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INFLUENCE OF NUTRIENTS SOURCE ON RADIAL GROWTH OF *MACROPHOMINA PHASEOLINA* (TASSI.) GOID

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Abstract– Sesame (*Sesamum indicum* L.) is oil seed crop of India and asian countries mostly preferred due to rich in its edible oil content (50%) and protein (23%) and having sufficient carbohydrate (15%). *Macrophomina phaseolina* is a soil borne phytopathogenic fungus having a wide host range of about 500 cultivated and wild plant species worldwide. In the present investigation nineteen nutrients were tested against *Macrophomina phaseolina* at 100, 150, 200 and 250 ppm concentrations that enhanced mycelial growth but lowest mycelial growth was recorded on Monoammonium phosphate and Ferrous sulphate over control. All the nutrients significantly influenced growth of test fungi when compared with control under *In vitro* conditions.

INTRODUCTION

Sesame (*Sesamum indicum* L.) is oil seed crop of India and asian countries mostly preferred due to rich in its edible oil content (50%) and protein (23%) and having sufficient carbohydrate (15%) (Ranganatha *et al.,* 2012). The medicinal value of sesame seeds contains rich source of linoleic acid, Vitamin E, A, B1 and B2 are accepted worldwide (Brar and Ahuja, 1979) and it also rich source of antioxidants (seasmin, seasminol, sesamolin) in sesame seeds increase many fold the medicinal value (Bramway El and Mahesh, 2010). Sesame cultivated in a wide range of atmospheres, extending from semi-arid tropics and sub-tropics to temperate areas of the world (Raikwar and Srivastava, 2013). *Macrophomina phaseolina* is a soil borne and phytopathogenic fungus having a wide host range of about 500 cultivated and wild plant species worldwide (Khan, 2007). *M. phaseolina* caused diseases like a collor rot, damping off, charcoal rot, stem rot, root rot, and seedling blight in economically important crops (Babu *et al.,* 2007). It is also affects the plant by secreting by cell wall pathogenic degrading enzymes which depolymerize the cell wall components such as cellulose, xylan, pectin, polygalacturonic acid and other proteins (Javaid and Saddique, 2012, Tonukari, 2003). From the present results it can be correlated which nutrient can enhance the Pathogenicity of *M.phaseolina* and their microsclerotia can be detected in this nutrients as well as chemical fungicides can also manage *M. phaseolina* however fungicides were toxic and residual in sesame to avoid replace of nutrients based fertilizers were best management of *M. phaseolina* in future.

MATERIALS AND METHOD

The laboratory investigation were conducted at ICAR-Indian Institute of Oilseeds Research, Rajendranagar, Hyderabad- 500030, Telangana, India.

Different nutrients source on the growth of *M. phaseolina*

The growth of *M. phaseolina* required 19 nutrients at 4 levels viz., 100, 150, 200 and 250 ppm (w/v) were tested on mycelial growth of *M. phaseolina* under *in vitro* conditions. The desired amounts of nutrient

were incorporated in the molten PDA. To prepare nutrient incorporated PDA, 100 ml of PDA was taken in a sterile conical flask and mixed with @ 0.10, 0.15, 0.20 and 0.025 g nutrients to obtain a 100, 150, 200 and 150 ppm concentration of the nutrients. The pH was adjusted to 7 by adding HCl or NaOH as per requirement. The nutrient incorporated PDA medium was poured in sterile Petri dish @ 20 ml/ plate and allowed to solidify. A mycelial disc (5 mm diameter) of *M. phaseolina* was kept in the centre of Petri plate and incubated at room temperature. The medium without nutrients (28±2 inoculated in a similar manner, served as control, three replications were maintained. The colony growth was recorded at 24 hours interval up to 72 h after inoculation. Two factorial RBD design were used for the analysis purpose.

RESULTS AND DISCUSSION

Nineteen nutrients in various concentrations viz @100, 150, 200 and 250 ppm were amended with Potato dextrose agar and the observations on mycelial growth were recorded after 48 hrs to 72 hrs intervals. Data indicated (Table 1 and Fig. 1) that nineteen nutrients (@100 ppm) when amended with Potato dextrose agar influenced growth of mycelium varied from 88.66 mm to 61.33 mm. Maximum mycelial growth (88.66 mm) was recorded on Zinc phosphate followed by Ammonium nitrate (88.16 mm) Ammonium sulphate (88 mm), Calcium carbonate (85.66 mm), Sodium chloride and Sodium sulphate (85.50 mm). Lowest mycelial growth (46.33 mm) was recorded on Monoammonium phosphate. All the nutrients have significantly influenced growth of test fungi as compared to control (68.66 mm).

Data presented in that (Table 1 and Fig. 1**)** at @150 ppm, the mycelial growth of *M. phaseolina* varied from 38.33 to 89 mm. Maximum mycelial growth (89 mm) was recorded on Ammonium sulphate followed by Zinc phosphate (87.66 mm) Calcium chloride (84.50 mm), Ferrous sulphate (83.66 mm) and copper sulphate (80 mm). Lowest mycelial growth (38.33 mm) was recorded on Monoammonium phosphate. All the nutrients have significantly influenced growth of test fungi when compare with control (68.66 mm).

Table 1. Influence of nutrients source on radial growth of *M. phaseolina* @ 100 and 150 ppm

Treat-ments	Nutrient Sources	Radial growth (mm) on PDA incorporated @ 100 ppm		Radial growth (mm) on PDA incorporated@ 150 ppm	
		48 hours	72 hours	48 hours	72 hours
T_1	Zinc phosphate	*54.83	88.66	50.00	87.66
T_2	Potassium phosphate	41.66	54.00	38.80	49.66
T_3	Magnesium sulphate	39.00	68.66	34.83	58.00
T_4	Manganese sulphate	45.5	81.16	38.66	66.00
T_5	Potassium sulphate	35.33	67.5	33.66	63.00
T_6	Magnesium chloride	38.33	55.16	36.00	53.33
T_7	Sodium chloride	40.83	85.5	34.16	76.16
T_8	Sodium sulphate	41.16	85.5	38.33	77.00
T_9	Ammonium nitrate	41.16	88.16	33.83	76.33
T_{10}	Calcium chloride	42.00	77.33	42.33	84.50
T_{11}	Calcium carbonate	51.5	85.66	41.50	76.00
T_{12}	Copper sulphate	44.00	81.66	41.00	80.00
T_{13}	Ammonium acetate	38.83	73.00	35.16	70.33
T_{14}	Ammonium sulphate	58.00	88.00	57.33	89.00
T_{15}	Ferrous sulphate	60.33	81.16	58.66	83.66
T_{16}	Sodium nitrite	57.33	67.5	53.40	65.00
T_{17}	Monoammonium phosphate (MAP)	33.83	46.33	29.00	38.33
T_{18}	Urea	51.16	76.00	49.00	67.00
T_{19}	Diammonium phosphate	32.16	61.33	43.66	73.66
T_{20}	Control	41.33	68.66	41.33	68.66
	Nutrients –A($p<0.05$)	CD.3.17	SE(m)1.12	CD.7.57	SE(m)2.68
	Hours –B($p<0.05$)	CD.1.0	SE(m)0.35	CD.2.39	SE(m)0.85
	Nutrients (A) × Hours (B) ($p<0.05$)	CD.4.48	SE(m)1.58	CD.10.71	SE(m)3.8

*Mean of three replications

Data depicted in revealed that (Table 2 and Fig. 1) the growth of mycelium varied from 35.33 to 90 mm at 200 ppm concentration. Maximum mycelial growth (90 mm) was recorded on Ammonium sulphate followed by Calcium chloride (89 mm). Lowest mycelial growth (35.33 mm) was recorded by Monoammonium phosphate and Potassium phosphate (44.66 mm). All the nutrients have significantly influenced growth of test fungi when compared with control (68.66 mm).

Data (Table 2 and Fig. 1) revealed growth of mycelium varied from 33.33 to 90 mm at 250 ppm concentration. Maximum mycelial growth (90 mm) was recorded on Ammonium nitrate, calcium chloride and Ammonium sulphate followed by DAP(88.83 mm). Lowest mycelial growth (33.33 mm) was recorded on Monoammonium phosphate and Ferrous sulphate (35 mm), over control (68.66 mm). All the nutrients significantly influenced growth of test fungi when compared with control. Sharma, (2006) found that potassium nitrate, sodium nitrate, sodium nitrite, calcium nitrate, ammonium nitrate, ammonium chloride, ammonium sulphate and ammonium phosphate as the most suitable nutrient sources for growth of *Macrophomina phaseolina*. Salunkhe *et al.* (2009) observed that sodium nitrate was the ideal source for the growth and sclerotial production of *Rhizoctonia bataticola.* Bhupathi and Theradimani (2018) observed that peptone promoted significant mycelial growth and dry weight of *Macrophomina phaseolina* followed by ammonium nitrate. Minimum mycelia growth and dry weight was

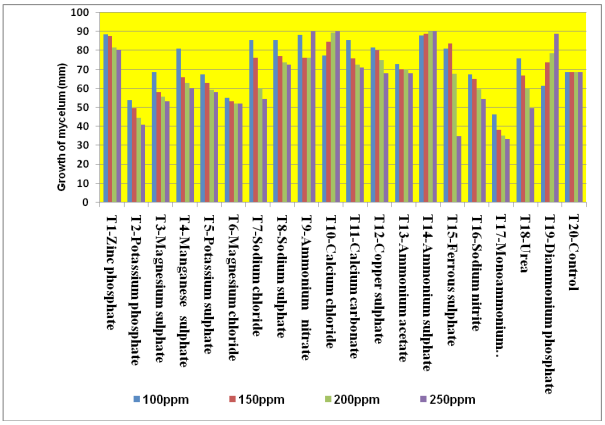

Fig. 1. Influence of nutrient source on radial growth of *M.phaseolina* at 72 hrs

Table 2. Influence of nutrient source on radial growth of *M. phaseolina* @ 200 and 250ppm

Treat-ments	Nutrient Sources	Radial growth (mm) on PDA incorporated @200 ppm		Radial growth (mm) on PDA incorporated @250 ppm	
		48 hours	72 hours	48 hours	72 hours
T_1	Zinc phosphate	*44.50	81.50	42.667	80.33
T_2	Potassium phosphate	38.00	44.66	36.33	41.10
T_3	Magnesium sulphate	33.00	55.66	33.00	53.33
T_4	Manganese sulphate	37.00	63.00	36.00	60.33
T_5	Potassium sulphate	32.00	59.33	29.16	58.00
T_6	Magnesium chloride	35.00	52.00	33.00	52.00
T_7	Sodium chloride	25.33	60.33	24.00	54.66
T_8	Sodium sulphate	36.00	73.66	36.16	72.66
T_9	Ammonium nitrate	36.66	76.33	42.33	90.00
T_{10}	Calcium chloride	48.66	89.33	54.00	90.00
T_{11}	Calcium carbonate	40.33	72.66	39.33	71.00
T_{12}	Copper sulphate	38.16	75.00	30.33	68.00
T_{13}	Ammonium acetate	31.66	70.33	60.00	68.00
T_{14}	Ammonium sulphate	59.00	90.00	60.00	90.00
T_{15}	Ferrous sulphate	51.16	67.66	29.33	35.00
T_{16}	Sodium nitrite	53.00	59.66	48.66	54.66
T_{17}	Monoammonium phosphate (MAP)	27.66	35.33	26.33	33.33
T_{18}	Urea	38.33	60.30	37.66	49.66
T_{19}	Diammonium phosphate	46.66	78.66	51.66	88.83
T_{20}	Control	41.33	68.66	41.33	68.66
	Nutrients (A) ($p<0.05$)	CD.2.52	SE(m)0.89	CD.2.47	SE(m)0.87
	Hours(B) ($p<0.05$)	CD.0.79	SE(m)0.28	CD.0.78	SE(m)0.27
	Nutrients (A)X Hours(B) ($p<0.05$)	CD.3.57	SE(m)1.26	CD.3.5	SE(m)1.24

*Mean of three replications

recorded in ammonium sulphate supplemented media. Patel, (2020) tested Potassium nitrate, Sodium Nitrate, Ammonium Metavanadate, Calcium Nitrate, Cobalt Nitrate, Ammonium Fluoride, Ammonium Chloride, Ammonium Nitrate, Ammonium Oxalate, and Ammonium Sulphate at concentration 0.2 per cent against *Fusarium Solani*. All the nutrient sources supported good mycelial growth except ammonium metavanadate and cobalt.

CONCLUSION

Most of the nutrients were significantly influenced mycelial growth over control (PDA), but two nutrients were reduction mycelial growth. The results can be correlated which nutrient can enhance the Pathogenicity of *M.phaseolina* and their microsclerotia can be detected in this nutrients as well as chemical fungicides can also be used for management of *M.phaseolina* however fungicides were toxic and residual in sesame to avoid replace of nutrients based fertilizers were best management of *M. phaseolina* in future.

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