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STUDIES ON THE INSECTICIDAL EFFICACY OF CERTAIN BOTANICALS AGAINST RICE BROWN PLANTHOPPER *NILAPARVATA LUGENS* (STAL)

T. Rani* and S. Arivudainambi

Department of Entomology, Faculty of Agriculture, Annamalai University, Annamalainagar-608 002 (Tamil Nadu), India.

Abstract

Bio efficacy studies conducted under semi-field conditions using sixteen botanical preparations against rice brown plant hopper *Nilaparvata lugens* (Stal) revealed that neem oil soap solution 10% concentration was most effective and followed by Ginger – Garlic –Chilli extract 10% and sida leaf extract were least effective.

Key words : Rice brown plant hopper *Nilaparvata lugens,* botanicals, non- insecticidal management.

Introduction

Rice (*Oryza sativa* L.) is one of the most important crop in the world, providing food for nearly half of the global population (FAO, 2004). It is a key source of employment and income for rural people, most of who live in developing countries. Rice is grown on over 145 million hectares in more than 110 countries. It occupies one fifth of the world crop land under cereal (Pathak and Khan, 1994). Almost 90% of the rice is grown and consumed in Asia. It is used as a food more than two billion people in developing countries of Asia (FAO, 1995; Khush and Brar, 2002).

Normally rice plant has strong compensatory abilities to recover from such minor injuries by insect pest (Graf *et al*., 1992 and Rubia *et al*., 1996). But, Oerke (2006) estimates 10.2 per cent attainable yield loss in rice due to key insect pests. The green revolution that began in the 1960s triggered a cascade of technological events in plant protection. In particular, pesticide use on rice, especially insecticides, increased with the adoption of rice varieties that lacked resistance to many pests. Natural regulation of pests in rice ecosystems was disrupted, creating a favourable environment for pest species. By the 1980s, insecticide resistance became an increasing problem, especially for organophosphates and carbamates that were replacing organochlorines. Farmers responded by increasing dosages or by combing several chemicals in toxic mixtures. As result, even more natural predators were killed, insecticides resistance buildup was accelerated and human health and the environment were further threatened. Other factors affecting the resilience of rice ecosystems have been associated with measures taken to increase rice production profitability, such as year round cultivation of rice on the same land (creating favorable conditions for pest outbreaks) and higher nitrogen application to the higher-yielding rice varieties (enhancing their susceptibility to some insects) (Rajappan *et al*., 2000 and Norton *et al*., 2010).

Current pest management practices, which are heavily dependent on insecticides, with a sale of approximately 145 million US$ ever year, for managing insect pests, still results in yield losses of 10-15%. So it becomes clear that alternative approaches to rice pest management are needed and it should reduce the cost of protection. Though, a list of alternative approaches are suggested, when comes to availability and adaptability, bio-pesticides obtained from plant sources are promising. In this experiment certain botanicals which are already used by organic farmers in field level are validated for their efficacy against *N. lugens.*

Materials and Methods

Mass rearing of test insect

The rice brown plant hopper (*Nilaparvata lugens* stal- Delphacidae: Hemiptera) was cultured in the

Author for correspondence : E-mail: rani.agrientomology@gmail.com

Table 1 : Insectidal Efficacy of certain botanicals against *N. lugens*.

T. no.	Treatment	Per cent mortality after 24 hrs
T_1	Neem oil soap solution 5%	58.33 (49.80)^{b}
T_2	Neem oil soap solution 10%	88.33 (70.11)^{a}
T_3	Neem seed kernal extract 5%	3.33 (8.61)^{f}
T_4	Neem seed kernal extract 10%	8.33 (6.59)^{e}
T_5	Neem cake extract 5%	3.33 (8.61)^{f}
T_6	Neem cake extract 10%	13.33 (21.33)^{de}
T_7	Five plants extract 5%	10.00 (18.43)^{de}
T_8	Five platns extract 10%	23.33 (28.85)^{c}
T_9	Sida extract 5%	1.66 (4.30)^{fg}
T_{10}	Sida extract 10%	1.66 (4.30)^{fg}
T_{11}	Adathoda extract 5%	8.33 (16.59)^{e}
T_{12}	Adathoda extract 10%	23.33 (28.85)^{c}
T_{13}	Andrograpis extract 5%	18.33 (25.31)^{cd}
T_{14}	Andrograpis extract 10%	26.66 (30.99)^{c}
T_{15}	Ginger- garlic-chillie extract 5%	51.66 (45.95)^{b}
T_{16}	Ginger- garlic-chillie extract 10%	83.33 (65.95)^{a}
T_{17}	Control	0.00 (0.00)
		CD=(0.05) 6.9743 SE=2.4211 SD=3.4239

Values are mean of three replications.
Values in paranthesis are arc sin transformed.
Values with different alphabets differ significantly.

laboratory /net house by following the rearing technique developed at IRRI by Waldbauer and Marciano (1979) with minor modifications. Adults of *N. lugens* collected from the rice field in around Annamalainagar were released into rearing cages (5'x3'x3') containing seedlings of 25 days old potted plants of rice variety Taichung Native (TN1). Twenty five tillers were in a pot of 1 foot diameter. Five pots were placed in a cage and when ever needed fresh plants were supplied. Pots were kept in plastic trough containing water about 15 cm height. Five potted plants in each cage maintained more or less 200 hoppers.

Preparation of botanical extracts

Eight botanicals such as *Andrographis paniculata* extract, *Sida acuta* extract, *Adhatoda vasica* extract, Five plants extract, ginger – garlic - chili extract, Neem seed kernel extract, Neem cake extract and Neem oil soap extract were prepared by following the methods acquired from the organic farmers in Sirkazhi taluk of Nagapettinam district. Unflowered plants of *A. paniculata, S. acuta, A. vasica* collected in the early morning were washed, air dried, macerated and 200g of each plant were separately transferred to a wide mouthed brass vessel containing 800ml of distilled water. The content was boiled under a low flame until it reduced to 200 ml, cooled and filtered by using muslin cloth. In five plants extract, leaves of *Adhatoda vasica, Vitex negundo, Azadireacta indica, Ricinus comucies* and *Pongamia glabra* were used. One kilogram of fresh leaves from each plant was taken and macerated separately and was transformed to a wide mouthed mud pot (10 l capacity) which contained 2 l of water and 0.5 l of fermented cow's urine (collected 48 kept hours before use). The mouth of the pot was covered with muslin cloth and kept as such for ten days. The content was stirred daily by using a wooden stick. After ten days the product was filtered by using muslin cloth and made into 2 l by adding water. Garlic (1 kg), ginger (1/2 a kg) and green chillies (½ a kg), were washed, macerated each separately and mixed with 7 l of water and filtered after six hours. Neem seeds (newly harvested, 3 kg) were pound and placed in an earthen pot which hold 10 l of water and after three days the content was filtered and used. Powdered neem cake (3 kg) packed in muslin cloth pouch was soaked overnight in 10 l of water and squeezed to get extract. Neem oil soap obtained from Centre for Indian Knowledge system, Sirkazhi was diluted with water and used. From the stock solution 5 and 10% concentrations were prepared and tested in the semi field conditions.

Bioassay against *N. lugens*

Thirty days old potted seedlings (5 seedlings/pot) of rice (TN 1) were sprayed with 5 and 10% concentrations of botanical extracts using an atomized and air dried. 3 ml of the extract was used per pot. One week old nymphs, pre – stared for two hours, were released on the treated seedlings @ 20/pot. Pots were covered by nylon mesh and kept in plastic trough containing water about 15 cm height.

Observations were made on the mortality of the hoppers at 24 hours post treatment. Each treatment was replicated thrice totally and there were seventeen treatments including control.

Results and Discussion

Percent mortality was high in neem oil soap solution 10% (88.33) and it was found on par with ginger-garlic-

chilli extract 10% (83.33) statistically. Neem oil soap solution 5% (58.33) and ginger- garlic- chilli extract 5% (51.66) were ranked second in exerting insecticidal efficacy. Five plants extract 10%, Adathoda extracts 10% and Andrograpis extract 10% were found on par in their efficacy and their efficacy level was between 23.33 to 26.66 per cent (table 1). This is in accordance with the finding of Sridharan *et al.* (2001) who reported that neem seed kernal extract 5%, neem oil 3% and combination of seed oil *viz. Pungam, Illupai*, and *Mustard* at 1% with neem seed kernal extract 4% and neem oil 2% exerted insecticidal activity against *N. lugens*. Further he added that among the seed oil mixtures, NSKE 4% + pungam oil 1% and neem oil 2%+ pungam oil 1% were superior.

Our findings also corroborated with the report of Krishnaiah and Kalode (1991), who explained that *N. lugens* and *N. virescens* died within four days when was sprayed 12% neem oil. Such that Krishnaiah *et al.* (2000) reported that neem azal was the most effective for *N. virescens*. Mayabini Jena (2004) reported that leaf extract of *Polygonum hydropipa* caused 90 per cent mortality of *N. lugens*. But in our study. The least per cent mortality (1.66) was noted in sida extract 10% and was on par with Neem seed kernal extract, neem cake extract and sida extract 5%. It is concluded that neem oil soap solution was effective among the neem products tested.

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