

## Preservative properties of selected herbal powders on *Arachis hypogaea* L. against *Tribolium castaneum*

\*Shraddha Srivastava and Sangeeta Awasthi

A.N.D.N.N.M. Mahavidyalaya (CSJMU) Kanpur-208002 (India)

\*Corresponding author Email: - [shrivastavasid99@gmail.com](mailto:shrivastavasid99@gmail.com)

### Abstract

*Arachis hypogaea* L. (groundnut) is primarily grown for its seeds and valued for its kernels having great source of oils and proteins. *Tribolium castaneum* is a major pest of shelled groundnuts during storage preferentially attacks on their germ. An experimental study was carried out to manage infestation of *Tribolium castaneum* on stored groundnuts with selected herbal powders made with the plant leaves of *Azadirachta indica*, *Ocimum sanctum* and *Eucalyptus globulus*. 15g leaf powder per 100g of groundnuts found effective against infestation and reduces the weight loss. Groundnuts treated with *A. indica*, *O. sanctum* and *E. globulus* whose weight loss was 5.8g, 5.71g and 5.87g, respectively which was significantly less than weight loss of untreated groundnuts which was 16.4g. Nuts treated with *Azadirachta indica* faced minimal weight losses.

**Key words :** Groundnut, *Tribolium castaneum*, *Azadirachta indica*, *Ocimum sanctum*, *Eucalyptus globulus*, Leaf powder, Protectants.

*Arachis hypogaea* commonly known as the groundnut or peanut is primarily grown for its seeds. It is a self-pollinated legume majorly cultivated for extraction of edible seed oil and food consumption like raw eating, salted and roasted seeds, use in confectioneries and as peanut butter. The ground nut is grown in more than 100 countries and covers about 24 million hectares of land worldwide. It is valued for its kernels having great source of oils and proteins and also rich in minerals and vitamins. During the storage of groundnut seeds, they face a terrific attack of several stored grain pests like *Tribolium castaneum*, *Oryzaep-*

*hilus mercator*, *Caryedon serratus*, *Trogoderma granarium*, *Cryptolestes ferrugineus*, *Alphitobius* spp., *Ephestia cautella*, and *Plodia interpunctella*. More than 100 species of insect pests infests groundnuts during its storage.<sup>3</sup> *Tribolium castaneum* is a major pest of shelled groundnuts, is the first to colonize a new stock which preferentially attacks on their germ. It consumes high levels of protein in its diet and protein of groundnut is adequate for its better development.<sup>5</sup> Infestation causes consumption of the endosperm followed by the caking, produces a musty smell and grain weight loss.<sup>1</sup> Over the years, the use of

synthetic chemical pesticides have harmful effects on the non-target organisms, also causes pollution of water, soil and air. The composition of plants have many direct chemicals known as phytochemicals beneficial for their growth and development. Plant also use these chemicals in their defense against herbivores and plant-feeding insects.<sup>4</sup> Plant materials including powders and leaf extracts have been reported to have strong efficacy against insect pests.<sup>2</sup> Use of plant based pesticides can be a strong and effective strategy to be efficacious against insect pests. In this study, powders from three plant species viz *Azadirachta indica*, *Ocimum sanctum* and *Eucalyptus globulus* were evaluated for their efficacy against *T. castaneum*.

*Site of experiment :*

The study was carried out in the Department of Zoology, A.N.D.N.N.M. Mahavidyalaya, Kanpur [UP, India] during January - March, 2023.

*Collection of leaves and powder preparation:*

Leaves of *Azadirachta indica*, *Ocimum sanctum* and *Eucalyptus globulus* were collected from local flora and then identified in the herbarium. After the identification, the leaves were properly washed and dried in air under the room temperature for 20 days. After it, the dried leaves were ground and sieved, the leaf powder was made ready to use.

*Groundnut collection and preparation :*

Whole and un-infested groundnuts

were collected from the cereal market, Kanpur. After the collection they were heat sterilized to kill any hidden infesting stage and disinfected seeds were weighed using digital balance and then stored in cool and dried place for further work.

*Insect collection and rearing :*

*Tribolium castaneum* were collected from infested stock of local grain market and mass rearing was carried out under laboratory conditions, controlled temperature  $30\pm 2$  °C and relative humidity in the range of  $65\pm 5\%$ . For initiation of the experiment, in a glass container having capacity of 500 ml., 250g of sterilized healthy groundnuts were taken into which 50 pairs adults (ratio of male and female was 1:1) were introduced. The mouth of the container was covered with muslin cloth and secured with help of a rubber band for proper aeration. The culture was periodically examined with precautions throughout the whole period of study. Newly emerged insects were considered as new generation for further study.

*Effect on damage and losses :*

Experiment was carried out in glass jars having 300 ml. capacity. 100g groundnuts were kept inside the jars with mixed 10g leaf powder along with control. 10 pairs of insects were released in each jar. After the completion of all experimental period of 60 days groundnuts of each of the treatment i.e. with protectant doses and control were taken out for valuation and their final weight were taken and the weight loss was calculated for every treatment.

Weight loss = weight of grains before treatments - weight of grains after treatments
--

Table : Loss of weight caused by *Tribolium castaneum*

S. N.	Protectant	Weight of grains [gm.]	Quantity of leaf powder	% Loss of weight [gm.]
1	<i>Azadirachta indica</i> A. Juss.	100	5 gm	8.76
			10 gm	7.22
			15 gm	5.8
2	<i>Ocimum sanctum</i> L.	100	5 gm	9.03
			10 gm	7.94
			15 gm	5.71
3	<i>Eucalyptus globulus</i> Labill.	100	5 gm	9.27
			10 gm	8.01
			15 gm	5.87
4.	Control	100	00 (control)	16.4

*Statistical analysis :*

Data collected from the laboratory experiments were statistically analyzed. Statistical design was Complete Randomized Design (CRD). Tabulated data was transformed into percentages (%) and analyzed.

After 60 days of introduction of plant powders, their effect on weight of groundnuts were demonstrated and results were analyzed, there was a significant drop of 16.4g in the weight of untreated groundnuts from the original weight of 100 g compared to groundnuts treated with *Azadirachta indica*, *Ocimum sanctum* and *Eucalyptus globulus* whose minimum weight loss was 5.8g, 5.71g and 5.87g, respectively. Nuts treated with *Azadirachta indica* faced minimal weight loss. However all three botanicals performed very well in the experiment but *Tribolium castaneum* could be best controlled by *Azadirachta indica*. Bio-pesticides are best

effective way to control the targeted pest & they are eco-friendly safer and easily available.

## References :

1. Davey PM, DW Hall, PL Conveney, and WD Raymond (1959). *Trop. Sci. 1*: 296-307.
2. Epiidi T T, A Alamene, and B A Onuegbu (2005). *J. Plant Prot. 22*: 65-67.
3. Redlinger LM, and R Davis (1982). Insect control in postharvest peanuts. In Pattee HE, Young CT eds., *Peanut Science and Technology*, Yoakum, Texas, USA, American Peanut Research and Education Society Inc., pp. 520-571.
4. Rosenthal GA, and DH Janzen (1979). *Herbivores: their interaction with secondary plant metabolites*. Academic Press, NY.
5. Shalom W. Applebaum. (1969). The suitability of groundnuts for the development of *Tribolium castaneum* (Herbst) (Coleoptera, Tenebrionidae) *Journal of Stored Products Research*, 5(4): 305-310, ISSN 0022-474X