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NEMATICIDAL ACTIVITY OF SOME SRI LANKAN PLANTS

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Nineteen solvent extracts from seven Sri Lankan plants were examined for nematicidal activity against the root knot nematode *Meloidogyne incognita*. Extracts of *Allophylus cobbe, Lepisanthes tetraphylla* (Sapindaceae), *Sarcococca zeylanica* (Buxaceae) and *Hedyotis lawsoniae* (Rubiaceae) have shown significant nematicidal activity.

Keywords: Nematicidal activity; Meloidogyne incognita

INTRODUCTION

Nematodes are tiny worms, abundant in the soil environment. Some nematode species are parasitic to plants. The nematode *Meloidogyne incognita*, is a widespread nematode found in all continents. Plants attacked by nematodes show retarded growth and development as well as heavy losses of harvest in quality and quantity. Synthetic nematicides are generally used to control nematodes. Continuous use of these synthetic nematicides may affect non-target organisms and also cause environmental pollution problems due to degradation etc. Therefore it is very important to identify environmental friendly and easily degradable compounds for reducing and controlling nematode populations to increase the world's food production. For this purpose, compounds of plant origin can play a very prominent role. To survive from nematodes in the environment, it can be expected that selection pressure would have led to the accumulation of secondary metabolites in plants for defense against nematodes.

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MATERIALS AND METHODS

Plant material and preparation of extracts Plants were collected from the various parts of Sri Lanka in 1997/1998 and identified by direct comparison with specimens available at the Royal Botanical Garden by Mr H.D. Ratnayake and Mr. A. Weerasooriya, Royal Botanical Garden, Peradeniya. Voucher specimens are deposited at the Institute of Fundamental Studies (Sp. Nos. *Ilex walkeri* – IFS/98/IW1, *Sarcococca zey-lanica* – IFS/97/SZ1, *Diploclisia glaucescens* – IFS/97/DG1, *Hedyotis lawsoniae* – IFS/97/HL1, *Allophylus cobbe* – IFS/98/AC1, *Dimocarpus longan* – IFS/97/DL1, *Lepisanthes tetraphylla* – IFS/97/LT1). Air-dried and ground plant materials ~ 100 g were sequentially extracted (12 h × 3 times) in room temperature with *n*-hexane, dichloromethane and methanol or directly with methanol using laboratory shaker. The insoluble material was filtered by filter paper and evaporated to dryness under reduced pressure at 40°C using rotary evaporator. In some cases crude alkaloid fraction was extracted to CHC1₃ from the methanol extract, after the treatment with 2N HCl and 20% NH₄OH.

Used organism Second larval stage of the plant parasitic root knot nematode Meloidogyne incognita.

Test for nematicidal activity [1] The known amounts of extracts were dissolved first in methanol or acetone. Water was added to obtain a final concentration of 2% methanol or 7% acetone. A 6 cm diameter plastic petri-dish was partitioned into two parts with a plastic barrier which was not fixed. Sephadex G-150 (50 mg) was poured in to the smaller compartment, which covered about 30% of the surface of the petri-dish and mixed with 1.25 mL of the test solution (500 ppm). One hundred (100) μ L suspension containing 140–180 second stage larvae of *M. incognita* were introduced to the sephadex. On the third day, 140 mg sephadex was added into the larger compartment and mixed with 3.5 mL of water. Two hours later, three lettuce (*Letuca sativa*) seedlings were inserted and the barrier was removed. The nematodes were allowed to feed on the roots of the seedlings. On the fourth day, petri-dishes were examined under a binocular microscope at 100X and the dead nematodes were recorded. Three repetitions were carried out. The results were evaluated by comparing the number of nematodes at the roots in the test compounds and in the control. The results are expressed as % Abbott [2] in Table 1.

$$\%\text{Abbott} = \frac{\Sigma \text{ control} - \Sigma \text{ test compound}}{\Sigma \text{ control}}$$

RESULTS AND DISCUSSION

The nematodes were maintained on tomato plants. Sephadex G-150 was used as a matrix where larvae can move freely in between particles and able to locate the roots of host plant. Sephadex G-150 is spherical material and transparent when wet. These properties enable direct observation under a light microscope. Nemacur used as the standard nematicide. At 100 ppm, nemacur caused 100% mortality of *M. incognita*. Extracts of *Allophylus cobbe*, *Lepisanthes tetraphylla* (Sapindaceae), *Sarcococca*

Plant	Plant part	Extract	Activity
AQUIFOLIACEAE * <i>Ilex walkeri</i> Wight and Gardn.	leaves	hexane CH ₂ Cl ₂ MeOH	29.95% 4.81% 51.33%
BUXACEAE <i>Sarcococca zeylanica</i> Baill	aerial	c. alkaloids	71.48%
MENISPERMACEAE * <i>Diploclisia glaucescens</i> (Bl.) Diels	stem	hexane CH ₂ Cl ₂ MeOH	32.90% 17.80% 31.89%
RUBIACEAE * <i>Hedyotis lawsoniae</i> (DC.) Wight et Arn	leaves stem	CH ₂ Cl ₂ MeOH MeOH	85.03% 16.17% 97.15%
SAPINDACEAE * <i>Allophylus cobbe</i> (L.) Bl.	stem	hexane CH ₂ Cl ₂ MeOH	31.66% 89.52% 75.05%
*Dimocarpus longan Lour.	stem	hexane CH ₂ Cl ₂ MeOH	32.08% 36.24% 46.54%
*Lepisanthes tetraphylla (Vahl) Radlk.	stem	hexane CH ₂ Cl ₂ MeOH	9.85% 86.16% 28.32%

TABLE 1 Nematicidal activity of some Sri Lankan plants

* - sequential extraction; c.alkaloids - crude alkaloids.

zeylanica (Buxaceae) and *Hedyotis lawsoniae* (Rubiaceae) showed significant nematicidal activity (> 50%) against the root knot nematode *M. incognita* as described in Table 1. These extracts could be potential sources for the isolation of nematicidal compounds. For *S. zeylanica* this activity should be due to the high content of steroidal alkaloids [3,4]. Preliminary investigations indicated that the absence of alkaloids in *H. lawsoniae* [5] and the presence of several lignans and triterpenes [5–7]. The activity of *H. lawsoniae* is probably due to lignans and/or triterpenes.

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