Available online at www.journalijmrr.com

INTERNATIONAL JOURNAL OF MODERN RESEARCH AND REVIEWS

Int. J. Modn. Res. Revs.
Volume 3, Issue 6, pp 706-708, June, 2015

ISSN: 2347-8314

ORIGINAL ARTICLE

STUDIES ON THE GERMINATION CAPACITY OF THE RED FLOUR BEETLE *TRIBOLIUM CASTANEUM* (HERBST) (COLEOPTERA: TENEBRIONIDAE) INFESTED SEEDS

***1G.Sathishkumar, [1]P. Ramya1, [1]V.Kuzhandhaivel, [1]G.Sridharan and [2]M.Loganathan**

[1]Department of Zoology, Rajah Serfoji Govt. College, Thanjavur -613 005, Tamil Nadu
[2]IICPT: Indian Institute of Crop Processing Technology, Thanjavur- 613 005

Article History: *Received 4th May,2015, Accepted June 29th 2015, Published June 30th ,2015*

ABSTRACT

The germination effect of seeds of infested grains were studied. Higher weight loss and damaged seeds were observed in Gingeli in all weeks of storage, where as low weight loss noted in black gram followed by Green gram. Studies on germination of seeds at 0 and 21 days. Ground nut was lesser germinated and Green gram and black gram was higher germinated. When compared with 7 (93.28%) and 14 days (80.5%).Hence 21(33.83%) was very smaller germination.

Keywords: *T.castaneum* - the red flour beetle (test insect), mortality- death rate

1.INDRODUCTION

Insect infestation of stored grains and their products is a serious problem throughout the world (Irshed and Gillani 1990). It was estimated that world's cereal production is lost to the extent of 8 % every year due to insect infestation alone in storage. If the losses incurred on farms were included, it may amount to 10 %. Among the important stored-product insect pests, the red flour beetle is one of the major pests (Zettler 1991; Talukder and Howse 1995; Collins 1998; Haubruge and Arnaud 2001). Though the red flour beetle *Tribolium castaneum* (Herbst) (Coleoptera: Tenebrionidae) originated in India, it is found throughout all tropical, sub-tropical and warm temperate regions of the world. It is one of the most common pests of stored products. The larvae and adults feed on a wide range of durable commodities and are important secondary pests of cereals, nuts, spices, coffee, coca, dried fruits and occasionally of peas and beans. Like most other storage beetles, *T. castaneum* can penetrate deeply into the storage commodity. However, the red flour beetle normally attacks the broken grains.

The red flour beetle, *Tribolium castaneum* (Herbst) (Coleoptera: Tenbebrionidae) is a major pest of groundnut and its products and can be a major pest in anthropogenic structures used for the processing and storage of groundnut products (e.g flour mills, biscuit industry warehouses and retail stores). *Tribolium castaneum* is found throughout the topics and is regarded as a major pest of shelled groundnut Odeyemi and Daramola, 2000), an important pest of processed cereal products (Odeyemi *et al*. 2001) and biscuits (Odeyemi *et al.* 2005). Adult *T. castaneum* are 2-3.4mm in length and red brown to dark brown in colour. Life cycle takes about 28 days under optimum conditions of 350C and 75% relative humidity. Female copulates many times, lay sticky eggs in the commodity and the number depends on the temperature. Eggs laid could be up to 500. Adults can live for about six months. The aim of our study is to study the weight loss in seeds during different storage period of 7 days, 14 days and 21 days and study the Germination of seeds during different storage period 7 days, 14 days and 21 days .

Corresponding author: **G.Sathishkumar Department of Zoology, Rajah Serfoji Govt. College, Thanjavur -613 005, Tamil Nadu*

2 MATEREIALS AND METHODS

Insects

Cultures of *T. castaneum* have been maintained on wheat flour plus 5% (by wt) of Brewer's yeast diet at 28^{o}C and 65% r.h. in growth chambers in the Department of Zoology and Rajah serfoji govt college(Autonomous), Thanjavur. (Fig-1)

Seeds- Growth and development

For determining the relative susceptibility of the different varieties, only sound and healthy oil seeds (Ground nut and Gingeli), pulses (Green gram and black gram) and millets(Fox tail millet and Ragi) were selected. The seeds were sterilized in oven at 60 + 5 ^{0} C for 8 hours to avoid any hidden infestations. Prior to the experiment, the seeds of each variety were conditioned at least for a week in an incubator maintaining 30 + 2 ^{0}C and 70 + 5 relative humidity in which

the tests were carried out. There were three replications for each variety.

Types of seeds	Common Name	Scientific Name	Family
Oi seeds	Ground nut	*Arachis hypogaea*	Fabaceae
	Gingeli(sasame)	*Sesamum indicum*	Pedaliacae
Pulses	Green gram	*Vigna radiata*	Fabaceae
	Black gram	*Vigna mungo*	Fabaceae
Millets	Fox tail millet	*Setaria italica*	Poaceae
	Ragi	*Eleusine coracana*	Poaceae

Weight loss

Ten grams of samples were weighed with a sensitive balance scale into plastic jars.10 number of *T. castaneum* adults were introduced into the plastic jars. A plastic jar without any insects served as the control. The jars were covered with muslin cloth to allow aeration and prevent other pests from entering. The experiment was set up in triplicates. The first batch of twelve jars was left for seven days after which, the samples were removed and reweighed. Weight loss was determined as the difference between the weight of uninfested sample and that of infested sample as a proportion of the weight of uninfested sample expressed in percentage. Thus,

$$WL = [(Wc - Wt) / Wc] \times 100$$

where:

WL – percentage weight loss

Wc – weight of uninfested sample

Wt – weight of infested sample

The number of live *T. castaneum* adults present was recorded. The powdery waste was not discarded but returned into the jars. At fourteen days and twenty one days after infestation (DAI), samples were also removed from the second batch and third batch jars and the procedures followed were similar to those done for the first experiment of fourteen days and twenty one days storage.

Grain damage

The damaged seeds and were recorded after 7, 14 and 21 days of the released of Insect. For this purpose, the sample of seeds was spread upon a white sheet and damaged seeds.

The grains were segregated and counted for percent damaged and undamaged grains by using the following equations.

$$\text{Damaged grains \%} = \frac{\text{No. of damaged grains}}{\text{Total sample grains}} \times 100$$

Germination

The germination tests were carried out according to International Rules of Seeds Testing (Anonymous, 1976). For assessing the germination of seeds, a lot of 50 seeds were drown from each replication and soaked in water for 24 hours and placed in petri dishes over a wet filter paper. These petri dishes were kept at a temperature of 20 + 20C and the numbers of germinated seeds were counted upto one week and the percentages of germination were calculated.

$$\text{Germination per cent} = \frac{\text{Number of seeds germinated}}{\text{Number of seeds kept for germination}} \times 100$$

3.RESULTS AND DISCUSSION

Weight loss in Seeds during different storage period of 7 days , 14 days and 21 days

In this study , under natural condition, higher weight loss and damaged seeds were observed in Gingeli in all weeks of storage, where as low weight loss noted in black gram followed by Green gram.(Gingeli >Ragi>Fox tail millet>Ground nut>Black gram> Green gram) (Table 1.)

Table 1. Weight loss in Seeds during different storage period 7 days , 14 days and 21 days

Sl. No	Seeds Name	Weight Loss (%) 7 DAS (Mean ± S.D)	14 DAS (Mean ± S.D)	21 DAS (Mean ± S.D)
1	Ground nut	0.10 ± 0.14	0.14 ±0.18	0.21±0.20
2	Gingeli	0.60 ± 0.83	0.75 ±0.63	0.82±0.62
3	Green gram	0.08 ± 0.03	0.08 ±0.03	0.08±0.03
4	Black gram	0.11 ± 0.14	0.14 ±0.15	0.14±0.15
5	Fox tail millet	0.42 ± 0.52	0.48 ±0.58	0.55±0.64
6	Ragi	0.45 ± 0.18	0.47 ±0.18	0.55±0.17
7				0

DAS - Days After Storage

Studies on germination of seeds at 0 and 21 days. Ground nut was lessor germinated and Green gram and black gram was higher germinated. When compared with 7 (93.28%) and 14 days (80.5%).Hence 21(33.83%) was very smaller germination. Result showed that germination decreased when the storage increased. Table .(2, 3 & 4)

4.CONCLUSION

In present study the germination effect of seeds of infested grains were studied. Higher weight loss and damaged seeds were observed in Gingeli in all weeks of storage, where as low weight loss noted in black gram followed by Green gram.(Gininli>Ragi>Fox tail millet>Grount nut>Black gram> Green gram) Studies on germination of seeds at 0 and 21 days. Ground nut was lessor germinated and Green gram and black gram was higher germinated. When compared with 7 (93.28%) and 14 days (80.5%).Hence 21(33.83%) was very smaller germination.

5.REFERENCES

Collins, P. J. (1998): Inheritance of resistance to pyrethroid insecticides in *Tribolium castaneum* (Herbst). J. Stored-Prod. Res. 34, 395–401.

Haubruge, E., Arnaud, L. (2001): Fitness consequences of malathion-specific resistance in red flour beetle (Coleoptera: Tenebrionidae) and selection for resistance in the absence of malathion. J. Econ. Entomol. 94, 552–557.

Irshad M., Gillani, W. A. (1990): Resistance in *Tribolium castaneum* (Herbst) (Coleoptera: Tenebrionidae) against malathion. Pakistan J. Zool. 22, 257–262.

Odeyemi, O. O., A. C. Adeniyi and A.O. Ojo (2001). Susceptibility of Processed Cereal Products to infestation

Table 2 .Germination of seeds during storage period of 7 days

S.No	Seeds Name	Total grams	Total no of Seeds (Mean ± S.D)	Damaged grains (Mean ±S.D)	New populations	% germination
1	Ground nut	10	36.5 ±0.71	2.5±0.71	-	93.28
2	Gingeli	10	1441±1.41	96.5±2.12	-	96.62
3	Green gram	10	223±1.41	0±0.00	-	96.67
4	Black gram	10	258.5±3.54	0±0.00	-	100.00
5	Fox tail millet	10	1985.5±2.12	14±1.41	-	96.17
6	Ragi	10	3148±4.24	14.5±0.71	-	97.17

Table 3 .Germination of seeds during storage period of 14 days

S.No	Seeds Name	Total grams	Total no of Seeds (Mean ± S.D)	Damaged grains (Mean ±S.D)	New populations (% No of Larva)	% germination
1	Ground nut	10	35.5±2.12	8±0.00	8	80.50
2	Gingeli	10	1447.5±10.61	94.5±0.71	12	79.00
3	Green gram	10	217.5±2.12	4±1.41	-	92.8
4	Black gram	10	264.5±0.71	3±1.41	-	93.33
5	Fox tail millet	10	1978±1.41	64.5±0.71	6	83.83
6	Ragi	10	3147±2.83	35±1.41	-	90.00

Table 4 .Germination of seeds during storage period of 21 days

S.No	Seeds Name	Total grams	Total no of Seeds (Mean ± S.D)	Damaged grains (Mean ±S.D)	No. New populations	% germination
1	Ground nut	10	36±1.41	10.5±0.71	8	33.83
2	Gingeli	10	1515±106.07	100.5±4.95	12 *	63.33
3	Green gram	10	216±1.41	8.5±0.71	-	88.27
4	Black gram	10	270±1.41	4.5±0.71	-	90.00
5	Fox tail millet	10	2119.5±201.53	108±4.24	6*	80.50
6	Ragi	10	3325±176.78	520±2.83	-	91.00

Insect * Larva

by *Sitophilus oryzae* Motsch and *Tribolium castaneum* Herbst. *Applied Tropical Agriculture;* 6(2): 85-91.

Odeyemi, O.O. and Daramola, A.M. (2000).*Storage Practices in the tropics. Volume1: Food Storage and Pest problems.* First Edition, Dave Collins Publications, Nigeria

Odeyemi, O.O.; Oyedare, B.M. and Ashamo, M.O. (2005). Resistance of Seven Biscuit types to Infestation by *Tribolium castaneum* (Herbst) (Coleoptera : Tenebrionidae). *Zoological Research; 26* (3): 300-304.

Talukder, F. A., Howse, P. E. (1995): Evaluation of *Aphanamixis polystachya* as repellants, antifeedants, toxicants and protectants in storage against *Tribolium castaneum* (Herbst). J. Stored-Prod. Res. 31, 55–61.

Zettler, J. L (1991): Pesticide resistance in *Tribolium castaneum* and *Tribolium confusum* (Coleoptera: Tenebrionidae) from flour mills in the USA. J. Econ. Entomol. 84, 763–767.

*****