

Efficacy of *Azadirachta indica* and *Curcuma amada* as grain protectants against rice weevile (*Sitophilus oryzae* Lin.) in wheat

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Botanicals, *Azadirachta indica* A. juss. (neem) leaves and mango ginger (*Curcuma amada*) rhizome in powder form were applied in three doses at 1,3 and 5 gm/kg grain for testing their efficacy against *Sitophilus oryzae* under free choice and no choice test. Both the botanical were found effective. Mango ginger rhizome powder was found most effective, which hinders the orientation of *Sitophilus oryzae* L and gave maximum mortality and reduced the emergence of the adult beetles.

Key words: *Azadirachta indica*, *Curcuma amada*, *Sitophilus oryzae*, *Stored wheat*.

INTRODUCTION

The growing awareness of environmental hazards due to use of synthetic insecticides has attracted attention towards indigenous technical knowledge (ITK). ITK has provided enough opportunity to researchers as well as farmers for selecting some of the low cost, eco-friendly and effective options to be used in successful pest management. Among the storage pests, rice weevil (*Sitophilus oryzae* L.) is the most destructive one in wheat (*Triticum aestivum* L.). The use of botanicals reportedly is an indigenous approach towards insect pest management and found effective against *S. oryzae* in the protection of stored wheat (Niber, *et al.* 1992, Paneru *et al.*, 1993, Dakshinamurthy and Goel, 1992, Tiwari, 1993, Bhusan and Ghatak, 1991, Xie *et al.*, 1995, Niber, 1994, Ignatowicz, 1997, Ignatowicz and Wesolowska, 1996, Paneru *et al.*, 1997, Bowry *et al.*, 1984, Weaver *et al.*, 1995, Mishra *et al.*, 1992). Neem (*Azadirachta indica*) and Mango ginger (*Curcuma amada*) is widely used as a medicinal plant, which also possesses multifarious insecticidal properties. Keeping these facts in view, the present investigation was designed to find out the insecticidal property of neem and mango ginger against rice weevil, *Sitophilus oryzae* in storage condition.

MATERIALS AND METHODS

An investigation was carried out under laboratory condition at Department of Entomology, College of Agriculture, J.N. Krishi Vishwa Vidyalaya., Gwalior (M.P.). The leaves of Neem and rhizomes of mango ginger were dried at ambient temperature and grinded in Mixer Grinder (PHILIPS, HL 1628) to powder. This powder was sieved in 30-mesh sieve and three doses @ 1, 3 and 5gm/Kg grain were prepared. The culture of *S. oryzae* was maintained in the laboratory at 30±5 °C temperature and 75±5 percent relative humidity with the help of incubator and desiccator. The culture was facilitated to multiply and only newly emerged adults were utilized in experimentation. The studies were conducted on wheat (*Triticum aestivum* var. DL 803-3) in free choice and no choice tests, separately.

In free choice test hundred non-infected, conditioned grains were treated with the 1, 3 and 5gm/kg doses of leaves powder of neem and rhizome powder of mango ginger and each of them were randomly arranged in a glass trough in circle-equi-distance from the center. Small solid glass rods were kept between the treatments to separate them from each other. Hundred pairs of ten days old adults were released in centre of trough and it was covered by muslin cloth. The number of adults oriented in each treatment was counted after twenty-four, forty-eight and seventy-two hours of their release.

In no choice test 20gm non-infected, conditioned grains treated with the 1, 3 and 5 gm/kg doses of leaves powder of

neem and rhizome powder of mango ginger and each of them were kept in separate spacemen tube. The all the tubes were kept in desiccator at 75±5 % relative humidity and desiccator in the incubators at 30±5 °C temperature. The adult mortality was recorded at 2, 7 and 14days after their release. All the remaining adults were removed 14 days after their release. Total number of adults emerged and percent weight loss due to pest infestation in each treatment were recorded, forty days after their release. Both the experiments were replicated four times. The data were subjected to suitable transformation and were analysed following randomized complete block design (RCBD).

RESULTS AND DISCUSSION

Effect of different doses of neem and mango ginger powder on infestation of rice weevil:

A. In free choice test

1. Orientation preference 24 hours after release:

The results revealed that there was significant difference observed in different treatments in orientation preference at 24 hours after release. Significantly minimum number of adults (0.33) was found in Mango ginger rhizome powder treated grain @ 5 gm/Kg grain in comparison to maximum number of adult emerge in untreated grain (8.33) (Table-1).

2. Orientation preference 48 hours after release:

Forty eight hours after release, significant differences were observed. Minimum number of adults (0.67) was oriented in Mango ginger rhizome powder treated grain @ 5 gm/Kg grain which was at par with Mango ginger rhizome powder treated grain @ 3 gm/Kg grain (0.67) and @ 1 gm/Kg grain (0.67) respectively in contrast to maximum in untreated control (7.33).

3. Orientation preference 72 hours after release:

Seventy two hours after release significantly minimum number (1.00) of adults was recorded in Mango ginger rhizome powder treated grain @ 5 gm/Kg grain which was at par with Mango ginger rhizome powder treated grain @ 3 gm/Kg grain (1.33) and @ 1 gm/Kg grain (1.33), respectively. However, significantly maximum number of adults was emerged in untreated control (3.08).

4. Mean orientation preference:

On the bases of mean orientation Mango ginger rhizome powder treated grain @ 5 gm/Kg grain were found most effective in which significantly minimum number of adults emerged (0.78) which was at par with Mango ginger rhizome powder treated grain @ 3 gm/Kg grain (0.78) and @ 1 gm/Kg grain (1.3), respectively. However significantly maximum numbers of adults

were emerged in untreated control (8.22).

treated grain @ 3 gm/Kg grain (90.00) and @ 1 gm/Kg grain (80.00) respectively. However, significantly minimum percent mortality was noticed in untreated control (23.3).

B. IN NO CHOICE TEST:

1. Adult mortality 2 days after treatment:

Data presented in Table-2 revealed that significant differences were observed in different treatments in adult mortality 2 days

3. Adult mortality 14 days after treatment:

Fourteen days after treatment percent adult mortality was

Table: 1 Effect of different doses of neem and mango ginger powder on orientation of *S.oryzae* Lin. in free choice test.

S No	Plants part	Number of adult oriented hours after release							Mean
		2	7	14					
1	Neem leaf powder @ 1 gm/ Kg grain	3.00	1.72*	4.33	2.19	3.33	1.90	3.56	1.94
2	Neem leaf powder @ 3 gm/ Kg grain	4.67	2.16	5.33	2.35	2.67	1.74	4.22	2.08
3	Neem leaf powder @ 5 gm/ Kg grain	5.33	2.35	4.33	2.16	2.00	1.52	3.89	2.01
4	Mango ginger rhizome powder @ 1 gm/Kg grain	1.33	1.34	1.33	1.34	1.33	1.34	1.33	1.34
5	Mango ginger rhizome powder @ 3 gm/Kg grain	0.67	1.00	0.67	1.05	1.33	1.34	0.78	1.09
6	Mango ginger rhizome powder @ 5 gm/Kg grain	0.33	0.88	0.67	1.00	1.00	1.17	0.78	1.06
7	Control	8.33	2.97	7.33	2.78	9.00	3.08	8.22	2.94
	Sem ±		0.31		0.25		0.23		0.26
	CD at 5%		0.95		0.77		0.69		0.81

* Values are square root transformed values

Table 2 : Effect of different doses of neem and mango ginger powder on the percent Mortality, emergence of *S.oryzae* Lin. in no choice test.

SNo	Plants part	Percent Adult mortality days after treatment						No of adult emerge
		2	7	14				
1	Neem leaf powder @ 1 gm/ Kg grain	23.33	28.79*	43.33	41.09	66.67	55.02	5.33
2	Neem leaf powder @ 3gm/ Kg grain	33.33	34.94	63.33	52.80	73.33	59.03	11.67
3	Neem leaf powder @ 5 gm/ Kg grain	23.33	28.79	53.33	46.95	63.33	52.80	13.33
4	Mango ginger rhizome powder @ 1 gm/Kg grain	33.33	35.24	80.00	63.96	96.67	83.90	6.00
5	Mango ginger rhizome powder @ 3 gm/Kg grain	36.67	36.87	90.00	78.97	96.67	83.90	5.00
6	Mango ginger rhizome powder @ 5 gm/Kg grain	43.33	41.18	96.67	83.90	100.00	90.05	3.33
7	Control	20.00	26.58	23.33	28.79	36.67	37.16	18.00
	Sem ±		3.91		4.97		3.39	2.19
	CD at 5%		12.01		15.28		10.42	6.72

* Values are angular transformed values

after treatment. Maximum percent mortality (43.33) was found in Mango ginger rhizome powder treated grain @ 5 gm/Kg grain which was at par with Mango ginger rhizome powder treated grain @ 3 gm/Kg grain (36.67) and @ 1 gm/Kg grain (33.33) respectively, in contrast to minimum percent mortality in untreated grain (20.0).

2. Adult mortality 7 days after treatment:

Significantly maximum percent mortality (96.67) was found in grains treated with Mango ginger rhizome powder @ 5 gm/Kg grain which was at par with Mango ginger rhizome powder

significantly higher in Mango ginger rhizome powder treated grain @ 5 gm/Kg grain (100.00), which was at par with Mango ginger rhizome powder treated grain @ 3 gm/Kg grain (96.67) and @ 1 gm/Kg grain (96.67), respectively. However, significantly minimum percent mortality was observed in untreated control (36.67).

4. Number of adults emergence:

The data of number of adults emerged 40 days after treatment showed that significantly minimum number of adult emerged (3.33) in Mango ginger rhizome powder treated grain @ 5 gm/Kg grain were at par with Mango ginger rhizome powder treated grain @

3 gm/Kg grain (5.00) and @ 1 gm/Kg grain (6.00), respectively. However, significantly maximum number of adults emerged in untreated control (18.00).

In the present study the leaves powder of *Azadirachta indica* A.juss. and rhizome powder of *Curcuma amada* have been found effective to reduce the infestation of *S.oryzae* as compared to control. Rhizome powder of *Curcuma amada* has been found effective over leaves powder of *Azadirachta indica* as its gives cent percent mortality at 14 days after treatment @ 5 gm/Kg grain and less preferred by the pest for orientation. No work has been reported on the efficacy of *C. amada* as a grain protestant. In *A. indicia* the inhibition on orientation and mortality of pest are probably due to presence of azadirachtin in Neem tree. Thomson (1992) reported that the key insecticidal ingredient found in the Neem tree is azadirachtin, a naturally occurring substance that belongs to an organic molecule class called tetranortriterpenoids. It breaks the insect life cycle to disturb the moulting process of insect and it is also serving as a feeding deterrent for some insects. Neem leaf powder was comparatively less effective than Mango ginger rhizome powder. However, it was significantly effective than untreated control. Ignatowicz and Weslowska (1996) also reported that the powder of dried leaves of *A. indica* was less effective as repellent against *S. oryzae* in comparison to seed karnal. In the present study, higher doses of neem and mango ginger powders were observed more effective than their lower doses. Ignatowicz and Weslowska (1996) also observed that higher dose of neem cake powder is more effective than the lower dose. Ignatowicz (1997) tested other botanicals viz. lavender, corn mint and horse mint etc, against *S. granaria* and reported that repellency effect increased with increase in concentration.

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