Journal of Entomology and Zoology Studies

Available online at www.entomoljournal.com

E-ISSN: 2320-7078
P-ISSN: 2349-6800
www.entomoljournal.com
JEZS 2025; 13(3): 163-166

Received: 15-04-2025
Accepted: 20-05-2025

Sanjay Hazarika
Research Scholar, Department of Entomology, Assam Agricultural University, Jorhat, Assam, India

Selchi Devi
Project Assistant, Assam Science Technology & Environment Council, Guwahati, Assam, India

Corresponding Author:
Sanjay Hazarika
Research Scholar, Department of Entomology, Assam Agricultural University, Jorhat, Assam, India

The dangers of insecticides: Naturally occurring compounds as alternatives to synthetic chemical insecticides for use in insect management in Nagaon district, Assam, India

Sanjay Hazarika and Selchi Devi

DOI: https://www.doi.org/10.22271/j.ento.2025.v13.i3b.9523

Abstract
Pests, whether vegetables or non-vegetables, are common in any garden. Organic insecticides are prepared by household members using local resources without any scientific study or research. It is usually a very old-fashioned, trustworthy practice by nature. The very common pests include aphids, bugs, beetles, and various insects that cause damage to plants and leaves alike. A three-month study was undertaken from February 2024 to April 2024, targeting Nagaon district as the area of focus, with the view of knowing that organic insecticides are always a friendly environment, a safe, low-cost, or free-of-cost locally available resource utilisation system through engaging family labour. The overall perception of organic insecticides and organic pest management was overwhelmingly positive. Perching, Insect traps, and cultural practices were very common in pest management. In this study, *Allium sativum, Allium cepa, Capsicum frutescens,* and *Zingiber officinale* paste with jaggery were effective with high degradation times. Most of the respondents mentioned that caterpillars were controlled through perching. Stem borers, aphids, and rice weevils are the most common pests for organic crop production. Garlic, onions, chilli, and ginger were widely used to repel insect pests. There is a significant knowledge gap in the formulation, targeted application, and efficacy assessment of organic insecticides, lacking scientific rigour and statistical analysis. More research could be helpful in the safe use of it and increase the efficacy rate and ensure wider acceptance of organic farming practices.

Keywords: Insecticides, pest management, natural, organic

Introduction

Natural insecticides are great for use in our vegetable garden. For generations, kitchen gardening and vegetable gardening have been an integral part of Indian tradition and culture. It is a practice that has been passed down through generations, instilling a sense of tradition and cultural identity in the participants. Kitchen gardens improve food security, encourage self-sufficiency, and support sustainability to live a healthy life. With the growing population, there is a decreasing amount of agricultural farming land available, particularly for vegetable farming (Pramanik *et al.,* 2021) [11], due to which kitchen gardens are gaining popular in both rural and urban Assam, where residents cultivate a variety of tubers, leafy greens, root vegetables, and fruit crops to meet their household needs. Vegetables are considered a protective food and a key component in meals. The ICMR (Indian Council of Medical Research, New Delhi) has recommended 300gm of vegetables per day per adult for a balanced diet. It is believed that the type of traditional home garden practices may depend on different communities, traditions, needs, beliefs, etc. (Tangjang and Arunachalam, 2009) [12]. A kitchen garden, also known as a vegetable garden or home garden, holds significant importance for several reasons:

1. Food security.
2. Nutrition.
3. Cost savings.
4. Income generation.
5. Reducing food waste.
6. Environmental benefits.
7. Teaching and learning.

In Assam, home gardens typically feature fast-growing vegetables like brinjal, chilli, and tomato, as well as tuber crops, leafy greens, root vegetables, and select fruit crops such as banana and papaya, to cater to daily household needs. In the kitchen garden, mostly local cultivars are used, which require fewer nutrients and fertilisers and are also resistant to many pests and diseases, but are susceptible to different insect pests and diseases. Each crop faces its own unique set of insect pests, demanding customised approaches for pest management. Kitchen garden prioritises sustainability by avoiding commercial insecticides, opting instead for indigenous technical knowledge and traditional practices that have successfully controlled insect pests for generations in different indigenous communities in Assam. These practices mostly involve the use of natural, organic, and sustainable methods and have proven to be very effective against a wide range of insect pests.

Indigenous technical knowledge refers to the traditional and time-tested practices and techniques that indigenous communities have developed and refined over generations to manage various aspects of their environment, including agricultural pest management. It represents the knowledge of a certain community that has evolved over many generations and continues to evolve throughout time (Lenka *et al.,* 2020). Organic pest control is easy and effective, so we don't have to resort to harmful chemical insecticides.

Study objectives

The main objective of this study is to determine the usefulness of organic insecticides in farming. The other objectives are to:

1. Know the common pests in the study area.
2. List down the names of the materials used for organic insecticides.
3. Know the benefits of pest management in organic farming.
4. Find out the problems related to organic insecticides.
5. Identify the factors influencing natural bio-insecticides and make appropriate recommendations.

Materials and Methods

Organic botanical products

1. **Garlic (*Allium sativum*):** The insecticidal properties of garlic are attributed to its active ingredients, diallyl disulphide and diallyl trisulfide. Garlic extracts have also shown promise in controlling a range of plant diseases, including fungal infections like *Alternaria spp.,* powdery mildew, and black spot, as well as bacterial infections like pseudomonaas. Garlic has long been a popular ingredient in Nepalese cookery, with hundreds of tonnes of garlic imported each year from India. Laboratory research has demonstrated that garlic extracts possess acaricidal properties. The extract possesses insecticidal properties against Dipteran, Coleopteran, Lepidopteran, and Hemipteran pests (Abdalla), implying that it could be a valuable botanical insecticide for a wide range of insect pests. Baidoo and Mochiah reported that garlic aqueous extract is effective in suppressing lepidopteran pests. (2016).
2. **Chilli peppers (*Capsicum spp.*):** Capsicum's widespread cultivation and inherent bio-insecticidal properties make it a valuable resource for managing diverse insect pests, including those from the Hemiptera order, by leveraging its insecticidal and repellent capabilities (Bergmann and Raupp 2014; Dayan *et al.,*2009). Antonious *et al.,* (2006) mentioned its insecticidal properties against Hemipteran pests, and Fening mentioned its Thysanopteran insecticidal properties. According to Belmain, chilli pepper was an effective deterrent and bio-insecticide for reducing the number of weevil species attacking stored grains.
3. **Onion:** Onion is a versatile crop that not only repels pests naturally but also enriches the soil with nutrients necessary for optimal plant development. Onion is the source of calcium, potassium, magnesium, iron and many more. Onions have natural insecticidal properties that make them an effective pest control solution. Onions contain a compound called allicin. When insects come into contact with this compound, it can damage their cell membranes and interfere with their respiratory systems. This makes onions a natural and safe alternative to chemical insecticides.
4. **Ginger:** Ginger rhizome is one of the plant sources of insecticides that can be used for thrips pest control because it contains zingerone ketone compounds that have a spicy taste, causing the insect's body to feel hot and die. This natural insecticide can also control other pests such as nematodes, caterpillars, aphids, and white flies, etc.

Fig 1: Preparation of organic insecticides

Management

First, we grind the onion, ginger, garlic, and chilli in a mixer to a coarse paste. Then we mixed 200 g of jaggery with this paste and kept it for 1 week. After 1 week, strain the paste and collect the juice separately. 10 ml of the collected insecticide will be used with 1 litre of water as required; mix well, take in a spray bottle, and use in the field or kitchen garden.

The study was conducted in Nagaon district over three months, from February 2024 to April 2024. The entire work involves field work, gathering information about the study area, and focused group activities, including respondent selection, rapport building with the respondents, and the preparation of the sample structure. The work also consists of the preparation of a questionnaire and the field testing of the questionnaire with the targeted people. Finally, an interview was conducted with the guided and field-tested semi-structured questionnaire in the study area. A total of three groups, one interview was conducted with the farmer group having an age below 30 years, one with the farmer group having an age between 30 and 50 years, and another with the farmer group having an age over 50 years. A total of 12 respondents were selected for the interview randomly.

1. **Category A:** farmers aged below 30 years.
2. **Category B:** farmers aged between 30 and 50 years.

3. **Category C:** farmers aged above 50 years.

Finally, all the data were collected, analysed, and presented in tabular form in this report.

Results and Discussion

The meaning of organic pest management

Organic pest control is known to be a method that utilises natural resources in order to eradicate different kinds of pests, primarily various insect species that destroy vegetation. This also involves the control of different insects that can hinder the growth of our plants as well. A significant proportion of farmers (83.33%) identified organic pest management as the use of natural resources to manage pests, with other descriptions highlighting the avoidance of chemicals and reliance on natural processes for pest control.

Table 1: Meaning of homemade bio-pesticide in organic farming

Meaning of homemade bio-pesticide	Category A N=4	Category B N=4	Category C N=4	All N=12
Use of natural resources to control pest	4(100)	4(100)	3(75)	10(83.33)
Control the pest without chemical	2(50)	2(50)	1(25)	5(41.66)
Leave the environment to control the pest own self	1(25)	2(50)	0(0)	3(25)

N= Number, figure in parenthesis indicates percentage value

Common pests in the study area

It has been said that an insect becomes an economic pest when it causes a yield loss of 5-10%. In any local pest complex, there are usually a few major pests that are the most important. A significant majority of farmers (83.33%) reported stem borer as a common major pest in the study area, emphasising the urgent need for effective control strategies.

Table 2: Common pests in the study area

Common pest in the study area	Category A N=4	Category B N=4	Category C N=4	All N=12
The rice weevil	2(50)	2(50)	3(75)	7(58.33)
Stem borer	3(75)	3(75)	4(100)	10(83.33)
Yellow mite	4(100)	2(50)	2(50)	8(66.66)
Rice hispa	4(100)	1(25)	1(25)	6(50)
Potato tuber worm	2(50)	4(100)	1(25)	7(58.33)
Aphids	3(75)	2(50)	3(75)	8(66.66)

Methods of organic pest management

Perching

Perching is a common method of organic pest management. It is an easy and very widely utilised method for rural farming. To do the perching, a person needs to put a long stick in the middle of the targeted crop field so that birds come and perch on the stick and eat harmful pests. 75% of farmers said that it is an effective method of organic farming.

Benefits of Organic Insecticide

Organic pest control methods are non-hazardous to the health of both the human and animal populations. Almost 66.66% of respondents in the specific area under study significantly reported that the organic pest management system is comparatively of low cost and is helping greatly to produce environment-friendly and chemical-free foods, and about 83.33% of respondents conveyed that the method was significantly easy to apply. As reported by 66.66% of respondents, it was seen to be very effective in almost controlling all kinds of insect pests in a variety of crops. Garlic contains diallyl disulfide and diallyl trisulfide, which possess insecticidal properties against Dipteran, Coleopteran, Lepidopteran, and Hemipteran pests. Onions contain a compound called allicin. Allicin can damage insect cell membranes and interfere with their respiratory systems. Ginger consists of zingerone compounds, a non-toxic methoxyphenol with a potent spicy taste, which induces the feeling of hotness, fever in the insect body, and sometimes even causes death.

Table 3: Benefits of homemade insecticides in organic farming

Benefits	Category A N=4	Category B N=4	Category C N=4	All N=12
Low cost	4(100)	3(75)	1(25)	8(66.66)
Environment friendly	2(50)	2(50)	4(100)	8(66.66)
Healthy	4(100)	3(75)	1(25)	8(66.66)
Easy to apply	3(75)	4(100)	3(75)	11(83.33)
Tasty food	3(75)	1(25)	3(75)	7(58.33)

Problems of Organic Insecticide

Homemade insecticides are derived from nature-friendly inputs and do not have a detrimental effect on the environment or on human health. Several problems were recognised by the respondents, including not being able to store for a long time, lack of knowledge on specific formulation and bad smell.

Table 4: Problems in Homemade Insecticides

Problems	**Category A N=4**	**Category B N=4**	**Category C N=4**	**All N=12**
Bad smell	3(75)	2(50)	1(25)	6(50)
Lack of knowledge on specific formulation	3(75)	3(75)	1(25)	7(58.33)
Can't store for a long time	4(100)	4(100)	3(75)	11(83.33)

Conclusion

Indigenous technical knowledge in pest management for kitchen gardens in Assam has immense potential in addressing the challenges posed by various insect pests, which result in loss of yield and quality. It is important to note that the dosage used in these practices may vary. Depending on the specific crops, the local pest population, and the environmental conditions in different regions. Therefore, there is a variation in the effectiveness of these practices due to the lack of systematic formulation of dosage. The indigenous practices that are mentioned in this study have been widely used in the kitchen gardens of Assam and have been observed to be eco-friendly and cause no harm to the soil and environment, as well as human health. Therefore, furthermore Research is demanded to extend the use of these indigenous practices in plant protection and can be analysed and used to promote sustainable agriculture. Current policies of the government to minimise the use of synthetic insecticides and fertilisers, we can pave the way for a more sustainable and pest-resistant horticultural future by harnessing the rich indigenous knowledge of Assam.

References

1. US Environmental Protection Agency. Regulating pesticides. What are biopesticides? [Internet]. Washington (DC): US Environmental Protection Agency; 2008 [cited 2008 Sep 28]. Available from: http://www.epa.gov/pesticides/biopesticides/whatarebiopesticides.htm
2. Clemson Extension, Home and Garden Information Center. Organic pesticides and biopesticides [Internet]. Clemson (SC): Clemson University; 2007 [cited 2008 Aug 20]. Available from: http://hgic.clemson.edu/factsheets/HGIC2756.htm
3. Steinwand B. Personal communication. Washington (DC): US Environmental Protection Agency; 2008.
4. Lewis W, van Lenteren C, Phatak S, Tumlinsen J. A total system approach to sustainable pest management. Proc Natl Acad Sci U S A. 1997;94:12243-122438.
5. Elahi KM. Social forestry, exotic trees and monga. The Daily Star [Internet]. 2008 Sep 6 [cited 2008 Sep 6]. Available from: http://www.thedailystar.net/story.php?nid=53438
6. Ware G, Whitacre D. An introduction to insecticides. In: Radcliffe E, Hutchison W, Cancelado R, editors. Radcliffe's IPM World Textbook [Internet]. St. Paul (MN): University of Minnesota; 2004 [cited date unknown]. Available from: http://ipmworld.umn.edu
7. Thakore Y. The new biopesticide market. BCC Research. 2006 Jan. Report ID: CHM029B.
8. Chattopadhyay A, Bhatnagar N, Bhatnagar R. Bacterial insecticidal toxins. Crit Rev Microbiol. 2004;30:33.
9. Thakore Y. The biopesticide market for global agricultural use. Ind Biotechnol. 2006;2(3):192-208.
10. Benbrook C. Personal communication. Troy (OR): The Organic Centre; 2008.
11. Pramanik D, Debnath S, Mitra S, Das A, Mandal B, Kar S. CRISPR/Cas-9-mediated generation of pathogen-resistant tomato yellow leaf curl virus and powdery mildew. Int J Mol Sci. 2021;22(4):1878.
12. Tangjang S, Arunachalam A. Role of traditional home garden systems in Northeast India. Indian J Tradit Knowl. 2009;8(1):1-8.
13. Lenka B, Kulkarni GU, Moharana A, Singh A. Millets: promising crops for climate-smart agriculture. Int J Curr Microbiol Appl Sci. 2020;9(7):656-668. DOI: 10.20546/ijcmas.2020.911.081