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Ecofriendly management of *Sitophilus Oryzae*

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Abstract

Voracious feeding on whole grain by *Sitophilus oryzae* causes serious damage to wheat grain. The use of chemical insecticides is the first line of defence to control the pest. But the next step is the proper selection of a botanical insecticide which is biodegradable and eco-friendly.

Four seed extracts (*Annona squamosa*, *Glycine max*, *Helianthus annuus* and *Ricinus communis*) were investigated to study the repellent action on *Sitophilus oryzae*.

Keywords: Sitophilus, ecofriendly, seed extract

Introduction

During storage the grain and seeds are subjected to spoilage and wastage by various means. A large amount of grain is spoiled by insects, *Sitophilus* is the predominant one causing considerable damage to stored grains. Voracious feeding on whole grain by *Sitophilus* results in weight loss, fungal growth and quality loss through an increase in fatty acids because of excessive use of chemically synthesized insecticides. The environment is getting polluted more and more by toxic residue of these insecticides. Thus leading to hazards and environmental pollution. The useful flora and fauna are also destroyed along with the pest in question, disrupting the ecological balance.

Keeping this in view, it was thought desirable to include some of the plants and their products for suppression of *Sitophilus oryzae*. The present investigation was carried out to evaluate the efficient, indigenous, economical and easily available botanical for management of *Sitophilus oryzae*.

Materials and Methods

For conducting tests, insects were reared at 27 ± 2 °C temperature and $65 \pm$ % relative humidity. Wheat grains were used as culture medium. Mass rearing of insects was carried out in glass bottles covered with muslin cloth. 4 seed extracts (*Glycine max* (soybean), *Helianthus annuus*, *Ricinus communis* and *Annona squamosa*) were evaluated for their repellent action against *Sitophilus oryzae*. Powder of seeds was prepared by grinding the material in a mixer cum grinder. Then the extract of seed powder was prepared in petroleum ether by soxhlet extraction method.

In the present investigation, the repellency of plant extracts against rice weevil was estimated. After two hours, insects in treated and untreated grains were counted. Insects in untreated grains were taken as repelled insects. The concentrations taken for evaluating repellent action were near about 50% mortality, so the percentage repellency was calculated mathematically.

Result and Discussion

For estimating repellency two concentrations had been taken, one which gives near about 50% mortality after 24 hours of application and the second lower than the former. 90% of the test insects were repelled by *Annona squamosa*, when 30 µl of seed extract was mixed in 20 gm of wheat seeds. Repellency was reduced to 73.33% when 20 µl of *Annona squamosa* seed extract was mixed in 20 gm of wheat seeds. The repellency recorded in the grain treated with *Glycine max* seed extract was 93.33% in higher concentration) 25 µl/ 20 gm) and 86.66% when 20 µl of extract was mixed in 20 gm of wheat seeds. In the present investigation 75% of repelling was observed, when 13.5 µl of *Helianthus annuus* seed extract was mixed in 20 gm of wheat seeds and 71.66% repellency was observed when 12.5 µl extract was mixed in 20 gm of whole grain, showing that repellency increases with increase in concentration of the extract used.

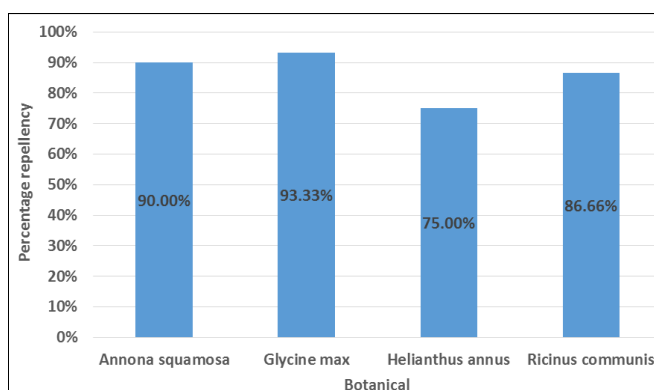
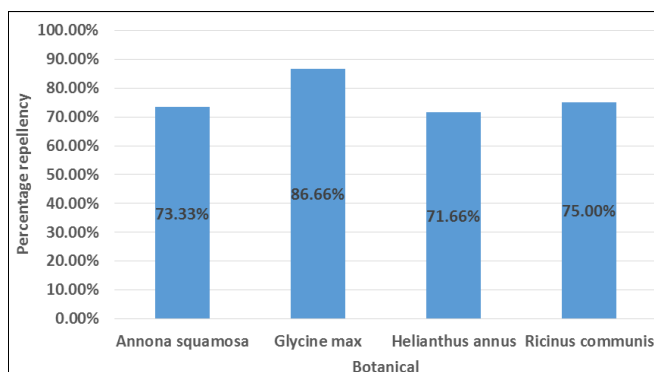
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Table 1: Repellency percentage of botanical insecticides to *Sitophilus oryzae*

S. No	Name of Botanical	Treated With High Concentration		Treated With Low Concentration	
		Concentration	Repellency %	Concentration	Repellency %
1	<i>Annona squamosa</i>	30 µl	90.00%	20 µl	73.33%
2	<i>Glycine max</i>	25 µl	93.33%	20 µl	86.66%
3	<i>Helianthus annuus</i>	13.5 µl	75.00%	12.5 µl	71.66%
4	<i>Ricinus communis</i>	125 µl	86.66%	100 µl	75.00%

Khalequzzaman and Shaja (2006) [4] reported that seed extracts of custard apple shows insecticidal activity. Reports of Nighat begum *et al.* (2013) [7] shows that *Annona squamosa* has potential of pest management. D. obengobrei (1995) reported that plant oils like soybean oil have the ability to suppress the populations of *Rhizopthera dominica* in maize and sorghum. This oil has the capacity to repel the adults of *Rhizopthera dominica*.

Lachance *et al.* (2014) [9] attributed the insect repellent action of seven plant essential oils and sunflower oil against horn flies. D. obeng-ofoi *et al.* and Freeman (2001) [2] in their investigation reported that the treatment with essential oil of *Ricinus communis* against *Sitophilus oryzae* shows repellency. Essential oil induced moderate repellency against two beetles. Findings of Nidhal Salem (2017) [6] *et al.* underlined the potential insecticidal effect of castor oil. According to them the repellency bioassay of *Ricinus communis* showed encouraging results against *Tribolium* and *Lasioderma* adults.

**Fig 1:** Graphical representation of Percentage repellency to botanical at high concentration.**Fig 2:** Graphical representation of Percentage repellency to botanical at low concentration

So the results of present investigation revealed that seed extract of *Annona squamosa*, *Glycine max*, *Helianthus annuus* and *Ricinus communis* possess the repellent efficacy against *Sitophilus oryzae*.

Conclusion

All the four seed extracts, *Annona squamosa*, *Glycine max*, *Helianthus annuus* and *Ricinus communis* have proved strongly repellent to *Sitophilus oryzae*.

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