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Study of mortality and repellency of rice weevil *Sitophilus oryzae* L. on wheat seeds during storage

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ABSTRACT

Application of 5 g Karanj leaf powder (*Pongamia pinnata*) per kg of seeds of wheat was found most effective and recorded 13.33 per cent mortality of rice weevil at 21 days after inoculation. However, *Pongamia pinnata* leaf powder water extract were found most effective and significantly superior treatment as repellent for the rice weevil and recorded 76.00 - 84.33 per cent repellency which was found to be effective seed protectant in suppressing the *Sitophilus oryzae* L. damage in wheat.

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INTRODUCTION

Most of the losses in cereals are caused by several pests and diseases, both in field and storage, qualitatively and quantitatively. Among the several insects attacking cereals *Sitophilus* spp. belonging to family *Curculionidae* is very serious pests of stored cereals. The insect pests of stored products mainly are Coleopterans, such as *Callosobruchus* spp., *Tribolium* spp. and *Prostephanus truncatus,* and followed by lepidopterans, such as *Sitotroga cerealella, Ephestia* spp. and *Plodia interpunctella* (Proctor, 1994). Among the several insects attacking stored grains, *Sitophilus oryzae* L. has got economic importance. It is the most destructive insect pest of the stored raw cereal grains in the world (Champ and Dyte, 1976). *Sitophilus oryzae* causes substantial losses to stored grain amounting 18.30 per cent (Adams, 1976).

The present investigation was carried out during 2014-2015 with a view to assess locally available plant materials *viz, Azadirachta indica, Annona Squamosa, Glyricidia sepium, Ocimum tenuiflorum, Justicia adhatoda, Thevetia peruviana, Eucalyptus oblique, Pongamia pinnata* for their insecticidal actions against *S. oryzae*.

MATERIAL AND METHODS

Single pair of rice weevil (*Sitophilus oryzae* L.) was obtained from Entomology Section, College of Agriculture, Dhule and maintained in laboratory at ambient conditions. The culture was developed and maintained as per the procedure described by Strong *et al*. (1968). The adult weevil were sorted out from the

culture every day and used for the experimental purpose.

The leaves of *Neem* (*Azadirachta indica*: Meliaceae), custard apple (*Annona squamosa*: Annonaceae), glyricidia (*Glyricidia sepium*: Fabiaceae), *Tulsi* (*Ocimum tenuiflorum:* Lamiaceae), adulsa *(Justicia adhatoda*: Acanthaceae), thevetia (*Thevetia peruviana:* Apocynaceae), eucalyptus (*Eucalyptus obliqua*: Myrtaceae) and Karanj (*Pongamia pinnata*: fabaceae) were collected from the KVK (Krishi Vigyan Kendra), Horticulture Section, College of Agriculture Dhule and around the foot hills of Laling ghats, Dhule District of Maharashtra INDIA.

The collected plant materials were cleaned, air dried in a shade and then ground to a powders were sieved through mesh No. 60. and mixed with the seeds @ 5 gm/kg seeds in plastic jar. The repellent activity of *S. oryzae* was worked out with the help of procedure described by Singh *et al.* (2013).

Three samples of 50 g sterilized and pest free seeds of wheat were taken and kept separately in the plastic containers for testing the efficacy against *S. oryzae.* Twenty adults (0-24 hours old) of *S. oryzae* were released in each container. The mouth of these containers were covered with muslin cloth and fastened with the help of rubber bands. These containers were kept in laboratory at room temperature. The observations were recorded at 3, 7, 14 and 21 days after the treatment. The dead weevils were sieved out and counted. Per cent beetle mortality was calculated as described by Simbarashe *et al.* (2013) as: (Number of dead weevils/ Total number of weevils) x 100

Repellency was tested by following the method described by Adriana *et al.* (2008). per cent repellency of *S. oryzae* were recorded at 1, 2, 3, 4 and 5 hrs after treatment.

Per cent mortality and repellency of *S. oryzae* were calculated, transformed appropriately and the data were statistically analysed as suggested by Panse and Sukhatme (1995).

RESULTS AND DISCUSSION

The results obtained on per cent mortality of *Sitophilus oryzae* L. are shown in Table 1. The highest per cent mortality of *S. oryzae* was recorded with *Pongamia pinnata* leaf powder (10.00 %) was significantly superior over all the other treatments. However, the treatment with *A.indica* (*Neem*) and *A. squamosa* (Custard apple) leaf powder were found at par with it (9.33 %) 3 days after inoculation.

The highest per cent mortality of *S. oryzae* at seven days after inoculation treatment was recorded with

Table 1 : Per cent mortality and repellency of rice weevil, *Sitophilus oryzae* L. to different botanicals on wheat seed

Sr. No.	Treatments	Per cent mortality of *S. oryzae*				Per cent repellency of *S.oryzae*				
		3 DAI	7 DAI	14 DAI	21 DAI	1 Hr	2 hrs	3 hrs	4 Hrs	5 Hrs
1.	*A. indica* (*Neem*) leaf powder @ 5g/kg	9.33 (17.79)*	10.00 (18.42)	11.00 (19.37)	12.26 (20.50)	66.67 (54.75)	68.00 (55.58)	73.33 (59.01)	66.67 (54.74)	70.00 (56.82)
2.	*A. squamosa* (C. apple) leaf powder 5g/kg	9.33 (17.79)	6.67 (14.96)	10.67 (19.06)	12.25 (20.47)	66.67 (54.75)	68.00 (55.58)	66.67 (54.74)	66.67 (54.74)	63.33 (52.74)
3.	*G. sepium* (Glyricidia) leaf powder @ 5g/kg	2.23 (8.59)	4.03 (11.63)	4.33 (11.98)	4.67 (12.47)	60.00 (50.78)	56.67 (48.83)	63.33 (52.75)	53.33 (46.92)	53.33 (46.91)
4.	*O. tenuiflorum* (*Tulsi*) leaf powder @ 5g/kg	1.33 (6.63)	1.67 (7.46)	1.67 (7.46)	3.67 (10.97)	43.33 (41.17)	46.67 (43.09)	50.00 (45.00)	43.33 (41.17)	36.67 (37.25)
5.	*J. adhatoda* (Adulsa) leaf powder 5g/kg	2.13 (8.40)	2.33 (8.75)	4.00 (11.48)	4.33 (11.99)	53.33 (46.92)	53.33 (46.91)	53.33 (46.94)	46.67 (43.09)	46.67 (43.08)
6.	*T. peruviana* (Thevetia) leaf powder 5g/kg	3.67 (11.14)	6.67 (14.95)	6.67 (14.95)	7.03 (15.38)	66.67 (54.74)	66.67 (54.74)	66.67 (54.74)	53.33 (46.92)	56.67 (48.87)
7.	*E. oblique* (Nilgiri) leaf powder @ 5g/kg	2.57 (9.34)	5.26 (13.33)	5.67 (13.76)	5.75 (13.88)	66.67 (54.74)	66.67 (54.74)	63.33 (52.76)	53.33 (46.91)	56.67 (48.84)
8.	*P. pinnata* (Karanj) leaf powder @ 5g/kg	10.00 (18.39)	10.33 (18.72)	11.33 (19.67)	13.33 (21.42)	76.67 (61.12)	76.00 (60.68)	83.33 (65.92)	73.33 (58.93)	76.67 (61.16)
9.	Untreated control	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	13.33 (21.15)	18.33 (25.00)	23.67 (29.09)	18.33 (25.27)	16.67 (24.05)
	S.E. ±	0.255	0.448	0.334	0.325	1.360	1.461	1.524	1.338	1.432
	C.D. (P=0.05)	0.760	1.331	0.992	0.966	4.041	4.342	4.530	3.976	4.256

DAI– Days after inoculation

*Figures in the parenthesis are arcsine transformed value

Pongamia pinnata (Karanj) leaf powder (10.33%) which was significantly superior over all the treatments. But, *A. indica* (*Neem*) leaf powder was found at par with *Pongamia pinnata* (10.00 %).

Fourteen days after inoculation the treatment with *Pongamia pinnata* leaf powder (11.33%) was significantly superior over all the other treatments, whereas *A. indica* (11.00%) and *A. squamosa* (10.67%) were found at par.

Similar results were recorded at 21 days after inoculation 13.33 per cent mortality was recorded in the treatment with *P. pinnata* (Karanj leaf powder) which was significantly superior over all other treatments, except, *A. indica* (12.26%) and *A. squamosa* (12.25%) which were found at par.

The overall results revealed that the treatment with *P. pinnata* (Karanj leaf powder) @ 5 g/kg seed of wheat was significantly superior over all other treatments and recorded maximum mortality (13.33 %) this was in agreement with the results obtained by Govindan and Jeyarajan (2009) who studied the effect of plant powders against *S. oryzae* L. infesting paddy grains, Arya and Tivari (2013) reported that the efficacy of some indigenous bio products against *S. oryzae* on wheat seeds, Asmanizar and Idris (2012) suggested plant powders of *A. indica* and *A. muricata* as rice grain protectant against *S. zeamais,* Devi *et al*. (2014) found *A. indica* powder as effective rice grains protectants.

The results obtained at 1 hr after inoculation on per cent repellency of *S. oryzae* on wheat variety Lok-1 are shown in Table 1. Maximum per cent repellency of rice weevil was recorded with *P. pinnata* (Karanj leaf water extract) 76.67 per cent which was significantly over all other treatments. But treatment with *A. indica* (*Neem* leaf water extract) and *A. squamosa* (Custard apple leaf water extract) 66.67 per cent were found the second best treatments followed by *Karanj* leaf water extract. The treatment with *O. tenuiflorum* (*Tulsi*) extract was found least effective.

Similar results were recorded at 2, 3, 4 and 5 hrs after inoculation where treatment with *P. pinnata* (Karanj leaf water extract) which was significantly superior over all other treatment followed by treatment with *A. indica* (*Neem* leaf water extract) and *A. squamosa* (Custard apple leaf water extract). The treatment with *O. tenuiflorum* (*Tulsi*) extract was found least effective.

The present studies of repellency of botanicals against *S. oryzae* were in conformity with earlier results obtained by Singh *et al*. (2013) whose results showed that only few tested plants had repellent activity against *S. oryzae.* Hmed *et al*. (1980) reported that the dried and powdered leaves of *Neem* as repellents against adults of *Sitophilus oryzae* (L.). Akhtar *et al*. (2013) evaluated ethanol extract of *A. indica* for their repellent effects against *S. oryzae* L. Junior *et al*. (2013) reported the repellency of extract of *A. squamosa* against *S. zeamais.*

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