Plant Archives Volume 20 No. 1, 2020 pp. 691-694 **e-ISSN:2581-6063 (online), ISSN:0972-5210**

EFFECT OF EXTRACTS OF DIFFERENT ORGANIC AMENDMENTS ON THE MANAGEMENT OF ROOT-ROT DISEASE OF SESAME INCITED BY *MACROPHOMINA PHASEOLINA* IN *IN VITRO*

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Abstract

In this study, we examined the in vitro effect of extracts of locally available different organic amendments like neem oil cake extract, groundnut oil cake extract, gingelly oil cake extract, mahua oil cake extract, and coconut oil cake extract on the mycelial growth and mycelial dry weight of *Macrophomina phaseolina* (Tassi) Goid. causing charcoal rot of sesame were tested at different concentration using poisoned food technique. Among different organic amendments, mahua oil cake registered the minimum mycelial growth (15.70 mm) at 50 per cent conc followed by neem cake (27.56 mm). Coconut oil cake was the least effective as it recorded the maximum mycelial growth (49.86 mm). And also the minimum mycelial dry weight of 50.36 mg was recorded in mahua oil cake extract at 50 % concentration followed by neem cake (97.80 mg). Coconut oil cake was the least effective as it recorded the maximum mycelial dry weight (184.95 mg). The results of present study suggest that among the organic amendments mahua oil cake effectively manage the *M. phaseolina* induced charcoal root rot disease in sesame plants.

Introduction

Macrophomina phaseolina (Tassi) Goid is one of the most destructive soil borne pathogen of sesame that causes serious charcoal rot disease with significant yield losses. The pathogen is widely distributed in the regions with high temperatures and drought conditions, and it cause *causes* charcoal rot, dry rot, stem blight, leaf blight and damping off in more than 500 plant species belonging to about 100 angiospermic families (Ijaz *et al.,* 2013). India is the world leader with the maximum production (25.8%) from the largest area (29.8%) and highest export (40%) in the world. The inherent hazards caused by the use of chemicals such as residual toxicity, upsetting the balance of the microbiological complex in the soil, development of resistance by the pathogens, environmental pollution etc., necessitated the search for alternative strategies for the management of pathogens. In recent years, organic amendments have been used against plant pathogen successfully in a biological way. The Application of organic amendments induced the association of beneficial micro flora around the rhizosphere, which can be help to reduce the plant pathogens in the soil (lukade, 1992; Tayyab *et al.,* 2019). These strategies are environmentally safe, cheaper, readily available and sustainable with minimal negative effects on the environment. Oil cakes are generally rich in mineral ingredients such as nitrogen and phosphorus (Akhtar and Alam, 1990). Also the application of organic amendments is one of the successful control methods of soil borne diseases through variety of mechanisms such as providing antimicrobial compounds during decomposition (Mansoor, 2007) reduced the inoculum density of the soil borne plant pathogen through changes in the microbial balance by different mechanism (Klein, 2011) such as (a) enhanced activities of antagonistic microbes (Hoitink and Boehm, 1999), (b) increased competition against pathogens for resources that cause fungistasis (Lockwood, 1990), (c) release of fungitoxic compounds during organic matter decomposition (Smolinska, 2000; El-Sharouny, 2016), or induction of

systemic resistance in the host plants (Zhang *et al.*, 1996; Pharand *et al.*, 2002). The aim of present study was therefore undertaken to determine the effectiveness of different concentration of locally available certain organic amendments in the biological control of root rot of sesame under *invitro* condition using poison food tecnhique.

Materials and Methods

Isolation of the pathogen

The pathogen *M. phaseolina* (Tassi) Goid. was isolated from the diseased roots of sesame plants showing the typical root rot symptoms by tissue segment method (Rangaswami, 1972) on potato dextrose agar (PDA) medium. The axenic cultures of the diffeent isolates of the pathogen were obtained by single hyphal tip method (Rangaswami, 1972) and these were maintained on PDA slants for subsequent experiments.

Preparation of aqueous extract from organic amendments

The organic amendments like neem oil cake extract, groundnut oil cake extract, gingelly oil cake extract, mahua oil cake extract, and coconut oil cake extract were used for the study. 30 g of each oil cake was taken and made into powder separately. It was soaked in sterilized distilled water @ 150ml of water separately in a conical flask and kept overnight. The extract was filter through a muslin cloth and filtrate was centrifuged at 10000 rpm for 15 min. the supernatant served as the standard extract solution (100%) (Dubey and Patel, 2001).

Effect of water extract of various organic amendments on the mycelial dry weight of *M. phaseolina*

Fifty ml of PDA broth was taken in 250 ml Erlenmeyer flask sterilized and amended with different conc. of organic amendments (groundnut, sesame, coconut, neem and mahua oil cakes filtrates *viz.*, 10, 20, 30, 40 and 50 percent Conc. and inoculated with the nine mm mycelial disc of *M. phaseolina* collected from periphery of seven days culture. The flasks were incubated for 10 days at room temp. 28+2˚C and after the incubation period the contents were filtered through previously weighed filter paper, Whatman No. 42. Then mycelial mat was dried in hot air oven at 60˚C until attaining constant weight and then the weight was recorded.

Results and Discussion

Effect of water extract of various organic amendments on the mycelial growth and mycelial dry weight of *M. phaseolina*

The results of the studies conducted to find out the effect of various organic amendments on the mycelial growth of *M. phaseolina* revealed an increasing trend in the per cent inhibition with an increase in conc. of various organic amendments extracts (Table 1, 2). Among the different organic amendments the mahua oil cake showed the minimum mycelial growth (15.70 mm) followed by neem cake (27.56 mm), Groundnut (42.67mm), Sesame (46.59 mm) at 50 per cent conc. Coconut oil cake was the least effective as it recorded the maximum mycelial growth (49.86 mm) (Table 1). Similarly, the result regard to the liquid medium assay that the flasks inoculated with the pathogen and amended with organic amendments recorded significant reduction in the mycelial dry weight whereas the flasks inoculated with *M. phaseolina* alone (control) recorded the maximum mycelial dry weight (310.36 mg) at 50 per cent conc.. The minimum mycelial dry weight of 50.36 mg was recorded in mahua oil cake extract at 50 % concentration. This was followed by neem cake (97.80 mg), Groundnut (120.59 mg), Sesame (169.90 mg) at 50 per cent conc. (Table 2). Coconut oil cake was the least effective as it recorded the maximum mycelial dry weight (184.95 mg). Similar to the present study, Suthin Raj *et al.*, (2008) reported that application of mahua oil cake significantly reduced the mycelial growth of *M.*

Table 1: Effect of water extract of various organic amendments on the mycelial growth of *M. phaseolina*.

S.No	Source	Mycelial growth (mm) of *M. phaseolina*					Per cent inhibition				
		Concentration (%)					Concentration (%)				
		10	20	30	40	50	10	20	30	40	50
1	Mahua cake	60.24	32.12	24.15	19.35	15.70	33.06	64.31	73.16	78.50	82.55
2	Sesame cake	86.00	79.64	64.19	60.32	46.59	04.44	79.64	28.67	32.97	48.23
3	Groundnut cake	85.74	75.52	63.17	54.93	42.67	04.73	75.52	29.81	38.96	52.58
4	Neem cake	72.51	52.00	47.32	39.17	27.56	19.43	52.00	47.42	56.47	69.37
5	Coconut cake	87.23	82.52	74.28	63.45	49.86	03.07	82.52	2.270	29.50	44.60
6	Control	90.00	90.00	90.00	90.00	90.00	-	-	-	-	-
	S. Ed	0.68	1.12	0.12	0.51	0.43	-	-	-	-	-
	CD (p=0.05)	1.45	2.54	0.25	1.10	0.98	-	-	-	-	-

Table 2: Effect of water extract of various organic amendments on the mycelial dry weight of *M. phaseolina*.

S.No	Source	Mycelial dry weight (mg) of *M. phaseolina*					Per cent inhibition over control				
		Concentration (%)									
		10	20	30	40	50	10	20	30	40	50
1	Mahua cake	100.00	93.65	79.28	61.27	50.36	67.77	69.82	74.45	80.25	83.77
2	Sesame cake	206.17	198.52	191.06	183.67	169.90	33.57	36.03	38.44	40.82	45.25
3	Groundnut cake	192.75	174.36	160.21	168.35	120.59	37.89	43.82	41.69	45.76	61.14
4	Neem cake	169.85	154.52	136.27	123.97	97.80	45.27	50.21	48.31	60.05	68.48
5	Coconut cake	280.16	210.46	204.82	200.64	184.95	9.73	32.18	34.00	35.35	72.62
6	Control	310.36	-	-	-	-	-	-	-	-	-
	S. Ed	0.51	1.01	0.74	0.97	0.85	-	-	-	-	-
	CD (p=0.05)	1.21	2.09	1.76	1.99	1.78	-	-	-	-	-

phaseolina in coleus. Lakhran and Ahir (2018) and Vinothini (2015) reported that Neem cake was the most effective in reducing the root rot incidence while wool waste and goat manure was found least effective in controlling root rot incidence. Murugan (2015) and reported that application of neem oil cake increased the growth parameters and reduced the wilt incidence in coleus. Manikandan (2017) suggested that application of mahua oil cake highly reduced the damping-off incidence in chilli. Dar *et al.,* (2017) reported that the application of vermicompost @ 20 q/ha + RFD was most effective in reducing the wilt/root rot incidence up to (21.0%) and increased dry fruit yield of chilli when compared to control. Meena *et al.,* (2014) reported mustard cake is more effective against *M. phaseolina* by maximum mycelial growth inhibition at different concentration concentration respectively. Dhingani *et al.,* 2013 reported that among oil cakes tested, neem cake exhibited maximum inhibition of mycelial growth of *M. phaseolina* causing root rot of chick pea. These findings correlates the present results. The organic amendments released organic acids, aromatic compounds and phenols which made the environment unfavorable for the pathogen was reported Linderman (1989). Besides organic amendments operated through more than one mechanism either simultaneously or sequentially in the suppression of the diseases (Balabasker, 2006). Due to the above reason organic amendments are effective against *M. phaseolina*.

Conclusion

It was concluded that application of organic amendments was effective and environmentally friendly method of managing charcoal rot of sesame. The results of present study suggest that among the organic amendments mahua oil cake effectively manage the *M. phaseolina* induced charcoal root rot disease in sesame plants.

References

Akhtar, M. and M.M. Alam (1990). Evaluation of nematicidal potential in some medicinal plants. *International Nematology Network Newsletter*, **6:** 8-10

Balabaskar, P. (2006). Certain studies on the management of root rot of sesame (*Sesamum indicum* L.) incited by *Macrophomina phaseolina* (Tassi) GoidPh.D. Thesis, Annamalai University Annamalainagar, Tamil Nadu.

Dar, W.A., M.G. Hassan, P.A. Sheikh, B. Summuna and S.A. Ganaie (2018). Integrated Disease Management Capsule for Wilt/Root Rot Complex of Chili. *Int. J. Curr. Microbiol. App. Sci.*, **7(1):** 1253-1261.

Dhingani, J.C., K.U. Solanky and S.S. Kansara (2013). Management of root rot disease *Macrophomina phaseolina* (tassi.) goid] of chickpea through botanicals and oil cakes. *The Bioscan*., **8(3):** 739-742.

Dubey, S.C. and B. Patel (2000). *In vitro* evaluation of some oil cakes and plant extracts against *Thanetophorus cucumeris*, *Gliocladium virens* and *Trichoderma viride. J. Mycol. Pl. Pathol.*, **30:** 411-413.

El-Sharouny, E.E. (2016). Effect of different soil amendments on the microbial count correlated with resistance of apple plants towards pathogenic Rhizoctoniasolani AG-5, *Biotechnology & Biotechnological Equipment*, **29:3:** 463-469, DOI: 10.1080/13102818.2014.1002285

Hoitink, H.A.J. and M.J. Boehm (1999). Biological control within in the contex of soil microbe communities: a substrate dependant phenomenon. *Ann. Rev. Phytopathology*, **37:** 427-446.

Ijaz, S., H.A. Sadaqat and M.N. Khan (2012). A review of the impact of charcoal rot *Macrophomina phaseolina* on sunflower. *J. Agrl. Sci*., 1-6.

Klein, E., J. Katan and A. Gamliel (2011). Soil suppressiveness to *Fusarium* disease following organic amendments and solarization. *Plant Dis*., **95:** 1116-1123.

Lakhran, L. and R.R. Ahir (2018). *In-vivo* evaluation of different fungicides, plant extracts, bio control agents and organics amendments for management of dry root rot of chickpea

caused by *Macrophomina phaseolina*. An legume research.

Linderman, R.G. (1989). organic amendments and soil borne diseases. *Indian J. Pl. Protec. Bull.* (Taiwan, R. O. C), **27:** 279-293.

Lockwood, J.L. (1990). Relation of energy stress to behaviourof soil borne plant pathogens and to disease development. In Hom by D. (ed.). *Biological Control of soil borne Plant Pathogens*, 197-214. CAB International, Wallingford, UK.

Lukade, G.M. (1992). Effect of organic soil amendments on root rot incidence of safflower. *Madras Agric. J.*, **79:** 179- 181.

Manikandan (2017). Use of plant and oil cake extract for the management of damping-off diseases in chilli.M.sc. (Ag.)Thesis, Annamalai University, India.

Mansoor, F., V. Sultana and S. Ehteshamul-Haque (2007). Enhancement of biocontrol potential of *Pseudomonas aeruginosa* and *Paecilomyces lilacinus* against root rot of mungbean by a medicinal plant *Launaeanudicaulis* L. *Pak. J. Bot.*, **39(6):** 2113-2119.

Meena, P.N., A.N. Tripathi, B.S. Gotyal and S. Satpathy (2014). Bio-efficacy of phytoextracts and oil cakes on *Macrophomina phaseolina* (Tassi) causing stem rot disease of jute, Corchorus spp. *Journal of Applied and Natural Science*, **6(2):** 530-533.

Murugan, S. (2015). Studies on the management of *Fusarium* wilt complex in *Coleus forskohlii* (wilt) briq caused by *Fusarium chlamydosporum* (Frag and Cif) booth and *Meloidogyne incognita* (Kofoid and White) Chitwood M.sc. (Ag.) Thesis, Annamalai University Tamil Nadu India.

Pharand, B., O. Carisse and N. Benhamou (2002). Cytological aspects of compost-mediated induced resistance against Fusarium crown and root rot in tomato. *Phytopathology*, **92:** 424–438.

Rangaswami, G. (1972). Diseases of crop plants in India. Prentice Hall of India Pvt. Ltd., New Delhi, 520.

Shoaib, E.A., M. Munir, A. Javaid, Z.A. Awan and M. Rafiq (2018). Anti-mycotic potential of *Trichoderma* spp. and leaf biomass of Azadirachta indica against the charcoal rot pathogen, *Macrophomina phaseolina* (Tassi) Goid in cowpea. *Egyptian Journal of Biological Pest Control*, **28:** 26.

Smolonska, U. (2000). Survival of *Sclerotium cepivorum* sclerotia and *Fusarium oxysporum* chalmydospores in soil amended with crucifers residues. *Journal of Phytopathology*, **148:** 343-349.

Suthin Raj, T., D. John Christopher, R.S.R. Kumar and S.U. rani (2008). Effect of organic amendment and *Trichoderma viride* on root length, shoot length and root rot incidence of sunflower. *Ann. Pl. Protec. Sci.*, **16(1):** 242-243.

Tayyab, M., W. Islam, C.G. Lee, Z. Pang, F. Khalil, S. Lin, W. Lin and H. Zhang (2019). Short-Term Effects of Different Organic Amendments on Soil Fungal Composition. Sustainability: 198 doi: 10.3390/su11010198)

Vinothini (2015). Studies on the efficacy of certain organic amendments, new chemicals and biocontrol for the management of root rot of *Coleus forskokhili* (wild.) Briq. Caused by *Macrophomina phaseolina* (Tassi) Goid. M.Sc., (Ag.) Thesis, Annamalai University, Tamil Nadu, India.

Zhang, W., W.A. Dick and H.A.J. Hoitink (1996). Composed induced systemic acquired resistance in Cucumber to *Pythium* root rot and Anthracnose. *Phytopathology*, **86:** 1066-1070.