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## Efficacy of plant and animal origin bio-products on major stored pest of rice (*Oryza sativa* L.) at Prayagraj (U.P)

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### Abstract

The studies on the efficacy of plant and animal origin bio-products on major stored pest of Rice (*Oryza sativa* L.) viz. Rice weevil (*Sitophilus oryzae*) were carried out to know the impact of above bio-products on percent weight loss and percent mortality. This experiment was conducted under Complete Randomized Design (CRD). Among the treatments with botanicals the orientation of *Sitophilus oryzae* was recorded highest in Control and least no. of adults were oriented towards *Lantana camara* (0.33), minimum percent weight loss was observed with Neem leaf powder (10.67%) as compared to coragen (0.00%), maximum mortality rate was observed when rice was treated with Neem leaf powder (90.00%) and *Lantana camara* leaf powder (90.00%). Percent mortality rate (hours from treatment) of smoke, in this case maximum was observed with the rice treated using Neem (semi-dried) leaves smoke (48.33%). Therefore, the present laboratory studies clearly showed the efficacy of plant and animal origin bio-products on major stored pest of Rice (*Oryza sativa* L.) were almost as effective when compared with Coragen (Insecticide). Hence it may be concluded that these plant and animal bio-products are eco-friendly, cost effective and easily available. It can easily be incorporated for the easy management of stored pest in paddy.

**Keywords:** Paddy, rice weevil, bio-products, coragen, orientation, mortality, weight loss

### Introduction

“Rice is Life” for millions of people and. Rice (*Oryza sativa* L.) is second most important cereal and the staple food for more than half of the world’s population. In the world at present the area of rice is 162.26 M ha with production of 483.80 million metric tons and productivity of 2.98 Mt/ha. In India the area of rice is 44.50 M ha with production of 106.50 million metric tons and productivity 3.59 Mt/ha. In the world at present the area of rice is 162.26 M ha with production of 483.80 million metric tons and productivity of 2.98 Mt/ha. India is the largest rice growing country, contributing more than 52% of the total food grain production and 55% of total cereal production. In India the production of rice is estimated of 110.15 million tonnes. Uttar Pradesh is the second largest rice producing state with almost 5.86 million hectare land under rice cultivation producing about 12.5 million tonnes of rice<sup>[1]</sup>. The year 2017-18 had in fact witnessed record production of Rice 112.91 million tonnes<sup>[2]</sup>. The storage of food grain is a serious problem at farmer’s level in many developing countries including India where considerable quantity of grains are damaged by insects. Post-harvest losses account for about 10% of total food grains due to unscientific storage, insects, rodents, micro-organisms etc. In India, annual storage losses have been estimated 14 –million tonnes worth of Rs. 7,000 crores in which insects alone account for nearly Rs. 1,300 crores (2015). Out of these post-harvest losses storage -insects alone account for 2.0 to 4.2 percent. A rice weevil will eat 14 mg out of 20 mg of a rice kernel during its developmental period. A female weevil, through three generations per year, has the biotic potential to reproduce 1,500,000 offspring which will consume 1,500,000 kernel of rice (amounting 30 kg of rice). The quantitative losses comprises of chemical changes in grain content, Contamination of grains with moulting skin and body parts, spreading the pathogenic micro-organisms, loss of seed viability<sup>[3]</sup>. Botanical pesticides or phyto-pesticides are more target species specific and safe for non-target insects. Even though hundreds of plant powder has been reported to control pest insects in the laboratory only two new botanical insecticides have been commercialized in the past 15 years<sup>[4]</sup>.

These products are based on limonoid and azadirachtin as their active ingredient<sup>[5, 6]</sup>. Use of edible or medicinal plants as insecticides, insect repellent or feeding deterrents not only ensures the safety of the environment and consumption of the treated produces, it is economical also to the farmers as they are easily available. Many plants possess chemical substances with remarkable biological activities which provide protection and resistance against pests and herbivores<sup>[7]</sup>. Animal origin products such as cow dung powder, cow dung ash powder and cow urine were also found effective and are the emerging traditional approaches for management of storage insect pest<sup>[8]</sup>.

#### The experiment was done with the following objectives

1. To study the Effect of Plant & Animal bio-products on orientation of *Sitophilus oryzae*, weevils towards the treated stored rice in choice test.
2. To study the efficacy of plant and animal bio- products on percent weight loss and mortality of *S. oryzae* on stored rice in receptacle.
3. To study the Percent mortality of *S. oryzae* on rice grains treated with cow dung, Eucalyptus and neem leaf smoke under airtight conditions.

#### Materials and Methods

##### Insect culture: Rearing of test insect *S. oryzae* and preparation of plant products

The experiment was conducted at laboratory, Department of Plant protection, SHUATS, Prayagraj .Treatments: Eight treatments including control. The cultures of *S. oryzae* were obtained from the FCI of Prayagraj. Plastic containers of 1.5 kg capacity were used for insect rearing. About 500 gm of grains were kept in each container and about 600 adults of insects were released separately. They were allowed to lay eggs for 3 to 5 days and removed after 7 days, when the egg laying was over. These containers were kept at room temperature for the adult emergence of *S. oryzae*. The plant products of Neem leaves, Eucalyptus leaves, Custard apple leaves, *Lantana camara* leaves, Root of *Hemidesmus indicus*, and Cow dung cake were crushed and ground to fine powder in a grinder. The powder was passed through one mm sieve to get the fine powder of uniform particle size in all cases along with chemical, Coragen (10 mg/100 g paddy grains) and control (untreated) seeds.

##### Mixing of grain protectants

Ten glass jars of one kg capacity were taken and each filled with 100g of paddy and treated with the above plant products. The treated seed material was stored in the glass jars covered with muslin cloth and fastened with a rubber band. Untreated seed served as control. 100 g paddy were taken into different jars to replicate the treatments for three times. Ten pairs of freshly emerged adults were released in each replication. Adult mortality and percent weight damage was noted at 30 days after release.

##### Statistical analysis

The data averaged into respective parameter requisite will be subjected to suitable transformation. After analysis, data will be accommodated in the table as per the needs of objectives for interpretation of results. The standard procedures in agriculture statistics given by<sup>[9]</sup> (Gomez and Gomez 1984) were consulted throughout. The interpretation of data will be done by using the critical difference value calculated at 0.05 probability level. The level of significance will be expressed

at 0.05 probability.

#### Results and Discussion

##### Percentage weight loss

A significantly negligible weight loss of grains was observed in Coragen (0.00%) after 90 days of treatments showed the efficacy of these plant and animal bio-products against *S. oryzae* with maximum weight loss in untreated grains (38.67%). Among the plant and animal bio-products Eucalyptus leaf powder, Neem leaf powder and Cow dung cake powder were found highly effective against *S. oryzae* with significantly minimum weight loss of (10.67%), (16.67%) and (16.67%) whereas other products also gave good impact with the weight loss ranged from (20.33%) percent in Custard apple leaf powder to 27.33 percent in *Lantana camara* leaf powder with weight loss in *Hemidesmus indicus* root powder (30.33%) .

All the treatments were found to be significantly superior to control in reducing weight loss. The negligible weight loss was recorded in Coragen (0.00) and minimum weight loss with most effective plant product was Neem leaf powder (10.67% w/w), this result was supported by<sup>[10, 11]</sup> Eucalyptus leaf powder was found to be next treatment<sup>[12]</sup>. Cow dung cake powder was found to be next effective treatment<sup>[13]</sup>.

##### Percentage mortality

Data (Table 1) revealed that the percent mortality of released adults was highest in treatments viz., Coragen (100%) , Neem leaf powder(90.00%) , *Lantana camara* leaf powder (90.00%), Custard apple leaf powder (87.00%) and Eucalyptus leaf powder (71.67%) respectively *Hemidesmus indicus* root powder (70.00%), Cow dung cake powder (20.00%), and untreated control recorded least mortality of (10.00%).

All the treatments were found to be significantly superior to control in Percentage mortality of test insect and highest mortality was observed in Coragen treated paddy and followed by highest mortality was recorded in Neem leaf powder (90%) and *Lantana camara* leaf powder (90%) were in agreement with<sup>[14]</sup> Singh *et al.*,2016 Custard apple leaf powder (87.00%) was found to be next best treatment the results supported by<sup>[15]</sup> Rojasara *et al.*,2019.

##### Percentage mortality with smoke

The effect of smoke generated by burning of neem leaves on different storage insect pests was recorded after different exposure periods and the related data is presented in (Table 2). The cow dung smoke, Eucalyptus leaf smoke and Neem leaf smoke was not found effective to the tested storage insect pest *S. oryzae*, 1 h of exposure of cow dung smoke, Eucalyptus leaf smoke and Neem leaf smoke showed the mortality rate of *S. oryzae* viz. (0.00%),(0.00%) and (0.00%) respectively, 3 h of exposure of cow dung smoke, Eucalyptus leaf smoke and Neem leaf smoke showed the mortality rate of *S. oryzae* viz. (0.00%), (0.00%) and (0.00%) respectively ,6 h of exposure of cow dung smoke, Eucalyptus leaf smoke and Neem leaf smoke showed the mortality rate of *S. oryzae* viz. (0.00%),(0.00%) and (0.00%) respectively. The highest mortality (16.00%) of *S. oryzae* were seen in paddy treated by Neem(semi-dried) leaf smoke followed by moderate mortality (14.67%) of *S. oryzae* were seen in paddy treated by eucalyptus (semi-dried) leaf smoke with the least mortality (10.00%) of *S. oryzae* were recorded in paddy treated with Cow dung cake powder smoke after 12h of smoke exposure.

After 24 h exposure, the smoke generated by burning of Eucalyptus (semi-dried) leaf smoke killed (28.00%) of *S. oryzae* adult beetles followed by mortality (27.33%) of *S. oryzae* were observed in paddy treated by Neem(semi-dried) leaf smoke with moderate mortality rate (18.00%) of *S. oryzae* were recorded in paddy treated with smoke of Cow dung cake powder After 48 h of smoke exposure the highest mortality was found of by Neem (semi-dried) leaf smoke (48.33%) of *S. oryzae* followed by Eucalyptus (semi- dried) leaf smoke (35.66%) of *S. oryzae* and the least mortality observed in smoke produced through cow dung cake powder (25.33%) of *S. oryzae* adult beetles.

All the treatments were found to be significantly superior to control in Percentage mortality of test insect and highest mortality was observed in Neem leaf smoke (48.33%) under airtight conditions were in agreement with [16, 17]. Yadav,U.,2016 and Michaelraj and Sharma 2006 studied fumigant toxicity of neem formulations viz. Ware house neem I (mist and spray) and Ware house neem II (thermal fog) both

containing Azadirachtin-1500 ppm against *S. oryzae* and *R. dominica* with more than 90 percent mortality of both insects in stored maize.

**Table 1:** Effect of plant and animal bio-products on percent weight loss and percent mortality of *S. oryzae* in stored paddy.

Treatments	% weight loss (90 days)	% mortality (90 days)
T1:Neem leaf powder	10.67	90.00
T2: <i>Lantana camara</i> leaf powder	27.33	90.00
T3: <i>Hemidesmus indicus</i> root powder	30.33	70.00
T4:Eucalyptus leaf powder	16.67	71.67
T5:Custard apple leaf powder	20.33	86.67
T6:Cow dung cake powder	16.67	20.00
T7:Coragen	0.00	100.00
T8:Untreated control	38.67	10.00
SEm ±	0.847	2.258
CD (P=0.05)	2.620	6.769
CV (%)	7.538	9.246

**Table 2:** Percent mortality of *S. oryzae* on paddy grains treated with cow dung smoke, Eucalyptus leaf smoke and Neem leaf smoke under airtight conditions.

Treatments	Percent mortality(hours from treatment)					
	1 h	3 h	6 h	12 h	24 h	48 h
T1:Cow dung cake powder	0.00	0.00	0.00	10.00 (18.378)	18.00 (25.08)	25.33 (30.205)
T2:Eucalyptus (semi-dried) leaves	0.00	0.00	0.00	14.67 (22.508)	28.00 (31.93)	35.67 (36.665)
T3:Neem (semi-dried) leaves	0.00	0.00	2.00	16.00 (23.552)	27.33 (31.50)	48.33 (44.045)
SEm ±	-	-	-	1.018	1.217	1.054
CD(P=0.05)	-	-	-	3.524 (3.051)	1.054 (2.834)	3.648 (2.287)
CV (%)	-	-	-	13.021 (7.110)	8.624 (4.086)	5.010 (3.096)

## Conclusion

On the basis of lab experimentation, it can be concluded that, Neem leaf powder @ 2 g/100 g and also Neem (semi-dried) leaf smoke treated Paddy grains were found effective against major insect pest of stored rice as being cost effective, eco-friendly and easy to adopt by small-scale farmers which also can be used as an alternative to synthetic insecticides under storage conditions for shorter duration. Since the findings are based on the laboratory experiment done for one time it may be repeated for further confirmation and recommendation.

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## References

- Ministry of Statistics and Programme Implementation 2015-2016  
<http://mospi.nic.in/asi-summary-results/820>.
- Times of India 2018.  
<https://timesofindia.indiatimes.com/business/india-business/indias-food-grain-production-touched-new-high-in-2017-18/articleshow/65583069.cms>
- Indian Grain Storage Management & Research Institute (IGMRI), Hapur (U.P)  
<https://igmri.dfpd.gov.in/igmri/insect-pests>.
- Isman MB. Botanical insecticides, deterrents, and repellents in modern agriculture and an increasingly regulated world. Annual Review of Entomology 2006;51:45-66.
- Isman M. Botanical insecticides: for richer, for poorer. Pest Management of Science 2008;64:8-11.
- Schmutterer H. Properties and potential of natural pesticides from the neem tree *Azadirachta indica*. Annual Review of Entomology 1990;35:271-297.
- Dwivedi SC, Garg S. Toxicology laboratory of flower extract of *Lantana camara* on the life cycle of *Corcyra cephalonica*, Indian Journal of Entomology, 2003;65:330-334.
- Awasthi M, Tiwari R. Effect of neem leaf, jatropha seed powders and cow urine on the growth and development of rice moth, *Corcyra cephalonica* (St.) in stored wheat. Indian Journal of Applied Entomology. 2012;26(1):63-67.
- Gomez KA, Gomez AA. Statistical procedures for Agricultural Research J Wiley and Sons, New York 1984.
- Tripathy MK, Das BC, Mohanty S. Efficacy of few botanicals against seed beetle *Caryedon serratus* (Bruchidae: Coleoptera) infesting stored groundnut under Bhubaneswar condition. Indian Journal of Agricultural Research 2004;38(1):15-21.
- Egwurube E, Magaji BT, Lawal Z. Laboratory evaluation of neem (*Azadirachta indica*) seed and leaf powders for

- the control of khapra beetle, *Trogoderma granarium* (Coleoptera: Dermestidae) infesting groundnut. International Journal of Agricultural Biology 2010;2(4):638-640.
12. Dufera TL, Tadesse AY, Gobena WS, Kuyu CG. On Farm Evaluation of *Eucalyptus globulus* Labill Leaf and *Chenopodium ambrosioides* L. Whole Plant Powder against Storage Insect Pests in Stored Maize at Sokoru District in Jimma Zone of Oromia Regional State, Ethiopia, A Journal of Entomology 2019, 1-7
  13. Yadav U, Tiwari R. Effect of smoke on insect mortality and quality parameters of stored wheat at pantnagar , Uttarakhand. Journal of Entomology and Zoology Studies 2018;6(3):1661-1666.
  14. Singh S, Sharma DK, Gill RS. Evaluation of three plant oils for the control of lesser grain borer, *Rhyzopertha dominica* (Fabricius) in stored wheat. Journal of Insect Science 2016;29:162-169.
  15. Rojasara AD, Patel DR, Pathak DM, Patel RR. Evaluation of different plant products against rice weevil *Sitophilus oryzae* on paddy, Journal of Entomology and Zoology studies 2019;7(4):1329-1332.
  16. Yadav U. Eco-Friendly Management of Major Insect Pests of Stored Wheat at Pantnagar 2016. <http://krishikosh.egranth.ac.in/handle/1/5810037338>.
  17. Michaelraj S, Sharma RK. Fumigant toxicity of neem formulations against *Sitophilus oryzae* and *Rhyzopertha dominica*. Journal of Agricultural Technology 2006;2(1):1-16.