

EFFICACY OF DIFFERENT PLANT PRODUCTS AGAINST RUST RED FLOUR BEETLE, *TRIBOLIUM CASTANEUM* IN STORED WHEAT GRAINS

MANOJ KUMAR TRIPATHI* AND DEO PRAKASH PATEL

Department of Entomology,
Tilakdhari Post Graduate College,
JAUNPUR-222002 INDIA

*Corresponding Author

Email: tripathi.manoj413@gmail.com

Received : 15.02.2018; **Accepted** : 12.4.2018**ABSTRACT**

A laboratory experiment was conducted to assess the efficacy of nine plant products namely neem, karanj, eucalyptus, lantana, custard apple, lemon grass and meetha neem using their leaf powder and turmeric and ginger using their rhizome powder against the rust red flour beetle, *Tribolium castaneum* in stored wheat. Among the different treatments of plant products were evaluated by treating 100 g of wheat grains with 2% of grain weight against *T. castaneum* up to 30 days. The grains treated with eucalyptus leaf powder were found to be most effective and 27.25% adult mortality and 0.09% weight loss was observed. The least effective treatment was custard apple leaf powder with 7.78 % mortality and lantana leaf powder where 0.37% weight loss was recorded .

Figure : 00

References : 11

Tables : 02

KEY WORDS : Plant products, *Tribolium castaneum*, *Triticum aestivum***Introduction**

In India, wheat is the second most important cereal crop after rice and it contributes 25 % to the national food basket. Storage is one part of the post-harvest system through which food material passes on its way from field to consumer⁸. Stored product insect pests are a problem throughout the world. The average loss of food grains in storage due to biotic and abiotic factors accounts for 10 % per year, out of which insects are contributing about 2.5 to 5.0%. The red flour beetle, *T. castaneum* (Herbst), is an economically important insect pest in food grains¹⁰. The larvae destroy 12.5-14.60 percent of the individual seeds and during their development some 88 grains are attacked by per larva. It leads to considerable loss in quantity of grains and reduces its viability². Modern methods of food grain treatment using insecticides and fumigants to check post harvest losses during storage are highly expensive and use of chemicals against insect pests of stored grains has become ineffective due to the development of resistance, in different strains of *T. castaneum*⁴.

Botanicals are one of the groups of safe insecticides, which have a broad spectrum of anti-pest activity, relatively specific mode of action, low mammalian toxicity and more tendencies to disintegrate, in nature or to metabolize in a biological system. The alternative methods are being emphasized to reduce use of insecticides to lessen the potential for human exposure and to slow the development of insecticide resistance in

pests¹. Over 120 plants and plant products can be used for the control of stored grain insect pests³.

Thus, there is a need to develop pest control strategies which will be commercial and safer in small and large scale storage. These strategies could be achieved by exploiting the plants of medicinal and insecticidal value, which are also easily available to the farmers. Keeping the above mentioned facts in view the present investigation was carried out.

Material and Method

The populations of *Tribolium castaneum* adults used in the experiments were collected from the infested wheat grains from Krishi Bhawan store house. The stock culture of the rust red flour beetle was reared in plastic bottle containing the wheat flour. The mouth of the bottle was covered with a muslin cloth and tied with rubber bands these bottles were confined under laboratory conditions in the department of Entomology, T.D.P.G. College, Jaunpur.

Various plant products viz., Neem, Karanj, Eucalyptus, Lantana, Custard apple, Lemon grass and Meetha neem using their leaf powder and Turmeric and Ginger using their rhizome powder were evaluated for their efficacy against *Tribolium castaneum* on stored wheat. Untreated check was also used for comparison. The plant products used in present experiment were collected from the campus of T.D.P.G. College, Jaunpur and adjoining areas.

TABLE 1:Effect of different plant products on mortality of *Tribolium castaneum*.

Treatments	Plant parts used	Doses (2g/100) of grain	Percent mortality of adult <i>Tribolium castaneum</i>			
			7 DAS	14 DAS	21 DAS	30 DAS
Neem	Leaves	2	15.33 (23.05)	11.52 (19.84)	12.18 (20.43)	8.85 (17.31)
Karanj	Leaves	2	18.78 (25.68)	18.19 (25.24)	15.32 (23.04)	8.78 (17.34)
Eucalyptus	Leaves	2	27.87 (31.86)	29.40 (32.84)	27.14 (31.40)	24.57 (29.71)
Lantana	Leaves	2	12.33 (20.56)	13.83 (21.83)	7.92 (16.34)	7.41 (15.80)
Custard apple	Leaves	2	10.89 (19.27)	7.89 (16.31)	7.94 (16.37)	4.48 (12.22)
Turmeric	Rhizome	2	12.89 (21.04)	13.19 (21.36)	10.31 (18.77)	9.97 (18.41)
Ginger	Rhizome	2	16.89 (24.27)	15.39 (23.10)	14.86 (22.67)	12.61 (20.81)
Lemon grass	Leaves	2	19.13 (25.93)	18.36 (25.37)	13.75 (21.77)	12.39 (20.61)
Meetha neem	Leaves	2	21.22 (27.43)	19.53 19.53(26.22)	9.78 (18.22)	5.27 (13.27)
Untreated			0.00 (0.00)	0.00 (0.00)	1.33 (6.63)	1.67 (7.42)
SEm±			1.64	1.72	1.47	1.48
CD at 5%			3.70	3.88	3.33	3.34

*Figures in parentheses are arc sine transformed value

After collecting the leaves, it was washed thoroughly and then dried under shade. The dried leaves were ground to a fine powder with the help of grinding machine. The powder was then sieved and preserved for experiment purpose. 100 g of healthy uninfested broken grains of wheat was taken in plastic bottle and then 2 g of each plant powder was mixed. After mixing thoroughly 10 pairs of newly emerged adult were released in a bottle. The mouth of the bottle was covered with muslin cloth and tied with rubber bands. The experiment was conducted using complete randomized design (CRD) replicated three times.

The observations were recorded on adult mortality,

adult emergence and percent weight loss due to insect damage. Observations on adult mortality at 7, 14, 21 and 30 days after storage, adult emergence and percent weight loss were recorded. Percent mortality was recorded on the basis of number of dead and live insects. Percent weight loss was calculated by weighing of grains after sieving of frass, which is due to the insect damage.

The data obtained on various characters/ parameters were subjected to analysis of complete randomized design. The data on percent adult mortality, percent weight loss, was transformed to square root and arc-sine transformation and subjected to statistical analysis and interpretation.

TABLE-2 : Effect of different plant products on weight loss due to *Tribolium castaneum* at 30 DAS

Plant product name	Per cent weight loss
Neem	0.34 (3.34)
Karanj	0.29 (3.09)
Eucalyptus	0.09 (1.72)
Lantana	0.44 (3.80)
Custard apple	0.39 (3.58)
Termeric	0.38 (3.53)
Ginger	0.14 (2.14)
Lemon grass	0.25 (2.87)
Meetha neem	0.17 (2.36)
Untreated	0.47 (3.93)
SEm±	0.02
CD at 5%	0.04

*Figures in parentheses are arc sine transformed value

Result and Discussion

The data recorded with respect to adult mortality of *T. castaneum* in stored wheat as influenced by various plant products at 7, 14, 21 and 30 days after storage are depicted in (Table-1). The data revealed that 27.87% adult mortality of *T. castaneum* was recorded in grains treated with eucalyptus leaf powder. It was followed by meetha neem (21.22 %) and lemon grass leaf powder (19.13 %). Significantly least adult mortality was recorded in custard apple (10.89 %) followed by lantana (12.33 %), turmeric

(12.89 %), neem (15.33 %), ginger (16.89 %), karanj (18.78%) and lemon grass leaves powder (19.13 %). Whereas zero per cent of adult mortality was recorded in untreated control. After 14 days of storage, the adult mortality ranges from 7.89 to 29.40 % in grains treated with different plant products. The maximum adult mortality of 29.40 percent was recorded in eucalyptus leaf powder followed by meetha neem (19.53 %), lemon grass (18.36 %), karanj (18.19 %) and ginger rhizome powder (15.39 %). Custard apple proved least effective treatment having 7.89 % adult mortality followed by neem (11.52%) and turmeric rhizome powder (13.19 %). The adult mortality ranged from 7.92 to 27.14% in grains treated with different plant product after 21 days of storage. The maximum (27.14%) adults mortality was observed in grains treated with eucalyptus leaf powder followed by karanj (15.32%), ginger rhizome powder (14.86 %) and lemon grass (13.75 %) and they were at par, lantana proved least effective treatment having 7.92 percent adult mortality followed by custard apple (7.94 %), meetha neem (9.78 %) and turmeric rhizome powder (10.31 %). After 30 days of storage the best adult mortality of *T. castaneum* was recorded 24.57 percent in eucalyptus treated grains. It was followed by ginger (12.61%), lemon grass (12.39 %) and turmeric rhizome powder (9.97 %). Significantly least adult mortality was observed in custard apple (4.48 %) treated grains. It was followed by meetha neem (5.27%), lantana (7.41%) and karanj (8.78 %). The similar trend existed at above storage period where no mortality was recorded in untreated control. Worker⁷ concluded that custard powder at 1% was effective in controlling stored insects. Others¹¹ also evaluated repellency and toxicity of some medicinal plants immune to insect attack like neem and eucalyptus leaf powder.

The data reveals that grain weight loss ranged from 0.09 to 0.44 per cent in grains treated with various plant products at 30 days after storage. Among different plant product evaluated for their efficacy against *T. castaneum* in stored wheat eucalyptus leaf powder @ 2 g /100 g of grains retained its efficacy by recording 0.09% weight loss, whereas significantly less weight loss was recorded in ginger rhizome powder (0.14 %). It was followed by meetha neem (0.17 %), lemon grass (0.25 %) and karanj (0.29%) (Table-2). The maximum weight loss was recorded in untreated grains (0.47%) followed by lantana leaf (0.44%), custard apple leaf (0.39%), turmeric rhizome (0.38%), and neem leaf powder (0.34%). Worker⁶ noticed per cent weight loss of wheat grains in custard apple seed powder treated grains. Others⁹ also reported that the per cent weight loss occurs in neem leaf powder treated chick pea due to infestation of *C. chinensis*.

References

1. ALDRYHIM, Y.N. (1993) Combination of classes of wheat and environmental factors affecting the efficacy of amorphous silica dust against *Rhizopertha dominica* (F.). *J. Stored Prod. Res.* **29**: 271-275.
2. ATANASOV, K.H. (1978) Damage by the rust red grain beetle on stored grains and its products. *Rastitelna Zashchita* **26**: 19-20.
3. DALES, M.L. (1996) A review of plant materials used for controlling insect pests of stored products. *Bull. Nat. Resc. Inst.* **pp** 65: 84
4. GUEDES, R.N.C., DOVER, B.A. AND KAMBHAMPATI, S. (1996) Resistance to chlorpyrifos methyl, pirimiphos methyl, and malathion in Brazilian and U.S. populations of *Rhizopertha dominica* (Coleoptera, Bostrichidae). *Journal of Economic Entomology* **89**: 27-32.
5. IMTIAZ, A., AFSHEN, S., RAHILA, T., AHMAD, I., SHAMSHAD, A. AND TABASSUM, R. (1999) Determination of toxicity of neem extract, cypermethrin, methyl parathion, stored grain pest, *Tribolium castaneum*. *Proc. Pakistan Congress Zool.* **19**: 51-56.
6. KALASAGOND, P.R. (1998) Management of beetle pests in stored wheat by noninsecticidal approaches. *M. Sc. (Agri.) Thesis*, University of Agricultural Sciences, Dharwad.
7. KUMAR, SUNIL (2003) Survey of indigenous technologies and evaluation of botanicals against major storage pests. *M. Sc. (Agri.) Thesis*, University of Agricultural Sciences, Dharwad.
8. PADIN, S., BELO, D.G. AND FABRIZIO, M. (2002) Grain loss caused by *Tribolium castaneum*, *Sitophilus oryzae* and *Achantoscelides obtectus* in stored durum wheat and beans treated with *Beauveria bassiana*. *J. stored Prod. Res.* **38**: 69-74.
9. SHARVALE, T.G. AND BORIKAR, P.S. (1998) Laboratory evaluation of plant products and grain protectants for prevention of damage by *Callosobruchus chinensis* (Linnaeus) in stored chickpea. *Agricultural Science Digest* **18**: 234-236.
10. SINHA, R.N. AND WATTERS, F.L. (1985) Insect pest of flour mills, grain elevators, and feed mills and their control. *Agriculture Canada* 290 p.
11. TOOBA, HAQ., USMANI, N.F. AND TAHIR, A. (2005) Screening of plant leaves as grain protectants against *Tribolium castaneum* during storage. *Pakistan Journal of Botany* **37**(1): 149-153.