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In vitro antifungal properties of garlic (*Allium sativum* L.) extracts against *Colletotrichum falcatum* Went

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ABSTRACT: *In vitro* studies were conducted to test the anti-fungal properties of garlic (*Allium sativum* L.) extracts, extracted with different solvents against the pathogen, *Colletotrichum falcatum* Went, which is a causal organism of red rot disease in sugarcane. Among the extracts tested, garlic with acetone followed by garlic with methanol were found to be significantly effective in inhibiting the growth of test fungi, inoculated in potato dextrose broth (PDB) medium. The mean weight of mycelial growth of test fungi in acetone, methanol, kerosene and water extracts were 0.0205, 0.0251, 0.1032 and 0.1744 mg, respectively.

KEY WORDS: *Colletorichum falcatum*, garlic, potato dextrose broth medium, red rot disease

Red rot is a fungal disease, that has held the Sugar Industry in Tamil Nadu at ransom, and it holds potential threat for the future. Its attack leads to complete drying of cane, resulting in poor yield and sugar harvest. Till date, all the efforts made by the research fraternity using chemical means proved to be futile. Hence, need was felt to develop some alternatives which should be permanent, economical and ecofriendly.

Plant products are known to act as antifeedants, repellents, sterilants, and growth inhibitors. Tripathi and Dixit (1977) identified the antifungal properties of *Rosa chinensis* against the *pathogen*, *Pythium aphanidermatum* and the conidial germination of *Fusarium moniliforme* was prevented by *Allium sativum* and *Allium cepa* extracts under poisoned food technique and liquid culture (Batikyan, 1975). Shekhawat and Prasada (1971) reported that the boiled water extracts of *Allium sativum*, *Allium cepa* and *Ocimum sanctum* inhibited the growth of *Alternaria tenuis*. An attempt was made to study the anti-fungal properties of *Allium sativum*

extracts against the red rot disease pathogen, *Colletotrichum falcatum* under laboratory condition.

A laboratory study was carried out to test the anti-fungal properties of garlic extracts, extracted with different solvents namely, acetone, methanol, kerosene and water against the pathogen, *Colletotricum falcatum*, under liquid culture technique (Gottlieb *et al.*, 1950) at the Main Biocontrol Research Laboratory, Chengalpattu, during 1996-1997.

Six treatments namely, garlic extract in water, garlic extract in acetone, garlic extract in methanol, garlic extract in kerosene, kerosene alone, and control, were replicated four times in a complete randomized design.

Known weight of garlic bulbs (85 g) after removing the outer skin was taken and then crushed with the help of pestle and mortar to obtain a paste. The paste was taken in conical flask and to it 50 ml of solvent was added. The flasks were tightly corked and allowed to stand for 24h. Then conical flasks were kept in water bath at 50°C till the solvents get evaporated and final residues were adjusted to get 5 per cent extracts in each treatment by adding distilled water.

Potato dextrose broth (Tuite, 1969) medium (potato 375 g, dextrose 30 g, distilled water 1500 ml, pH 5.8) was prepared. From this, 50 ml of medium was added to each of the 100ml conical flasks followed by addition of 5ml each of extract. After additon of each extract the pH was adjusted to 5.8. In order to avoid bacterial growth, one to two drops of Rifamicin was added in the medium. Then sterilized at 10 Kg/cm^2 pressure for half an hour. Four days old test fungi was inoculated in each conical flasks by using 5 mm discs and inoculated flasks were allowed to incubate at room temperature of 30 ± 1°C for 15 days. After 15 days, mycelial mats were taken out from the flasks by using spatula and placed in the Petri-dishes containing filter paper. The initial weight of the paper was recorded. Then Petri -dishes were kept in hot air oven at 50 ± 1°C for half an hour. Final weight

Table 1. *In vitro* effect of garlic extract in different solvents against *C. falcatum*

Treatment / Concentration	Mycelial weight (mg)*	Transformed value
Garlic extract in water (5%)	0.1744	2.38
Garlic extract in acetone (5%)	0.0205	0.80
Garlic extract in methanol (5%)	0.0251	0.91
Garlic extract in kerosene (5%)	0.1032	1.83
Kerosene (5%)	0.1550	2.26
Control (PDB medium alone)	0.3743	3.50
CD (P=0.05)		0.36

of the fungal mat + filter paper was recorded immediately. The data were statistically analyzed.

Observations recorded on 16th day showed that among all the treatments, acetone and methanol extracts were on par and statistically significant from the rest of the treatments in inhibiting the mycelial growth when compared with control. The mean dry weights of fungi in acetone and methanol extracts were 0.0205 mg and 0.0251 mg, respectively (Table 1).

Garlic extract in kerosene was found to be the next best in inhibiting the growth of test fungi compared with other treatments *viz.*, kerosene alone, garlic extract in water and control. Kerosene alone and garlic extract in water were on par, but statistically inferior to garlic extracts in acetone, methanol and kerosene.

Acetone and methanol extracts of garlic significantly reduced the mycelial growth of test fungi. Alice (1984) also reported growth inhibition of *Alternaria brassicae* by acetone extracts of *Allium sativum* and *Piper nigrum* under food poisoned technique. The maximum inhibitory effect in these two extracts (acetone and methanol) might have been due to the complete extraction of responsible bio-active compounds present in garlic namely sulphur containing compound allicin, allyl propyl disulphide, diallyl disulphide or due to an enzyme allinase.

In the case of garlic with kerosene treatment, the inhibitory effect might have been due to the combined action of kerosene and garlic. Though, second best to acetone and methanol in inhibiting mycelial growth, garlic with Kerosene holds more scope for in-depth study. This is inferred based on the cost factor, availability and accessibility of the solvents used (kerosene).

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