Univ. j. zool. Rajshahi Univ. Vol. 27, 2008 pp. 95-96
http://journals.sfu.ca/bd/index.php/UJZRU
ISSN 1023-6104
© Rajshahi University Zoological Society

Short Communication

# Toxicity of chloroform extracts of *Derris indica* Bennet. against *Callosobruchus maculatus* (F.) adults

**Omar Ali Mondal and Nurul Islam**
Department of Zoology, University of Rajshahi, Rajshahi-6205, Bangladesh
**Key words:** Toxicity, *Derris indica*, Chloroform extract, *Callosobruchus maculatus*

*Derris indica* is belonging to family Fabaceae, inhabitants of India, Srilanka, Malaysia, North Australia and Polynesia, occurs in the tidal forests, river and canal banks, along the water edge in all districts in Bangladesh. It is a medicinal plant. The dried flowers are used in decoction to quench thirst in diabetes. Extracts of the leaves were active against *Micrococcus pyogenes* var. *aureus* (Anon, 1969). The juice of the leaves is prescribed in flatulence dyspepsia, diarrhoea and cough.

*Preparation of plant materials for extraction:* The fresh leaves, fruit shell, root bark, root wood, seeds, stem bark, and stem wood of *D. indica* were collected from Rajshahi University Campus.

*Leaves:* After collection the leaves were spread out to dry without heaping the material together under the shade avoiding direct sunshine.

*Fruit shell:* Fruits were picked and the shells were opened to remove the seeds for the collection of fruit-shells and spread them out to dry under a shade

*Root bark:* Root bark was collected by striping from the stem and cut into small pieces as thin as possible. After collection barks were dried thoroughly in a well-ventilated room.

*Root wood:* The root-wood was collected and cut into small pieces and dried.

*Seeds:* Having peeling out the fruit shells the seeds were cut into small pieces and spread out under a shade to dry*Stem bark:* Stem bark was collected by striping from the stem and cut into small thin pieces and dry thoroughly.*Stem wood:* The stem-wood was collected and cut into small thin pieces and dried as described above.

After drying the plant materials were powdered in a grinder machine.

*Chemical extraction of the plant parts:* The ground dried *D. indica* leaves, fruit shell, root bark, root wood, seeds, stem bark, and stem-wood were extracted with sufficient amount of chloroform (500g × 1500ml × 3 times) by the cool method after 72 hours of plunging. Extracts, thus obtained were filtered and concentrated to dry out while only as residue was left and kept in a refrigerator after labeling.

*Preparation of doses:* A concentration for each of the extracts was selected as 2 g/2ml as the stock dose for surface film application to make other successive doses by serial dilution to give 0.708, 0.354, 0.177-, 0.088 and 0.044 mg/cm$^2$ for seed extract; 1.769, 0.885, 0.442, 0.221 and 0.110 mg/cm$^2$ for root bark, stem bark and stem wood extracts and 1.417, 0.708, 0.354, 0.177 and 0.088 mg/cm$^2$ for root wood extract.

*Application of doses:* All extracts were diluted with the solvents and the actual amount of extracted material in a dose was recorded and applied by residual film method (Busvine, 1971). For each dose one ml of mixture was dropped on a petri dish (90 mm) in such a way that it made a uniform film over the petri dish. The petri dishes were air-dried leaving the extract on it. The actual extract present in one ml mixture was calculated and dividing the value by the area of the petri dish the dose per square centimeter was calculated. Ten *C. maculatus adults* (3-5 day old) were released in each petri dish with 3 replications. A control batch was also maintained.

*Observation of mortality:* The mortality of *C. maculatus* was observed every 24 h. A simple microscope was used to check each and every beetle by tracing natural movement of its organs. In some cases hot needle was taken closer to the bodies (without movement) to confirm death

*Statistical analysis:* The mortality was corrected by the Abbott's (1925) formula:

$$P_r = \frac{P_o - P_c}{100 - P_c} \times 100$$

Where, $P_r$ = Corrected mortality (%)
$P_o$ = Observed mortality (%)
$P_c$ = Control mortality (%), sometimes called natural mortality (%).

Then mortality percentages subjected to statistical analysis (Finney, 1947 and Busvine 1971) by using software developed in the Department of Agricultural

Environmental Science, University of Newcastle upon Tyne, U.K. The dose-mortality relationship was expressed as a median lethal dose ($LD_{50}$).

The $LD_{50}$ values for the root bark, root wood, seed, stem bark and stem wood extracts were 2.506-, 1.369-, 0.399-, 134.094- and 2.883 mg $cm^{-2}$ for 24 hours of exposure (Table 1). The regression equations, $\chi^2$ values and 95% confidence limits for the respective extracts are also shown in Table 1. The fruit shell and the leaf extract didn't show any mortality. The intensity of activity of the extracts could be arranged in a descending order as seed > root wood > root bark > stem wood > stem bark.

**Table 1:** $LD_{50,}$ 95% confidence limits and regression equations of *D. indica* extracts against *C. maculatus* adults after 24 h of exposure.

| | **$LD_{50}$ value** | **Regression equation** | **$\chi^2$ Value (df 3)** |
|---|---|---|---|
| Root bark | 2.506 | Y = 3.863 + 0.812X | 2.405 |
| Root wood | 1.369 | Y = 3.018 + 0.928X | 2.693 |
| Seed | 0.399 | Y = 2.387 + 1.631X | 0.135 |
| Stem bark | 134.094 | Y = 3.860 + 0.364X | 0.941 |
| Stem wood | 2.883 | Y = 3.973 + 0.702X | 0.739 |

These findings receive support from the report of Chaurasia and Jain (1978), as they have mentioned karanjin or pongapin, kanugin and dimethoxy kanugin, pongamol, etc. to be present in the seeds of the test plant *D. indica*. However, rotenone was reported in its roots in 1950 and the roots said to use as fish-poison by the aborigines of Australia as mentioned by Kirtikar and Basu (1935). Some of the previous workers reported along with various other plant materials including oils in checking the multiplication of pests in stores (Krishnamurti & Seshagiri, 1944; Su *et al.,* 1972; Sangappa, 1977). The pongam oil is from the seeds is now marketed as karanjin biopesticide by SOM Phytopharma (India) Limited, which is reported to have nitrification inhibitory properties but has been tested in few soil types by Majumdar (2001).

**Acknowledgement**

The University Grant Commission (UGC) of Bangladesh and the Rajshahi University Research Grants for financial supports and the Department of Zoology, Rajshahi University for laboratory facilities.

**References**

Abbott, W.S. 1925. A method of computing the effectiveness of an insecticide. *J. Econ. Ent.* **18**: 265-267.

Anon, 1969. *The wealth of India*- a dictionary of Indian raw materials and industrial products. CSIR, New Delhi, **8**: p.210.

Busvine, J.R. 1971. *A critical review of the techniques for testing insecticides.* Commonwealth Agricultural Bureau, London. pp. 345.

Chaurasia, S.C. & Jain, P.C. 1978. Antibacterial activity of essential oils of four medicinal plants. *Indian J. Hosp. Pharm.* **15**(6): 166-168.

Finney, D.J. 1947. In: *Probit Anolysis*: *a statistical treatment of the sigmoid response curve*. Cambridge Univ. Press, London. 333 pp.

Kirtikar, K.R. & Basu, B.D. 1935. *Indian Medicinal plants.* Vol. III, 2nd. ed. Basu, L.M., Alluhadad, India. 1593-2393 pp.

Krishnamurti, B. & Seshagiri, R. 1944. Results of certain experiments and observations carried out recently in the matter of control of insect pests of food grain in storage. *Mysore J. Agric. Sci.,* **22** (3): 91-101.

Majumdar, D. 2001. Suppression of nitrification and $N_2O$ emission by karanjin: a nitrification inhibitor prepared from karanja (*Pongamia glabra* Vent.) *Chemosphere*, **47**(8): 845-850.

Su, H.C.F., Speir, R.D. & Mahany, P.G. 1972. Citrus oils as protectants of blackeyed peas against cowpea weevils: laboratory evaluations. *J. Econ. Entomol.* **65**: 1433-1436.

Sangappa, H.K. 1977. Effectiveness of oils surface protectants against the bruchid, *Callosobuchus chinensis* Linn. infestation on red grain. *Mysore J. Agric. Sci.,* **11**: 391-397.

*Manuscript received on 14.06.200, accepted on 03.09.2008*