



Insecticidal Activity of Bioactive Compound: 2H-Furo [2, 3-H]-1-Benzopyran-2-One, Isolated Form Seeds of *Psoralea Corylifolia* L against *Sitophilus Oryzae*

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ABSTRACT

Insecticidal activity of the bioactive compound 2H-Furo[2,3-H]-1-benzopyran-2-one isolated from the seeds of *P. corylifolia* against *S. oryzae* was observed at 1000ppm and 1500ppm concentration. 50% of the seeds got infected by insects at 250 and 500ppm concentration. The number of insects gradually increased with increase in storage period from 0 to 120 days. In treated seeds at 1000 and 1500ppm concentration complete inhibition of insects was observed without altering the nutritive value. At 250 and 500ppm concentration, significant insecticidal activity was observed. Hence the percent mortality was increased with increase in concentration without biodeterioration

Keywords: *S.oryzae*, Insects, Mortality, *Psoralea corylifolia*, Bioactive compound.

1. INTRODUCTION

Post harvest losses of grain are a significant factor in the world food supply. The losses are primarily due to infestation by insects, microorganisms and also due to rodents and birds. A smaller but quite significant proportion of the total losses results from respiration and gradual deterioration of viability, nutritive quality and end use properties during storage under commercial conditions. Deterioration of grains involves a succession of microorganisms resulting in the breakdown of organic matter to yield carbon dioxide and water and the generation of heat. Nutrients are lost because of changes in carbohydrates, proteins, lipids and vitamins. Functional properties, including germinability are lost and aesthetic changes including discoloration, caking and abnormal odors occurs also produces mycotoxins that elicit a toxic

response when the damaged grain is ingested by mould [1]. For millions of people, food supplies depend almost entirely on each year's harvest. Protecting our harvested crops from insects pests can significantly increase available food resources because at least 10% of our harvested foods are destroyed in storage by insects pests. Losses of 30% are common throughout large areas of the world [2]. One of the most effective alternative approaches under the biological control programme is to explore the floral biodiversity and enter the field of using safer insecticides of botanical origin [3]. Prevention of biodeterioration of grains is generally achieved by treatments with synthetic fungicides used in the prevention of biodeterioration of grains are also known to be toxic to non target organisms and cause side effects to

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man^[4]. Exploitation of bioorganic molecules for the prevention of biodeterioration of grains would help to overcome these ill effects. Considering these, a systematic investigation was envisaged to evaluate the potency of 2H-Furo[2,3-H]-1-benzopyran-2-one compound isolated from *P. corylifolia* for prevention of biodeterioration of maize grains during storage.

2. MATERIALS AND METHODS

2.1. Collection of seed sample and determination of moisture:

Maize seed samples (20kg) was directly collected from seed market, Mysore and brought to the laboratory for further experiments. The sample was subjected to determination of moisture content (%) by following the procedures of high constant temperature oven method^[5].

2.2. Plant material:

Fresh and healthy seeds of *P. corylifolia* L., were washed with tap water thrice and two to three times with distilled water. The seeds were air dried at room temperature. Completely air dried seeds were powdered using waring blender (Waring international, new hart-ford, CT, USA).

2.3. Isolation of Bioactive compound:

Bioactive active compound was isolated from seeds of *P. corylifolia* following the procedure of Harborne^[6].

2.4. Antifeedent activity

2.4.1. Effect of Bioactive compound [2H-Furo[2,3-H]-1-benzopyran-2-one] on mortality of *Sitophilus oryzae*

Insect culture:

Standard laboratory cultures of *Sitophilus oryzae* were collected from Food protectants and infestation control department, CFTRI, Mysore. The cultures were maintained in our laboratory in maize seeds at 30±1°C and 70±5% RH. Plastic containers covered with muslin cloth served as rearing cages.

Bioassay: Test maize seeds (100gms in 5 replicates) were sterilized at 45°C for 8hrs. in order to kill the eggs and developing larvae (if any). The seeds treated with the bioactive compound, isolated from the seeds of *P. corylifolia* at 250, 500, 1000, 1500ppm concentration were taken in a polyethylene bag and covered with muslin cloth. All the bags were shaken thoroughly for uniform distribution of the bioactive compound. Seeds without the bioactive compound treatment served as control. Each bag was then released with 5 pairs of newly emerged adults of *S. oryzae*. Treated and control seeds were incubated at room temperature (30±1°C) at R.H of 70 ± 5 % for 30,60,90 and 120 days. Observations on the adult mortality were made up to 120 days^[7]. The percent mortality was calculated using Abbott's formula^[8].

$$\text{Corrected mortality} = \frac{\% \text{ alive control} - \% \text{ alive treated} \times 100}{\% \text{ alive control}}$$

3. RESULTS

3.1. Collection of seed sample and determination of moisture content:

The moisture content of the seed sample was 13.5%.

3.2. Isolation of the bioactive compound:

The bioactive compound 2H-Furo [2,3-H]-1-benzopyran-2-one was isolated. From the observation it was recorded 0.47 Rf value and 1380 C melting point.

3.3. Antifeedent activity

3.3.1. Effect of Bioactive compound [2H-Furo [2,3-H]-1-benzopyran-2-one] on mortality of *Sitophilus oryzae*

Significant activity of bioactive compound of seeds of *P. corylifolia* against *S. oryzae* was observed at 1000ppm and 1500ppm concentration and at 250 and 500ppm conc. 50% of the seeds got infected by insects. It was observed that in the untreated control the number of the storage insect *S. oryzae* increased significantly with increasing period of storage. At 0 days, the number was 10, at 30 days it was 13 and the same increased to 95 after 60 days of storage. At 90 days of storage their number was 13 and the same increased to 150 after 120 days of storage. There was a significant increase in the number of insects after 90 days of storage. In the seeds treated with 250ppm concentration of the bioactive compound, it was also observed that with increasing period of storage there was increase in the number of adult *S. oryzae*. At 0 days it was 10 and after 60 days of storage their number marginally increased to 19. However after 90 days of storage there was a highly significant increase in their number (15) which further increased to 73 after 120 days of storage. At 500ppm concentration treatment the number of *S. oryzae* which was 10 at 0 days decreased to 7. After 30 days of storage, there was a gradual increase in their number after 60 days of storage. After 90 and 120 days of storage a slight increase in their number was also observed which was 20 and 29 respectively. In the seeds treated with 1000ppm and 1500ppm concentration of the bioactive compound, the number of insects was 10 at 0 days and all the insects were killed after 30 days of storage. Thus there were no live insects in both the treatments (Figure 1).

4. DISCUSSION:

The results of the experiments conducted with regard to the effect of treatment of maize grains with different concentrations of the bioactive compound isolated from seeds of *P. corylifolia* on the mortality of two important storage insects *S. oryzae* and *S. zeamais* revealed that during storage is also encouraging. A highly significant increase in the *S. oryzae* and *S. zeamais* population was observed in the untreated control seeds with increasing periods of storage. A marginal increase in their population was observed in 250ppm and 500ppm concentration treatment, where as total mortality of all the test insects were observed at 1000 and 1500ppm concentration at

and beyond 30 days of storage. Thus the results of the present investigation suggest that at and beyond 1000ppm concentration is lethal to these insects^[9] have demonstrated the insecticidal potency of different fractions of *P. corylifolia* against tobacco caterpillar *Spodoptera litura*. But they have not isolated the bioactive compound (2H-Furo [2,3-H]-1-benzopyran-2-one) and evaluated their potency for insecticidal property. Thus the results of the present investigations are in the conformity with the results of the earlier reports with regard to the mortality of the storage insects. Thus for the first time in the present investigation, the potency of the bioactive compound to manage storage insects in maize grains has been demonstrated.

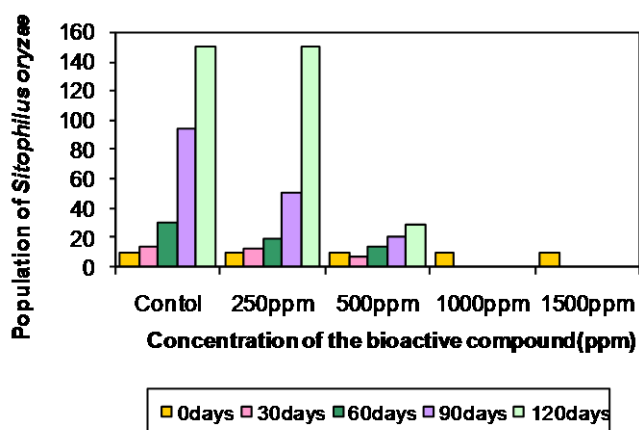


Figure 1 : Effect of bioactive compound [2H-Furo [2,3-H]-1-benzopyran-2-one] of seeds of *P. corylifolia* L. on mortality of *Sitophilus oryzae*.

5. CONCLUSION:

Thus it is evident from the results of the present investigation that treatment of maize grains with 1000ppm concentration of the bioactive compound, 2H-Furo [2,3-H]-1-benzopyran-2-one isolated from seeds of *P. corylifolia* could be exploited for the prevention of insect attack and loss of maize seeds during storage.

However further investigations are necessary with regard to toxicological aspects of this compound before it is finally recommended for commercial exploitation.

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Conflict of Interest: None Declared