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Efficacy of *Annona squamosa* against Saw-toothed grain beetle, *Oryzaephilus surinamensis* (L.) in Stored Rice

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Abstract: *Stored grain insects cause serious loss of stored rice and the nutritional value of grain. Use of synthetic insecticides is often beyond the reach of growers and regular and frequent application of these organic pesticides creates lots of problems such as toxicity to non-target species, pest resistance and resurgence. The undesirable effects of synthetic insecticides may be solved with the use of botanicals.*
Number of plant species possess pest control chemicals but only few of them seem to be ideally suited for management of stored grain pests. These botanicals are active against specific target insects and they are biodegradable and potentially sound for use in pest management. In the present study, alcoholic extracts of leaves and seeds of Annona squamosa were evaluated for protection of rice grain against saw-toothed grain beetle, Oryzaephilus surinamensis (L). Result demonstrated that alcoholic extract of Annona squamosa leaves was found effective for more than 5 days @ 150.0 mg/gm, where as alcoholic extract of Annona squamosa seeds was found effective for more than 20 days @ 54.0 mg/gm..

Keywords: Annona squamosa, Oryzaephilus surinamensis, Saw-toothed grain beetle, alcoholic extract, rice, storage

I. INTRODUCTION

Infestation of different grains due to several insect pest during storage, make them unfit for human consumption. This causes loss of germination capacity of seeds (1). Among different food grains, rice is the second most important food after wheat. It is very nutritious food contain carbohydrate and fulfil large amount of human caloric needs (2). The large production and consumption of rice comes from Asia. (3) and Africa (4) It is estimated that 98 percent of the world rice is produced in Asia (5).

China and India consume about 50 percent of the global rice production. This commodity is currently grown over that produce more than 715 million tons of rice annually (4,6).

This valuable food continually infested by several pests during the period of storage. The some insect pest on rice are *Sitophilus oryzae , Tribolium and Oryzaephilus surinamensis* (1).

Synthetic insecticides have been extensively used since 1960[s] in stored grain for the control storage pests (7). Champ (8) has reported a wide spread resistance development to almost all groups of pesticides for protection of stored grain and other stored food by major insect pests. Although these chemical pesticides are effective but their repeated use has led environment pollution and adverse effects on food and humans besides increasing cost of their application.(9,10,11,12).The development of insecticidal resistance in various insects and their residual effect are some of the serious threats (1), creates worldwide interest to develop some alternative strategies .(13)

Hence, effective alternatives methods should be evaluated against wide range of stored product insect pest to mitigate the adverse effects of continuous use of traditional pesticides (14).

During recent decades, a wide range of botanicals has been evaluated for the control of stored product insects (13). Numerous papers have been published on botanicals that can be used at the post harvest stages of agriculture commodities (14).

Naturally, plant, herbs and spices are best alternative of pest control because contains a range of bioactive chemicals (15,16).

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Therefore, aim of this study, to determine the efficacy of alchoholic extracts of *Annona sqamosa* (leaves and seeds) against *Oryzaephilus surinamensis* (L.)

II. MATERIAL AND METHOD

The plant parts (seeds and leaves of *Annona sqamosa*) were dried in shade and pulverized into powder. All the materials were passed through a domestic flour sieve. The extracts were prepared through Soxhlet apparatus in alcohol. The experimental insects saw-toothed grain beetle, *Oryzaephilus surinamensis* were obatained from laboratory culture, maintained on rice at the temperature of 30 degree C. and 70 % humidity. The various dosages of extracts were sprayed uniformaly in culture vials containing 20 gm of rice grain. 10 pairs of insects were released in each vial. Each vial was covered with muslin cloth after spray and kept in suitable conditions for 24 hours. Each treatment was replicated three times. The adult mortality was recorded after 24 hours.

III. LITERATURE REVIEW

Singh and Shrivastava (1980) studied the efficacy of neem seed powder mixed with wheat grains in three doses i.e. 1.0, 2.5 and 5.0 % (w/w) against lesser grain borer for three months. They observed that population increased with time but there was significant difference in the insect population and viability of grain at different doses in comparison to control. Maximum protection of grain occurred at a dose of 5 %.

Gupta and Ahmed (1988) evaluated the efficacy of different non edible oils viz. neem (*Azadirachta indica*), karanj (*Pongamia glabra*), mahua *(Bassia latifolia*), palas (*Butea frondosa*), dhupa *(Vateria indica*) at 2.5 ml and 5 ml per kg. of wheat seed for protecting the grain from pest infestation in storage with their effect on germination. Neem and palas at 5 ml /kg seed offered better protection by allowing only 0.2 and 1.2 % infestation after 6 months and 1.3 and 3.3 % infestation after 12 months of the treatment respectively.

Shaaya *et al*. (1991) worked on 28 essential oils extracted from various spices and herb plant and some of their major constituents were assessed for adult coleopterans, *Rhyzopertha dominica, Oryzaephilus surinamensis, Tribolium castaneum, and Sitophilus oryzae*. The compounds linalool, α terpinoids carvacrol and the essential oil of oregano, basil, syrian, marjoram and thyme were most active against *O.surinamensis*.

Fang *et al.* (2002) tested the performance of spinosad against adult of lesser grain borer, *Rhyzopertha dominica* (F), rice weevil, *Sitophilus oryzae* (L*),* saw-toothed grain beetle, *Oryzaephlius surinamensis* (L), red flour beetle, *Tribolium castaneum* (H) and larvae of the Indian meal moth, *Plodia interpunctella* (Hub). They found that Spinosad was effective aginst *S.oryzae, O.surinamensis* and *T. castaneum* only on durum wheat at 1 ml/kg.

Beckel *et al.* (2007) worked on rearing method of *Oryzaephilus surinamensis* (L.) on various grain granulometry mainly because of its feeding behaviour, small size, and high mobility.The aim of this work was to develop a simple and efficient laboratory rearing method for *Oryzaephilus surinamensis* (L.).

Dubey *et al.* (2008) studied on the current status of plant products as botanical pesticides in storage pest management.The increasing concern over the level of pesticide residues in food has encouraged researchers to look for alternatives of synthetic pesticides.Because of non-phytotoxicity, easy biodegradability and stimulatory nature of host metabolism, plant products posses the potential in pest management. Pyrethroids and neem products are well established commercially as botanicals against storage pests because of their relatively safe status and wide acceptance by the consumers.

IV. RESULT AND DISCUSSION

Alcoholic extract of *Annona squamosa* leaves was found effective for more than 5 days @ 150.0 mg/gm where as alcoholic extract of *Annona squamosa* seeds was found effective for more than 20 days @ 54.0 mg/gm.

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TABLE-1

Residual toxicity of deposits of individual Alcoholic plant Extracts to the adult *of Oryzaephilus surinamensis (Linn.)* at different intervals after spraying

S. No.	Plant Extracts	Part	Dose (mg/gm)	Residual Toxicity of deposits at interval of					
				1DAT % Mortality	3 DAT % Mortality	5 DAT% Mortality	7 DAT % Mortality	15 DAT % Mortality	30 DAT% Mortality
1	*Annona squamosa*	Leaf	150.0	100	75	30	_	_	_
2	*Annona squamosa*	Seed	54.0	98	80	65	40	30	_

DAT=Days After Treatment

V. CONCLUSION

It has been estimated through the present study that Annona sqamosa alchoholic seed extract @ 54mg/gm dose has been found most effective ecofriendly, Which deposited its residue on rice grain for more than 15 days to protect it from the infestation of Oryzaephilus surinamensis (L.).

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