REFERENCES

ANONYMOUS(1987). The State of Forest Report.. Govt. of India, Ministry of Environment and Forest and Forest Survey of India.

ROY,P.S.(1983). Vegetation mapping and forest condition monitoring through visual analysis of multidat landsat data. Proc.Nat.Cong.Appl.ofRemote sensing of National Resources. Environ. land use and Problems related to training and evaluation. IIR. Bombay. 15-17

ROY,P.S.(1984). Forest type delineation from spaceborne data using visual and computer aided techniques. A case study from eastern Himalayas, India. Proc. XV.Int.Cong. and Photointerpretation and Remote Sensing. Rio de Saniciro. Brazil. pp 25-33.

TOMMERNIK, H.(1986). Comparision of SPOT simulated and Landsat TM imagery in vegetation mapping. Symp.on Remote Sensing for RD & EM, A.A.Balkema. Boston.

(Received : February 1996 Revised : December 1996)

Madras Agric. J., 84(3): 149-153 March 1997
https://doi.org/10.29321/MAJ.10.A00858

In vitro ANTIFUNGAL ACTIVITY OF SOME HIGHER PLANT PRODUCTS AGAINST SOIL-BORNE PHYTOPATHOGENS

V.N. PANDEY AND D.C PANT
Department of Mycology and Plant Pathology
Institute of Agricultural Sciences
Banaras Hindu University
Varanasi 221 005

ABSTRACT

Seed extracts of *Coriandrum sativum*, *Cuminum cyminum*, *Foeniculum vulgare* and *Trachyspermum ammi* were screened against *Pythium aphanidermatum*, *Macrophomina phaseolina* and *Rhizoctonia solani*. Seed extracts of *T. ammi* showed high antifungal potentiality as it inhibited mycelial growth of all three fungi tested. The extracts from seeds of the other three could inhibit mycelial growth of *P. aphanidermatum* only. The essential oils of four plant seeds exhibited strong fungitoxicity as they completely checked mycelial growth of all the tested fungi, even at very low concentrations. These oils were not found phytotoxic on seed germination, seedling growth, general health and morphology of bhindi (*Abelmoschus esculentus*).

KEY WORDS : Antifungal activity, seed extracts, essential oils, soil-borne phytopathogens

Pythium aphanidermatum (Edson) Fitpatrick., *Macrophomina phaseolina (Maublanc) Ashby. and Rhizoctonia solani* Kuhn are some of the soil-borne plant pathogens which cause serious diseases of several seedlings and crop plants. A large number of synthetic chemicals are used for control of such pathogens. Due to their non- biodegradable nature and high toxicity they pollute environmental ecosystems (Edwards, 1973) and create human health problems (Arya, 1988). It is therefore, necessary to look for some alternatives for the control of such soil-borne diseases. It has been proved that higher plants are the reservoirs of different secondary metabolites which are easily biodegradable (Fawcett and Spencer, 1970). Recent reports on the possibility of using active principles from higher plants (Pandey and Dubey, 1991, 1992, 1994), have led to the present study *in vitro*, of antifungal activity of some higher plant products against soil-borne phytopathogens.

MATERIALS AND METHODS

Test of crude extract for fungitoxic activity :

The aqueous extract (1:2 w/v) of seeds of 4 plants were tested for their fungitoxicity by the

Table 1. Fungitoxic activity of crude extract of seeds of some higher plants

Name of Plants	% mycelial inhibition at different concentrations					
	Pythium aphanidermatum		Macrophomina phaseolina		Rhizoctonia solani	
	25% conc.	50% conc.	25% conc.	50% conc.	25% conc.	50% conc.
Coriandrum sativum	100	100	0	44.40	0	05.00
Cuminum cyminum	77.78	100	05.00	11.15	28.89	62.20
Foeniculum vulgare	100	100	50.00	88.89	50.00	75.00
Trachyspermum ammi	100	100	100	100	100	100

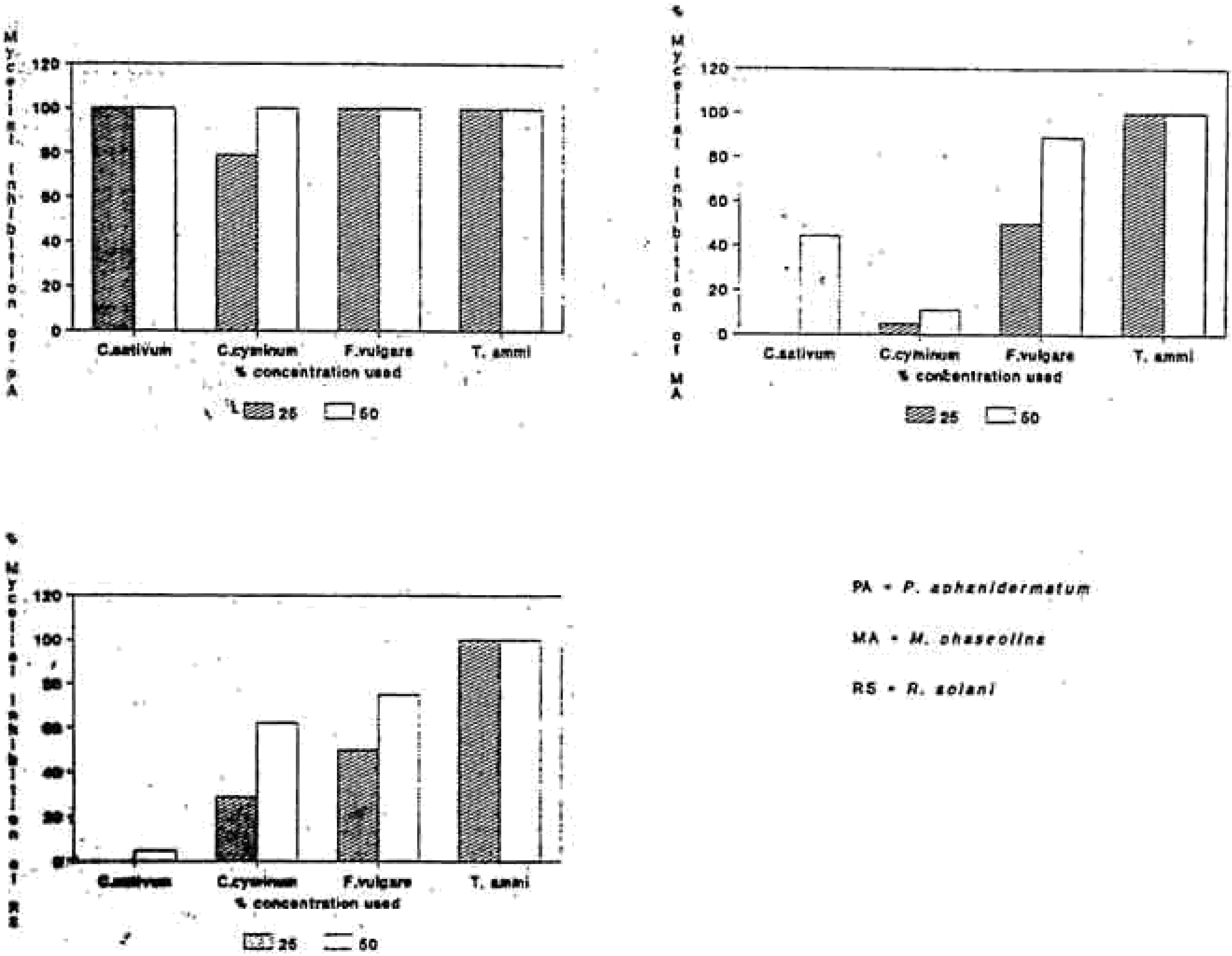

Fig. 1. Fungitoxic activity of crude extracts of seeds of some higher plants

poisoned food technique (Grover and Moore, 1962) against *Pythium aphanidermatum*, *Macrophomina phaseolina* and *Rhizoctonia solani*. Twenty gm seeds of each of the plants were pulverised with 40 ml of distilled water in pestle and mortor (1:2 w/v) and a clear extract obtained by filtering them through sintered filter. Aqueous extract (2.5 and 5.0 ml) was mixed with 7.5 and 5.0 ml of melted potato dextrose agar (PDA) medium separately in Petri plates. Control sets contained only 10 ml of PDA. Plates inoculated with each of the test fungi were incubated at $25 \pm 2^{\circ}C$ for seven days and percent mycelial inhibition calculated as per formula of Dixit et al. (1976).

Isolation of essential oils and test of their minimum inhibitory concentration (MIC)

Essential oils, of seeds of *Coriandrum sativum* Linn., *Cuminum cyminum* Linn., *Foeniculum vulgare* Mill. and *Trachyspermum ammi* (Linn.) Sprague. were isolated by hydrodistillation through Clevenger's apparatus (Langenau, 1948). Traces of moisture removed by treating them with anhydrous sodium sulphate. MIC of above oils was tested separately on 25, 50, 100, 200, 300, 500, 1000 and

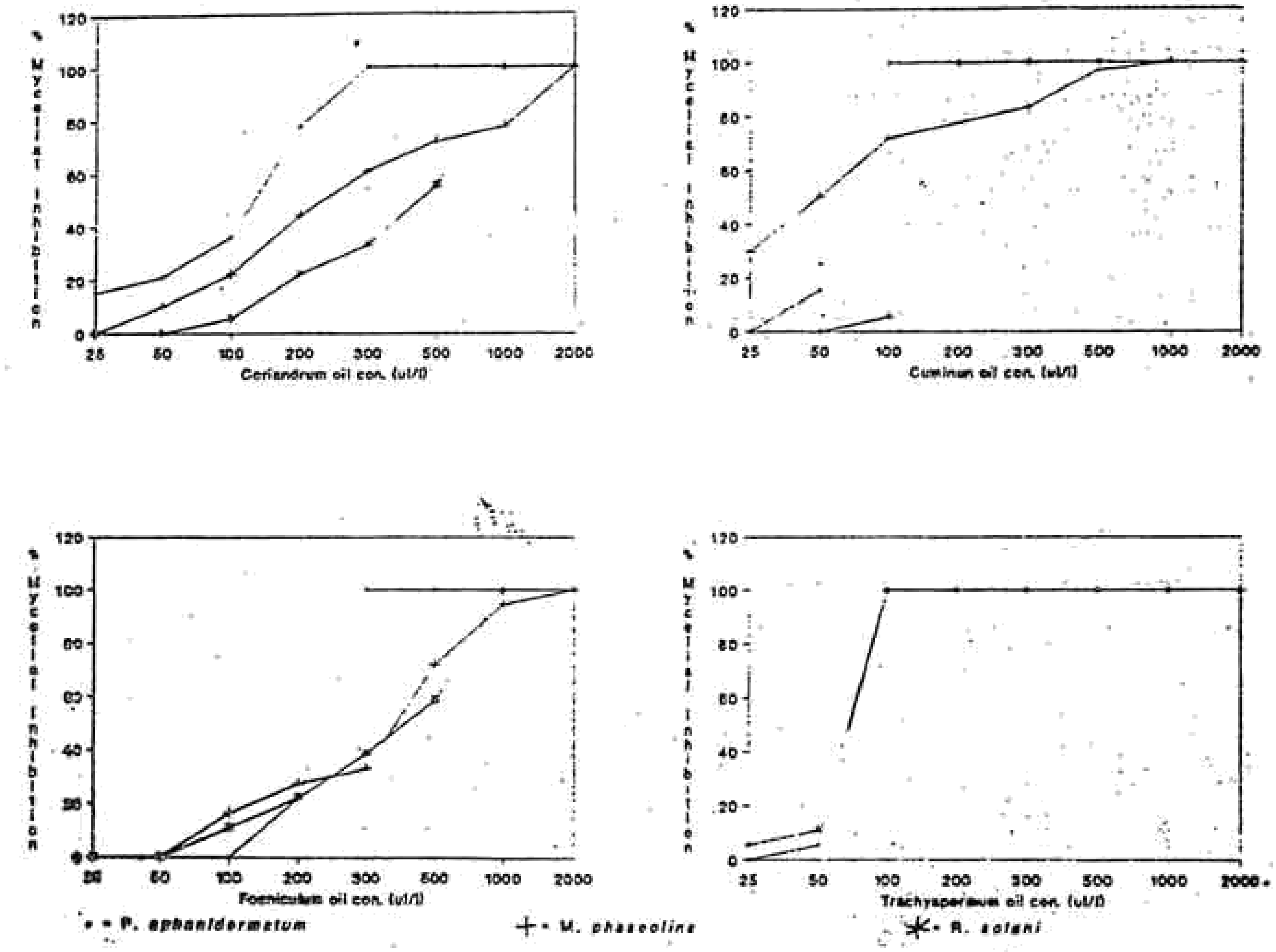

Fig. 2. Antifungal activity of essential oils of seeds of some higher plants

2000 µl l^{-1} against *P. aphanidermatum, M. phaseolina* and *R. solani* by poisoned food technique, using PDA. The nature of fungitoxicity of the oils was studied by the standard technique (Thompson, 1989). The inhibited fungal disks of treatment sets were washed with sterilized distilled water, re- inoculated on virgin PDA medium, incubated at 25 ± 2° C and growth of the test fungi observed.

Phytotoxic evaluation of the essential oils

Phytotoxic studies of the said oils were carried out as per the technique of Dikshit et al. (1979).

RESULTS AND DISCUSSION

Aqueous crude extracts from seeds of *Coriandrum sativum* and *F. vulgare* completely inhibited the mycelial growth of *P. aphanidermatum* but showed poor and moderate efficacy respectively on other two test fungi. The aqueous crude extract of seeds of *C. cymimum* inhibited mycelial growth of *P. aphanidermatum* at 50 per cent concentration but on *M. phaseolina* and *R solani* it was less effective. The aqueous crude extract of seeds of *T. ammi* was found to be most effective in comparison to other three seed extracts

Table 2. **Antifungal activity of essential oils of seeds of *Coriandrum sativum*, *Cuminum cyminum*, *Foeniculum vulgare* and *Trachyspermum ammi* against *Pythium aphanidermatum***

Volatile Oils	% mycelial inhibition at different concentrations (µl l^{-1})									
	25	50	100	200	300	500	1000	2000	3000	3500
Coriandrum sativum	15.0	21.0	36.1	17.7	100*	100*	100*	100*	100*	100*
Cuminum cyminum	0	15.5	100*	100*	100*	100*	100*	100*	100*	100*
Foeniculum vulgare	0	0	0	22.2	100*	100*	100*	100*	100*	100*
Trachyspermum ammi	0	5.5	100*	100*	100*	100*	100*	100*	100*	100*

* denotes fungicidal nature

Table 3. **Antifungal activity of essential oils of seeds of *Coriandrum sativum*, *Cuminum cyminum*, *Foeniculum vulgare* and *Trachyspermum ammi* against *Macrophomina phaseolina***

Volatile Oils	% mycelial inhibition at different concentrations (µl l^{-1})									
	25	50	100	200	300	500	1000	2000	3000	3500
Coriandrum sativum	0	10.0	22.2	44.4	61.1	72.2	77.7	100+	100*	100*
Cuminum cyminum	30.0	50.5	72.2	77.7	83.3	97.2	100*	100*	100*	100*
Foeniculum vulgare	0	0	16.6	27.7	33.3	72.2	94.6	100+	100*	100*
Trachyspermum ammi	5.5	11.1	100+	100+	100*	100*	100*	100*	100*	100*

+ denotes fungistatic nature ; * denotes fungicidal nature

because it inhibited mycelial growth of all three fungi at 25 as well as 50% concentration (fig.1). The MIC of essential oil of *C. sativum* was found to be 300, 2000 and 1000 µ l l^{-1} against *P. aphanidermatum*, *M. Phaseolina* and *R. solani* respectively. The oil showed fungistatic nature against *M. phaseolina* and fungicidal nature against *P. aphanidermatum* and R. solani on their MIC. Whereas MIC of *C. cyminum* oil was 100, 1000 and 200 µl l^{-1} against *P. aphanidermatum*, *M. phaseolina* and *R. solani* respectively. It showed fungicidal nature against *P. aphanidermatum* and M. phaseolina and fungistatic against *R. solani* up to 1000 µl l^{-1}. Essential oil of *F. vulgare* exhibited MIC of 300, 2000 and 1000 µ l l^{-1} against *P. aphanidermatum* and *M. phaseolina* and *R. solani* respectively. The oil showed fungistatic nature against *M. phaseolina* and fungicidal nature against *P. aphanidermatum* and *R. solani* on their MIC. The MIC of essential oil of *T. ammi* was found to be 100 µl l^{-1} against all three fungi tested and showed fungicidal nature against *P. aphanidermatum* but against *M. phaseolina* and *R. solani* its nature was fungistatic upto 300 and 200 µl l^{-1} respecitively (fig. 2). All three oils were non-phytotoxic on seed germination, seedling growth, general health and morphology of bhindi (*Abelmoschus esculentus*).

The crude extracts and essential oils of seeds of *C. sativum*, *S. cyminum*, *F. vulgare* and *T. ammi* can be used as seed treatment for control of seedling infections caused by the above said soil-borne pathogens because they are easily available, their MIC very low and are non-phytotoxic to the host.

ACKNOWLEDGEMENT

The authors wish to thank the Head of Mycology and Plant Pathology Department, I.A.Sc., B.H.U., Varanasi for facilities and to C.S.I.R., New Delhi for financial assistance to senior author.

Table 4. **Antifungal activity of essential oils of seeds of *Coriandrum sativum*, *Cuminum cyminum*, *Foeniculum vulgare* and *Trachyspermum ammi* against *Rhizoctonia solani***

Volatile Oils	% mycelial inhibition at different concentrations (µl l^{-1})									
	25	50	100	200	300	500	1000	2000	3000	3500
Coriandrum sativum	0	0	5.5	22.2	33.3	55.5	100*	100*	100*	100*
Cuminum cyminum	0	0	5.5	100+	100+	100+	100*	100*	100*	100*
Foemiculum vulgare	0	0	11.1	22.2	38.8	100*	100*	100*	100*	100*
Trachyspermum ammi	5.5	11.1	100+	100*	100*	100*	100*	100*	100*	100*

+ denotes fungistatic nature ; * denotes fungicidal nature

REFERENCES

ARYA, A. (1988). Control of phomopsis fruit rot by leaf extracts of certain medicinal plants (including Microbes and Fungi). In : **Indigenous Medicinal Plants** (Purshotam Kausik, Ed.), Today and Tomorrow's, New Delhi, pp. 41-46.

DIKSHIT, A. SINGH, A.K., TRIPATHI, R.D. and DIXIT, S.N. (1979). Fungitoxic and phytotoxic studies of some essential oils. **Biol. Bull. India 1** (1) : 45-51.

DIXIT, S.N., TRIPATHI, S.C. and UPADHYAY, R.R. (1976). The antifungal substance of rose flower (*Rosa indica*). **Eco. Bot., 30**: 371-374.

EDWARD, C.A. (1973). **Environmental Pollution by Pesticides.** Plenum Press, London, 542 pp.

FAWCETT, C.H. and SPENCER, D.M. (1970). Plant chemotherapy with natural products. **Annu. Rev. Phytopathol., 8**: 403- 418.

GROVER, R.K. and MOORE, J.D. (1962). Toximetric studies of fungicides against brown rot organism, *Sclerotinia fructicola* and *S. laxa*. **Phytopathology 52** : 876-880.

LANGENAU, I.E.E. (1948). The examination and analysis of essential oils, synthetics and isolates. In : **The Essential Oils** (Guenther, E. Ed) Vol. 1. R.E. Krieger Publishing C Huntington, pp. 227-348.

PANDEY, V.N. and DUBEY, N.K. (1991). The synergistic activity of volatile fungitoxic compounds from some higher plants. **Acta. Bot. Indica 19** : 290-295.

PANDEY, V.N. and DUBEY, N.K. (1992). Effect of essential oils from some higher plants against fungi causing damping-off disease. **Biologia Plantarum 34** :143-147.

PANDEY, V.N. and DUBEY, N.K. (1994). Antifungal potential of leaves and essential oils from higher plants against soil phytopathogens. **Soil Biol. Biochem., 26** : 1417-1421.

THOMPSON, D.P. (1989). Fungitoxic activity of essential oil components on food storage fungi. **Mycologia 81** 151-153.

(Received : February 1996 Revised : December 199

Madras Agric. J., 84(3): 153-156 March 1997

CHARACTER ASSOCIATION AND PATH ANALYSIS IN VEGETABLE COWPEA

A.CHATTOPADHYAY, T.DASGUPTA, P.HAZRA and M.G.SOM

Department of Horticulture
Bidhanchandra Krishi Viswavidyalaya
Mohanpur,
Nadia 741 252

ABSTRACT

The genotypic and phenotypic correlations of green pod yield with different components were estimated from 20 genotypes of vegetable cowpea pooled over two seasons. The genotypic and phenotypic correlations agreed closely with each other. Pod length, green pod weight, dry pod weight, seeds per pod and 100 seed weight exhibited significantly positive correlations with green pod yield. Their genotypic correlations with green pod yield were also high and positive. Days to flowering, on the otherhand, registered high and negative association with green pod yield both at phenotypic and genotypic levles. A few significantly positive interrelationship were found between the different components. Pod number, on the contrary, exhibited significantly negative interrelationships with green pod weight and pod length. The path coefficient analysis of green pod yield showed that green pod weight, dry pod weight, pod number and seeds per pod were the most important components because of highly positive direct effects. Days to flowering registered highly negative direct effect indicating early flowering would lead to high yield. Therefore, green pod weight, dry pod weight, pod number, seeds per pod and days to flowering were the important components for improving pod yield in vegetable cowpea.

KEY WORDS : Cowpea, correlation, path analysis

Yield is a complex character which is influenced by a number of component traits. The knowledge of correlation helps in determining the relative importance of component characters influencing yield whereas the path coefficient analysis provides an effective means of partitioning direct or indirect causes of association. Correlation and path analysis thus help in identifying suitable selection criteria for improving the yield. In view the meagre information available on component analysis of vegetable cowpea, the present investigation was undertaken to assess the importance of various components of green pod yield in vegetable cowpea.

MATERIALS AND METHODS

Twenty promising genotypes belonging to two cultigroups *viz., unguiculata* and *sesquipedalis* from exotic and indigenous sources were selected