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Research Article



Rhizosphere Algal Flora of Fenugreek (*Trigonella Foenum-Gracecum L.*)

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Abstract

In present research work rhizosphere algal flora of Fenugreek (*Trigonella foenum-gracecum L.*) has been studied in detail by soil dilution method. Locally Fenugreek plant is known as Methi. Rhizosphere algae from Fenugreek plant were isolated at three different growth stages of plant i.e. seedling stage, flowering stage and fruiting stage. Soil from the same field was also collected and cultured for algal composition termed as control. The number of algal taxa was greater in rhizosphere than the control. Maximum number of algal taxa were recorded at flowering stage of plant. A total of 21 species under 14 genera were recorded from rhizosphere of Fenugreek plant. Of these, 4 species under 3 genera belonged to Chlorophyceae, 2 species under 2 genera belonged to Bacillariophyceae and 15 species under 9 genera belonged to Cyanophyceae. In rhizosphere *Gloeocystis gigas*, *Chlorella vulgaris*, *Chroococcus minor*, *Chroococcus turgidus*, *Gloeothece palea*, *Aphanothece nidulans*, *Oscillatoria obscura*, *Oscillatoria subbrevis* and *Phormidium molle* were found dominant. Species composition study of rhizosphere algal flora reveals that, species composition of Cyanophyceae was greater as compared to Chlorophyceae and Bacillariophyceae.

INTRODUCTION

Rhizosphere is the zone of soil in the immediate vicinity of plant roots, characterized by intense microbial activity. The term Rhizosphere was introduced by Lorenz Hiltner (1904) to denote the region of soil which is influenced by plant roots. Rhizosphere microflora is quantitatively and qualitatively different from that of the soil. Extensive review of literature reveals that very few studies on rhizosphere algae have been made in the past. Starkey (1938) reported diatoms from rhizosphere of higher plants. Katznelson (1946) observed blue green algae from rhizosphere algae of tea plant. Gonzalves and Yalavigi (1960) worked on algae in rhizosphere of sorghum, wheat and cotton plants. Hodfield studied Rhizosphere effect on soil

algae. Woodbine and Cullimore (1963) studied rhizosphere algae of pea plant. Gantar *et al.* (1991) conducted a survey on Cyanobacteria associated with roots of wheat plant. Prasanna *et al.* (2009) worked on diversity of Cyanobacteria in the rice rhizosphere. Kumar and Kumar (2010) recorded 12 taxa of algae living in close proximity of the rhizoidal system of mosses.

Hifney *et al.* (2013) studied quantitative and qualitative variations in the various rhizosphere algae of 16 weed plants. In order to study algal population in the rhizosphere of Fenugreek (*Trigonella foenum-gracecum L.*) plant the present research work was carried out. Locally Fenugreek plant is known as methi.

MATERIALS AND METHODS

In present research work, rhizosphere algae of Fenugreek plant have been studied in detail. Rhizosphere algae from Fenugreek plant has been isolated at three different growth stages of plant i.e. seedling stage, flowering stage and fruiting stage. This was studied by soil dilution plate count method as suggested by Hiltner (1904). Petriplates with agarized Bold's basal medium were used for culturing of rhizosphere algae.

A Fenugreek plant from field carefully uprooted and brought to the laboratory. The soil around roots was removed and collected in sterilized petriplate. 1gm of soil is dissolved in 100 ml of sterile distilled water. 1ml of suspension was inoculated into the plate containing agarized Bold's basal medium. Liquid nutrient medium was poured in to the plates at the time of keeping those for incubation in algal culture chamber. After 21 days algal colonies were counted and observed under research microscope for identification and taxonomic study. Soil from same field was collected and cultured for algal composition termed as control.

RESULTS AND DISCUSSION

An account of algal colonies isolated from control and rhizosphere shows maximum number of algal colonies were recorded in rhizosphere than control (Table 1). Algal taxa isolated and cultured from control and rhizosphere at different growth

stages are listed in Table 2. These taxa belonged to class Chlorophyceae, Bacillariophyceae and Cyanophyceae. Classwise species and genera of algae from control and rhizosphere at 15 days, 45 days and 80 days growth stages is given in Table 3. Number of algal taxa increases from seedling stage to flowering stage and decreases at fruiting stages. Maximum number of algal taxa were recorded at flowering stage in (Table 3)

Altogether 21 species under 14 genera were recorded from rhizosphere of Fenugreek plant of these 4 species under 3 genera belonged to Chlorophyceae, 2 species under 2 genera belonged to Bacillariophyceae and 15 species under 9 genera belonged to Cyanophyceae. The members of Cyanophyceae were abundant. Gonzalves and Yalavigi (1960), Gantar *et al.* (1991), Prasanna *et al.* (2009), Hifney *et al.* (2013) and Madhvi *et al.* (2014) reported dominance of Cyanophyceae members from rhizosphere of jowar, wheat, cotton, pea and weed plants. During present study a total of 12 species under 9 genera were recorded from control soil, of these 4 species under 3 genera belonged to Chlorophyceae and 8 species under 6 genera belonged to Cyanophyceae. Maximum number of algal taxa were recorded in rhizosphere than control. Similar kind of observations were made by Gonzalves and Yalavigi (1960), Gantar *et al.* (1991), Prasanna *et al.* (2009). Rhizosphere and soil ratio is significant while studying rhizosphere algal flora.

$$R: S = \frac{\text{Total number of algal taxa isolated and cultured from rhizosphere}}{\text{Total number of algal taxa isolated and cultured from control soil}}$$

$$R: S = 21/12$$

$$R: S = 1.75$$

Algal taxa which were found dominant in rhizosphere of Fenugreek plant are *Gloeocystis gigas*, *Chlorella vulgaris*, *Chroococcus minor*, *Chroococcus turgidus*, *Gloeothece palea*, *Aphanothece nidulans*, *Oscillatoria obscura*, *Oscillatoria subbrevis* and *Phormidium molle*. Gonzalves and Yalavigi (1960) reported dominance of *Chlorococcum humicola*, *Hantzschia amphioxys*, *Nostoc sphaericum* and *Phormidium faveolarum*. Prasanna *et al.* (2009) observed abundance of *Chlorococcum*, *Anabaena*, *Nostoc* and *Scytonema* from rhizosphere of rice. Madhvi *et al.* (2014) recorded dominance of *Chlorella vulgaris*, *Chlorococcum humicola*, *Chroococcus minor*, *Chroococcus turgidus*, *Merismopedia tenuissima*,

Nostoc commune, *Nostoc linkia*, *Nostoc punctiformae*, *Phormidium ambighum* and *Calothrix braunii* in rhizosphere of rice plant. In present study maximum number of algal taxa in rhizosphere were recorded at flowering stage. Similar kind of results were reported by Gonzalves and Yalavigi (1960). While studying rhizosphere algal flora of jowar, wheat and cotton. Madhvi *et al.* (2014) recorded algal population dynamics at optimum level in flowering stage of rice.

Hence it is concluded that, rhizosphere algal flora of Fenugreek plant has been studied at three different growth stages of plant i.e. seedling, flowering and fruiting stage and compared with control soil.

Table1: Number of colony forming units in control and rhizosphere of Fenugreek (*Trigonella foenumgraecum* L.) plant at different growth stages.

Sr. No.	Growth Stage	Control	Rhizosphere
1	15 days	03	06
2	45 days	05	13
3	80 days	07	10

Table 2: Algal of taxa recorded at different growth stages in control and rhizosphere.

Sr. No.	Name of Algae	Control			Rhizosphere		
		I stage	II stage	III stage	I stage	II stage	III stage
I	CHLOROPHYCEAE						
1	<i>Gloeocystis gigas</i> (Kuetzing) Lagerheim	+	+	+	+	+	+
2	<i>Gloeocystis major</i> , Gerneck et lemmer mann	-	+	+	+	+	+
3	<i>Chlorochocum humicola</i> (Naeg.) Rabenhorst	-	+	+	-	+	+
4	<i>Chlorella vulgaris</i> Beyerink	-	+	+	+	+	+
II	BACILLARIOPHYCEAE						
1	<i>Pinnularia</i> sp. Ehrenberg	-	-	-	-	+	+
2	<i>Nitzschia palea</i> (Kuetz) W. Smith	-	-	-	-	-	+
III	CYANOPHYCEAE						
1	<i>Chroocococcus minor</i> Kuetzing	-	+	+	+	+	+
2	<i>Chroocococcus minutus</i> Kuetzing	-	-	-	-	+	+
3	<i>Chroocococcus turgidus</i> Kuetzing	-	+	-	+	+	-
4	<i>Gloeothece palea</i> (Kuetz.) Rabenh	+	-	-	-	+	+
5	<i>Aphanocapsa pulchra</i> (Kuetz.) Rabenh	-	-	-	-	-	+
6	<i>Aphanothece nidulans</i> Richter	-	+	+	+	+	+
7	<i>Aphanothece saxicola</i> Nag.	+	-	+	+	+	+
8	<i>Merismopedia punctata</i> Meyen	-	-	-	-	+	-
9	<i>Merismopedia tenuissima</i> Lemm	-	+	-	+	-	-
10	<i>Oscillatoria obscura</i> Bruhl et Biswa	-	-	-	-	-	+
11	<i>Oscillatoria subbrevis</i> schmidle	-	-	-	-	+	+
12	<i>Phormidium jenkelianum</i> Shmid	-	-	-	-	-	+
13	<i>Phormidium molle</i> (Kuetz.) Gomont	+	-	+	+	+	+
14	<i>Lyngbya hieronymusii</i> Lemm	-	-	+	-	+	+
15	<i>Calothrix</i> sp. Ag.	-	-	-	-	-	+

+ = Present; - = Absent

Table 3: Number of algal taxa isolated from control and rhizosphere of Fenugreek (*Trigonella foenum-graecum* L.) plant.

Sr. No.	Growth stage	Chlorophyceae		Bacillariophyceae		Cyanophyceae		Total	
		Genera	Species	Genera	Species	Genera	Species	Genera	Species
1	15 days Control	01	01	-	-	03	03	04	04
	rhizosphere	02	03	-	-	05	05	05	08
2	45 days Control	03	04	-	-	03	04	06	08
	rhizosphere	03	04	02	02	08	12	13	18
3	80 days Control	03	04	-	-	04	05	07	09
	rhizosphere	03	04	01	01	06	10	10	15

Fig.1: Algal taxa isolated from Rhizosphere of Fenugreek.

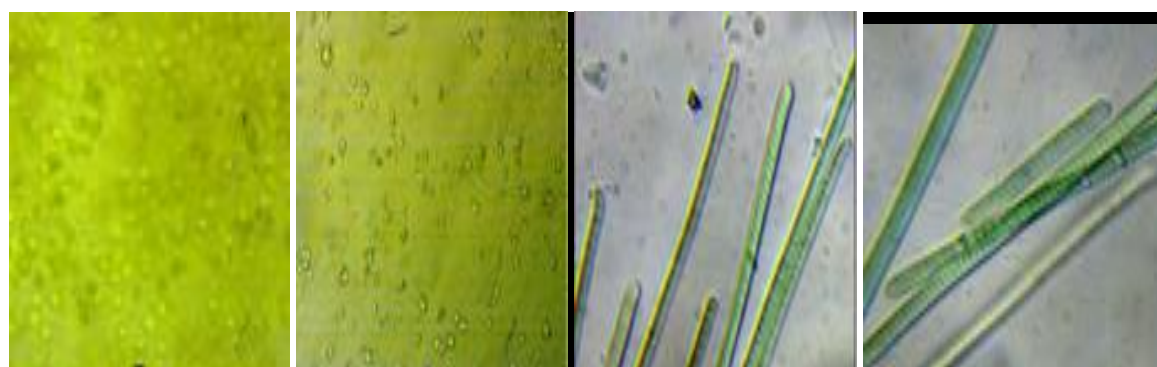


Gloeocystis major

Nitzschia palea

Pinnularia sp.

Chroococcus turgidus



Gloeotheca palea

Aphanothece saxicola

Oscillatoria obscura

Oscillatoria subbrevis

Maximum number of algal colonies were recorded in rhizosphere than control. Altogether 21 species under 14 genera were recorded from rhizosphere of Fenugreek plant. In control 12 species under 9 genera were recorded. Maximum number of algal taxa were recorded in rhizosphere than control. The

number of algal taxa was greater in rhizosphere than control soil. Maximum number of algal taxa were recorded at flowering stage of plant. Cyanophycean algal taxa dominated rhizosphere algal flora.

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