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Effect of Certain Naturally Occurring Herbal Grain Protectants on Trogoderma granarium Everts (Dermestidae: Coleoptera)

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ABSTRACT

Effect on growth and development of T. granarium was observed in grains treated with various grain protectants. All grain protectants were found to be significantly superior in affecting the growth and development 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 beetle 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 protecatants 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 (19.30 days), significantly highest larval period (26.50 days) was recorded on grain 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 beetles were found in grains treated with A. indica oil. The wheat grains treated with different grain protectants the grains damage by T. granarium was maximum in grain 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: Trogoderma granarium, Grain Protectants, Azadirachta indica, Momordica dioica, Melia azedarach, cocus nucifera.

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 above 226.94 million hectares. Out of the total production of food grain 70 percent is stored traditionally by the farmers for their own consumption, seed an bags and about 30 percent surplus food grains are handed over to traders and government agencies in India. Due to improper storage conditions, 10 percent and 5 to 10 percent losses occur during storage in a period of 3 to 8 months especially during rainy season (Rai and Singh, 1979 and Arya et. al., 1991). Which is directly correlated with the insect population. The wheat grains are damaged by T. granarium, T. casteneum, S. oryzae, R. dominica, and S. cerealella in storage (Mookherji et al., 1968). Among them T. granarium causes severe damage to wheat grains (Rahman, 1942). 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 have proved to give effective control of various pest 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 Kavadia (1994), Kumar and Okonronkwo (1991), 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. Many workers worked on plant products as insecticides for the control of several insect pests (Ahmed and Bhattacharya, 1991, Tripathi et al., 2000; Pandey and Raju; 2003; Subhasni *et al.*, 2004; Chandel *et al.*, 2005; Dwivedi and Bhati, 2006). The present studies were therefore under taken to determine the effective plant products as protectants 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 T. granarium in wheat grains. Different grain protectants were thoroughly mixed separately with seeds of susceptible wheat variety C 306@ 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 5 pairs of 24 hours old adult of *T. granarium* were kept in three replications for taken observations on fecundity, adult emergence developmental period and grain damage. For the loss assessment 5 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 larva and their stages. The difference was recorded between initial and final weights to assess the loss of weight in grains.

RESULTS AND DISCUSSION:

(A) EFFECT ON THE GROWTH AND DEVELOPMENT OF T. GRANARIUM

Efficacy of different grain protectants viz. Makoi (*Solanum dulcamara* Linn), Jangli parwal (*Momordica dioica* Roxb.), coconut (*Cocus nucifera* L.), Dharek (*Melia azedarach* Linn.), Neem (*Azadirachta indica*), Mustard (*Brassica juncea* Linn. Czern & coss), Sadabahar (*Ipomea carnea* Jacq.) and Kali tulsi (*Ocimum bacilicum* Linn.) were tested on growth and development of *T. granarium* data presented in Table 1.

1. Effect on Fecundity:

The eggs laid by female on the grains treated with different grain protectants were significantly less in comparison to untreated check. The minimum eggs (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 21.00, 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 pest was observed on grains treated with *C. nucifera* (51.67 eggs). Significantly less oviposition of T. granarium were also recorded by Singh *et al.* (1991) in wheat grains treated with neem oil, sadabahar, dharek and neem cake.

2. Effect on incubation period:

The incubation period of Khapra beetle 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 *T.granarium* significantly increased in various grain protectants and ranged from 19.30 to 26.50 days. Significantly maximum larval period was observed in grain treated with *A. indica* powder. Larval period decreased significantly in the grains 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 pupal period (13.94 days) was in *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.*, 13.84m 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 F_1 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. cerelella* in grains treated with neem oil, neem cake, castor cake and castor oil.

(B) EFFECT ON DAMAGE

The damaged grains by Khapra beetle in various treated grain samples ranged from 4.65 to 31.39 percent being minimum in *A. indica* oil and maximum in *C. nucifera* and in untreated grains it was 57.36 percent (Table-2). The loss in weight by *T. granarium* was loss (1.95 percent) in *A. indica* oil treated seeds. The treatment *A. indica* powder and *M. azedarach* were significant 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 percent. Hassan (2001) also effective control of *T. granarium* and *S. granaries* by sesame, sunflower and castor oil.

Treatments	Dosages/ kg Seed	Fecundity	Incubation Period (days)	Larval Period (days)	Pupal Period (days)	F1 Progeny
Solanum dulcamara	15 g	37.33	8.26	21.50	13.46	8.67
Momordica dioica	15 g	31.00	6.72	22.18	13.84	9.00
Cocus nucifera	1 ml	51.67	6.70	19.30	12.54	31.00
Melia azedarach	15 g	24.67	6.48	24.12	13.24	6.67
Azadirachta indica (Powder)	15 g	21.00	8.95	26.50	13.94	4.67
Brassica juncea	1 ml	48.33	6.80	19.43	13.81	22.67
Ipomea carnea	15 g	43.33	7.41	23.75	13.23	7.00
Azadirachta indica (oil)	1 ml	18.00	7.90	24.45	13.50	3.33
Ocimum bacilicum	15 g	39.00	8.91	21.94	12.88	12.00
Untreated check		86.00	6.69	18.15	11.95	76.23
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 1: Effect of grain protectants on fecundity, incubation period, larval period, pupalperiod and F1 progeny of *T. granarium*

Table 2: Effect of grain protectants on damage by *T. granarium*

Treatments	Dosages/ kg Seed	Damaged grain (%)	Loss in weight (%)
Solanum dulcamara	15 g	18.10	8.75
Momordica dioica	15 g	17.80	9.92
Cocus nucifera	1 ml	31.39	23.02
Melia azedarach	15 g	8.90	4.46
Azadirachta indica (Powder)	15 g	5.52	2.17
Brassica juncea	1 ml	20.43	11.73
Ipomea carnea	15 g	16.36	5.44
Azadirachta indica (oil)	1 ml	4.65	11.73
Ocimum bacilicum	15 g	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

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