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Diagnostic study of algae present in some soils cultivated with Medicago sativa (Alfalfa) in Al-Shafia district.

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Conclusion

The current study aimed to test the algae found in some soils planted with Medicago Sativa (Alfalfa) in Al-Shafia district. Four sites were selected during the period from March to April 2022.

The results of the current study indicated that the number of species diagnosed in the current study reached to 51 species belonging to 30 genera. The blue-green algae were the dominant, as the number of species reached to 29 species belonging to 13 genera, with a rate 56.862%. Followed by green algae, which were 12 species belonging to 9 genera, with a rate 23.529%. Finally, diatoms reached to 10 species belonging to 8 genera, with a rate 19.607%. It was also noted in the current study that the genus Oscillatoria, which belongs to blue-green algae, was the dominant over the rest of the species. It was 12 species, with a rate 23.529%. The highest number of algae was 30 in the second site during the month of March, and the lowest number of algae reached 18 in the fourth site during April.

Some types of algae recorded complete dominance in all sites during April, including sex *Chroococcus disperses* and *Oscillatoria perornata* and *Scenedesmus dimorphus*. As for the month of March, the species prevailed were *Scenedesmus longus*, *Tetraedron muticum*, and *Nitzschia hungarica.* While it was noted that there are species that appeared in one site and did not appear in another site. This may be due to the fluctuation

in water availability in addition to other factors, while the species composition remains constant.

Introduction

Algae are thallus plants that lack roots, stems, and leaves, and are distinguished by their presence of chlorophyll pigment (Hu *et al.*, 2003). It was also able to live in different environments such as water, soil and tree bark (Fleming and Haselkorn, 1973). It is also found on the surface of the soil or places where light reaches within the soil (Russel, 1973). The presence of algae in the soil depends on many environmental factors, including plants and other organisms. Moreover, its presence in the soil varies according to the seasons of the year and the availability of appropriate conditions, including soil moisture and temperature (Patterson, 1995). Algae diversity may occur as a result of ecosystem stability, plant type, soil properties, nutrient level, and climatic conditions (Kumar and Sahu, 2012). Its distribution and abundance are affected by a group of factors such as plant type and soil condition, cultivated or uncultivated (Aleksachina and Ština, 1984). The algae present in the soil are of importance to the plant, as some types of algae fix nitrogen and work to improve the quality of the soil (Metting, 1981).

Among them are blue-green algae, they have a role in fixing nitrogen and phosphorus and secreting organic acids that help to increase soil fertility, retain water and provide nutrients (Saadantia and Riahi, 2009).

Key words: algae, agricultural soils, *Medicago sativa (Alfalfa).*

Materials and methods of work

1- Description of the study area

Al-Shafi district is considered one of the important sub-districts in Al-Diwaniyah, located 5 kilometers to the west of the Al-Diwaniyah-Najaf road. It has an area of 612 km2 located between latitudes 31.9482757 N and 44.8344051 E. Al-Shafia sub-district depends mainly on agriculture, especially the cultivation of alfalfa, as well as the cultivation of rapeseed in the summer and wheat and barley in the winter, in addition to the

cultivation of fruits and vegetables. And it contains many orchards planted with palm trees and various types of fruits.

A figure of the Shafia district map showing the study sites

2-Sample collection

Samples were collected from the surface layer of soil planted with alfalfa plants in Al-Shafia district, during the period from March to April, in four sites. Samples were collected from several places in each site.

The places where the samples were collected and planted with alfalfa

3-Isolation and identification of algae

Algae were isolated from the soil according to the method described by Moss (1966), where samples were collected from the study area from the surface layer of moist soil at a depth of approximately 5 cm.

Using a shovel with a sharp edge, then the samples were placed in marked polyethylene bags and a little distilled water was added to them. After that, they were closed and left without stirring. In the laboratory, 40 g of soil was taken and placed in Petri dishes to isolate soil algae Then, lens papers were placed on the surface of the soil from which algae were to be isolated so that the algae would stick to them. These dishes were left inside the laboratory during the night. It was exposed to a very dim light and left until the next morning, after which papers were removed to clean the lenses and the algae that had stuck to them. After that, they were placed in vials of 25 ml, and 10 ml of distilled water was added with 4-5 drops of Lugols Solution as a preservative, and shaken well. Algae found in soil samples were diagnosed by examining them with a light microscope under 40x magnification and using temporary slides. For diagnosis, sources were used (Desikachary, 1959 and Prescott, 1973).






Results and discussion

The number of species diagnosed in the current study was 51 species belonging to 30 genera, and blue-green algae were the dominant species. And the number of species reached 29 species belonging to 13 genera, with a rate of 56.862%. Followed by green algae, which reached 12 species belonging to 9 genera, with a rate of 23.529%, and finally diatoms reached 10 species belonging to 8 genera, with a rate of 19.607%. In the current study, it was noted that the genus *Oscillatoria*, which belongs to blue-green algae, was dominant over the rest of the species, reaching 12 species, with a rate of 23.529%. Perhaps this is due to its ability to withstand unsuitable environmental conditions and adapt them (Ahmed, 1994). The dominance of blue-green algae over the rest of the species may be due to its ability to adapt to survive under unfavorable conditions (Brock, 1973). The results showed in Table (1) that the highest number of algae was 30 in the second site during the month of March. The reason for the high number of algae in this site may be due to the presence of a high percentage of nitrates and organic matter, which has a significant and positive effect on the growth and reproduction of algae (Osman et al., 2003). As for the lowest number

of algae, it reached 18 in the fourth site during April. The decrease may be due to the availability of unfavorable conditions, which have an effect on the decrease in metabolic activity in algal cells (Elliott *et al.*, 2006). perhaps to a decrease in calcium, which is necessary for the growth of algae (Allen and Arnon, 1955). It may be due to the type of cultivated plant, which is the alfalfa plant.

Keeling (1974) mentioned that the number and type of organisms present in the soil is affected by the root secretions of plants, which have chemical compositions that directly or indirectly affect the number of species present in the soil.

Some types of algae recorded complete dominance in all sites during April, including sex *Chroococcus disperses* and *cillatoria perornata* and *Scenedesmus dimorphus.* As for March, the species were *Scenedesmus longus, Tetraedron muticum,* and *Nitzschia hungarica*, while it was noted that there are species that appeared in one location and do not appear in another location. This may be due to the fluctuation in the availability of water in addition to other factors, while the composition of the species remains constant (Metting, 1981). In addition, the cultivated soils use fertilizers, herbicides, and pesticides; it is known that these pesticides affect algae, as some species vary in their sensitivity to different concentrations of pesticides (Mostafa and Helling, 2002). The results also showed in Table 1 that the number of algae species containing the heterotrophic and nitrogen-fixing vesicles, such as Anabaena, was less than the non-nitrogen-fixing species that did not contain the heterovesicle. This may be because the types of blue-green algae that fix nitrogen are affected by environmental factors and resulting from human activities. Such as the use of chemical fertilizers that inhibit nitrogen fixation in blue-green algae (Deluca et al., 1996). The alfalfa plant also releases flavonoids, which have chemical structures through which the plant can create an Ecochemical Zone that controls the number and type of microorganisms present in the soil (Hartwig *et al.,* 1991). Huang *et al.,* (2015) indicated that flavonoids affect the growth and physiological functions of some types of blue-green algae.

Table (1) shows the types of algae in soils planted with Medicago Sativa (Alfalfa) during March until April of 2022 in Al-Shafia district

agricultural sites / Algae species	April				March			
	S4	S3	S2	S1	S4	S3	S2	S1
Cyanophyta								
Anabaena spirodes Klebehn	_	+	+	_	_	+	+	+
Aphanocapsa koordersi smith	+	+	_	+	+	_	+	_
Aphanothece microscopica Nag	_	_	_	_	+	_	+	_
A. nidularis Richter,p	_	+	_	_	_	+	+	+
Arthrospira khannae Dronet	_	_	+	+	_	_	+	_
Chroococcus dispersus G.M.Smith	+	+	+	+	+	_	+	_
C. minutus (kutz)Nag	_	_	_	+	_	+	_	+
Gloeocapsa Fuscolutea Nag.	_	+	_	+	+	_	_	_
Lyngbya birgei Smith,G.M	_	+	+	_	_	+	_	_
L. lagerheimii(moebius)Gom	+	+	_	+	_	_	+	+
Merismopedia punctata Meyen	+	_	+	_	_	+	_	_
Microcystis marginata (Menegh) Kutz.	_	_	+	_	+	_	+	+
Oscillatoria acuta Bruhlet Biswas	_	+	_	_	_	+	+	_
O. Agardhii Gomont	_	+	_	+	_	_	+	+
O. amoena Gom	+	_	+	_	+	_	_	_
O. animalis Ag.ex.Gomont	_	+	+		_	_	+	_
O. boryana Bory	_	_	+	+	_	+	_	+
O. chlorine Kutz	_	+	_	_	_	_	_	_
O. curviceps Ghose	_	_	_	+	_	_	+	_
O. geitleriana Fremy	_	_	+	_	_	_	+	_
O. lemmermanni Wolosz	+	-	-	-	+	+	_	+
O. limosa Ag.ex.Gomont	-	+	-	-	-	-	+	+
O. perornata Skuja	+	+	+	+	-	+	+	-
O. subbrevis Schmidle	+	-	+	-	-	+	-	+

Phormidium Favosum Bory	_	_	_	+	_	_	_	_
P. Jadinianum Gomont	_	_	+	_	+	_	_	+
P.tenue (Meneegh) Gom	_	_	_	+	_	_	+	+
Schizothrix. Vaginata (Nag)Gomont)	+	+	_	_	+	_	+	_
Spirulina meneghiniana (zanard) Gom	_	+	_	+	_	_	+	+
Chlorophyta								
Ankistrodesmus convolutus Corda	+	_	_	+	_	_	+	_
Chlamydomonas tremulans (Rodhe)	_	+	_	_	+	_	_	_
Chlorella sp.	_	+	_	_	_	+	_	_
Chlorella vulgaris Beyerinck	_	+	_	+	_	_	+	+
Cosmarium hammeri Reinsch	+	_	_	_	+	+	_	_
Gleocystis bcillus Teiling	_	_	_	+	_	_	_	_
Pediastrum simplex Meyen	+	+	_	+	_	_	+	_
P. duplex Meyen	_	+	+	_	_	+	_	+
Scenedesmus acuminatus (Lag.) Chodat	_	_	+	_	_	_	+	_
S. dimorphus (Turp) Kuetzing	+	+	+	+	+	+	-	+
S. longus Meyen	+	_	+	_	+	+	+	+
Tetraedron muticum Hangsgirg	+	_	+	_	+	+	+	+
Bacillariophyta								
Amphora veneta Kutz	_	+	_	+	_	_	+	_
Cyclotella ocellata Pantocsek	_	+	+		+	_	+	+
Cymbella lanceolata Ehrenb	+	_	_	+	_	+	_	+

Gymatopleura solea (Brebisson) W. Smith	–	–	+	–	–	+	+	–
Navicula accomoda (Hust)	–	+	+	–	+	+	+	–
cryptocephala Kutz..*N*	–	+	–	–	–	+	–	+
Nitzschia frustulum (Kutz) Grun.	+	–	–	–	+	+	–	+
hungarica Grun..*N*	+	–	–	–	+	+	+	+
Pinnularia appendiculata (Ag)Cleve	–	+	+	–	+	+	+	–
Synedra acus Kutzing	+	–	–	–	–	+	–	+
The number of algae species found at each site	18	26	23	20	19	24	30	23

(+) the presence of the type (-) the absence of the type

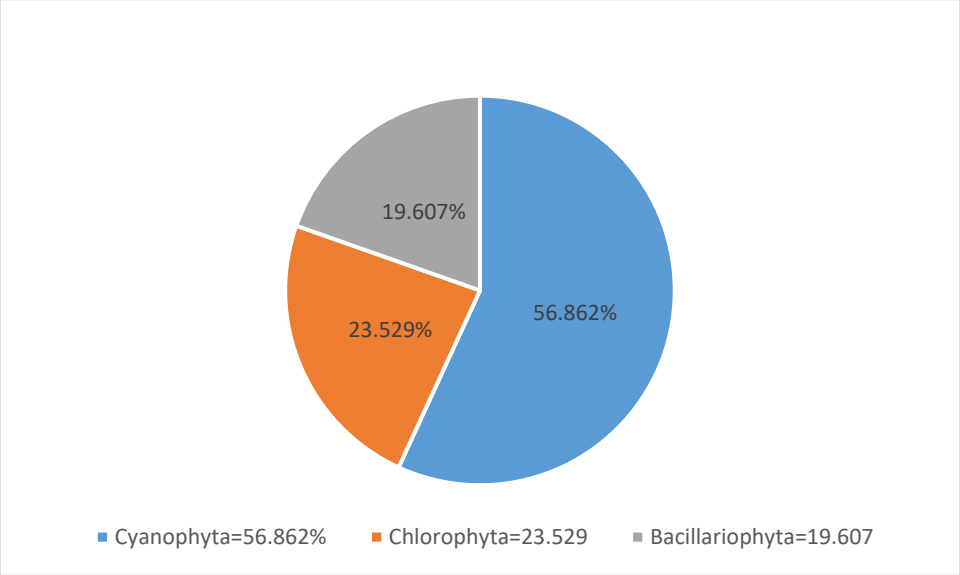

Figure showing the percentage of algae

Conclusions

1- The diversity of algae in soils cultivated with alfalfa plants is affected by many factors; including the type of plant grown, water availability, and the addition of fertilizers and pesticides.
2 The dominance of the genus Oscillatoria over the rest of the species due to its characteristics that enabled it to resistance to various environmental conditions
3- The lack of appearance of species in some sites as a result of human activities such as the use of fertilizers and pesticides.

Recommendations

1- Conducting a comparative study among the types of algae found in soils planted with alfalfa plants and other agricultural lands planted with different plants.
2- Carrying out awareness and guidance programs on how to use fertilizers and pesticides.
It will reduce the appearance of beneficial soil species that fix nitrogen

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