Environment & Ecology 35 (4C) : 3315—3317, October—December 2017
Website : environmentandecology.com ISSN 0970-0420

Influence of Carbon and Nitrogen Sources on Growth of *Sclerotium rolfsii* Sacc. Causing Stem Rot of Tuberose (*Pollanthes tuberosa* L.)

Divya Bharathi A. R., Narayanba Swamy H.

Received 16 March 2017; Accepted 18 April 2017; Published online 8 May 2017

Abstract Among different diseases affecting tuberose plant stem rot induced by *Sclerotium rolfsii* Sacc. is important soil borne disease causing devastating losses. *In vitro* studies were conducted on the effect of carbon and nitrogen sources on the mycelia growth and biomass production of *S. rolfsii*. The results reveal that among the carbon sources tested, sucrose (602.57 mg) recorded the maximum mycelia growth and dry weight of *S. rolfsii* and least was obtained on lactose (121.19 mg). Among the nitrogen sources potassium nitrate (453.17 mg) supported the maximum mycelia growth and dry weight of the fungus where as threonine (121.01 mg) found to be least effective.

Keywords Nutritional studies, *Sclerotium rolfsii,* Tuberose.

Divya Bharathi*A. R., Narayana Swamy H.
Department of Plant Pathology,
University of Agricultural and Horticultural Sciences,
Shimoga 577225, Karnataka, India
e-mail : divyagowda.ar@gmail.com
e-mail : swamyareca@gmail.com
*Correspondence

Introduction

Tuberose (*Polianthes tuberosa* L.) is one of the most important bulbous ornamentals of tropical and subtropical areas. It is commercially cultivated for cut and loose flower trade and also for the extraction of highly valued natural flower oil. Among the fungal diseases stem rot (*S. rolfsii*) is a destructive soil borne disease of economic importance. The disease occurs in *kharif* season and under severe condition losses go up to 50—60%. The pathogen *Sclerotium rolfsii* is a soil inhabitant, polyphagous and facultative parasite has an extensive host range of at least 500 species in 100 families. The most common hosts are legumes, crucifers, cucurbits and ornamental crops. In case of severe attack, no flowering shoots are obtained Das [1].

Sclerotium rolfsii Sacc. is a well known and most destructive soil borne fungus initially described on tomato. The *Sclerotium rolfsii* is widely distributed and causes severe damage to more than 500 crops.

Materials and Methods

Carbon utilization

The carbon requirements of the fungus were studied by replacing sucrose with different carbon compounds in Richards's solution. The carbon compounds used in the present study were dextrose, fruc-

Table 1. Effect of carbon sources on dry mycelial weight of *Sclerotium rolfsii.*

Carbon sources	Mean dry mycelia weight (mg)
Xylose-$C_5H_{10}O_5$	435.24
Dextrose-$C_6H_{12}O_6$	529.39
Fructose-$C_6H_{12}O_6$	222.31
Cellulose-$C_6H_{10}O_5$	225.33
Sucrose-$C_{12}H_{22}O_{11}$	602.57
Mannitol-$C_6H_{14}O_6$	174.59
Glucose-$C_6H_{12}O_6$	532.19
Lactose-$C_{12}H_{22}O_{11}$	121.19
SEm±	0.89
CD at 1%	3.70

Table 2. Effect of nitrogen sources on dry mycelial weight of *Sclerotium rolfsii.*

Nitrogen sources	Mean dry mycelial weight (mg)
Ammonium sulfate- $(NH_4)_2SO_4$	433.17
Asparagine-$CH_4H_8N_2O_3H_2O$	421.67
Urea-$CH_4H_8N_2O_3H_2O$	136.07
Ammonium chloride-NH_4Cl	422.93
Threonine-$H_2OCCH(NH_2)CH(OH)CH_3$	121.01
Sodium nitrate-$NaNO_2$	290.33
Ammonium phosphate- $(NH_4)_2PO_4$	343.63
Potassium nitrate-KNO_3	453.17
SEm±	0.52
CD at 1%	2.16

tose, glucose, mannitol, sucrose, lactose, starch and cellulose. The quantity of each carbon compound to be added was determined on the basis of their molecular weight, so as to provide an equivalent amount of carbon as that of sucrose present in the basal medium. All the sugars were dissolved properly. They were sterilized at 1.1 kg/cm^2 for 15 minutes. From 7 days old cultute of the fungus, 5 mm discs were cut and inoculated then incubated at 27 ± 1^{o}C for 10 days.

At the end of incubation period mycelial mat was filtered through Whatman No. 42 filter paper which was previously dried at 60^{o}C for three days to obtain constant weight. The filter papers along with the fungal mat were then dried in the oven at 60^{o}C for three days to obtain constant weight and then cooled in a dessicator and weighed immediately on an analytical electrical balance. The dry weight of mycelium was recorded. All the treatments were replicated thrice and the data obtained were analyzed statistically.

Nitrogen utilization

The nitrogen requirements of the fungi were studied by replacing potassium nitrate of Richards's liquid medium with different nitrogen sources. The nitrogen sources used in the present study were ammonium chloride, ammonium sulfate, sodium nitrate, urea, potassium nitrate, threonine, asparagine and ammonium phosphate.

The quantity of the nitrogen sources was determined on the basis of molecular weight so as to provide an equivalent amount of nitrogen as that of potassium nitrate present in the basal medium. All the nitrogen sources were dissolved properly and each source was replicated thrice. Further, they were sterilized at 1.1 kg/cm^2 for 15 minutes. The flasks were inoculated and incubated as described earlier. The dry mycelial weight of the fungus was recorded as described earlier and data were analyzed statistically.

Results and Discussion

Carbon utilization

Among the different carbon sources tested, maximum growth of the fungus was obtained on sucrose (602.57 mg), this was succeeded by glucose (532.19 mg) and dextrose (529.39 mg). Least growth of the fungus was obtained in lactose (121.19 mg) (Table 1). The utilization of various carbon compounds may depend on either of the activity of the fungus to utilize simpler forms or on its power to convert the complex carbon compounds into simpler forms, which may be easily utilized. Sucrose being a simpler carbon source and major component of photosynthesis in plants is generally utilized as a good source by most of the plant pathogenic fungi. Muthukumar and Venkatesh [2] reported among the nine carbon sources tested, sucrose recorded maxi-

mum mycelia growth and dry weight of *Sclerotium rolfsii*.

Nitrogen utilization

Among the different nitrogen sources tested, potassium nitrate (453.17 mg) supported the maximum growth of the fungus followed by ammonium sulfate (433.17 mg), ammonium chloride (422.93 mg) and were significantly different amongst each other. Minimum growth was observed in urea (136.07 mg) and threonine (121.01 mg) (Table 2). Khattabia et al. [3] and Basamma [4] reported that potassium nitrate and peptone recorded the maximum mycelial growth of *S. rolfsii*. Nitrogen being a component of protein is an essential element and like carbon, it is used by fungi for functional as well as structural purposes. But all the sources of nitrogen are not equally good for the growth of fungi.

References

1. Das AC (1961) Diseases of Rajanigandha (*Polianthus tuberose* L.) and Larkspur (*Delphinium ajacis* L.) caused by *Sclerotium rolfsii* Sacc. Sci Cul 27 : 543—550.
2. Muthukumar A, Venkatesh A (2013) Effect of light and aeration on growth of *Sclerotium rolfsii in vitro* . Afr J Biotechnol 12 : 6843-6846.
3. Khattabia N, Brahim E, Latifer L, Abdullah O (2004) Effect of nitrogen fertilizers on *T. harzianum* and *S. rolfsii*. Agronomiea 24 : 281—288.
4. Basamma (2008) Integrated management of *Sclerotium* wilt of potato caused by *Sclerotium rolfsii* Sacc. MSc (Agric) thesis. Univ Agric Sci Dharwad, India, pp 110.