derris dust were used in the 1930s-40s.

There is a long history of use of various materials as repellents and botanically based insecticides against rice bug, *Leptocorisa* by different local communities world-wide. Some of the Indigenous Traditional Practices used against the rice bug in different parts of world are listed below(Table 1).

Farmers in Sri Lanka burn certain aromatic herbs and resinous substances to repel rice bugs Lefroy (1908). Some farmers set fires to repel the bugs by burning obnoxious plants. Leaves and branches are piled on a bund upwind. Vander Goot (1949) however, remarked smoke as a repellent. Leaves and branches are piled on a bund upwind. The most popular plants used to produce smoke that act as repellents to rice bug are given below. Leaves and branches of the plants are used to generate smoke.

- *Annona squamosa* (custardapple,agathi).
- *Derris elliptica.*
- betel nut *Areca catechu*.
- *Gliricidia sepium* (seema konna).
- *Erythrina variegate* (Murukku).
- *Pittosporum resiniferum* (Kattavanak).
- *Pongamia pinnata* (Pongam tree).
- *Wikstroemia ovate* (desert cotton.)

Pesticidal formulas used against rice bug:

Different plant extracts in different concentrations are effectively used traditionaly to control rice bug. Some of them are listed below.

- Fish(3kg) +Neem leaf (5 kg) extract
- Table salt solution spray 4%
- Goat dung extract 7%
- Fuel wood ash dusting @16 kg/acre
- Acacia timber sawdust @16 kg/acre
- Dashparni Arc/ Ten plant parts extract

Dashparni Arc: It is a ten plant leaves extract mixed and fermented with cow urine and cowdung. Farmers in Solapur district are using the extract of leaves of different plants for spraying on the crop to control major pest and diseases. This preparation is used against all majour sucking insects. The plants are as follows:Mahananda- *Ipomoea carnea*.. Dhatura- *Datura stramonium*, Gulvel -*Tinospora cordifolia*. Nirgundi -*Vitex negundo*,. Sitaphal- *Annona squamosa,* Neem- *Azadiracta indica*, Castor- *Ricinus communis* , Kanher- *Nerium oleander,* Tantani- *Lantana camara*, Papaya- *Carica papaya*.

Scientific Studies Based On Indigenous Practices

Against *L. acuta*, a number of botanicals viz., 5 per cent aqueous leaf extract of king of bitters (*A. paniculata*), 3 per cent oil emulsion spray of neem (*A. indica*), seed extract of orange (*C. reticulate*) and leaf extract of lemon grass (*C.citrates*) are found to protect developing rice grains and reduce the population of *L. acuta* (Gupta et al., 1990). Durairaj and Venugopal, (1993) studied the different neem products and their effectiveness against *L. acuta*, compared with that of malathion. The plot treated with 0.05 per cent malathion showed a reduction in the pest incidence of 86.2 per cent, followed by (0.5 %) neemark (2.0%) neem oil and (5.0%) *Vitex negundo* leaf extract showed a reduction in the pest incidence of 82.8, 69.0, and 50.7 per cent, respectively. Prakash and Rao, (1994) reported that (0.5%) and (1.0%) Achook spray effectively controlled the pest of *Leptocorisa acuta*. Also, Ma et al (2005) tested two extracts from neem, alone or in combination with abamectin, against *Leptocorisa chinensis*. Results showed that treatment with the mixture of neem oil and abamectin was most effective in reducing the survivalof L. chinensis, followed by azadirachtin at 60 ppm, 30 ppm and 3% neem oil. Eight biopesticides (Achook, Neem Azal, Neem gold, Spictaf, Tricure, Wanis, Biofer and Biotos) were evaluated against *Leptocorisa* bug in two consecutive years 2007 and 2008 in high susceptible variety Pusabasmati(Amit Tivari et al.,2014). Jayarajan. et al., (2003) reported that *Acorus calamus* recorded the lowest bug population (3.56/m^2), followed by *Nicotiana tabacum* (4.56 /m^2) and *Ocimum basilicum* (4.67 /m^2).(Amal Hayat Makmur, 2016) showed control of earhead bug *Leptocorisa oratorius* Fabricius by using formulated *Calotropis gigantea* linn extract in rice field.

Conclusion

Various traditional practices have been used by farmers in different parts of world against the rice bug-*Leptocorisa*. All of them must be tapped for future agriculture. We can sustain our agriculture by adopting these practices. Especially,the knowledge about insecticidal medicinal plants should be preserved. It could be helpful for the discovery of new novel molecules which show insecticidal property.

Table 1. Indigenous Traditional Practices used to control rice bug.

Sl No:	Region of local communities.	Description of identified Traditional Practices.	Activity against pest	Citations
1.	Adi tribesman in Arunachal Pradesh, India	Pomelo leaves locally called robeltenga (kambili naranga in Malayalam) are dried and placed in field.	Insect repellent.	Saravanan, 2010
2.	Farmers in Assam, India.	Spread goat dung in rice field.	Odour repelles pest.	Deka et al.,2006
3.	Coastal Odisha, India.	Some scented aquatic plants like *Ceratophyllum demersum* Linn.*C. submersum*Linn., *Lycopodium corinatum* Desb., *Limnophila spp.* and *Hydrilla verticilata* are found useful to trap the gundhi bugs.	Insect attractants.	S.K.Srivastava,2016
4.	Coastal Odisha, India	Hanging a snail or fish in a cloth attached to a stick erected in the field. Due to rotten smell of snail, bugs leaves the field.	Odour repells bugs.	S.K.Srivastava,2016
5.	Andhra Pradesh, India	Farmers place leaves or implant twigs of *Cleistanthus collinus*, (Garari in hindhi; odukku in Malayalam) in the field.	Toxic and repellent.	Rao et al,2010
6.	Tribal areas in Tamil Nadu, India	Flowers of *Cycas circinalis* (sago palm; commonly called inta panai)	Repellent and Antifeedent.	Kathirvelu & Narayanasamy ,2005
7.	Bara, Sigdi East, Singhbhum, Jharkhand.	Neem (*Azadirachta indica*) flowers is placed in small bundles at 5-6 places, bugs are repelled by using these practices.	Repellent.	Niva bara, 2016
8.	Farmers of Cooch Behar and Jalpaiguri districts	Leaves of locally available plants of the family Rutacae like, Jambura, Lemon etc. were dried, crushed in flakes or powder form and was mixed with crushed mustard cake applied to the crop to prevent pest attack.	Attractant.	Nripendra Laskar,2016
9.	Tribal areas of Tamil Nadu.	Leaf and stem of *Nicotiana tabacum*.	Stomach poison and repellent.	P. Narayanasamy ,2005
10.	Farmers of Malappuram district, Kerala.	Use a mixture of fish (sardine) and jaggery.	Repellent.	Berin, et al,2016
11.	Philippines.	Derris roots, seeds of *Jatropha curcas* (Katalavanakku) and *Barringtonia asiatica* (Aattu pezhu).	Toxic to pest.	Blauw, 1986
12.	Manobo tribe of Mindanao.	Burn the tail of a palm civet in the middle of the field.	Repellent.	Parreñode Guzman & Fernandez, 2001
13.	Javanese farmers.	Smoke from rubber tree branches.	Repellent.	Dresner,1958
14.	Farmers in Kalimantan.	Burned fragrant grasses such as lemongrass which produce a thick smoke.	Repellent.	Watson & Willis, 1985
15.	Malaysia.	Farmers burned coconut fronds at night.	Repellent.	Lever,1955
16.	Filipino farmers.	Flowering bamboo used along with chilli fruits and tobacco plants.	Insecticide.	Alburo and Olofson,1987

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