ISSN: 2456-7744

Advanced Scientific Research 2017 2(1) 10–11

Advanced Scientific Research
journal homepage: www.advancedscientificresearch.in

Bioefficacy of extract of turmeric and ginger as potential biopesticides on *Sitophilus oryzae*

Alka Rani*

Department of Botany, PPN College Kanpur - 208001, India

ARTICLE INFO

Article history:
Received 18 July 2016
Received in revised form 28 June 2017
Accepted 30 June 2017
Available online 14 July 2017

Keywords:
Sitophilus oryzae
Turmeric
Ginger
Biopesticides
Plant extracts

ABSTRACT

Rice is one of the major food crops of the world which is adversely affected on large scale in storage condition by *Sitophilus oryzae* L. The rice weevil i.e., *S. oryzae* is managed by using chemical pesticides such as DDT. It has been established that use of chemicals as pesticides and insecticides is not safe for our environment as well as they are harmful to humans and other living beings due to their residual properties and cause health hazards. Keeping in view harmful effects of chemical pesticides recent research works focus on finding out alternative methods to control storage pests and in relation to this a number of plant extracts have been tested for their bioefficacy against storage pests. The present work is an attempt to determine the effectiveness of extracts prepared from turmeric and ginger against *Sitophilus oryzae*. It has been found that both turmeric and ginger have the potential to control the pest. It was observed that both are more effective in lower concentration and effectiveness of turmeric is more as compared to ginger.

1. Introduction

Cereal grains are amongst the major crops in the world which is maintained in storage condition and is an important components of the world food supply. It has been estimated that post-harvest grain losses on the global basis caused by insect damage and other bioagents vary from 10-40 % approximately one third of the global food production is destroyed annually by field and storage pests[1,2]. In their study estimated that approximately one third of the worlds food production which cost around more than $100 billion on the annual basis are destroyed by more than 20,000 species of field and storage pests, occur in developing Asian and African countries[3].

In recent times emphasis is being laid upon the uses of alternative methods to control pest on grains instead of using hazardous chemical treatments. In this reference the European Union has also decided to increase environmental awareness and the Commission of the European communities has launched a Strategy on the Sustainable Use of Pesticides in 2006. It was decided to minimize the hazards and risks to health and the environment caused by the use of plant protection products and recommended the use of biological control methods. Biological control comprises various technologies of which one option is the use of botanical products[4].

Rice i.e., Oryza sativa is a crop which belongs of the Graminae family. As a cereal grain, it is the most widely consumed staple food for a large part of the world's human population, especially in Asia. It is the agricultural commodity with the third-highest worldwide production, after sugarcane and maize, according to 2012 FAOSTAT data.

Moreover, a large portion of maize crops are grown for purposes other than human consumption, rice is the most important grain with regard to human nutrition and caloric intake, providing more than one-fifth of the calories consumed worldwide by humans. The rice weevil, (*Sitophilus oryzae* L.) has being identified as the most common coleopteran pests of stored white and brown rice.

2. Experiment

Materials: Turmeric rhizome, ginger rhizome, storage pest *Sitophilus oryzae*, grains of rice, absolute alcohol, Whatman filter paper no.1.

Insects: *Sitophilus oryzae* was collected from infested rice obtained from a local market and reared on rice grain in glass jars covered with muslin cloth, tied with a thread for the passage of air and kept at 27±2˚C and 70-80% relative humidity (r.h.).

Plant extract is prepared using rhizomes of *C. domestica* and *Z. officinalis* and further evaluated for their pesticidal activity against *Sitophilus oryzae*. Extraction of plant parts is done separately in absolute alcohol. The extracts of turmeric and ginger were prepared separately in absolute alcohol. For preparing the extract in absolute alcohol, five gram of fresh rhizomes of turmeric were taken and crushed in 20 mL. of absolute alcohol and left as such overnight. The next day this extract mixture was filtered through Whatman's number 1 filter paper. For preparing 1 per cent concentration of this extract, one mL of the extract was added to 99 mL distilled water. Similarly, 2%, 5% and 10% solutions were prepared by mixing 2,5,10 mL in 98,95,90 mL of distilled water separately. Twenty mL of each of the extract of *Curcuma domestica* was mixed thoroughly with

* Corresponding author. Tel.: +919415480959; e-mail: alkaranippn@rediffmail.com

20 g of rice grains and allowed it to dry. Each of these was placed in a 250 mL specimen jars and 20 adults of *Sitophilus oryzae* were introduced in to it. The mouth of each jar was covered with a cotton cloth and was tied tightly with the help of thread. These jars were maintained as such for four weeks and readings at the end of each week was taken. A control experiment was also maintained in which twenty gram wheat grains were mixed with solution of absolute alcohol in water of the same concentration which had been used to set up treatment experiment and 20 insects had been introduced in each control experiment. The same process was repeated for ginger rhizome. Each treatment was replicated three times and the numbers of dead weevil were counted and recorded at the end of seven days for 4 weeks. Moreover, any other abnormality if occurred was also recorded for further study.

Observation: The results of the above experiments is summarized in the Table 1 and Table 2.

TABLE 1. Effect of *C. domestica* extracts prepared in absolute alcohol on the mortality % of *Sitophilus oryzae* L.

% concentration> observation∨	1	2	5	10
After 1 week	6/20(30%)	6/20(30%)	5/20(25%)	3/20(15%)
After 2 weeks	10/20(50%)	11/20(55%)	9/20(45%)	8/20(40%)
After 3 weeks	15/20(75%)	16/20(85%)	12/20(60%)	10/20(50%)
After 4 weeks	16/20(80%)	17/20(85%)	13/20(65%)	11/20(55%)

TABLE 2. Effect of *Z. officinalis* extracts prepared in absolute alcohol on the mortality % of *Sitophilus oryzae* L.

% concentration> observation∨	1	2	5	10
After 1 week	5/20(25%)	5/20(25%)	2/20(10%)	2/20(10%)
After 2 weeks	9/20(45%)	8/20(40%)	5/20(25%)	4/20(20%)
After 3 weeks	12/20(60%)	10/20(50%)	7/20(35%)	6/20(30%)
After 4 weeks	13/20(65%)	11/20(55%)	8/20(40%)	7/20(35%)

3. Results and discussion

The results of the above experiments show that both *C. domestica* and *Z. officinalis* are effective in controlling the growth of *Sitophilus oryzae* and *C. domestica* is more effective in controlling the insect. It is also observed that *C. domestica* is effective more at 1% and 2% concentrations i.e., 80% and 85% mortality rate and *Z. officinalis* at 1% concentration i.e.,65% mortality rate. Therefore, it can be said that these plant extracts are more effective when used in small concentrations. On the basis of these findings, it can be said that biopesticides prepared from plant extract are as useful as chemical pesticides and cause no environmental and health hazards to the other living beings unlike chemical pesticides. Many researchers are working in this field and have found out the other plants as effective biopesticides in the form of extracts and essential oil. The insecticidal effect of a group of plant essentials oils[5] (Caraway, coriander, sweet basil, garlic and chrysanthemum) against *Callosobruchus maculates* and *Sitophilus granaries*.). Insecticidal activity of many plants against several insect pests has been demonstrated by many researchers[6-8] introduced that there are many plant allelochemicals including, nicotine, pyrethrins, azadirachtin and rotenoids. These have been isolated, characterized and developed as commercial insecticides.

4. Conclusion

As it has been found in present work that plant extracts from turmeric and ginger are effective in controlling rice weevil, it can be said that plant extracts have the potential to be used as an alternative to the chemical pesticides. The use of chemicals cause hazardous effect on human health and environment so there is need to develop techniques and methods to commercialize and popularize the use of biopesticides and bioinsecticides for human welfare on a long term.

References

1. N. Raja, S. Albert, S. Ignacimuthu and S. Dorn, *Journal of stored product research,* **2001**, 37, 127.
2. S. Ahmed, C. Mitchell, and Y. R. Saxena, *Prote. Intern. Rice. Res. Inst. Los, Banos.,***1984**, 29.
3. M. Jacobson., *Economic Botany,* **1982**, 36(3), 346.
4. M. B. Isman, *Annual Review of Entomology*, **2006**, 51, 45.
5. P. M. J. Villalobos, P. F. Credland, D. M. Armitage, C. H. Bell, P. M. Cogan, and Highly, *Adv. Stored Prod. Protec. Proc. VIII Intn. Conf. on Stored Prod. Protect. Yark, U.K.* **2003. (Ed.)** 22–26.
6. C. R. Carlini and M. F. Grossi-de-Sá, *Toxiocon*, **2002**, 40(11),1515.
7. J. T. Arnason, B. J. R. Philogene and P. Morand, (eds.), *Insecticides of plant origin,* **1989**, 387,11.
8. S. J. Longstaff and D. E. Evans, *A comparison of the demography of four major stored grain coleopteran pest species and its implications for pest management*, **1994**.