NOXIOUS EFFECTS OF NEEM EXTRACTS ON 
CROCIDOLOMIA BINOTALIS

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The potential of neem extracts to control the cabbage webworm, Crocidolomia binotalis Zell. (Lepidoptera: Pyralidae), was investigated in the laboratory. Neem, besides being an antifeedant at as low as 0.001% of the methanolic extract, was shown to be very toxic, as evidenced by high larval mortality and poor emergence. It also caused disruption of normal development: significant delays in larval moults, appearance of permanent larvae in the 3rd and 6th instars, and abnormal pupation. A possible interference with hormonal activity is discussed.

KEY WORDS: Crocidolomia binotalis; cabbage pest control; Azadirachta indica; neem; hormonal activity.

INTRODUCTION

Attractants, repellents and antifeedants from natural products have been for some time favorite experimental candidate substances for pest control purposes within the framework of behavioral insect control, as pointed out, for example, by Kubo and Nakanishi (6). These substances are potentially safe control agents as they do not lead to toxicity build-up, being rapidly biodegraded in the environment. Extracts from the neem tree, Azadirachta indica A. Juss., and its active principles, such as azadirachtin and meliantriol, belong to the natural products which hold promise in this context.

As early as 1937, Volkonsky (17) recommended the use of extracts from Melia azederach, another member of the Meliaceae, for repelling locusts. Since then neem has been shown to be a potent antifeedant to a wide range of insect species, including some cabbage pests such as Plutella xylostella and Pieris brassicae (12), and aphids (5). Growth disruption effects have also been reported upon treatment of, for example, Antestiopis orbitalis bechuana (7), Dysdercus fasciatus, Plutella xylostella and Pieris brassicae (12), Epilachna varivestis (14, 16), Leptinotarsa decemlineata (15), Earias...
insulana (8) and Boarmia selenaria (9). Consequently, the hypothesis of a possible interference with the normal hormonal balance has often been proposed (1, 4, 12, 14).

In the present study, which was aimed at assessing the potential of neem leaf extracts for the control of the cabbage webworm, Crocidolomia binotalis Zell. (Lepidoptera: Pyralidae), a major local cabbage pest, evidence concerning various noxious effects of neem has been obtained. A possible mechanism of action of this natural product is outlined.

MATERIALS AND METHODS

Crocidolomia binotalis
The cabbage webworm was mass-reared in the laboratory, in large, well-aerated cages (75 cm x 75 cm x 60 cm) under the following conditions: 13 h light at 23°C and 11 h dark at 17°C, at 70-90% R.H. Simultaneous measurements of the width of shed head capsules and of larval body length enabled us to identify six larval instars (2), the duration of the successive instars being 2, 1, 1, 2, 2 and 3 days, respectively. Adults emerged after a pupal period of 11 to 13 days.

L3, L4 and L5 larvae, 3-6 after moulting, were selected from the breeding cages for the bioassays. They were starved for 3 h before being used in the experiments.

Preparation of extract
Neem leaves were oven-dried at 50°C to constant weight, ground into powder, and soaked in absolute methanol for about 24 h. After filtration and distilling off of the solvent, an oily, almost viscous and bitter residue (11% yield) was obtained. Various dilutions in methanol (w/v) were prepared for the bioassays.

Leaf-disc method
Cabbage leaf discs (2.5-cm diam.) were dipped in different concentrations of the extract. The solvent was allowed to evaporate and then two discs were placed in a 9-cm-diam. petri dish. The discs, both treated and untreated (control), were weighed before exposure to the larvae and after 24 and 48 h. A correction factor for desiccation was calculated each time by placing discs under similar conditions without larvae. Five larvae per dish were confined and observed on the treated discs for 48 h, and then transferred to untreated ones for further observation. The leaf discs did not become desiccated to such a degree as to deter larvae from feeding during the 2-day period, as shown by normal feeding in control groups.

Topical treatment
Larvae were topically treated, using Arnold’s automatic microapplicator (Burkard Manufacturing Co., UK), with 0.7 μl of methanolic extract at different concentrations being placed dorsally on the thorax. Treated larvae were fed on fresh (untreated) leaf discs and their subsequent fate was observed.