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EFFICACY OF PLANT POWDERS FOR THE MANAGEMENT OF *TROGODERMA GRANARIUM* EVERTS

B.L. JAKHAR, M.C. BHARGAVA AND S.L. JAT

S. D. Agricultural University, Agricultural Research Station, Ladol – 382 840

ABSTRACT

The per cent adult emergence of *T. granarium*, weight loss and grain damage decreased with the increased doses of the plant powders admixed with wheat grains. The minimum emergence 18.0 was found in neem kernel powder whereas maximum 37.33 in kaner leaf powder at highest dose (5.0 g/100 g seed) different dose ranged from 15.54 to 26.45 per cent, maximum in kaner leaf powder and minimum in neem kernel powder. The minimum per cent weight loss (3.03%) was observed in neem kernel powder, being at par with karanj powder (3.25%). It was followed by dharak leaf neem leaf, citrus leaf, tulsi leaf, citrus bark, aak leaf, podina leaf, datura leaf, eucalyptus leaf and kaner leaf powder.

Key words: *Trogoderma granarium,* plant powder and management.

The khapra beetle, *Trogoderma granarium* Everts is one of the most destructive insects of stored wheat in hot and dry regions of the world. Although it has been recorded to be thriving well on other cereals also. In view of the typical biology of this insects, the protection of grains against its infestation has been posing a severe problem. Pesticides are the most powerful tool available for pest control. The indiscriminate use of pesticides has been found ecologically unsound, associated with disadvantages like pest resistance, out breaks of secondary pest, adverse effect on non-target organisms. This situation dictates the need for safe, locally available and less expensive materials for pest control in storage.

One of the eco-friendly and economic approaches for the stored food grains to keep from insect attack, the plant products can be used as grain protectants (Jotwani and Sircar, 1965; Saramma and Verma, 1971; Chander and Ahmed, 1983; Jacob and Sheila, 1990 and Abdallah *et al.*, 2001). The present investigations were carried out to confirm the effects of plant powders on adult emergence, per cent grain damage and weight loss.

MATERIALS AND METHODS

The fine powders of different plant products were prepared by drying them in shade and then grinding in electric grinder. The powders were sieved through 60 mesh sieve and mixed with seeds @ 1.0, 2.5, and 5.0 g/100 g seeds. For mixing the powder with seeds, 100 g seeds were placed in glass vial. The powders were mixed thoroughly with seeds by shaking the vials. Samples of seed from each treatment were transferred to specimen tubes. A control was also kept simultaneously. The treatments were replicated three times. The per cent adult emergence was worked out on the basis of number of larvae released and number of adult emerged after completion of life cycle. The damaged grains and weight loss were recorded after 90 days from the released of larvae. For this purpose, the samples of grains were spread over a white sheet and damaged grains were counted and percentage of damaged grains were calculated. The loss in weight was obtained after removing all insect stages and frass. It was worked out by subtracting the final weight from the initial weight and converted into percentage.

RESULTS AND DISCUSSION

The data presented in Table-1 reveal that per cent adult emergence from the grains admixed with different doses of plant powders showed significant difference as compared with control. The per cent adult emergence decreased with the increase in different dose of the test compounds. The results obtained in different treatments, the neem kernel powder was found most effective with minimum percentage of adult emerged. The mean percentages of adult emergence in neem kernel, karanj kernel, dharak leaf, neem leaf, aak leaf, datura leaf, citrus bark, podina leaf, citrus leaf, tulsi leaf, eucalyptus leaf and kaner leaf powders were 24.22, 25.77, 26.77, 27.77, 29.11, 30.44, 31.55, 33.55, 34.88, 35.10, 43.55 and 44.66, respectively. The present findings are in accordance with the results of Saramma and Verma (1971), Chander and Ahmed (1983) and Sharma (1999) who found significant reduction in adult emergence of *T. granarium* from grains treated with different plant powders.

Table 1: Effect of plant products on adult emergence of *T. granarium*

Dose (Parts per 100 parts of seeds)	Per cent adult emergence*												
	Tulsi leaf Power	Neem kernel Powder	Karanj kernel Powder	Dharak leaf Powder	Neem leaf Powder	Eucalyptus leaf Powder	Aak leaf Powder	Datura leaf Powder	Kaner leaf Powder	Citrus leaf Powder	Citrus bark Powder	Podina leaf Powder	Mean
1..0	43.33 (41.17)	31.33 (34.03)	32.67 (34.86)	34.00 (35.67)	34.66 (36.05)	52.00 (46.15)	36.00 (36.87)	37.33 (37.65)	53.33 (46.91)	40.66 (39.60)	38.67 (38.44)	41.33 (40.01)**	39.60 (38.95)
2.5	33.33 (35.26)	23.33 (28.88)	25.33 (30.22)	26.00 (30.66)	27.33 (31.52)	42.00 (40.40)	28.00 (31.95)	29.33 (32.79)	43.33 (41.17)	34.67 (36.06)	30.67 (33.61)	32.00 (34.45)	31.27 (33.91)
5.0	28.66 (32.35)	18.00 (25.10)	19.33 (26.08)	20.33 (26.80)	21.33 (27.51)	36.66 (37.25)	23.33 (28.88)	24.66 (29.76)	37.33 (37.66)	29.33 (32.79)	25.33 (30.22)	27.33 (31.51)	25.96 (30.49)
Mean	35.10 (36.26)	24.22 (29.33)	25.77 (30.38)	26.77 (31.04)	27.77 (31.69)	43.55 (41.26)	29.11 (32.56)	30.44 (33.40)	44.66 (41.91)	34.88 (36.15)	31.55 (34.09)	33.55 (35.32)	
Control	60.33 (50.96)												

	SEm±	C.D. at 5%	C.V. %
Treatment	0.26	0.74	
Dose	0.13	0.37	2.29
Treatment × Dose	0.45	1.28	

* Data based on 150 individuals (Three replications of 50 in each).

** Percentage transformed to angles open values are back transformation to percentage.

Table 2: Effect of plant products on per cent grain damage of *T. granarium*

Dose (Parts per 100 parts of seeds)	Per cent grain damage*												
	Tulsi leaf Power	Neem kernel Powder	Karanj kernel Powder	Dharak leaf Powder	Neem leaf Powder	Eucalyptus leaf Powder	Aak leaf Powder	Datura leaf Powder	Kaner leaf Powder	Citrus leaf Powder	Citrus bark Powder	Podina leaf Powder	Mean
1.0	28.10 (32.01)	18.00 (25.10)	19.00 (25.84)	19.36 (26.08)	20.00 (26.56)	37.00 (37.47)	25.20 (30.00)	26.00 (30.66)	35.25 (36.27)	27.05 (31.31)	29.15 (32.58)	34.00 (34.67)	26.45 (30.71)
2.5	24.85 (29.90)	15.10 (22.79)	16.20 (23.73)	17.18 (24.48)	18.40 (25.40)	33.50 (35.37)	21.10 (27.35)	22.00 (27.97)	29.00 (32.58)	23.00 (28.66)	24.30 (29.53)	26.10 (30.66)	22.74 (28.20)
5.0	19.30 (26.06)	7.05 (15.34)	8.10 (16.54)	8.90 (17.36)	9.20 (17.66)	25.00 (30.00)	15.10 (22.79)	16.00 (23.58)	21.09 (27.28)	18.00 (25.10)	19.05 (25.84)	20.15 (26.56)	15.84 (22.84)
Mean	24.08 (29.32)	13.39 (21.07)	14.43 (22.03)	15.14 (22.64)	15.86 (23.20)	31.83 (34.28)	20.46 (26.71)	21.33 (27.40)	28.44 (32.04)	22.66 (28.35)	24.16 (29.31)	26.74 (30.63)	
Control	40.00 (39.23)												
			SEm±		C.D. at 5%		C.V. %						
Treatment			0.20		0.57								
Dose			0.10		0.28		2.26						
Treatment × Dose			0.35		0.99								

* Data based on 150 individuals (Three replications of 50 in each).

** Percentage transformed to angles open values are back transformation to percentage.

Table 3: Effect of plant products on per cent grain damage of *T. granarium*

Dose (Parts per 100 parts of seeds)	Per cent weight loss*												
	Tulsi leaf Power	Neem kernel Powder	Karanj kernel Powder	Dharak leaf Powder	Neem leaf Powder	Eucalyptus leaf Powder	Aak leaf Powder	Datura leaf Powder	Kaner leaf Powder	Citrus leaf Powder	Citrus bark Powder	Podina leaf Powder	Mean
1.0	5.80 (13.94)	4.00 (11.54)	4.20 (11.83)	4.50 (12.25)	4.90 (12.79)	10.00 (18.44)	6.70 (15.00)	7.20 (15.56)	10.50 (18.91)	5.40 (13.44)	6.00 (14.18)	6.40 (14.65)	6.30 (14.37)
2.5	4.55 (12.32)	3.20 (10.31)	3.40 (10.63)	3.80 (11.24)	4.00 (11.54)	7.10 (15.45)	4.90 (12.79)	5.60 (13.69)	7.90 (16.32)	4.20 (11.83)	4.65 (12.45)	5.10 (13.05)	4.86 (12.63)
5.0	3.20 (10.30)	1.90 (7.92)	2.15 (8.43)	2.40 (8.91)	2.65 (9.37)	4.80 (12.66)	3.10 (10.14)	3.40 (10.63)	5.00 (12.92)	2.90 (9.81)	3.25 (10.39)	3.40 (10.63)	3.17 (10.17)
Mean	4.51 (12.19)	3.03 (9.92)	3.25 (10.29)	3.56 (10.80)	3.85 (11.23)	7.30 (15.51)	4.90 (12.64)	5.40 (13.29)	7.80 (16.05)	4.16 (11.69)	4.63 (12.34)	4.96 (12.77)	
Control	13.00 (21.13)												
			SEm±		C.D. at 5%		C.V. %						
Treatment			0.18		0.51								
Dose			0.09		0.26		4.38						
Treatment × Dose			0.32		0.89								

* Data based on 150 individuals (Three replications of 50 in each).
**Percentage transformed to angles open values are back transformation to percentage.

The data (Table-2) revealed that in neem kernel powder the per cent grain damage was 18.00 at the lowest dose (1.0 g/100 g seeds) which reduced to 7.05 per cent at highest dose of 5.0 g/100 g seeds. Similar trend was also recorded in other treatments. The mean grain damage at different dose ranged from 15.84 to 26.45 per cent. Among the plant different powders, the mean per cent grain damage ranged from 13.39 to 28.44, maximum in kaner leaf powder and minimum in neem kernel powder.

The data (Table-3) indicate that the mean per cent weight loss at different doses ranged from 3.17 to 6.30, against 13.00 per cent in control. While the results obtained in different plant powders, the minimum per cent weight loss (3.03%) was recorded in neem kernel powder and was at par with karanj powder (3.25%), followed by dharak leaf, neem leaf, citrus leaf, tulsi leaf, citrus bark, aak leaf, podina leaf, datura leaf, eucalyptus leaf and kaner leaf powders posses 3.56, 3.85, 4.16, 4.51, 4.63, 4.90, 4.96, 5.40, 7.30 and 7.80 per cent, respectively.

Efficacy of neem products worked out in the present investigation against *T. granarium* is in accordance with the reports of earlier workers (Saramma and Verma, 1971; Girish and Jain, 1974; Chander and Ahmed, 1983; Jood *et al.*, 1993; Sharma, 1999 and Chander, 2003).

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