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To evaluate the repellent action of botanicals on *Sitophilus oryzae* and *Rhyzopertha dominica*

Dr. Kusum Dang**Abstract**

Enormous losses of grains takes place after harvest of food crops. Losses resulting from insect infestation are widespread and involve more than loss of quality. Insect infestation also causes a reduction in nutrients in grains. Laboratory studies were conducted to determine the repellency of botanicals on *Rhyzopertha dominica* and *Sitophilus oryzae*.

Eucalyptus sp and *Mentha* sp leaf extract were used for repellent action against *Sitophilus oryzae*. Experimental findings revealed that 71.66% of the test insects (*Sitophilus oryzae*) were repelled by 16µl of *Eucalyptus* leaf extract and 81.66% of the test insects (*Sitophilus oryzae*) were repelled by using 17.5 µl of *Mentha* sp leaf extract. In the present experiment with *Calotropis procera* leaf powder repellency percentage of *Rhyzopertha dominica* increased upto 80%, with *Cassia fistula* leaf powder repellency of *R. dominica* was observed 85% and with *Lantana camera* leaf powder repellency of *R. dominica* was observed upto 85%.

Keywords: *Sitophilus oryzae*, food crops, *Rhyzopertha dominica*

Introduction

During storage the losses caused by various pests throughout the world in grain is just beyond our imagination. According to P. Kishor (2000) in India 15 - 20% of the the crops are destroyed by the pests. A number of insect pests like *Tribolium granarium*, *Rhyzopertha dominica*, *Sitophilus oryzae* and *Tribolium castaneum* destroy the stored grains. Among these *Sitophilus oryzae* causes considerable damage to stored grains. Insects are responsible for enormous spoilage to storage, as they feed on grains, bore the kernel, destroy the germ portion, causes heating and deterioration in stored produce. In addition they are also responsible for the qualitative loss in food grains. If the grain is protected from pest infestation there is possibility of extending food availability from existing production.

Various Chemicals have been used to protect grain from *Sitophilus oryzae* and *Rhyzopertha dominica*. But chemicals cause enormous damage to environment and livestock. So there is requirement of easily available, economic pesticides which do not disrupt the environment. Biopesticides fulfill this need. Present work deals with the efforts to explore new grain protectants from the plants against *Rhyzopertha dominica* and *Sitophilus oryzae*.

Materials and Method

Rhyzopertha dominica and *Sitophilus oryzae* require $26 \pm 2^\circ\text{C}$ temperature and 65 ± 5 percent relative humidity for proper maintenance of culture. Both the insects were reared in wheat grain. Leaves of *Eucalyptus* and *Mentha* were evaluated for their repellent action against *Sitophilus oryzae*. Fresh leaves were washed with water, dried in shade and then dried leaves were powdered in mixture cum grinder. Extract of leaves was prepared in petroleum Ether by Soxhlet extraction method.

Insects were released in the Petri dish having grains treated with botanical on one side and untreated grain on other side. After two hours, the insects in treated and untreated grain were counted. Insects in untreated grain were taken as repelled insects. The concentrations taken for evaluating repellent action were near about 50% mortality, as previously determined in relative toxicity experiments. So the percentage repellency was counted mathematically.

Result and Discussion

71.66% of the test insects were repelled, when 16 µl of *Eucalyptus* leaf extract was mixed in 20 gm wheat seeds.

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Repellency was reduced to 68.3 % when 15 µl of *Eucalyptus* leaf extract was mixed in 20 gm of wheat seeds.

When 17.5 µl of *Mentha* leaf extract was applied to the grains, 81.66% repellency was observed, whereas when 17.0 µl of *Mentha* leaf extract was used it showed 70% repellency.

When *calotropis procera* leaf powder was mixed with wheat in 10% concentration (w/w), 70% of the the test insects were repelled. Repellency percentage increased upto 80% when the leaf powder was mixed with wheat seeds in 20% (w/w) concentration. The repellency recorded in grains treated with

10% (w/w) *Cassia fistula* leaf powder was 60%. Repellency was observed 85%, when the leaf powder was mixed in 20% (w/w) concentration.

80% of the test insects were repelled when 20% (w/w) of the *Lantana camera* leaf powder was mixed in 20 gm of wheat seeds. Repellency was increased up to 85% when 40% (w/w) concentration of *Lantana camera* leaf powder was used.

All the extracts proved good repellent to *Sitophilus oryzae* and all the leaf powder used against *Rhyzopertha dominica* showed good repellency.

Table 1: Repellency Percentage of *Sitophilus Oryzae* to Botanicals

S. N.	Botanical Name	Plant part used	Treatment with high concentration		Treatment with low concentration	
			Concentration µl	Repellency %	Concentration µl	Repellency %
1	<i>Eucalyptus</i> sp	Leaves	16 µl	71.66%	15µl	68.33%
2	<i>Mentha</i> sp	Leaves	17.5 µl	81.66%	17 µl	70.00%

Table 2: Repellency Percentage of *Rhyzopertha Dominica* to Botanicals

S. N.	Botanical Name	Plant part used	Treatment with high concentration		Treatment with low concentration	
			Concentration in gm	Repellency %	Concentration gm	Repellency %
1	<i>Calotropis procera</i>	Leaves	4 gm	80%	2 gm	70%
2	<i>Cassia fistula</i>	Leaves	4 gm	85%	2 gm	60%
3	<i>Lantana camera</i>	Leaves	8 gm	85%	4 gm	80%

Results revealed that plant powder/extract used in present experiment have good repellent efficiency against *Rhyzopertha dominica* and *Sitophilus oryzae* in wheat grain up to 80% repellency was reported in case of both the test insects.

Umsalama *et al.* (2006) [10] observed the repellent potential of aqueous extract. Neiro and stashenko (2009) [4] investigated that *Eucalyptus citriodora* show replent potential to the the *Sitophilus zeamais* at doses between 0.063 and 0.503 µl/cm² Altemir J Massi *et al.* (2011) [1] reported that essential oil of *Eucalyptus* sp presented insecticidal and repellency against *Sitophilus zeamais*.

Magalisl *et al.* (2008) [5] in their studies revealed that essential oil from *Eucalyptus globulus* show toxicity against *S. zeawais*.

Odeyemi *et al.* (2008) [7] revealed that essential oil from leaves of *Mentha longifolia* shows contact and repellent action against *Sitophilus zeamais*. A high repellency was recorded for the oil at all concentrations tested. Repellency values of as high as 100% were recorded for most concentrations.

For khan manzoor (2011) evaluated *Mentha longifolia* ethanolic extract against *oryzaphilus*, *Tribolium* and *Callosobruchus*. Tested plant extracts exhibited significant repellency on the target species by following it to move from treated to untreated jar through plastic pipe.

Kumar *et al.* (2000) [3] tested 4 species of *Mentha* for repellent, contact toxicity and development inhibition against adults, larva and pupa of *T. castaneum*. The essential oils of *M. arvensis*, *M. Citrata*, *M. Piperita* and *M. Spicata* possessed repellent activity against *T. castaneum*.

Extract of ten plants were evaluated by Singhvi *et al.* (2002) [8] for repellent activity against *Rhyzopertha dominica* infesting maize seeds. *Cassia fistula* plant extract was reported strong repellent against *R. dominica*. Study of Govind rajan (2009) [2] proved the repellent activity of leaf extract of *Cassia fistula* against *Aedes aegypti* crude extract of *Cassia fistula* showed significant repellency against *Aedes aegypti*.

Umsalama *et al.* (2006) [10] observed the repellent potential of aqueous extracts from leaves of *Calotropis procera* against *Henosepilachna elateru*. This aqueous extract proved most

effective in control of *Henosepilachna elateru* and showe strong repellent action. Ogendo *et al.* (2011) [2] evaluated the insecticidal and repellent properties of *Lantana camera* against *Sitophilus zeamais*. 62.5 % of insects were repelled.

Outcome of all the above described investigations are in favour of the observations of present experiment in which leaf extract of *Eucalyptus* and *Mentha* show repellent action against *Sitophilus oryzae*. Whereas leaf powder of *Calotropis procera*, *Cassia fistula* and *Lantana camera* are promising repellent for *Rhyzopertha dominica*.

Conclusion

The results of present study indicate good potential of using locally available plants in storage grain pest management.

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