REPELLENT, TOXIC, AND FOOD PROTECTANT EFFECTS OF PITHRAJ, Aphanamixis polystachya EXTRACTS AGAINST PULSE BEETLE, Callosobruchus chinensis IN STORAGE

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Abstract—Ground leaves, bark, seeds, and four seed extracts of pithraj, Aphanamixis polystachya (family Meliaceae), a locally grown plant in Bangladesh, were evaluated for their repellency, contact toxicity, and food protectant efficacy against adult pulse beetle (Callosobruchus chinensis L.). The seed extracts showed poor repellent effects, but high contact toxicity to adults at 72 hr after application. The ground leaves, bark, and seeds provided good protection for mung beans against pulse beetles, and the seed powder greatly reduced the F1 progeny and seed damage rates.

Key Words—Aphanamixis polystachya, pithraj, repellent, contact toxicity, food protectant, Callosobruchus chinensis, Coleoptera, Bruchidae.

INTRODUCTION

Pithraj (Aphanamixis polystachya Wall & Parker, also known as Amoora ruhi-tuka Wright & Arn.) is a perennial tree that grows in tropical climates (Islam, 1984, 1985). This plant, which belongs to the family Meliaceae, is used traditionally for insect control in Bangladesh. Farmers use the seed-oil to avoid insect bites during the early morning and evening field works. Ground leaves, bark, and seeds are used to protect grain in storage. This plant is also a source of pharmaceutical compounds (Srivastava and Agnihotri, 1984). Few studies have been conducted on the antiinsect properties of this plant (Islam, 1984, 1985; Khanam et al., 1990). Experiments were carried out to determine the

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repellent, contact-toxic effects of pithraj seed extracts and the food protectant value of ground leaves, bark, and seeds against the pulse beetle, *Callosobruchus chinensis* (L.), a major storage pest of pulse seeds.

**METHODS AND MATERIALS**

**Insects**

The pulse beetle, *Callosobruchus chinensis* (L.) (Coleoptera: Bruchidae), a major stored-product insect pest, was collected from the Agrochemical Evaluation Unit, University of Southampton, England, and reared on a diet of 100 g mung bean (*Phaseolus mungo*) per jar (size 14 × 10.5 × 30 cm), in the laboratory at 27 ± 2°C with alternating 12-hr light and dark periods. The relative humidity was kept constant at 70 ± 5% by using a standard solution of sodium chloride (Greenspan, 1977).

**Preparation of Plant Extracts**

Pithraj seeds, leaves, and bark were collected from Bangladesh in 1993. Seeds were air-dried and ground in an electric grinding machine. In a Soxhlet apparatus 75 g of ground seeds were extracted with redistilled petroleum ether (bp 40–60°C) for 6 hr. The marc was then extracted successively with acetone, 95% ethanol, and methyl alcohol, for 6-hr periods in each case. Solvents from each extract were evaporated in a rotary vacuum evaporator under reduced pressure and yielded the petroleum ether, acetone, ethyl alcohol, and methyl alcohol extracts, respectively. The diagrammatic presentation of the whole extraction process is given in Figure 1.

**Bioassays**

*Repellency Tests by Filter Papers.* Repellency was tested according to the McDonald's standard method number 3 with some modifications (McDonald et al., 1970). Substrates were prepared by cutting filter-paper circles (Whatman No. 40), 9 cm in diameter, in half. Pithraj extracts were redissolved in known amounts of solvents to provide a concentration of 10 mg/ml. One milliliter of solution of each extract was applied to half-filter papers as uniformly as possible with a pipet, so that the treated substrate contained 0.16 mg/cm² of extract. The treated half circles were then air-dried to evaporate the solvent completely. One full circle was then remade by attaching a treated half to an untreated (control) half circle of the same dimension by cellotape. Precautions were taken so that the attachment did not interfere with the free movement of insects from one half to another, but a small gap was left between the filter paper halves to prevent seepage of test samples from one half of circle to another. The filter paper