REVIEW OF RESEARCH
IMPACT FACTOR : 5.7631(UIF) ISSN: 2249-894X
VOLUME - 1 | ISSUE - 1 | MARCH - 2019

BIOEFFICACY OF AQUEOUS AND METHANOLIC LEAVES EXTRACT OF MENTHA ARVENSIS L. AGAINST FUSARIUM SOLANI CAUSING RHIZOME ROT OF ZINGIBER OFFICINALE.

Choudhari S. S. [1] & Kareppa B. M.[2]
[1]Department of Botany, Adarsh College, Hingoli, Maharashtra, India
[2]Department of Botany, Dnyanopasak College, Parbhani, Maharashtra, India

ABSTRACT :

The in vitro aqueous and methanol leaves extract of Mentha arvensis L. plant at different concentrations from 10 to 40% each was tested by following poisoned food technique. The different concentrations of leaves extract used were as 0.0 (control), 10, 20, 30 and 40%. The Mentha arvensis L. aqueous leaves extract at 40% concentration showed 33.66 mm inhibition and methanolic leaves extract at 30% concentration showed 15.66 mm inhibition which was found to be most effective in reducing the mycelial growth of the Fusarium solani. In the present study, among the aqueous and methanol solvent extracts tested, the methanol extracts of Mentha arvensis L. was found to be more effective to inhibit fungal growth than aqueous extract

KEYWORDS : *Mentha arvensis L., Fusarium solani, rhizome rot, Zingiber officinale.*

INTRODUCTION

Ginger (Zingiber officinale Rosc.) is an important commercial crop cultivated throughout India for its rhizome as spice and has high medicinal value. Among the major constraints for growing ginger is the rhizome rot. Even though important foliar diseases do exist, rhizome rot is very important in view of severe crop losses. It occurs in several parts of India wherever these crops are grown (Spices Board, 2005). The term rhizome rot is loosely used for all the diseases affecting the rhizome irrespective of pathogens involved, since the ultimate result is the partial or total loss of rhizome. Ginger is affected by several fungal pathogens during storage (Dohroo, 1993). Among which, rhizome rot caused by Fusarium solani is most common (Kumar, 1977).

Mentha Arvensis L belongs to the family Lamiaceae, has been found major source of antimicrobial compound and used in pharmaceutical, cosmetics and flavoring industries and different human ailments (B. Rachel et al, 2011). The chemical compositions of the essential oil obtained on hydrodistillation of M. arvensis were menthol, p-menthone, iso-menthone and neo-menthol. These constituents and menthol mint oil are reported to exhibit antifungal activity (Moleyar & Narashimham, 1986 & Rath et al., 2001). M. piperita has been shown to possess strong antifungal activity, even when compared to synthetic fungicides. Peppermint oil showed antifungal activity against A. niger, Alternaria alternata and Fusarium sp. by agar well diffusion method (Aqil et al, 2000).

Materials and Methods

The in vitro aqueous and methanol leaves extract of Mentha arvensis L. plant at different concentrations from 10 to 40% each was tested by following poisoned food technique as given by (Mishra and Tiwari, 1992). Fresh and healthy leaves of Mentha arvensis L. were collected locally and the leaves were washed under tap water followed by sterilized water, shade-dried and pulverized to obtain dry powder. The fine powder, and the precisely weighed amount of the powder was extracted with aqueous and 80%

methanol solvents and was vacuum dried to obtain the dried aqueous and methanol extracts. One liter of 80% methanol extraction solvent was mixed with 200 g of powdered plant material. The mixtures were kept for 2 days in tightly sealed vessels at room temperature and stirred several times daily with a sterile glass rod. This mixture was filtered through muslin cloth. Further extraction of the residue was repeated 3 times until a clear colorless supernatant extraction liquid was obtained indicating that no more extraction from the plant material was possible.

The extracted liquid was subjected to water bath evaporation at 400 C to remove the solvent. The same procedure was used for the aqueous extract. The semi-solid extract produced was kept under a ceiling fan to dry. The extract was weighed and portion of it used for phytochemical screening (Thakare, 2004). To study the efficacy of plant extracts, the poisoned food technique was used (Nene and Thapliyal, 1973). The required amount of stock solution was mixed with sterilized molten PDA medium, respectively so as to get 10, 20, 30, and 40 per cent concentration. The medium was thoroughly shaken for uniform mixing of extract. 20 ml of medium was poured into 90 mm sterilized Petri plates and all plates were inoculated with actively growing 5 mm mycelial disc in the centre of media and incubated at room temperature for 7 days. Control was maintained without adding any plant extract to the medium. Three replications were maintained for each.

Results & Discussion

The aqueous and methanolic leaves extract of Mentha arvensis L. plant was used to study its effect on growth of Fusarium solani causing rhizome rot of ginger. The different concentrations of leaves extract used were as 0.0 (control), 10, 20, 30 and 40 %.

The Mentha arvensis L. aqueous leaves extract at 10 % shows 77.66 mm growth, at 20% shows 57.00 mm growth, at 30% shows 41.66 mm growth, and at 40% shows 33.66 mm growth on 7th day of incubation period. 40 % concentration was found to be most effective in reducing the mycelial growth of the pathogen.

Similarly, the methanolic leaves extract at 10 % shows 57.00 mm growth, at 20% shows 34.66 mm growth, at 30% shows 15.66 mm growth, and at 40% shows 5 mm growth on 7th day of incubation period. 40 % concentration was found to be most effective in reducing the mycelial growth of the pathogen. The observations indicated that, aqueous and methanolic leaves extract of Mentha arvensis L. reduces the growth over control. The above data was shown in Table 1, Fig. 1& 2.

In the present study, among the aqueous and methanol solvent extracts tested, only methanol extracts of Mentha arvensis L. was found to be more effective to inhibit fungal growth than aqueous extract, which may be due to the wide range of solubility of various polar compounds present within plant in methanol. Singh et al. (1983) has reported fungitoxic properties of M. arvensis oil. In a study, menthol was found to be the active responsible for the antifungal effect (Edris, 2003) which is having some degree of similarity with our study.

Table 1: Effect of *Mentha arvensis* L. leaves extract against growth of *Fusarium solani*

Incubation period (Days)	Growth (mm)									
	Conc. of plant extract (%)									
	Aqueous					Methanol				
	0 (Control)	10	20	30	40	0 (Control)	10	20	30	40
1	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
2	13.33	14.00	12.00	11.00	8.00	14.00	11.00	9.00	5.00	5.00
3	25.00	20.66	18.66	15.66	10.66	21.33	17.66	14.66	5.00	5.00
4	35.66	33.33	24.33	20.00	15.33	33.66	23.33	19.33	7.00	5.00
5	52.33	48.66	35.66	25.66	20.66	48.00	34.66	25.66	9.66	5.00
6	75.00	63.00	43.33	33.33	27.00	64.66	41.33	29.00	12.33	5.00
7	90.00	77.66	57.00	41.66	33.66	79.33	57.00	34.66	15.66	5.00
SE ±	1.257	1.152	0.955	0.752	0.654	1.942	1.83	1.623	1.084	0
CD @ 5%	3.869	2.942	2.539	2.464	2.365	3.913	3.877	3.748	3.323	0

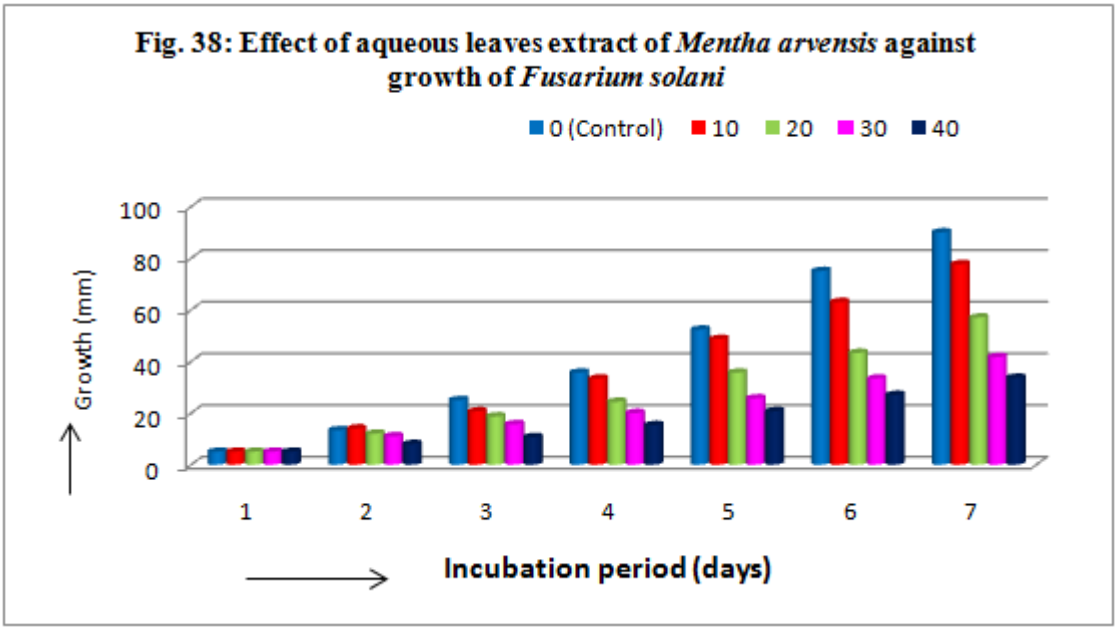

Fig. 38: Effect of aqueous leaves extract of *Mentha arvensis* against growth of *Fusarium solani*

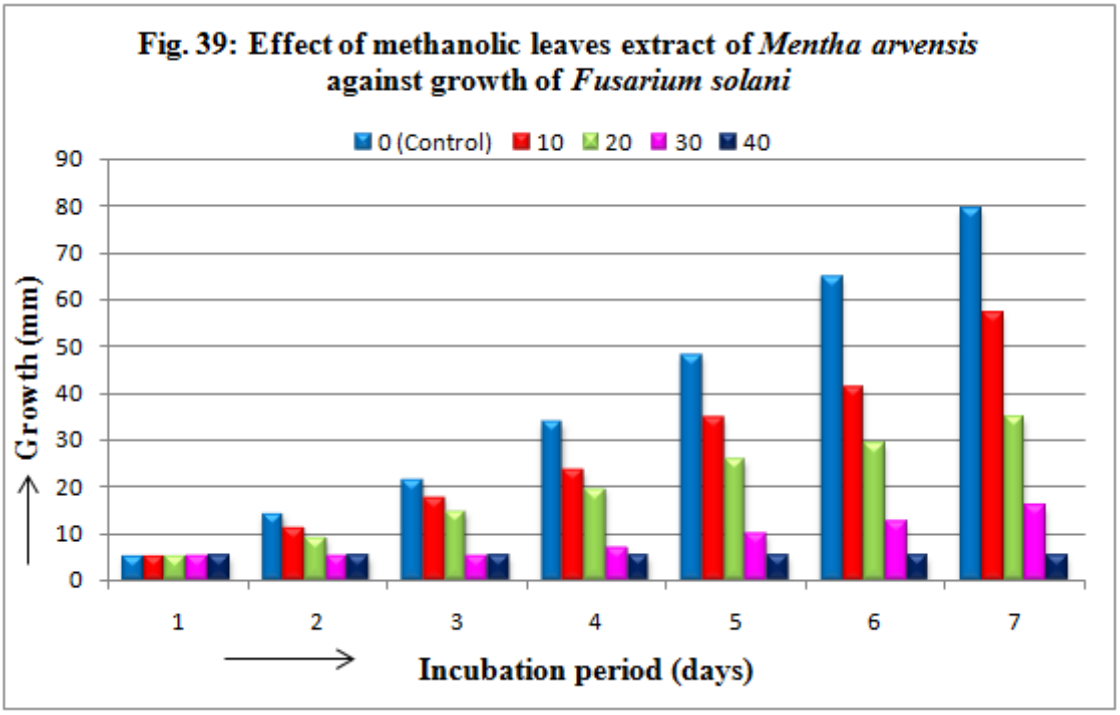

Fig. 39: Effect of methanolic leaves extract of *Mentha arvensis* against growth of *Fusarium solani*

Conclusion

The present investigation showed that the active bioactive compounds from Mentha arvensis L. can inhibit the growth of Fusarium solani for the control of rhizome disease of ginger. It is economical and easily available and could be used as a biocontrol agent control of rhizome rot disease of ginger. It is suggested the farmers can use plant extracts along with minimum fungicides to increase yield of rhizome plants and reduce the environmental concerns regarding negative impact of fungicides.

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