

## **EFFICIENCY AND PERSISTENCE OF DIAZINON INSECTICIDE ON DIFFERENT SURFACES AGAINST *SITOPHILLUS ORYZAE* (L.) AND *RHIZOPERTHA DOMINICA* (F.)**

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### **Abstract**

A laboratory studies were undertaken to assess the efficacy of Diazinon insecticide (EC). Formulation of insecticide were applied to different surfaces i.e. steel, ceramic, wood and cement at 0.0006 and 0.0003 ml / cm<sup>2</sup> to determine their persistence up to 28 weeks against *Sitophilus oryzae* (L.) and *Rhizopertha dominica* (F.). Insects were exposed on the treated surfaces for 24 hrs. at 28 weeks after treatment. Results indicated that; mortality rates were positively corrected with the concentration and negatively corrected with the time of application. The results indicated that:

- Steel and ceramic were the most persistent surfaces which gave 100 % mortality up to 18 and 20 weeks at the highest concentration in both tested insects respectively.
- Wood surface can provide good protection only up to the tenth and eighth weeks after application at the highest concentration for *S. oryzae* and *R. domonica* respectively.
- In cement surface, Diazinon deteriorated very rapidly starting from the first two weeks at 0.0006 ml / cm<sup>2</sup> on both tested insects.
- Values of gross persistency of the different surfaces indicated that steel and ceramic surfaces were the most ideal to retain toxicity followed by wood surface, meanwhile cement surface lost most of its efficiency when used.
- Finally, *Rizopertha dominica* (F.) adults were more tolerant to insecticide than *S. oryzae* (L.).

### **INTRODUCTION**

It is common practice in many developing countries to spray the grain stores with residual formulations of contact insecticides to control stored-product insects, this is achieved by first killing the insect present, and secondly by leaving a persistent deposit, which continues to kill insects arriving on the surface.

The surfaces commonly sprayed include walls, floor and bag-stacks. Materials which are likely to be sprayed therefore are concrete, wood, metal and sacking such as jute, sisal, polypropylene and multi-wall paper.

A residual insecticide is first deposited as an overdose which continues to kill the target pests until the concentration of available residue has dropped to a sub-

lethal level. Depletion of this available residue takes place by a number of means, including oxidation, volatilization, sorption into the substrate, and removal by insect pick-up, or other disturbance such as weathering, accidental abrasion or cleaning. (Hodges and Dales 1991), (Hodges 1993), (Hodges *et. al.*, 1989) and (Nayak *et. al.*, 2002).

The aim of the study is to evaluate the efficiency and persistence of Diazinon insecticide against *Sitophilus oryzae* (L.) and *Rhizopertha dominica* (F.) after their application on different surfaces such as steel, ceramic, wood and cement by two tested concentration i.e. 0.0006 and 0.0003 ml / cm<sup>2</sup>.

## MATERIALS AND METHODS

Two species of stored grain insects were used in the study, rice weevil, *Sitophilus oryzae* and the lesser grain borer, *Rhizopertha dominica* cultures of both species were maintained at 27 ± 1°C and 65 ± 5 % RH.

Commercial formulation of Diazinon 60 % (E.C) insecticide was used for surface treatment. Tested two concentrations were 0.0006 and 0.0003 ml / cm<sup>2</sup>.

Diazinon insecticide was sprayed over different surfaces i.e. (steel, ceramic, wood and cement). Every surface prepared as a circular discs (9cm diameter) in individual Petri dishes (1.5 cm high × 9 cm diameter), while, cement discs were prepared by mixing 3200 g of cement in 1600 ml of water to a thick running consistency, which was subsequently poured into individual Petri dishes.

Fifty insects of each *S. oryzae* or *R. dominica* were released on each Petri dish. Mortalities were counted after 24 hrs. (Initial treatment).

To evaluate the persistence efficiency of the used surfaces against the tested insects, 50 insects were introduced periodically to each Petri-dish at one week and up to 28 weeks after initial treatments. In all cases, three replicates were made for each treatment and the untreated check.

Percent mortalities were calculated and corrected with Abbott`s formula (1925). Gross persistency values were worked out according to the formula used by Power and Yadav (1980) as follows:

$$\text{Gross persistency} = \frac{\text{sum of (\% mortality} \times \text{period days)}}{\text{Number of observations}}$$

## RESULTS AND DISCUSSION

Data in tables (1) & (2) showed clearly that the mortality rates were positively corrected with the time of application. At two tested concentrations, steel and ceramic surfaces were more persistence than wood and cement surfaces. Steel and surface gave 100% mortality to *S. oryzae* up to 20 and 18 weeks at 0.0006 and 0.0003 ml / cm<sup>2</sup>. The corresponding data were 18 and 16 weeks at the two previous concentrations for *R. dominica* , respectively.

The reduction in the efficiency of Diazinon insecticide was relatively moderated in wood surface at two tested concentrations. Wood surface can provide good protection up to the tenth and eighth weeks after application at the highest concentration for *S. oryzae* and *R. domonica* respectively.

In cement surface, Diazinon deteriorated very rapidly starting from the first two weeks on 0.0006 ml / cm<sup>2</sup> and from the first week at 0.0003 ml / cm<sup>2</sup> in both tested insects. These results agree with the Power Yadav (1980) who sprayed some surfaces by some insecticides against adults of *C. chinensis*.

The values of gross persistency of the different surfaces were tabulated in Tables 1 & 2 and indicated that steel and ceramic surfaces were the most ideal to retain toxicity followed by wood surface; meanwhile cement surface lost its efficiency rapidly. These results indicated that Diazinon insecticide was more persistent on non porous surfaces. Similar results had already been shown against *C. chinensis* using glass, metallic and plywood surface (Cogburn 1972), also (Mahgoub 1995) had pointed out that the porosity of surface was responsible for less persistency.

It can be concluded that fair protection of tested stored grain insects up to 20 weeks could be achieved through surface treatment of steel and ceramic with 0.0006 ml / cm<sup>2</sup>.





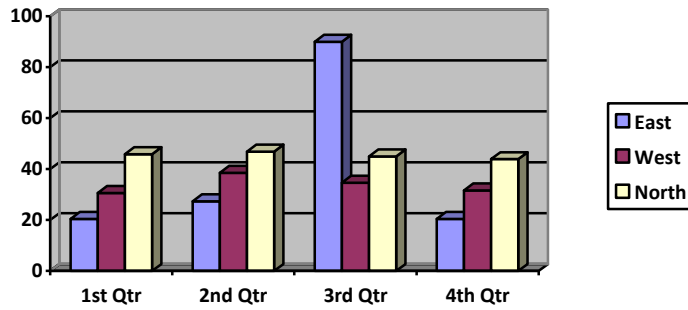
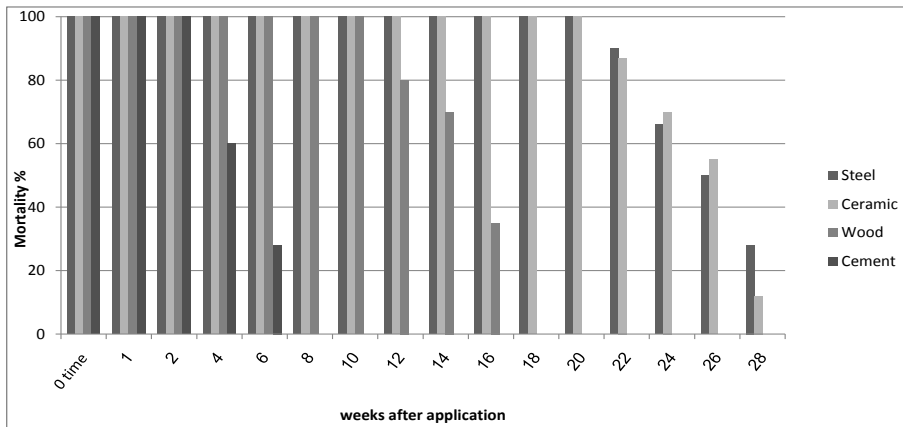


Fig. 1. Persistence of Diazinon 60 % insecticide on different surfaces against *S. oryzae* indicated by percent mortality Conc. (0.0006 ml / cm<sup>2</sup>).

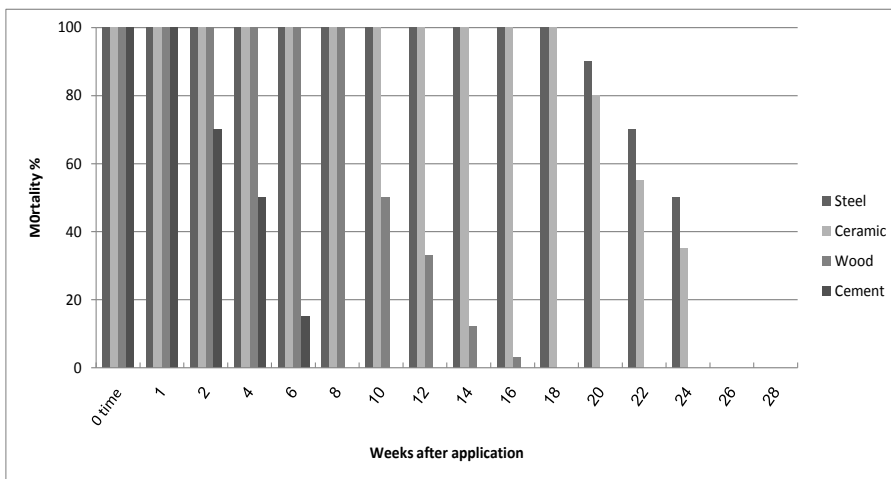


Fig. 2. Persistence of Diazinon 60 % insecticide on different surfaces against *S. oryzae* indicated by percent mortality Conc. (0.0003 ml / cm<sup>2</sup>).

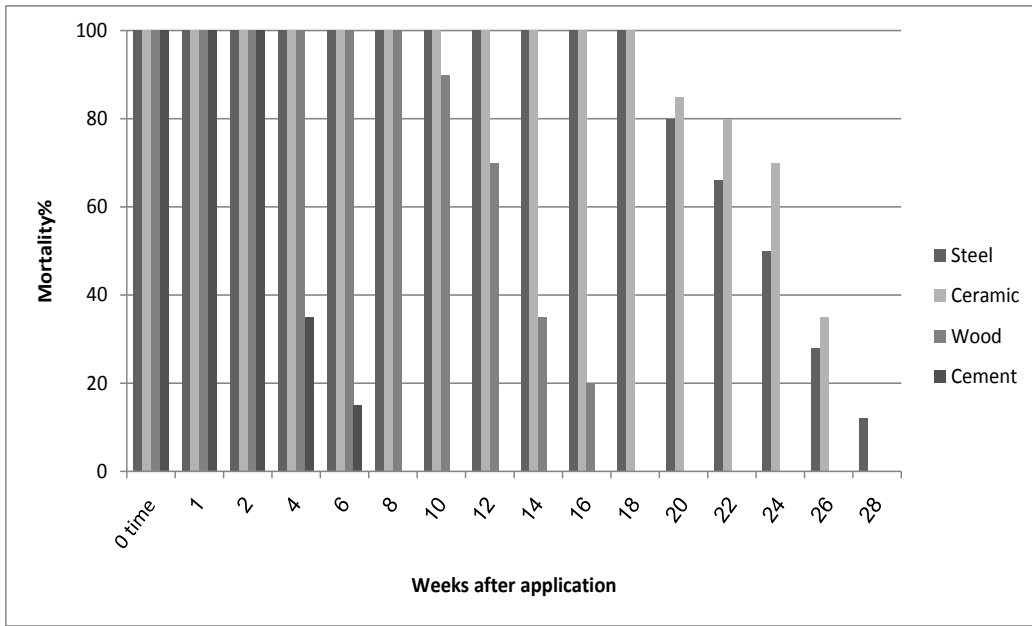


Fig. 3. Persistence of Diazinon insecticide on different surfaces against *R. dominica F.* indicated by percent mortality Conc. (0.0006 ml / cm<sup>2</sup>)

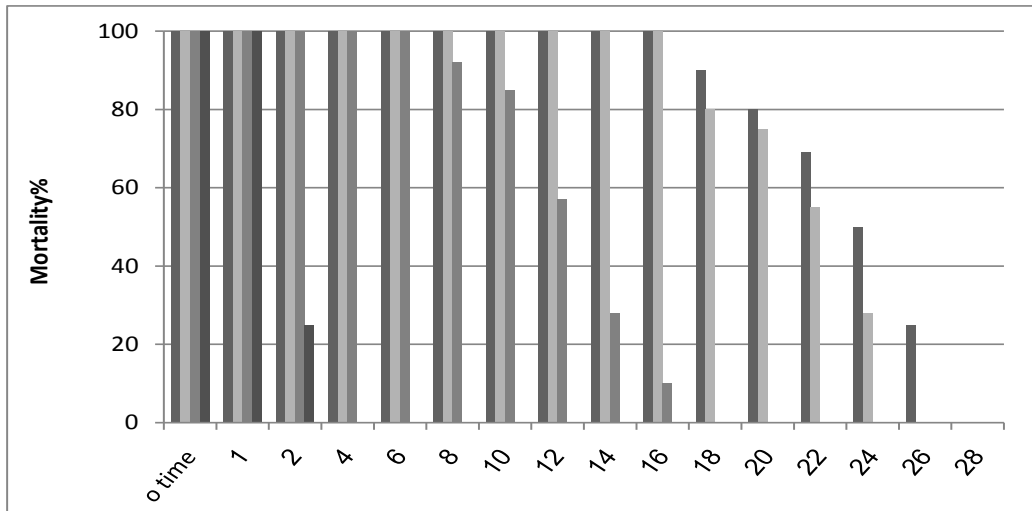


Fig. 4. Persistence of Diazinon insecticide on different surfaces against *R. dominica F.* indicated by percent mortality Conc. (0.0003 ml / cm<sup>2</sup>).

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## تأثير وبقاء مبيد الدياتينون على أسطح المواد المختلفة ضد حشرتي سوسة الأرز فاعلية وثاقبة الحبوب الصغرى

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تم اختبار التأثير المتقي لمبيد الدياتينون ٦٠ % وذلك لفترات مختلفة وصلت إلى ٢٨ اسبوع على بعض الأسطح المختلفة مثل الصفيح ، السيراميك ، الخشب والأسمنت ضد حشرتي سوسة الأرزو ثاقبة الحبوب الصغرى وقد أثبتت الدراسة الآتي:-

- اختلف تأثير المبيد المستخدم على حشرات الاختبار تبعاً لإختلاف تركيز المبيد المستخدم وإختلاف نوع السطح المعامل.

- أعطى سطحي الصفيح والسيراميك أعلى بقاء وتأثيراً على حشرات الاختبار حيث أعطيا نسبة موت ١٠٠ % حتى ١٨ - ٢٠ اسبوع من المعاملة.

- أعطى سطح الخشب المعامل تأثير بقائي أقل حيث أعطى نسبة موت ١٠٠ % حتى الاسبوع العاشر فقط لحشرة سوسة الأرز والأسبوع الثامن لحشرة ثاقبة الحبوب الصغرى.

- أعطى سطح الأسمنت أقل كفاءة بقائية حيث حدث تدهورا واضحا وصل إلى اسبوعين فقط بعد المعاملة في الحشرات المختبرة.

- كانت حشرة ثاقبة الحبوب الصغرى أكثر تحملاً للمبيد عند مقارنتها بحشرة سوسة الأرز.