



ISSN 2347-2677

www.faujournal.com

IJFBS 2015; 2(2): 65-67

Received: 15-01-2015

Accepted: 20-02-2015

Dr. Kusum Dang
Government College,
Kota, Rajasthan, India

A study of residual toxicity of some plant extracts on rice weevil

Dr. Kusum Dang

Abstract

The rice weevil *Sitophilus oryzae* attacks mostly stored grains like wheat, maize and rice. Both the adult and larval stages destroy the grain by boring into it and reducing it to husk. The grain loss is huge therefore an eco-friendly approach to control the pest is needed. Plant products are a good solution. Seed extracts of *Annona squamosa*, *Glycine max*, *Ricinus communis* and *Helianthus annuus* were used for control of pest. In the evaluation of residual toxicity it was observed that the seed extract of sunflower (*Helianthus annuus*) was most effective and protects the wheat grain up to 90 days of treatment (90 DAT).

Keywords: *Sitophilus oryzae*, seed extracts, residual toxicity

Introduction

During storage the losses caused by various pests throughout the world is just beyond our imagination. According to Prem Kishore (2000) [4], in India 15-20% of the crops are destroyed by the pests. If we can reduce the loss, we can get 15-20 million tonnes extra grain for human consumption. *Sitophilus oryzae* is universally regarded as one of the most destructive primary pest of stored cereals. The rice weevil, *Sitophilus oryzae* attacks mostly in wheat, less in maize, rather rare in rice products, millets and other grains. It can attack cereal plants even in fields. Both the larvae and adult cause serious damage and convert the grain into husk and dust with unpleasant smell, rendering it unfit for consumption. Therefore, to control this pest eco-friendly botanical insecticides can be used. The present investigation is to study the residual effect of some seed extracts i.e. how effective the extracts are and their period of effectivity for control of *S. oryzae*.

Material and Methods

Four plant products were evaluated for their residual toxicity viz. seed extracts of castor (*Ricinus communis*), custard apple (*Annona squamosa*), soybean (*Glycine max*) and sunflower (*Helianthus annuus*).

500 gm of wheat was taken in a glass jar and the required amount of toxicant was added. Three replicates of 20 gm each were taken in small culture tubes, 10 pairs of insects were released in each culture tube and the mouth of the tube was covered with muslin cloth by help of rubber band. The number of dead insects was counted after 24 hours. A set of control experiment was also studied.

On the 3rd day, again 20 gm of wheat in each culture tube was taken from the 500 gm of treated seeds and mortality count was studied after three days of treatment (3 DAT). Three replicates were studied along with a set of control. Similarly mortality count on 7 DAT, 15 DAT, 30 DAT, 60 DAT and 90 DAT were made from the treated wheat grain and residual toxicity was calculated.

Result and Discussion

Four seed extracts were evaluated for their residual toxicity against rice weevil till the residue of the extract gave no mortality. The concentration which gives near about 100% mortality within 24 hours of application of botanical was mixed with 500 gm of wheat which was used in the complete experiment. Residual effect was studied at 3rd, 7th, 15th, 30th, 60th and 90th DAT (days after treatment).

A dose of 50 µl/20gm of *Annona squamosa* seed extract was found to be effective on wheat seed for 30 days only. Mortality of test insects in the wheat seeds treated with *Annona*

Corresponding Author:
Dr. Kusum Dang
Government College,
Kota, Rajasthan, India

squamosa was 83.33% at 3 DAT, 71% at 7DAT, 38.33% at 15DAT and it reduced to only 10% at 30 DAT. After 30 days of treatment the seed extract of *A.squamosa* was no longer effective in control of *S.oryzae*.

Mortality of *Sitophilus oryzae* in the wheat seeds, applied with 50 µl of *Glycine max* seed extract was (table 1) 93.33% 1 DAT, 53.33% 3 DAT, 24.56% 7 DAT, 15.00% 15 DAT, 10.00% 30 DAT and 1.66% 60 DAT. It is evident from data presented in table 1, 2 and 3 that *Glycine max* seed extract was effective till 60 days after treatment. Residue of the deposits of *Glycine max* was 25.1266 µl 3DAT, 15.657 µL 7 DAT, 10.8667 µL 30 DAT and 6.3958 µL 60 DAT.

Residue of deposit of *Glycine max* extract was reduced by 58.14%, 73.91%, 81.89% and 89.34% till 3 DAT, 7 DAT, 15 DAT, 30 DAT and 60 DAT respectively.

Helianthus annuus seed extract persists only for seven days (table 1). Residue of deposit was 7.346 µl three days after treatment 6.0842 µl seven days after treatment. Residue of deposit was reduced by 85.56% 3DAT and was reduced by 88.04% 7 DAT (table 3). Mortality reduces from 90% to 5.00% seven days after treatment.

Ricinus communis seed extract protected the wheat seeds against *Sitophilus oryzae* for about 3 months.

Table 1: Residual toxicity of Botanicals/chemical insecticide (in terms of percent mortality)

S.NO.	Botanical/chemical insecticide	Concentration (µl)	Percent mortality due to residue of deposits						
			1DAT	3DAT	7DAT	15DAT	30DAT	60DAT	90DAT
1	<i>Annona squamosa</i>	50µl	86.66%	83.33%	71.66%	38.33%	10.00%	-	-
2	<i>Glycine max</i>	50µl	93.33%	53.33%	24.56%	15.00%	10.00%	1.66%	-
3	<i>Helianthus annuus</i>	55µl	90.00%	8.33%	5.00%	-	-	-	-
4	<i>Ricinus communis</i>	250µl	98.00%	73.33%	58.33%	53.33%	48.33%	21.05%	10.00%

Table 2: Residue of the deposits of various insecticides (botanical/chemical)

S.NO.	Botanical/chemical insecticide	Residue of the deposit (in µl)					
		3DAT	7DAT	15DAT	30DAT	60DAT	90DAT
1	<i>Annona squamosa</i>	49.0028	36.4284	18.9812	9.0670	-	-
2	<i>Glycine max</i>	23.1266	15.6573	12.6334	10.8667	6.3958	-
3	<i>Helianthus annuus</i>	7.3461	6.0843	-	-	-	-
4	<i>Ricinus communis</i>	145.1000	122.1000	114.1000	109.8000	79.7900	65.4000

Table 3: Percentage reduction of the residue of deposits of insecticides (botanical/chemical)

S.NO.	Botanical/chemical insecticide	Residue of the deposit (in µl)					
		3DAT	7DAT	15DAT	30DAT	60DAT	90DAT
1	<i>Annona squamosa</i>	10.0800	33.1600	65.1700	83.3600	-	-
2	<i>Glycine max</i>	58.1432	73.9176	78.9548	81.8978	89.3456	-
3	<i>Helianthus annuus</i>	85.5600	88.0400	-	-	-	-
4	<i>Ricinus communis</i>	48.2400	56.8100	59.6900	61.3400	72.3600	77.5700

Mortality data of *Sitophilus oryzae* exposed to 250 µl of *Ricinus communis* seed extract (per 20gm of wheat seeds) showed that percentage mortality reduces from 98.00% 1DAT to 10.00% after 90 days of treatment. Residue of the deposit was reported 145.1 µl 3DAT, 122.1 µL 7DAT, 114.1 µL 15 DAT, 109.8 µL 30 DAT, 79.79 µL 60DAT and 65.40 µL 90DAT. Residue of deposit was reduced by 48.24% 3DAT, 56.81% 7DAT, 59.69% 15DAT, 61.34% 30DAT, 72.36% 60DAT and 77.57% 90DAT. (table 1, 2 and 3).

B.J. Adegah (1989) [1] evaluated the residual toxicity of admixture treatment of oils and the powder from neem, legunde and oregano against *Sitophilus*, *Rhizopertha* and *Callosobruchus* for 210 days. Oregano oil can protect the corn seeds for 60 days from attack of *Sitophilus*. In the present findings, *Ricinus communis* seed extract protect the wheat seed from attack of *Sitophilus* for even 90 DAT.

Persistent toxicity of Malathion, pyrocon and pyrethrin were conducted by Senapati *et al* (1972) [6]. It was reported that pyrocon and pyrethrin were not able to protect the seeds beyond 2 months after treatment. In the present investigation, a botanical, *Ricinus communis* proved highly toxic to *Sitophilus oryzae* and persisted for 90 days.

Gupta *et al* (2000) [2] used castor, mustard, linseed, soybean, coconut, groundnut and sesame oil against *Sitophilus oryzae* and reported that all the oils afforded protection even after 120 days. Similarly in present investigation castor seed extract provided protection even after 90 days.

In nut shell, it is clear that *Ricinus communis* proved to be most persistent and can be used to protect the wheat more than 90 DAT against *Sitophilus oryzae*.

The root extracts of *Decalepis hamiltonii* tested for residual toxicity on *S.oryzae* was analysed (Rajashekar *et al* 2010) [5]. The extract was effective as a grain protectant for wheat and green gram. Reduction of F1 progeny was observed in treated grain stored for 3-4 months.

Paul *et al* (2008) [3] used 5% concentration of five extracts (in water) viz. neem, nishinda, pudina, ipomea, and marigold to find out their effectiveness as grain protectant against *Sitophilus oryzae*. All the five extracts were superior to untreated control in both the criteria i.e. grain damage percentage and loss of grain weight percentage after 60 days of inoculation.

Reference

1. Adegah BJ. Residual toxicity of three plant materials against three storage pests. College Leguna 1989, 84.
2. Gupta AK, Behal SR, Awasthi BK, Verma RA. Efficacy of different vegetable oils against *Sitophilus oryzae* in maize grain. Indian journal of Entomology 2000;62(3):301-303.
3. Paul SK, Samanta A. Effect of some extracts as grain protectants against *Sitophilus oryzae*. Env. And Eco 2008;26(A):1933-35.
4. Prem Kishor. New directions of insect control.

Entomology dept, IARI India 2000.

5. Rajashekar Y, Gunsekaren N, Shivenandappa T. Insecticidal activity of the root extract of *Decalepis hamiltonii* against stored product insect pests and its application in grain protection. J Food Sci Technol. 2010;47(3):310-314.
6. Senapati B, Satpathy JM. Persistent toxicity of Malathion and pyrethrins to the adults of rice weevil, *Sitophilus oryzae*. Indian journal of entomology 1972;34(1):1-4.