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Use of Certain Naturally Ocurring Herbal Grain Protectants against *Sitophilus oryzae* Linn. (Coleoptera :Curculionidae)

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Abstract : Effect on life process of *S. oryzae* was observed in grains treated with various grain protectants. All grain protectants were found to be significantly superior in affecting the life process of the pest over untreated check, the oil of A. *indica* (18.00 eggs) was found to be most effective in reducing the number of egg laid by weevil which was followed by A. *indica* powder, *M. azedarach* and *M. dioica* being 21.00, 24.67 and 31.00 eggs, respectively. The incubation period was non significant in different grain protectants which varied from 6.48 to 8.95 days. However, it was 6.48 days in *M. azedarach* signify the minimum larval period was in the treatment *C. nucifera* (19.30days), significantly highest larval period (26.50 days) was recorded on grains treated with *A. indica* powder. There was no significant variation in pupal period of the pest and it ranged from 12.54 to 13.94 days in different treatments. The F_1 population of the pest ranged from 3.33 to 31.00 adults in different grain protectants, while it was 76.33 adults in untreated check. The less number of weevils were found in grains treated with *A. indica* oil. The wheat grains treated with different grains protectants the grain damage by *S. oryzae* was maximum in grains treated with *C. nucifera* (39.39 percent) and minimum (4.65 percent) in *A. indica* oil. The loss in weight of the wheat grains in different grain protectants was significantly less, which ranged from 1.95 to 23.02 percent in comparison of untreated check (48.63 percent).

Key words : *Sitophilus oryzae*, Grain protectants, *Azadirachta indica, Momordica dioica, Melia azedarach.,Brassica juncea*

Introduction

Cereals are the major food crops grown all over the globe. Among the different cereals, wheat is the most important food crop of India. It is an important winter cereal. It is grown very extensively through out the world in an area of about 226.94 million hectares. Out of the of food grain 70 percent is stored traditionally by the farmers for their own consumption, seed an wags and about 30 percent surplus are hended over to traders and government agencies in India. Due to improper storage conditions 10 per cent and 5-10 per cent losses occur during storage in a period to 3 to 8 months especially during rainy period (Rai and Singh, 1979). The wheat grains are damaged by *S. oryzae*, *R. dominica*, *T. granarium T, castaneum* and *S. cerealella* in storage, (Mookherjee *et al*., 1968). Among them *S. oryzae* causes severe damage to wheat grains, (Rahman, 1945). The control of the stored grain pests by chemical and other methods is being explored to affect further improvement in stored pest control techniques. Though, chemical has proved to

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give effective control of various pests infesting grains, but simultaneously they also creates several problems such as appearance of the resistant strains of pests and toxic hazards due to chemical residue. Earlier Girish and Jain (1974), Mishra *et al.* (1992) and Singh *et al.* (1993) reported some plant products *viz.* soybean, groundnut, mustard, neem, citrus, peels, *Saussurea lappa*, coconut and dharek effective against storage, pests. Mahapatra *et al.* (1996) tested extracts of neem seed kernels were evaluated against *S. oryzae* adults at different concentration (0.001, 0.01, 0.1, 0.5 and 1.0 per cent) only aqueous and alcoholic extract were effective. Many workers worked on plant products as insecticides for the control of several insect pests (Verma and Srivastava, 1988; Jilani and Saxena, 1990; Ahmed and Bhattacharya, 1991; Ambedkar and Khan, 1994; Gbolade *et al.*, 1999, Tripathi *et al.*, 2000; Umrao and Verma, 2002; Pandey and Raju, 2003; Singh. and Kanaujia, 2003; Singh *et al.*, 2003; Subhasni *et al.*, 2004; Anonymous, 2004; Seenivasan *et al.*, 2004; Chandel *et al.*, 2005; Dwivedi *et al.*, 2005; Dwivedi and Bhati, 2006). The present studies were therefore undertaken to determine the effective plant products as protestants against the pest.

Materials and Methods

The unripe fruits of *M. dioica*, seeds of *S. dulcamara*, *O. bacilicum* and *A. indica*, leaves of *M. azedarach* and *I. carnea* oil of *A. indica* and *B. juncea* plant product grain protectants, which were tested to check to damage by *S. oryzae* in wheat grains. Different grain protectants were thoroughly mixed separately with seeds of susceptible wheat variety Sonalika @ 15 g and 1 ml/kg grains of powder and oil, respectively in cylindrical jars by manual shaking in required quantity sub samples infested with five pairs of 24 hours old adult of *S. oryzae* were kept in three replications for taken observations on fecundity, adult emergence developmental period and grain damage. For the loss assessment five pair of adults were placed in tubes containing 50g grains of each variety. At the end of experiment after 90 days, grains and their particles were weighed after removing all dusts, insects and their stages. The difference was recorded between initial and final weights to assess loss of weight in grains.

Results and Discussion

(A) Effect on the growth and development of S. oryzae

Efficacy of different grain protectants viz. Makoi (*Solonum dulcamara* Linn). Jangli parwal (*Momordica dioica* Roxb.), coconut (*Cocus nucifera* L.), Dharek (*Melia azedarach* Linn.) Neem (*Azadirachta indica* A. Juss.), Mustard (*Brassica juncea* Linn.Czern & coss), Sadabahar (*Ipomea carnea* Jacq.) and kali tulsi (*Ocimum bacilicum* Linn.) were tested on growth and development of *S. oryzae* data presented in Table I.

1. Effect on Fecundity

The egg laid by female on the grains treated with different grain protectants were significantly less in comparison to untreated check. The minimum egg (18.00) were observed in the grains treated with *A. indica* oil, which was followed by *A. indica* powder, *M. azedarach and M. dioica* having 21.0, 24.67 and 31.00 eggs respectively. The treatment of *A. indica* oil, *A. indica* powder and M. azedarach were significantly better than *I. carnea, B. juncea and C. nucifera* in minimizing the egg laying by the female. Maximum fecundity of the

post was observed on grain treated with C. nucifera (51.67 eggs). Significantly less oviposition of S. oryzae were also recorded by Singh and Mall (1991) in wheat grains treated with neem oil, sadabahar, dharek and neem cake.

2. Effect on incubation period

The incubation period of Rice weevil did not differ significantly among various treatments. However, minimum incubation period (6.48 days) was recorded in grains treated with M. azedarach and followed by *C. nucifera, M. dioica, B. juncea, I. Carnea, A. indica oil, S. dulcamara, O. bacilicum* and *A. indica* powder being 6.70 to 8.95 days, while it was 6.69 days in untreated grains.

3. Effect on larval period & pupal period

The larval period of *S. oryzae* significantly increased in various grain protectants and ranged from 19.30 to 26.50 days. Significantly maximum larval period was observed in grains treated with *A. indica* powder. Larval period decreased significantly in the grain treated with *C. nucifera, B. juncea* and *S. dulcamara* being 19.30, 19.43 and 21.50 days, respectively than *I. carnea, M. azedarach, A. indica* oil and *A. indica* powder. Highest 13.94 days pupal period was in *A. indica* powder, which was followed by *M. dioica, B. juncea, A indica* powder, which was followed by *M. dioica, B. juncea, A indica oil, S. dulcamara, M. azedarach, I. carnea, O. bacilicum and C. nucifera viz.*, 13.84, 13.81, 13.50, 13.46, 13.24, 13.23, 12.88 and 12.54 days, respectively, while it was 11.95 days in untreated grains. Saxena (1993) found that developmental period of R. dominica on grains treated with cakes of neem, castor, linseed and mustard. Mustard oil, Sadabahar, neem kernel was more than the control.

4. Effect on F1 progeny

Treatment *A. indica* oil (3.33 adult) was proved to be most effective in reducing F1 populations, which was followed by *A. indica* powder and *M. azedarach* being 4.67 and 6.67 adults, respectively. Treatment of *A. indica powder, M. azedarach, I. carnea* and *S. dulcamara* did not differ significantly among themselves. The efficacy of *C. nucifera* was least in comparison to other treatments. Verma *et al*. (1983) reported 26.66 to 46.66 percent adult emergence of *S. cerealella* in grains treated with neem oil, neem cake, castor cake and castor oil.

(B) Effect on damage

The damaged grain by Rice weevil in various treated grain samples ranged from 4.65 to 31.39 per cent being minimum in *A. indica* oil and maximum in C. nucifera and in untreated grains it was 57.36 per cent (table-2). The loss in weight by S. oryzae was less (1.95 per cent) in *A. indica* oil treated seeds. The treatements *A. indica* powder and M. azedarach were significantly better regarding loss in weight than *O. bacilicum, S. dulcamara, M. dioica, B. juncea* and *C. nucifera* being 7.54, 8.37, 9.92, 11.73 and 23.02 per cent. Singh and Mall (1991) observed that cakes of castor neem, mustard, linseed and powder of dhareka and sadabahar were effective in protecting wheat grains against *S. oryzae*. Mishra *et al*. (1992) recorded 2.6 to 8.2 percent loss in weight and 6.9 to 15.5 percent damaged grain by *S. oryzae* among wheat grains samples treated with powder of custard apple seed, neem seed, neem leaf

Table 1 - Effect of grain protectants on fecundity, incubation period larval period, pupal period and F_1 progeny of *S. oryzae*.

Treatments	Dosages/ kg Seed	Fecundity	Incubation Period(days)	Larval Period(days)	Pupal Period(days)	F_1 Progeny
Solanum dulcamara	15g	37.33	8.26	21.50	13.46	8.67
Momordica dioica	15g	31.00	6.72	22.18	13.84	9.00
Cocus nucifera	1ml	51.67	6.70	19.30	12.54	31.00
Melia azedarach	15g	24.67	6.48	24.12	13.24	6.67
Azadirachta indica (Powder)	15g	21.00	8.95	26.50	13.94	4.67
Brassica juncea	1ml	48.33	6.80	19.43	13.81	22.67
Ipomea carnea	15g	43.33	7.41	23.75	13.23	7.00
Azadirachta indica (oil)	1ml	18.00	7.90	24.45	13.50	3.33
Ocimum bacilicum	15g	39.00	8.91	21.94	12.88	12.00
Untreated check	--	86.00	6.69	18.15	11.95	76.33
S.E. m±	--	0.62	2.16	0.92	0.38	0.28
C.D. at 5%	--	1.54	NS	2.20	NS	0.78

Table 2 - Effect of grain protectants on damage by *S. oryzae*.

Treatments	Dosages/ kg Seed	Damaged grain (per cent)	Loss in weight (per cent)
Solanum dulcamara	15g	18.10	8.75
Momordica dioica	15g	17.80	9.92
Cocus nucifera .	1ml	31.39	23.02
Melia azedarach	15g	8.90	4.46
Azadirachta indica (Powder)	15g	5.52	2.17
Brassica juncea	1ml	20.43	11.73
Ipomea carnea.	15g	16.36	5.44
Azadirachta indica (oil)	1ml	4.65	11.73
Ocimum bacilicum	15g	14.35	7.54
Untreated check	–	57.36	48.63
S.E. m±	–	2.10	1.90
C.D. at 5%	–	5.24	4.80

and citrus peel @ 3 per cent damage grains were observed when the grain samples were treated @ 5 per cent. Kumar *et al.* (1990) and Uttam *et al.* (2002) reported effective control of *Sitophilus oryzae* L. by grain protectant oils as taramira and mustard. Hassan (2001) also reported effective control of *T. granarium* and *S. granaries* by sesame, sunflower and castor oil.

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