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## Effect of *Azadirachta indica* and *Citrus sinensis* on *Sitophilus zeamais* (L.) (Coleoptera: Curculionidae) insect of stored maize grains.

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**Abstract-** Powders of Neem (*Azadirachta indica*) leaf and Orange (*C. sinensis*) peels were tested for their insecticidal actions against adult *Sitophilus zeamais*, (Coleoptera: Curculionidae) under controlled conditions at 75±5 percent relative humidity and 27±2°C temperature during the Winter season. Experiments consisted of exposing adult *S. zeamais* to both the Neem leaf and orange peels powders. The maize seeds were treated with Neem leaf powder and Citrus peel powder in different dosage from 10g, 20g and 30gm during the study period. These biopesticides were thoroughly mixed with required quantity of seeds and kept in 1 kg capacity glass jars by manual operation. The result indicated that pulverized plant powder had no significant reproductive effect on adult *S. zeamais*. The maximum number of eggs was found in Neem powder (22.34%) rather than Citrus peel powder in different dosages in this study. The incubation period did not differ significantly among various plant protectant treatments. The maximum incubation period was in Neem leaf powder (12.6 days) while it was minimum in citrus peel powder. The hatchability percentage of the pest was minimum (27.24 %) in the grains treated with Neem powder and this treatment was followed by Citrus peel powder in different concentrations in this research.

**Key words:** Neem Leaf, Orange Peel, *S. zeamais*, Maize grains

### INTRODUCTION

The Maize is another important cereal grain belongs to the family of Gramineae. It is an important staple food for human beings and animals. Maize can flourish in diverse climates condition and is grown-up by small holder families in many countries of the world. Maize is the gift of the new world to old world. Maize has few insect-pests under storage situation, but it is vulnerable to insect attack after harvest. This pest is an internal feeder and causes significant loss to cereals affecting the quantity, as well as quality of stored cereal grains through storage. Insect pests cause heavy economic losses to stored grains. Maize weevil (*S. zeamais*) is a major pest that attack stored maize grains

in the tropic and temperate regions of the world. The control of stored-grain insect pests by chemical insecticides and fumigants are tools for preventing or minimizing insect damage to stored grain. Research work done over the years has revealed that, two plant extracts possess pesticidal properties and could therefore replace the hazardous synthetic products currently being used. Such plant materials include powders from parts of the Neem tree (*Azadirachta indica*). Mixing dried neem leaves with grain in storage is classic example of natural produce use that has been practiced by farmers in many countries for many years. The main active insecticidal ingredients are present mainly in the seeds, leaves, and other parts of the neem.<sup>1</sup> A particular grain variety showed different responses by similar mode of infestation on insect pests. The cereal food

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grain differs each other in their nutritional and physical factors and varied responses, which greatly influences the grain resistance. It is principally an energy giving food because of its high starch content. The grain is also used to feed monogastric such as pigs and poultry as the main basis of energy whereas the plant also serves as fodder for ruminants.<sup>2</sup> The starch is used in creation ice cream, alcohol, beverages, cosmetics and adhesive, cooking oil, salad oil, glycerine, soap and pharmaceuticals can as well be made from maize.<sup>3</sup>

Post harvest losses occur between harvest and the moment of human use. They include on-farm losses, such as when grain is threshed, winnowed, and dried, as well as losses next to the chain through carrying, storage and processing. Harvesting is done by defiance the ear from the stalk using the hand with both cutlass and sickle. This is done through natural draying using Sun draying or non-natural draying like photovoltaic solar energy.<sup>4</sup>

The pests attack the grains, cause losses to the crops in many ways such as, reduce the yield of crops and grains, Lower the quality of crops and grains and increase the cost of production. Therefore, measures should be taken to prevent damage to various crops in the field and during storage. For the purpose of saving the grains from insect attacks during storage it needs systematic research approach to determine the source of physico-biochemical resistant techniques, so that the resistant factors can be utilized in breeding programmes to save the grains from insect infestation. Various factors responsible for the grain resistance have been suggested by many workers. Similarly, the chemical factors responsible for the resistance have also been established in a few cases.<sup>5</sup>

The protection of grains from the stored grain pests is one of the most important problems before us. The discovery of selective plant insecticides meant a great advancement in our fight against insect enemies because they were very toxic to insects and comparatively harmless to humans. They could, therefore, be used freely as domestic insecticides. The discovery of chlorinated hydrocarbons and organophosphate insecticides overshadowed these plant insecticides which were considered to be non-toxic and comparatively safe for humans and domestic animals. The recent studies, however, showed that the synthetic insecticides badly suffer from the presence of poisonous residual toxicity and development of insect resistance. This has led to the revival

of interest in plant insecticides. In addition, the chemical pesticides cause serious health hazards by transmitting pathogens and viruses to human beings and livestock's. The control of the stored grain pest by the chemical and other method is being explored to effect further improvement in stored pest control technique. Though chemicals have proved to give effective control of various pests infesting grains, but simultaneously they also create several problems such as appearance of the resistant strain of pest and toxic hazards due to chemical residue. The plant parts have been habitually used to control domestic insect pests in stored grains, crop, in human and cattle medicine. Hence, the objective of this laboratory experiment was to determine the effect of ground Neem leaf and Orange peels against maize weevil and storage Neem leaf and Orange peels on its insecticides movement. Many studies reported its effective use in administration insect pest. Plant based necessary oil like Citrus and Neem have stepped in market place and is best suited for organic food invention in developing and industrial Countries. Azadirachtin, extracted from Neem leaf, act on target organism as antifidant growth regulator. For example, Plant powders from Neem and Citrus had strong insecticidal activity on *Sitophilus oryzae* and *S. granaries*, and *S. zeamais*. The study proves the insecticidal activity of plant powder of Neem leaf and Orange peels against *S. zeamais* in addition; the current study was designed to investigate the suitability of these plant powders to protect stored maize grains. Recently voluminous work has been done on Neem and its chemical components to control the pests in the field and in storage. Considering the foresaid facts in view, the following studies have been planned against *Sitophilus zeamais* so as to develop effective and feasible management of this serious pest of maize grains in storage.

## **MATERIAL & METHODS**

### **Experimental Site: -**

This research was carried out in the Department of Botany laboratory of Jai Prakash University Chapra. Chapra is located between latitude 180<sup>0</sup> (90<sup>0</sup> North and 90<sup>0</sup> South) and 360<sup>0</sup> of longitude (+180<sup>0</sup> eastward and -180<sup>0</sup> westward). This distance between each degree of latitude is about 67 miles 9110 Kilometers).

**Insect culture: -** The adult *S. zeamais* used for the experiment were cultured in a plastic container under ambient laboratory temperature of 27±2°C and 75±5% humidity during the Winter season.

### Collection and Preparation of Plant Materials

The fresh leaves of Neem were collected from a farm at Mashrak in Shastritola while the Orange Peels were collected from Orange sellers in Chapra market. The collection of adults for mass rearing was made local *S. zeamais* of Mashrak. The plant materials were air dried for one week. The dried leaves were ground separately into powder and sieved to obtain fine powders. The powders were stored in a cool dried place until when needed.

### Experimental Condition

The Maize seeds were treated with Neem leaf powder and Citrus peel powder in different dosage from 5 gm to 30 gm during the study period. These bio-pesticides were thoroughly mixed with required quantity of seeds and kept in 1 kg capacity glass jars by manual operation. Each experiment was divided into 3 replicates having 25g seed each in separate glass vials measuring 15 x 6 cm. In individual treatment of each replication, 10 pairs of matured adults of beetles were released into every vial obtained from the pure culture raised in the laboratory. All vials were kept under room temperature of  $27\pm 2^{\circ}\text{C}$ . and relative humidity at  $75\pm 5\%$ . The mouth of each vial was covered with muslin cloth and tied with rubber bands. For taking the observations on fecundity, adult emergence, grain damage and mortality of the insects, four sets of experiments were analyzed separately for each study.

It was clear from the data shown in Table 1 that all grain protectants showed their superiority over control check (88.04%). The females laid minimum number of eggs (22.34%) on grains treated with Neem leaf powder which proved highly protected in comparison to Citrus peel powder in this study.

**Table 1- Effect of biopesticides upon Maize weevil reproductive performance**

Sl. No.	Protectant	Dosages	Fecundity % female	Incubation (days)	Hatchability (Percentage)
1.	Neem powder	10g	22.34 (5.40)	12.06	27.24 (32.62)
2.	Neem powder	20g	20.13 (4.60)	10.23	24.58 (27.31)
3.	Neem powder	30g	18.52 (4.14)	08.56	20.18 (23.42)
4.	Citrus peel powder	10g	24.42 (5.82)	14.13	30.36 (38.62)
5.	Citrus peel powder	20g	22.18 (4.46)	13.03	28.86 (36.83)
6.	Citrus peel powder	30g	21.46 (3.98)	12.28	26.91 (34.43)

### CONCLUSION

The study shows that neem leaf powder was most effective in suppressing weevils population. The two plant powder indicates that higher dosage is more efficient in management of pests. The effects of neem leaf and citrus

### RESULTS & DISCUSSION

As regards the incubation period of the eggs, there were significant differences in various treatments (Table 1). The maximum incubation period was observed in grains treated with Neem Seed rather than citrus peel powder and similar results was obtained for hatchability of maize weevils in this investigation.

All the grain protectants were found to be effective in reducing the number of eggs laid by female maize weevils. This is in consonance with the reports of Don-Pedro (1989); Kumar & Okonkwo (1991).<sup>6,7</sup> The maximum number of eggs was found in Neem powder (22.34%) rather than Citrus peel powder in different dosages in this study. The incubation period did not differ significantly among various plant protectant treatments. The maximum incubation period was in Neem leaf powder (12.6 days) while it was minimum in citrus peel powder. The hatchability percentage of the pest was minimum (27.24 %) in the grains treated with Neem powder and this treatment was followed by Citrus peel powder in different concentrations in this research. Plant natural products that constitute effective safer alternatives to synthetic insecticides producing adverse effects on the ecosystems have been tested in the management of stored product pests.<sup>8-10</sup>

These findings were in accordance with the results given by Radha (2014)<sup>11</sup> who found that Neem reduced the oviposition rate of *R. dominica* in maize grains. The present findings were also found in conformity with the results of Srivastava (1994)<sup>12</sup> who also reported that *A. indica* adversely affects the fecundity and hatchability of rice moth.

peels powders in different dosage have been tested on growth and development of maize weevils. The neem plant is very common in India, therefore making its leaf readily available for the control of insect pests of stored grains. The insecticidal action of neem leaf and orange peels

powder when mixed was not very effective in the control of insect pest of stored maize grains *S. zeamais*. The consist use of neem leaf and orange peels in pest management is recommended as it will help reduce heaps of waste capable of polluting the environment.

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