IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 12, Issue 1, December 2020
Impact Factor: 4.819

Effect of Rhizosphere Fungi on Root Hair Curling, and Rhizobium Growth of Vicia Faba Linn.

Mahesh Babu
Department of Botany
Govt. (P.G.) College bisalpur (Pilibhit), Uttar Pradesh
drmaheshbabu1@gamil.com

Abstract: *Effect of rhizosphere fungi on root hair curling and growth of Rhizobiun was studied. The number of curled root hair was found to be less in all the treatment. The presence of antibiotic substances in the metabolites is responsible for the inhibition.*

Keywords: *Rhizobium;* Rhizosphere fungi; Root hair curling

I. INTRODUCTION

Very few workers have studied the effect of fungal metabolite on the root hair curling. Bharadwaj and Dwivedi (1982) studied the effect of rhizosphere fungal metabolites on root hair curling and found that all the tested fungi inhibited the curling in the leguminous plant. Djordjenic et, al (1985) reported that nodulation genes involved in root hair curling. Gupta (1974) and kumar (1993) reported that fungal metabolites have toxic Substance which inhibits curling in leguminous plant. Mohan et al. (1994) studied the effect of 19 fungal metabolites on root hair curling and reported that almost all metabolites reduced the number of curled root hairs.

Gupta (1971), Kumar (1993) and Jain (2001) studied the effect of fungal metabolites on the growth of *Rhizobium* and reported that some fungi inhibited the growth of *Rhizobium* in culture plate.

Material and method

Seeds from test plant of *Vicia faba* were surface sterilized with .1% $HgCl_2$ and thereafter washed thoroughly three times with sterilized distilled water. Seeds surface dried with whatmann filter paper no.44.they were transferred, then 100 mm sterilized petri dish containing 15ml. sterilized cooled seedling agar medium of the following composition: $CaHPO_4$ 1.0g; $MgSO_4$ $7H_2O$ 0.2 g; K_2HPO_4 0.2g; NaCl 0.2g; $FeCl_3$ 0.1g; Agar –agar 15g; distilled water 1000 ml. and pH 6.5. The Petri dishes were kept inverted to keep the radicles free from the medium and incubated for two days at 25^0C. Culture tubes (8/ 1") containing 35ml. of n-free medium of the following composition: $CaCl_2$ 0.1g; $MgSO_4$ $7H_2O$ 0.12g; KH_2PO_4 0.1g Na_2HPO_4 12 H_2O 0.15g; Ferric citrate 0.005g; Mn, Cu, Zn, B and Mo in trace, distilled water 1000 ml and pH 6.5 were autoclaved at 15 Ibs pressure for 15 minutes, were prepared for the further procedure.

Seedling's radicle was inserted at one end of the sterilized Fa^{0}hraeus Slide cell and thereafter transferred gently in above sterilized culture tube. One ml of *Rhizobium* suspension and two ml different fungal metabolites were added in an individual tube. In order to obtain fungal metabolites, fungi were grown in sterilized liquid Czapek medium in 100 ml conical flasks containing 25 ml of the medium of the following composition: KH_2PO_4 1.0g; $MgSO_4.7H_2O$ 0.5g; KCl 1.0g; $FeSO_4$ trace, yeast power 0.5g; $NaNO_3$ 2.0g and distilled water 1000 ml. fungi were allowed to grow for 10 days at 25^0C and thereafter the content was filtered through Whatmann filter paper No. 44. Three uninoculated tubes were also kept side by side which served as control. Lower portion of the tubes was covered with black paper. The whole experiment was prepared aseptically. After 8 days of incubation at 25^0C curled roots hairs were counted under microscope and compared with control and data were subjected to 't' test.

Sixteen fungi were selected for the study. Fungal culture filtrates of 10 days old culture fungi were obtain as described earlier. Three sterilized paper disks (15mm dia.) were dipped for 1 minute into each fungus metabolite and were kept, as designed in plate, on sterilized medium in perti dish containing one ml. of homogenous *Rhizobium* suspension and 15 ml. yeast extract mannital agar medium. One set paper dishes dipped in sterilized distilled water was kept as control.

ISSN 2581-9429 IJARSCT

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429 Volume 12, Issue 1, December 2020 Impact Factor: 4.819

Plates were incubated for two days at 25^0C. The extent of inhibition was assessed by measuring the distance from the disks to the edge of the zones of inhibition of bacterial growth.

Table-1 Effect of dominant rhizosphere fungi on root hair curling.

Name of fungi	Average number of curled root hair	Value of 't'
Control	96	-
1.*Mucor luteus*	28.33	46.65**
2.*Syncephalastrum racemosun*	37.66	31.48**
3.*Aspergillus flavus*	30.66	35.26**
4.*A. terreus*	30.33	39.41**
5.*A.luchuensis*	27.00	36.08**
6.*A.niger*	25.00	54.99**
7.*Penicillium citrinum*	35.66	21.22**
8.*Torula convolute*	47.66	14.30**
9.*Paecilomyces fusisporus*	43.00	27.71**
10.*Cladosporium cladosporioides*	83.66	4.16**
11.*Curvularia tetramera*	46.00	38.72**
12.*Curvularia lunata*	44.00	31.84**
13.*Alternaria humicola*	59.00	7.94**
14.*Trichoderma lignorum*	35.33	36.41**
15.*Fusarium udum*	33.00	48.79**
16.White st. mycelium	41.00	28.76**

*Significant at 5% level

**Significant at 1% level

Table 2 Effect of dominant rhizosphere fungi on the growth of *Rhizobium.*

Name of fungi	Zone of inhibition zone (in m.m)
Control	-
1.*Mucor luteus*	-
2.*Syncephalastrum racemosum*	-

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429 Volume 12, Issue 1, December 2020 Impact Factor: 4.819

3.*A. flavus*	-
4.*A. terreus*	-
5.*A. luchuensis*	4.5
6.A, niger	5.5
7.*Penicillium citrinum*	2.5
8.*Torula convolute*	-
9.*Paecilomyces fusisporus*	-
10.*Cladosporium cladosporioides*	-
11.*Curvularia tetramera*	-
12.*Curvularia lunata*	-
13.*Alternaria humicola*	-
14.*Trichoderma lignorum*	-
15.*Fusarium udum*	-
16.White st. mycelium	-

II. RESULT AND DISCUSSION

Effect of fungal filtrates of rhizosphere fungi on the root hair curlings has been studied by a few workers, Bharadwaj (1970) reported that the fungal metabolites of some fungi enhanced while others reduced the number of curled root hairs. This is attributed to the presence of antibiotic substances in culture filtrates. Singh (1970) found less number of curled root hairs in presence of fungal metabolites. Mohan et. al (1994) reported that the rhizosphere fungal metabolites inhibited the number of curled root hair in *Glycine max.*

In the present study, the effect of fungal culture filtrates on root hair curling was studied by the method followed by Fa^{0}haraes (1957). The number of curled root hairs was found to be less in all the treatments (Table-1).

Fungal metabolites inhibit the growth of *Rhizobium* due to the presence of antibiotic and other toxic substance as reported by Allen and Allen (1950), Robison (1945), Ruschmann (1951) and Dorn (1956). The present finding is in accordance with Allen and Allen (1950) and Robison.

A large number of workers have published papers on the interaction between *Rhizobium* and fungi. The following fungi have been found to exert an antibiotic effect on *Rhizobium*, eg., *A. flavus* (Allen and Allen, 1950), *P. claviforme* And *A. niger* (Ruschmann, 1951*) P. expansum* (Stolp, 1952), *A. wentii* (Robison, 1945*) P. notatum* (Gregory et. al 1952*), F. lini* (Dorn1956) and *Trichoderma lignorum* (Gregory et. al1 952). Bharadwaj (1970) reported that a few fungi secreted antibiotic substances in their metabolites, which inhibited the growth of various strains of Rhizobium.

In the present investigation it has been found that only three fungi viz,. *A. niger*, *A. luchuensis*, and *Penicillium citrinum* were found to secrete such substances which inhibited the growth of *Rhizobium*. *A. niger* inhibited maximum growth of Rhizobium in comparison to other (Table-2).

ISSN 2581-9429 IJARSCT

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 12, Issue 1, December 2020
Impact Factor: 4.819

The reason for the above inhibition may be due to the presence of antibiotic substances in the metabolites.

ACKNOWLEDGEMENT

The author of thankful to Dr. V. K. Gupta, Reader, Department of Botany, Narain (P.G.) College, Shikohabad, Firozabad for guidance and to Dr. M. C. Yadav for providing facilities.

REFERENCES

[1]. Allen, E. K. and Allen, O. N. (1950). Biochemical and Symbiotic properties of the rhizobia. Bacterial Rev., 14: 273-330.
[2]. Bharadwaj, S. D. Dwivedi, R. S (1982). Rhizosphere studies in relation to nodulation in leguminous plants. In vitro, effect of culture filtrates of rhizosphere fungi on curling of root hairs during development of bacterial nodules in legume hosts. Proc. Nat. Acad. Sci., India Sect B) 52 (I): 49-53.
[3]. Djordjenic, M. A., Scho field, P. R., Ridgen, R.W., Morrison, A. Bassam , B. J., plazinski, J., Jinwatson and Rolfee, B. G. (1985).*Rhizobium* nodulation genes involved in root hair curling (hac) are functionally conserved. Plant Mol. Biol; 4 (2/3): 147-160.
[4]. Dorn, M. (1956). Uber den Einflusz Phytopatha genen pilze auf die Entwicklung und Inflektions Kraft Von drei *Rhizobium*. Arten, Zenter, Bakterial 4. Parasi toli, 2e Apt., 109-139.
[5]. F^{0}ahraeus, G. (1957). The infection of clover root hairs by nodule bacteria studied by a simple glass slide technique. J. Gen. Microbiol; 16: 374-381.
[6]. Gregory, K. F., Allen, O. N., Ricker, A. J. and Peterson, W. H (1952). Antibiotics as agent for the control of certain damping off fungi. Am, J. Botany, 39: 405-415.
[7]. Gupta, V. K. (1971). Rhizosphere studied in relation to nodulation of *Trigonella foenum-graecum* linn.Doctoral Thesis, Banaras Hindu, University, Varanasi-5, India.
[8]. Gupta, V. K. (1974). Effect of subamycin on nodulation in *Trigonella foenum-graecum* Linn. Indian Phytopathology, 27 (2):262-263.
[9]. Jain, Vivek (2001). Effect of rhizosphere mycoflora and foliar application of certain Chemicals on nodulation and growth of *Vigna mungo* L. Hepper. Doctoral Thesis, Dr. B.R. Ambedkar University , Agra.
[10]. Kumar, Satish (1993).Rhizosphere mycoflora studies in relation to nodulation of *Vigna radiata* L. Wilezek. Doctoral Thesis. Agra University, Agra.
[11]. Mohan, J., Sindhu, T. R; Singh, P. N. and Naaz, S; (1994). Studies on rhizosphere mycoflora of Glycine max. I-Influence of rhizosphere fungi and root hair curling, nodulation and length of root shoot growth. Acta Botanica Indica 19 (2): 224-231.
[12]. Robison, R. S. (1945). The antagonistic action of the by product of several soil microorganisms on the activities of the legume bacteria. Soil Sci, Soc. Ann. Proc.,10: 206-210.
[13]. Ruschmann, G. (1951).Uber Antibiosen und Symbiosen V on Boden organismen und ihre Bedentung fur die Boden fruchtbarheit. Mitt. I. Z. Pflanzenernahr, Dung. U. Boclenk. 55: 201-235.
[14]. Singh, B. P. (1970). Rhizosphere mycoflora of two leguminous plants growing under natural and artificial condition. Doctoral Thesis, Banaras Hindu University, (India).
[15]. Stolp, H. (1952). Bilarge Zur Frage Der Bezichungen Zwischen Mikroorgarisme und hoheren Pflanzen. Arch. F. Mikrobiol, 17: 1-29