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IN VITRO NEMATICIDAL ACTIVITY OF DIFFERENT SEAWEED EXTRACTS AGAINST *MELOIDOGYNE JAVANICA* (TYLENCHIDA: HETERODERIDAE)

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ABSTRACT

The different types of seaweeds viz., *Caulerpa racemosa, Caulerpa scalpelliformis, Ulva fasciata, Padina tetrastromatica, Stoechospermum polypodioides, Sargassum wightii, Cheilosporum spectabile and Gracillaria edulis* were collected and processed for the extraction. The effect of methanol extract of different seaweeds was studied on the larvae of *Meloidogyne javanica* at different exposure of time (24 hrs, 48 hrs, 72 hrs). The test seaweed extract were taken into two different concentrations (2 mg/ml, 4 mg/ml). *Stoechospermum polypodioides* showed high nematicidal activity in both the concentrations of methanol extract of test seaweeds. *U. fasciata* were found to be least active in its nematicidal activity than the other seaweeds. The present finding brings out new insight in the development of ecofriendly bio-pesticides for the management of root-knot nematodes.

INTRODUCTION

Nematodes are one of the most abundant multicellular organisms on earth. They are scattered worldwide and obligate parasites of roots of thousands of plant species, including lower and higher herbaceous and woody plants. The root-knot nematodes (*Meloidogyne*) are the most vital economically damaging genera of phytoparasitic nematodes on horticultural and field crops. The secondary metabolites produced by seaweeds demonstrate a broad spectrum of bioactivity varying from neurologically active in humans to algicidal, nematicidal, insecticidal and ichthyotoxicity in lower form of animals (Smith, 2004). Plant parasitic nematodes comprise one of the most devastating and commonly distributed pest group and are responsible for tremendous disease symptoms in diverse crops resulting in heavy loss. Pesticides are frequently used for the control of pests and diseases. A control strategy of nematode should be developed which may be safe and cost effective (Abid *et al*., 2005). During the last two decades, there have been great development that have had significant effects on the prospects and opportunities for the biological control of plant-parasitic nematodes. With this background, the present study was commenced to investigate the different seaweed extracts against *Meloidogyne javanica*.

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MATERIALS AND METHODS

The different types of seaweeds viz., *Caulerpa racemosa, Caulerpa scalpelliformis, Ulva fasciata, Padina tetrastromatica, Stoechospermum polypodioides, Sargassum wightii, Cheilosporum spectabile and Gracillaria edulis.* They were handpicked and washed thoroughly with seawater to remove debris, sand particles and epiphytes. It was kept in an ice box containing slush ice, transported to the laboratory and washed thoroughly with tap water to get rid of the salts from the surface of the samples. The water was drained off and the algal material was spread on blotting paper to remove excess water. After completely drying, the different seaweed materials were ground to a fine powder using Electrical blender. Forty gram of powdered seaweeds were extracted successively with 200 ml of Methanol in Soxhlet extractor until the extract was clear. The extracts were evaporated to dryness reduced pressure using rotary vacuum evaporator and the resulting pasty form extracts were stored in a refrigerator

at 4°C for future use. Nematicidal activity was assessed using juvenile nematodes of *Meloidogyne javanica.* Assay system was prepared with 2 ml sterile water containing different concentrations of seaweed extracts (2 and 4 mg/ml) in glass tubes. Egg masses of root - knot nematode obtained from a pure culture maintained on tomato (*Lycopersicon esculentum*) roots were placed on sterilized distilled water and incubated for 24 h at room temperature for hatching. Ten juveniles of *M. javanica* were transferred in test, positive (with 2% methanol) and negative (control) tubes. Each concentration had three replicates. The number of dead juveniles were recorded after 24, 48 and 72 hrs using a stereoscopic microscope. Mortality was confirmed by touching the larvae with fine needle (Atta-ur-Rahman *et al*., 1997).

RESULTS AND DISCUSSION

Of the various species of seaweeds extract at different concentrations are tested for nematicidal activity against larvae of *Meloidogyne javanica* root-knot nematode (Table 1 and Table 2). Root knot nematode are distributed worldwide, infecting wide range of plants including major crops and caused considerable economic loss (Sasser, 1980). In 2 mg/ml methanol extract of seaweeds, *Stoechospermum polypodioides* belongs to brown algae are appeared to be the most active seaweed than the other seaweeds, as it caused high mortality percentage of the nematode larvae after different hours of exposure and the *C. racemosa, U. fasciata* was found to be least active in its nematicidal activity. Presence of cytokinins in seaweed extracts may be responsible for nematicidal activity (Featonby Smith *et al*., 1983). In the 4 mg/ml methanol extract of seaweeds, *Stoechospermum polypodioides* have the high mortality percentage of nematodes and the *U. fasciata* was found to be low mortality percentage of *Meloidogyne javanica.* According to Wu *et al.* (1997) betaines of seaweed extracts can suppress the growth of nematodes. Terpenoid compounds in seaweeds known to have nematicidal activity (Abid *et al*., 1997).

Table 1. In vitro Nematicidal activity of 2 mg/ml Methanol extract of Seaweeds

Seaweeds	Exposure time (hrs)		
	24	72 Mortality (%)	48
C. racemosa	4±0.6	9±1.3	14±1.9
C. scalpelliformis	6±0.7	12±1.8	16±1.7
U. fasciata	5±0.4	10±1.1	13±1.4
P. tetrastromatica	12±1.7	23±2.0	38±2.3
S. polypodioides	24±1.9	46±2.5	72±3.6
S. wightii	16±1.8	22±2.0	41±2.5
C. spectabile	11±1.6	19±2.1	25±2.3
G. edulis	15±1.8	23±1.9	29±2.1

Mean±SD, N=3

Table 2. In vitro Nematicidal activity of 4 mg/ml Methanol extract of Seaweeds

Seaweeds	Exposure time (hrs)		
	24	72 Mortality (%)	48
C. racemosa	9±1.3	12±1.4	20±1.8
C. scalpelliformis	14±1.7	18±1.6	27±2.2
U. fasciata	8±1.1	16±1.9	19±2.0
P. tetrastromatica	15±1.8	30±2.3	44±2.6
S. polypodioides	30±2.3	52±2.7	89±3.0
S. wightii	20±1.9	28±2.2	36±2.5
C. spectabile	15±1.7	26±2.1	30±2.3
G. edulis	18±1.6	30±2.3	35±2.4

Mean±SD, N=3

On the average, the species of brown seaweeds were found to be most active and those of green seaweeds least active, while the members of red seaweeds presented an intermediate value of nematicidal activity. In other studies also the aqueous and ethanol extracts of *Stoechospermum polypodioides* were found to display strong nematicidal activities against the larvae of *Meloidogyne javanica* (Abid *et al*., 1993, Sultana *at al*., 2000). When compared with green and red seaweeds the marine brown algae from the coast of Pakistan as well as those of other coastal areas have always revealed much stronger nematicidal activities against juveniles (Ara *et al*., 1996; Sultana *et al*., 2000; Noreen *et al*., 2002; Whapham *et al*., 1994; Zaki *et al*., 2005). Considering the emerging problems pertaining to the use of chemical pesticides, appropriate alternative resources and ecofriendly perspective are an urgent need of sustainable agriculture. The present finding brings out new insight in the development of ecofriendly biopesticides for the management of root-knot nematodes.

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