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BIOLOGICAL ACTIVITY OF A COMMON WEED – *PORTULACA OLERACEA* L. II. ANTIFUNGAL ACTIVITY

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Portulaca oleracea L. (Portulacaceae), although an alien, has turned to be a very useful plant in Indian folk medicine. The present work deals with the evaluation of the antifungal activity of this plant. Fungitoxicity of aqueous and organic solvent (e.g. hexane, ethanol and chloroform) extracts were tested against *Aspergillus niger*, *Rhizopus artocarpi* and *Fusarium* sp. by Agar Cup Assay and Filter Disc methods. Hexane and aqueous extracts show antifungal activity against *Fusarium* sp., while ethanol and chloroform extracts of the same herb inhibit the growth of *Rhizopus artocarpi*. These findings can have practical application.

Key words: antifungal activity, *Aspergillus niger*, fungitoxicity, *Fusarium*, *Portulaca oleracea*, *Rhizopus artocarpi*

INTRODUCTION

Portulaca oleracea L., a plant belonging to the family Portulacaceae and the order Caryophyllales representing the subclass Caryophyllidae, is an exotic element in India with nativity probably in North Africa (Rajagopal and Panigrahi 1965) and Europe (Maheswari and Paul 1975). Although an exotic element, it has thoroughly naturalised in various topographical and climatic regions in India and has developed an intimate relation with her people. To most of the tribes in India this plant is known mainly as a vegetable with medicinal value (Banerjee and Mukherjee 1996, Mukherjee and Banerjee 2000).

In view of the well-known traditional use of this herb in curing many diseases it was felt necessary to evaluate its biological activity covering antimicrobial as well as pharmacological effects. Although Nene *et al.* (1968) and Pravindrachary *et al.* (1984) observed the antifungal activity only with the aqueous extract of this herb, the plant still awaits a thorough evaluation. As such the present work was undertaken using *Fusarium* sp., *Aspergillus niger* and *Rhizopus artocarpi* as test organisms.

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MATERIAL AND METHODS

Preparation of extracts

Water, ethanol, chloroform and hexane extracts of the herb were prepared. Different concentrations (0.01–5.0%) were made under fully sterilised conditions (i.e. using sterilised water, pipettes, culture tubes, conical flasks and distilled water).

Preparation of inoculum

A loopful of fungus from culture was directly transferred to the experimental media.

Composition of media used

For detecting the effect of the plant species Malt Extract Agar Medium (in case of *Fusarium* species) and Malt Agar Medium (in case of *Aspergillus niger* and *Rhizopus artocarpi*) were used. The Malt Agar Medium was prepared with 2.5% malt and 2% agar. Distilled water was added to make the volume one litre and the pH was adjusted to 5.5 before adding the distilled water. The Malt Extract Agar Medium was prepared with agar 20.0 gm; malt extract (Difco) 20.0 gm; dextrose 20.0 gm; peptone 1.0 gm and the pH was adjusted to 5.5. Distilled water was added to make the volume one litre.

Each of the aforesaid media was sterilised (autoclaved at 15 lb pressure for 15 minutes) and melted in a waterbath. When the agar medium was completely melted, the culture tube was taken out of the waterbath and cooled at room temperature.

The culture tube containing medium was then held with right hand and the plug opened with left little finger after which the mouth of the tube was flamed briefly. The upper lid of a pair of sterile Petri dishes was lifted and the 15 ml of the melted medium was poured into it and the lid closed. This pouring was continued in other Petri dishes in the culture room which was previously sterilised with UV rays.

The agar plates were allowed to cool at room temperature until the medium had solidified. Plates were stored in an inverted position.

Cup disc method

The peripheral part of the sterile agar plate was inoculated with the fungus (*ca* 5 mm diam). A single cup of 5 mm diam. was then cut out at the centre of the sterile agar plate with a sterile cork borer and 2 ml of the extract at a par-

ticular concentration ranging between 0.01–5.00% was poured into it with the consideration that the extract would diffuse through the agar and produce its effect, if any, around the cup. The whole set was kept in the incubator at a temperature of 30.0±1 for 5 days.

Standard cultures of fungal species were obtained from Mycology Laboratory of the University of Burdwan, West Bengal.

RESULTS

The effects of different concentrations of chloroform, ethanol, hexane and water extracts of plant material on three different fungi are presented in Table 1 and stated in the following.

Aspergillus niger remains unaffected by all treatments.

Water extract shows moderate antifungal activity at 0.25% and appreciable activity from 0.5% onwards against *Fusarium* sp.

Neither ethanol nor chloroform shows any inhibitory influence against *Fusarium* sp.

The hexane extract shows some anti-*Fusarium* activity from 1.0% onwards.

No concentration of either aqueous or hexane extracts shows action against *Rhizopus artocarpi*.

Ethanol extract is somewhat active against *Rhizopus artocarpi* from 1.0% onwards.

Chloroform extract is more antagonistic to *Rhizopus artocarpi* exhibiting progressively increasing inhibitory effect from 0.25% onwards.

Table 1
Effect of *Portulaca oleracea* L. on fungi

	Tested fungi									
	Fusarium sp.					*Rhizopus artocarpi*				
	0.25	0.5	1.0	1.5	2.0	0.25	0.5	1.0	1.5	2.0
Chloroform	–	–	–	–	–	++	+++	++++	SA	SA
Ethanol	–	–	–	–	–	–	–	++	++	++
Hexane	–	–	++	++	++	–	–	–	–	–
Water	+++	++++	SA	SA	SA	–	–	–	–	–

SA = Similar activity as preceding concentration; + = Inhibition; – = No inhibition

DISCUSSION

P. oleracea in form of different extracts (chloroform, hexane, aqueous and ethanol) failed to exert any inhibitory influence on *Aspergillus niger*. Thus, they are expected not to inhibit in nature decomposition of organic matter even from themselves by *A. niger*. However, its aqueous extracts have considerable inhibitory action on *Fusarium* sp. (Table 1) which are known to cause wilt disease in vascular plants. Thus, this herb may be considered in controlling such a disease. A similar result was obtained with the application of aqueous extract of fresh shoot on *Helminthosporium tauricum* by Nene *et al*. (1968). In the work of Pravindrachary *et al*. (1984) water extracts of leaf of *P. oleracea* were seen to produce 25.7% and 32.9% inhibition of spore germination in case of *Curvularia lunata* (Walker) Boed. and *Alternaria alternata* (Fr.) Keissler, respectively. In the present work chloroform extracts of *P. oleracea* were seen to be highly active against *Rhizopus artocarpi*, a fungal species known to cause rotting of jackfruit. Thus, the chloroform extract of this herb may pave the proper pathway to practical utilisation for fruit preservation and processing.

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