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Int. Res. J. of Science & Engineering, 2019; Vol. 7 (6): 176-180 http://www.irjse.in
ISSN: 2322-0015

ORIGINAL ARTICLE

Comparative study of rhizosphere mycoflora of brinjal and chili from western Vidarbha of Maharashtra

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Manuscript Details

Received: 21.11.2019
Accepted: 27.12.2019
Published: 30.12.2019

ISSN: 2322-0015

Cite this article as:
Kanherkar Suryakant H. Comparative study of rhizosphere mycoflora of brinjal and chili from western Vidarbha of Maharashtra, *Int. Res. Journal of Science & Engineering,* 2019, 7 (6): 176-180.

ABSTRACT

In the present investigation rhizosphere mycoflora of two vegetables were fully exploited during 2013. Rhizosphere soil samples were collected from two vegetables crops viz. brinjal, and chili, from Amravati and Akola region at regular intervals from the month of February to December 2013. The collected rhizosphere soil samples from two vegetables crops mixed separately to get uniform soil samples from every field. The serial dilution agar plating method was adopted for isolation of fungal population from each soil sample. The potato dextrose agar (PDA) media used for isolation of rhizosphere mycoflora so as to accommodate the nutritional requirements of the fungi there in. The numbers of fungi were calculated from each soil sample of all two vegetable crops. The population of number of colonies of fungi (10^{-4}) was calculated in both the region i.e. Amravati and Akola. In the present study 12 fungal species from brinjal, 12 species from chili have been isolated and identified. The rhizosphere fungal population in Amravati region was highest in second season i.e. in the month of August 261.1 and lowest in month of March 59.2. While in Akola region the rhizosphere mycoflora increased in the month of August 301.9 and it was declined in the month of February 59.6.

Keywords: *Brinjal, Chili, Rhizosphere, Population, Mycoflora*

1. INTRODUCTION

Rhizosphere: - The rhizosphere is a micro ecological zone in direct proximity of plant roots. It is functionally defining as the particulate matter and microorganisms that cling to roots after being gently shake in water.

The theoretical extent of the rhizosphere is dependent on the zone of influence of the plant roots and associated microorganisms. The rhizosphere is a metabolically busier, faster moving, more competitive environment than the surrounding soil [1].

Brinjal: - *Sclerotinia sclerotiorum* it is soil born fungi of brinjal it has worldwide distribution. It is caused root knot diseases caused loss of yield of vegetables. The brinjal rhizosphere has various antagonistic fungal species that is *Trichoderma, Penicillium, Aspergillius* etc. These are used for in vitro and in vivo evaluation. In this investigation, isolation of rhizosphere mycoflora were conducted and their study for antagonistic effect. The fungal soil community was more abundant and diverse than the communities colonizing the stems and roots of eggplants. The applied biological and chemical control agents effectively reduced the abundance of fungi, including pathogenic species, in the organs of eggplants and the substrate used for eggplant cultivation. Potential pathogens (*Alternaria alternata, Botrytis cinerea and Fusarium species*) were isolated in high numbers from eggplant stems in the control treatment and in the Polyversum treatment (67%). The lowest number of potential pathogenic species was isolated from plants treated with the bio-stimulator Asahi SL, the fungicide Bravo 500 SC and the mycorrhizal inoculums. The population size of pathogenic fungi (Colletotrichum coccodes and Fusarium) isolated from eggplant roots [2].

Chili: - Chili (*Capsicum annum* L.) is mainly cultivated for its vegetable green fruits and for the dry chili as the spice of commerce. It is a rich source of Vitamin C, A and B. In India, it is an important cash crop, which is grown for the both domestic and export market [3]. India is the largest producer of chilies in the world (8.5 lakh tones) followed by China (4 lakh tones), Pakistan (3 lakh tones) and Mexico (3 lakh tones). Andhra Pradesh ranks first in India in both area and production with 2.04 lakh hectares producing 323 thousand tones [4]. Chili crop suffers with many fungal, bacterial and viral diseases resulting in huge yield losses. Among the fungal diseases, in recent years' dry root rot of chili caused by *Sclerotium rolfsii* is of major concern and causing the economic losses in chili [5]. In the year 2001 root rot of chili caused by *S. rolfsii* was first time reported from Rajasthan near Jaipur chili growing areas, where the sever mortality of chili plants during March-April was observed [5]. The chili crop suffers from many diseases like damping off, anthracnose or fruit rot or dieback, wilt, leaf spots and powdery mildew. Among the fungal diseases, root rot of chili caused by Sclerotium rolfsii has attained the economic importance. In recent years, this disease is causing the economic losses in chilies crop [5,6]. *Sclerotium rolfsii* Sacc is a well-known polyphagous, ubiquitous, omnivorous and most destructive soil borne fungus [6]. Chili is a common crop and cultivated all over the world. It is known as economically very important and valuable cash crop. Chili plant number of diseases reported like damping-off caused by Pythium spp., anthracnose by Colletotrichum capsici, root rot by Phytophthora capsici, alternaria blight caused by Alternaria capsici, leaf spot of chili by *Cercospora capsici*, Fusarium wilt of chili by Fusarium anum, fro-eye leaf spot by Cercospora spp. All these diseases are soil borne diseases. The chili production affects by various factors that is biotic and abiotic factor. The number of soil born fungi infected the chili crop. A number of soil-borne root infecting fungi were isolated and identified, such as, *Fusarium oxysporum, F. solani, Macrophominaphaseolina, Phytophthora capsici, Pythium sp., and Rhizoctonia solani* [7].

2. MATERIAL AND METHODS

a. Isolation of rhizosphere mycoflora by serial dilution agar plating method

Dilution plate method [8] was used for isolation of rhizosphere mycoflora of vegetable crop. For the isolation of fungal serial dilution factor 10^{-4} were used. Soil sample were collected randomly from rhizosphere of vegetable crop plant. Composite soil sample from each field were used for fungal analysis during every month. At the time of serial dilution labeled the dilution blank, as 10^{-1},10^{-2},10^{-3},10^{-4} marked with marker pencil. 10gm of air dry sol sample from composite soil sample was added into 90ml sterilized distilled water and dilution blank labeled 10^{-1}. Thus diluting original sample 10 times (1:10), the suspension was shaken thoroughly for 20 minutes to obtain a uniform distribution and release of microorganisms from adhering soil particles. From the first dilution 1 ml of suspensions was added in 9 ml sterilized water to the dilution blank number 10^{-2} by sterile pipette. The dilution numbers second was shaken for 5 minutes. The same procedure was repeated till the original

sample has been diluted to 10^{-4} times, every time a fresh sterile pipette was used. Freshly from the dilution numbers 10^{-4} 1 ml of suspensions was transferred with the help of sterile pipette to sterilized Petridis containing potato dextrose agar medium. The 1ml of soil sample suspensions was added in three sterile poured petri plates. The inoculated petri plates were incubated in inverted position at room temperature 27°C±2 for 2-7 days.

b. Counting of fungal colonies

After 4 days of incubation number of distinct colonies was counted by using colony counter. The number of organism per ml of original suspensions was calculated as follows

$$\text{Organism per gram of the sample} = \frac{\text{No. of colonies (Average of three replication)}}{\text{Amount plated X Dilution factor}}$$

The number of colonies per plate in 1 gm of soil sample was calculated. The percentage contribution of each isolate was calculated by using the formula. Distinguishing colonies were picked up and subculture on appropriate media. The subculture was maintained for further observation on selection media.

c. Identification of fungal forms

Asthana and Hawker, s medium 'A' was used to maintain stock cultures. Isolated fungal forms were identified on the basis of available literature including manuals and monograph as Raper and Thorm [9], Gilman [10], Illustrated genera of imperfect fungi by Barnett and Bary Hunter [11] and isolates were stored in Mycopathological Laboratory,Yashwantrao Chavan Arts & Science Mahavidyalaya, Mangrulpir, Dist. Washim.

3. RESULTS

Rhizosphere mycoflora of vegetables: - The rhizosphere soil samples were collected from the specific vegetables field of Amravati and Akola region for fungal isolation at monthly interval i.e. in February, March, April, July, August, September, October, November and December 2013. The potato dextrose agar (PDA) media were used for isolation of rhizosphere mycoflora of each field so as to accommodate nutritional requirements of the fungi. During every month for the isolation of rhizosphere mycoflora of vegetable of each field, 3 Petri plates were used so 24 dishes are poured. After 4 days of incubation, all possible fungi in vegetable rhizosphere formed colonies and no further increase in the number of colonies was there; hence the colonies per dish were calculated on 6th or 7th day. A fungus was tentatively identified based on color of colonies, fruiting bodies, spore, etc.

Rhizosphere mycoflora of brinjal: -The 12 species belonging to 12 genera were isolated and identified from the brinjal field viz. *Rhizoctonia solani* Kuehn, *Aspergillus niger* Van. Tiegh, *Oidiodendron sp.* Robak, *Trichoderma harzianum Rafai*., *Eurotium sp.* Link ex Fr., *Verticillium lecanae* Nees., *Alternaria alternata* Fr. (C) Keissler, *Fusarium equisetii* Corda., *Monilia sp.*Pers., *Peyronellaea sp.* Goidanich., *Phoma exigua* Desm and *Penicillium notatum.* Amongst the predominant fungi 12 species were isolated from brinjal rhizosphere from Amravati and Akola region. The total number of fungal populations in Amravati region was 1030.6 and in Akola region total number of fungal population was recorded 1168.2; (Table-1).

The observation table clearly shows that amongst the total fungal population ($X10^{-4}$) in vegetable rhizosphere of different fields (Table -2) fungal population was more in the month of August and declined thereafter up to February. The rhizosphere fungal population of brinjal found to be highest infield of Amravati region and it was found to be (193.6). In Akola region fungal population of brinjal increased in the month of August (298.8) and declined in month of February i. e. 53.1; (Table-2).

Rhizosphere mycoflora of chili: - Various types of soil born fungi infected the chili crop. The number of rhizosphere fungi were isolated and identified from chili. The 12 species were isolated and identified from rhizosphere soil samples of chili. These are-*Rhizoctonia bataticola* (Taub.) Butler, *Aspergillus flavus* Link. *Trichoderma viride* Pers. Ex Fr., *Colletotrichum capsici*, *Alternaria sp.* Nees., *Fusarium moniliformae* Sheldon, *Curvularia lunata* (Wakker) Boedijn, *Helminthosporium sp.* Link ex Fr., *Catenophora sp.* Luttrell, *Macrophomina phaseolina* (Tassi) Goid, *Phoma alternare*, *Penicillium oxalicum* Currie and Thom.

Table 1: - Total no. of rhizosphere fungal population (x 10^{-4}) of different vegetables in Amravati (A) and Akola (B) region.

Sr. No.	Region- field	Name of the vegetable	Total no. of fungal population (x 10^{-4})
A	Amravati Region	Brinjal	1030.6
		Chili	1014.6
B	Akola Region	Brinjal	1168.2
		Chili	1596.4

Table 2: - Monthly rhizosphere fungal population (x 10^{-4}) of different vegetables in Amravati (A) and Akola (B) region.

Sr. No.	Region-Field	Name of the vegetable	Monthly fungal population (x 10^{-4})								
			Feb.	Mar.	Apr.	July.	Aug.	Sep.	Oct.	Nov.	Dec.
A	Amravati Region	Brinjal	53.9	76.7	86.4	101.6	193.6	182.1	144.8	111.4	80.1
		Chili	60.1	59.2	65.1	78.9	261.1	229.9	82.9	74.9	102.5
B	Akola Region	Brinjal	53.1	70.1	89.2	118.2	298.8	242.1	130.8	87.8	78.1
		Chili	59.6	78.9	87.2	76.2	301.9	284.4	176.6	461	70.6

Total 12 species were isolated from brinjal and chili rhizosphere in Amravati region and Akola region. The total no. of fungal population reported in chili rhizosphere was 1014.6, and from Akola region total number of fungal population in chili rhizosphere found to be 1596.4; (Table-1). The observation table clearly shows that fungal population of chili was again more in the month of August and declined thereafter up to February. The rhizosphere fungal population in Amravati region was highest in second season i.e. in the month of August 261.1 and lowest in month of March 59.2. While in Akola region the rhizosphere mycoflora increased in the month of August 301.9 and it was declined in the month of February 59.6; (Table- 2).

4. CONCLUSION

The present study clearly indicates that the rhizosphere fungal population was more in the rainy season particularly in the month of August and September but decreases thereafter up to February. The highest fungal population was reported in month of August (311.9) and lowest recorded in the month of February (50.8) from chili rhizosphere of Amravati region. The main aim and objective of study of rhizosphere mycoflora of vegetable to known the fungi present and to investigate the soil born pathogenic and non-pathogenic fungi of selected two vegetable crops. The identified pathogenic fungi were treated for antagonistic analysis, which showed excellent results.

From the earlier literature it was noticed that several studies were conducted in India and outside. It was conclusively established that mycoflora of rhizosphere of different plants are next to bacteria in abundance [12].

Conflict of interest

No conflict of interest influenced in this research.

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