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Taxonomic Composition of Soil Algoflora of the Northern Fergana Valley

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Abstract

The article provides information on the leading classes, order, families, genera, and species identified in the soil algoflora of the Northern Fergana Valley. The distribution of the species at the observation points of the eastern and western parts was explained by the fact that the species is constantly changing as a result of the influence of environmental factors. Species belonging to the divisions Cyanophyta, Xanthophyta, Bacillariophyta and Chlorophyta have been systematically analyzed and scientifically based on the seasons.

Keywords: Algae, section, species, variation, dominant, diatom, region, abiotic, biotic, anthropogenic, dominant

Introduction

Particular attention is paid to the identification of soil algae diversity in the world, the assessment of their biological activity and their involvement in the production of productive species. In this regard, the distribution characteristics of algae depending on soil types and its agro-physical characteristics were determined, the dynamics of algoflora in the soil of active agricultural lands was assessed, methods of propagating cost-effective algae species on soil horizons based on biotechnological methods were improved. It should be noted that the rapid increase in soil algae, the characteristics of easy occupation of open areas and the ability to easily adapt to adverse environmental factors determine the sharp differences in the representatives of soil algoflora in different geographical regions.

Materials and Methods

Fieldwork included sampling soil by steep regions. Soil sampling was conducted throughout the year - in spring, summer, autumn and winter - based on a pre-planned route. Directions were mapped and the time and location of the samples were determined. Laboratory soil collection, planting, cultivation and microscopy testing were performed using techniques developed by Gollerbach and Stein. The collected specimens were used in the cultivation of soil algae and in the identification of the species, ordinary Petri plates and sausages. Initially, Petri's plates and sausages are covered by an autoclave made of special lids. 1.5 atmospheric pressure is sterilized at 1200 C. The process took about 20-30 minutes. Sterilized tubes are filled with 10 grams of soil and pour 100 ml of distilled water. Petri's plates were filled with 10 grams of soil and poured 50 ml of water. The tube and Petri plates were then stored in a moderate environment with sufficient light. After 1–2 weeks, microscopy of algae growth and development was investigated [12; Pp. 350, 13; Pp. 228].

Research Objects

Observatory No. 1, where algal samples were collected, was taken from the field of Buramatut Sahovati farm in Buramatut village, Turakurgan district, Namangan region. This observation point is located at an altitude of 450 meters above sea level (N 71, 40 989 9; E40, 92 232 9) and belongs to the dark gray soil type. 2 observation points. It was taken from the wheat field of Mirzo Bobur farm in Yorilgan village of

Yangikurgan district. The region is located at an altitude of 712 meters above sea level (N 71, 70 109 7; E 41, 15 344 6) and the soil belongs to the gray soil type.

3 observation points. Samples were taken from the orchard of the farm "Kahharov Halim Ergashevich" in Pastyalangoch village of Yangikurgan district. This observation point is located at an altitude of 1100 meters above sea level (N 71, 68 097 6; E 41, 36 610 1).

4 observation points (4 kn.). Samples were taken from the orchard of Mamurjon farm in Zarkent village of Yangikurgan district. This observation point is located at an altitude of 1150 meters above sea level (N 71, 68 220 5; E 41, 39 988 3).

5 observation points. Taken from the field of agricultural crops of the farm "Tukhtamurod Samatov" in Nanay village of Yangikurgan district. This observation point is located at an altitude of 1400 meters above sea level (N 71, 69 466 4; E 41, 50 760 3).

6 observation points. Taken from the arable land of the farm "Archideya" in the village of Valley, Pop district. This observation point is located at an altitude of 375 meters above sea level (N 71, 11 506 5; E 40, 85 253 3).

7 observation points. Samples were taken from the newly built orchard of the Kuronbi farm of the Jiydali reservoir in the Pop district. This observation point is located at an altitude of 535 meters above sea level (N 70, 90 024 4; E 40, 83 757 6).

8 observation points. Samples taken from Madaniyat village of Pop district. This observation point is located at an altitude of 1100 meters above sea level (N 70, 89 960 8; E 41, 09 931 4).

9 observation points. Samples taken from Chorkesar village of Pop district. This observation point is located at an altitude of 1,500 meters above sea level (N 70, 87 685 1; E 41, 02 295 2).

10 observation points. Samples from Parda Tursun village, Pop district. This observation point is located at an altitude of 1650 meters above sea level (N 70, 86 485 2; E 41, 09 147 2).

Analysis of the Results

There are a total of 9 classes in the soil algoflora of the steep regions of the Northern Fergana Valley, and the following classes Cyanophyceae, Bacillariophyceae, Chlorophyceae, and Xanthophyceae were considered polymorphic among the leaders. The number of species in them is given in Table 1.

Table 1: Leading classes in soil algoflora

Departments	Class	Number of species	In 247% of rounds
Cyanophyta	Cyanophyceae	177	71,66
Bacillariophyta	Bacillariophyceae	26	10,53
Chlorophyta	Chlorophyceae	20	8,09
Xanthophyta	Xanthophyceae	15	6,07
Total:	**4**	**238**	**96,36**

These polymorphic classes combine a total of 238 species and subspecies. The species in them accounted for 96.36% of the total algae flora. Among these classes, Cyanophyceae is the clear leader, comprising 177 species and subspecies, and accounting for 71.66% of the total algoflora. The remaining classes of

Bacillariophyceae (26; 10.53%), Chlorophyceae (20; 8.09%), and Xanthophyceae (15; 6.07%) owned a total of 61 species and subspecies and accounted for 24.69% of the total algoflora .

The leading arrangements included 192 species and varieties of algoflora, accounting for 77.73% of the total soil algoflora. The number of species in their composition is given in Table 2.

Table 2: Leading regimes in soil algoflora

Departments	Order	Number of species	In 247% of rounds
Cyanophyta	Oscillatoriales	94	38,06
	Chroococcales	31	12,55
	Nostocales	25	10,12
	Synechococcales	22	8,91
Xanthophyta	Mischococcales	10	4,05
Chlorophyta	Chlamydomonadales	10	4,05
Total:	**6**	**192**	**77,73**

The order of Oscillatoriales presented in the table included 94 species and species diversity (38.06%) and showed itself as the main leader. The remaining leading modes are: Chroococcales (31; 12.55%), Nostocales (25; 10.12%), Synechococcales (22; 8.91%), Mischococcales (10; 4.05%) and Chlamydomonadales (10; 4, 05%). The leading orders of algoflora in the Bacillariophyta division were not identified. The leading families in the algoflora were 12, including: Oscillatoriaceae (77; 31.17%), Microcystidaceae (26; 10.53%), Nostocaseae (17; 6.88%) from the Cyanophyta division. Microcoleaceae (14; 5.67%), Schizothrichaceae (12; 4.86%), Merismopediaceae (9; 3.64%), Rivulariaceae (5; 2.02%), Pleurochloridaceae (5; 2.02%), Bacillariaceae (8; 3.24%), Achnanthaceae (6; 2.43%), Naviculaceae (6; 2.43%), and Chlorococcaceae (5; 2.02%) were noted. This section combined 190 species and accounted for 76.92% of the total soil algoflora. The number of species in the leading families listed is given in Table 3.

Table 3: Leading families in soil algoflora

Departments	Family	Number of species	In 247% of rounds
Cyanophyta	Oscillatoriaceae	77	31,17
	Microcystaceae	26	10,53
	Nostocaceae	17	6,88
	Microcoleaceae	14	5,67
	Schizothrichaceae	12	4,86
	Merismopediaceae	9	3,64
	Rivulariaceae	5	2,02
Total:	**7**	**160**	**64,78**
Xanthophyta	Pleurochloridaceae	5	2,02

Total:	**1**	**5**	**2,02**
Bacillariophyta	Bacillariaceae	8	3,24
	Achnanthaceae	6	2,43
	Naviculaceae	6	2,43
Total:	**3**	**20**	**8,09**
Chlorophyta	Chlorococcaceae	5	2,02
Total:	**1**	**5**	**2,02**
That's all:	**12**	**190**	**76,92**

The data in the table show 7 families from the Cyanophyta division, 160 species (64.78%); 3 families, 20 species (8.09%) from the division of Bacillariophyta; Pleurochloridaceae family, 5 species (2.02%) from Xanthophyta division and Chlorococcaceae family, 5 species (2.02%) from Chlorophyta division. The remaining 45 families have a total of 56 species, with 1-4 species. They accounted for 22.67% of the total algoflora [1; Pp. 344, 2; Pp. 384].

The leading genera in algoflora were coni 12, which owned 160 species and varieties, i.e., total soil algoflora (64.78%). The number of species in the leading categories is given in Table 4.

Table 4: Leading categories in soil algoflora

Departments	Category	Number of species	In 247% of rounds
Cyanophyta	*Oscillatoria*	30	12,15
	Phormidium	27	10,93
	Gloeocapsa	17	6,88
	Lyngbya	17	6,88
	Nostoc	16	6,48
	Schizothrix	12	4,86
	Microcystis	9	3,64
	Microcoleus	8	3,24
	Symploca	5	2,02
Total:	**9**	**141**	**57,09**
Bacillariophyta	*Nitzschia*	7	2,83
	Achnanthes	6	2,43
	Navicula	6	2,43
Total:	**3**	**19**	**7,69**
That's all:	**12**	**160**	**64,78**

In this table, Oscillatoria (30 species; 12.15%), Phormidium (27; 10.93%), Gloeocapsa (17; 6.88%), Lyngbya (17; 6.88%), Nostoc (16; 6) from the Cyanophyta division are included in this table. , 48%), *Schizothrix* (12;

4.86%), Microcystis (9; 3.64%), Microcoleus (8; 3.24%), Symploca (5; 2.02%); From the division of Bacillariophyta are the families Nitzschia (7; 2.83%), Achnanthes (6; 2.43%) and Navicula (6; 2.43%). In the remaining soil algoflora, there were 66 genera with 1-4 species, which occupied 86 species (34.82%).

As a result of the study, 181 species and varieties of soil algae of the eastern part, 55 genera, 42 families, 20 orders, 8 classes and 4 divisions (Suanophyta, Xanthophyta, Bacillariophyta, Chlorophyta), their taxonomic analysis is given in Table 5.

Table 5: Taxonomic composition of soil algoflora of the eastern part of the Northern Fergana Valley

Departments	Class	Order	Family	Category	Total tour	hence			
						tour	var.	form	% yes
Cyanophyta	1	5	20	29	**140**	110	-	30	77,35
Xanthophyta	1	2	5	8	**11**	11	-	-	6,08
Bacillariophyta	3	8	8	8	**20**	14	4	2	11,05
Chlorophyta	3	5	9	10	**10**	10	-	-	5,52
total: 4	**8**	**20**	**42**	**55**	**181**	**145**	**4**	**32**	**100**

According to the data given in the table, the species of the Suanophyta division are common, which include 140 species and subspecies (110 species, 30 forms). These species accounted for 77.35% of the total algoflora of the soil.

The observation points in the eastern part covered the altitudes from 400 m to 1400 m above sea level, and the distribution of soil algae by sections and the dynamics of encounters varied, as shown in Figure 1. From the results of scientific research, it became clear that the species and species belonging to the genus Cyanophyta were predominant. The following species include Synechocystis salina, S.aquatilis, Aphanocapsa muscicola, Microcystis pulverea f.parasitica, M.aeruginosa f.pseudofilamentosa, Chlorogloea microcystoides, Nostoc punctforme f. populorum, N.paludosum. f.entophytum, N.zetterstedtii, N.verrucosum, Oscillatoria rupicola, O.gracilis, O.splendida, O.deflexa, O.lemmermannii, Phormidium foveolarum, Ph.inundatum, Symploca cartilaginea, Schizothrix lutea, Microcoleus tenerrim observed.

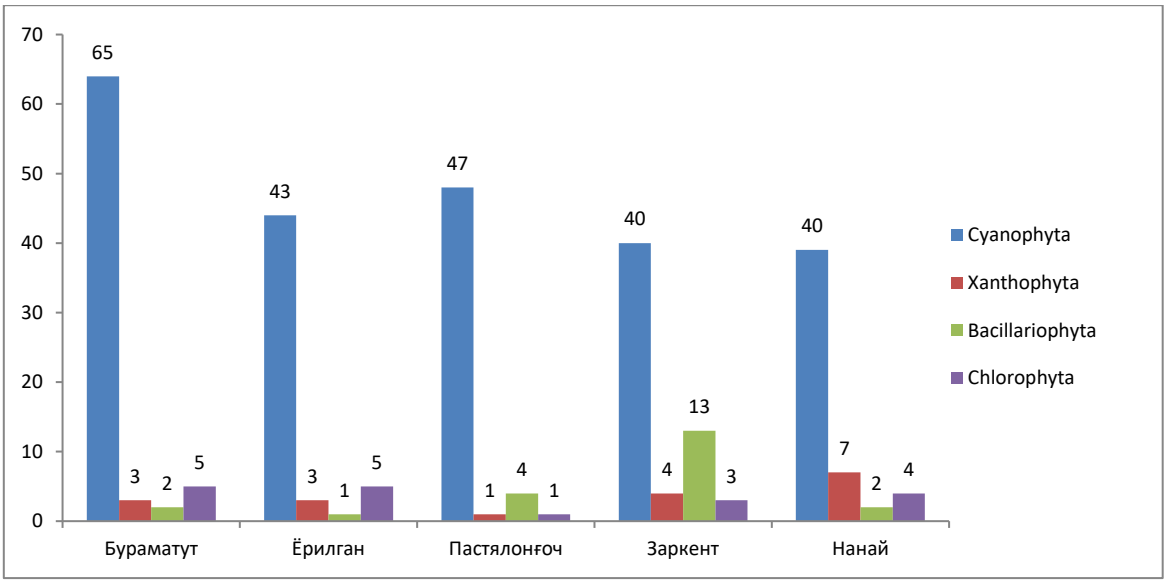

Figure 1. Indicator of distribution of soil algae in the eastern part, the amount of algae

Synechocystis sallensis, Gloeocapsa magma f.*magma, Gl.alpina f.alpina, Gl.alpina* f.*lignicola, Gl.rupestris, Gl.varia, Gl.turgida* f.*subnuda, Gl.turgida* f.*quaternaria, Gl.bituminosa, Gl.punctata, Gl.minor* f.*dispersa, Gl.minor* f.*minor, Pseudoncobyrsa lacustris, Entophysalis samoensis, Xenococcus kerneri, Pleurocapsa minor, Hydrococcusrivularia, Fischerella thermalis, Nostoc punctiformeme, N.microscopicum, N.coeruleum, N.sphaeroides, N.commune* f.*commune, Scytonema ocellatum, Leptobasis caucasica, Oscillatoria ornata, O.subtilisssima, O.lacustris, O.irriguan*ap was found to be rare. *Chlorogloea microcystoides, Nostoc punctforme* f.*populorum, Nostoc zetterstedtii, N.verrucosum, Oscillatoria lemmermannii, Phormidium foveolarum, Symploca cartilaginea, Schizothrix lutea* such species were found at all observation points in the eastern part, while the remaining species were encountered at different levels at the observation points (Figures 2 and 3). The scientific explanation for this can be explained by the fact that the representatives of this department live in different climatic conditions [3; Pp. 405, 4; Pp. 406-815, 5; Pp. 816-1215].

Figure 2.*Schtzothrix lutea* Fremy

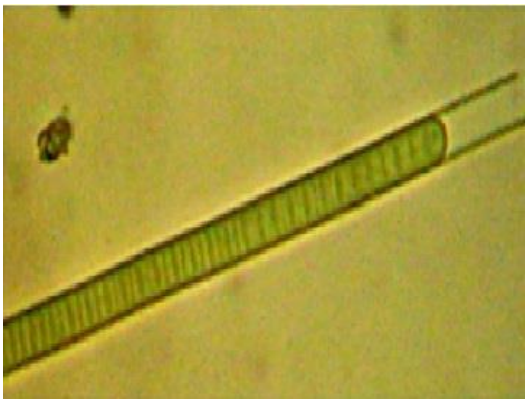

Figure 3. *Oscillatoria lemmermannii* Voloszynska

Representatives of the Xanthophyta department 3 types at 1 observation point (*Botrydiopsis eriensis, Ilsteria quadrijuncta* ва *Tribonema vulgare),* 2 3 types at the observation point (*Tribonema vulgare, Botrydiopsis arhiza* and *Pleurochloris polychloris),* Tribonema vulgare species at 3 observation points, 4 species at 4 observation points (Tribonema monochloron, T.vulgare, T.intermixtum and Heterococcus caespitosus) and 7 species at 5 observation points (Botrydiopsis arhiza, B.eriensis, Monodus subterranean, Chlorocroster terrest Tribonema vulgare and T.intermixtum) have been reported. According to the results, Tribonema vulgare type was observed in soils from the plains to the upper regions (Fig. 4).

Representatives of the department of Bacillariophyta 2 species at 1 observation point (Melosira dickiei and Cymbella hybrida), 2 observation points Navicula halophila f.*subcapitata* (5 %), 4 species (Melosira islandica var procera, Epithemia zebra, Nitzschia parvula and N.obtusa) were detected at 3 observation points, 13 species at 4 observation points and 2 species (Navicula lacustris var.parallela, Nitzschia stagnorum) at 5 observation points. Species that were common to all points were not recorded at these observation points.

Species belonging to the division of Chlorophyta 5 species at 1 observation point (Chlorococcum infusionum, Chloroplana terricola, Palmadictyon varide, Palmella miniata and Scenedesmus bijugtus), 5 species at 2 observation points (Dictyococcus pseudovarians, Chloroplana terricola, Scadiospum varicola, Palogtum varicola, Palmadiction) Scenedesmus bijugtus at point 4, 3 species at 4 observation points (Dictyococcus pseudovarians, Scenedesmus bijugtus and Ankistrodesmus tortile) and 4 species at 5 observation points (Hydrianum horizontale, Palmadictyon varide, Scenedesmus bijugtus and Ciches. The species Scenedesmus bijugtus was also observed to spread in areas from the plains to the upper regions (Fig. 5). It has been observed during research that many species of the chlorophyta division occur in summer and autumn.

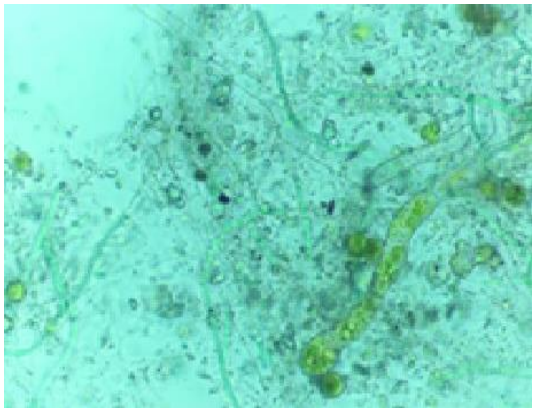

Figure 4. ***Tribonema vulgare*** **Pascher.**

Figure 5.Scenedesmus bijugtus **Kützing**

In the western part of the observation points where the study was conducted, different soil types were distributed in it due to the fact that the climatic indicators were not the same in all regions. This region is characterized by mountain, foothill, hill and plain soils typical of other regions of Central Asia. These soils are characterized by low thickness of the humus layer in the western part and the skeletal nature of the soil.

The study revealed that 154 species and species listed in the soil algoflora of the western part belong to 56 genera, 43 families, 18 orders, 6 classes and 4 divisions (Suanophyta, Xanthophyta, Bacillariophyta, Chlorophyta). Their taxonomic analysis is presented in Table 6.

According to the data in the table, the Suanophyta section was considered rich in species. This section includes 112 species and varieties (84 species, 28 forms). It accounted for 72.73% of the total algae.

Table 6: Taxonomic composition of soil algoflora of the western part of the Northern Fergana Valley

Departments	Class	Order	Family	Category	Total tour	hence			% yes
						tour	var.	for.	
Cyanophyta	1	5	15	24	**112**	84	-	28	72,73
Xanthophyta	1	2	6	7	**9**	9	-	-	5,84
Bacillariophyta	2	5	7	8	**13**	12	1	-	8,44
Chlorophyta	2	6	15	17	**20**	20	-	-	12,99
Total: 4	**6**	**18**	**43**	**56**	**154**	**125**	**1**	**28**	**100**

As a result of experiments conducted at observation points in the western part, it was observed that soil algae are dominated by species and species belonging to the Cyanophyta division (Fig. 6).

Species such as Schizothrix arenaria (occurrence rate 2 very low, 3 low), Chlorogloea microcystoides (3-7), Nostoc verrucosum (2-5), Oscillatoria lemmermannii (3-9) were found at all observation points in this section (Table 2.1). Although the species and subspecies of the Xanthophyta division are the least common, the Botrydiopsis eriensis species of the Botrydiopsis family has been identified at all observation points. Species and species of the Bacillariophyta division were found to have different rates of occurrence at observation points.

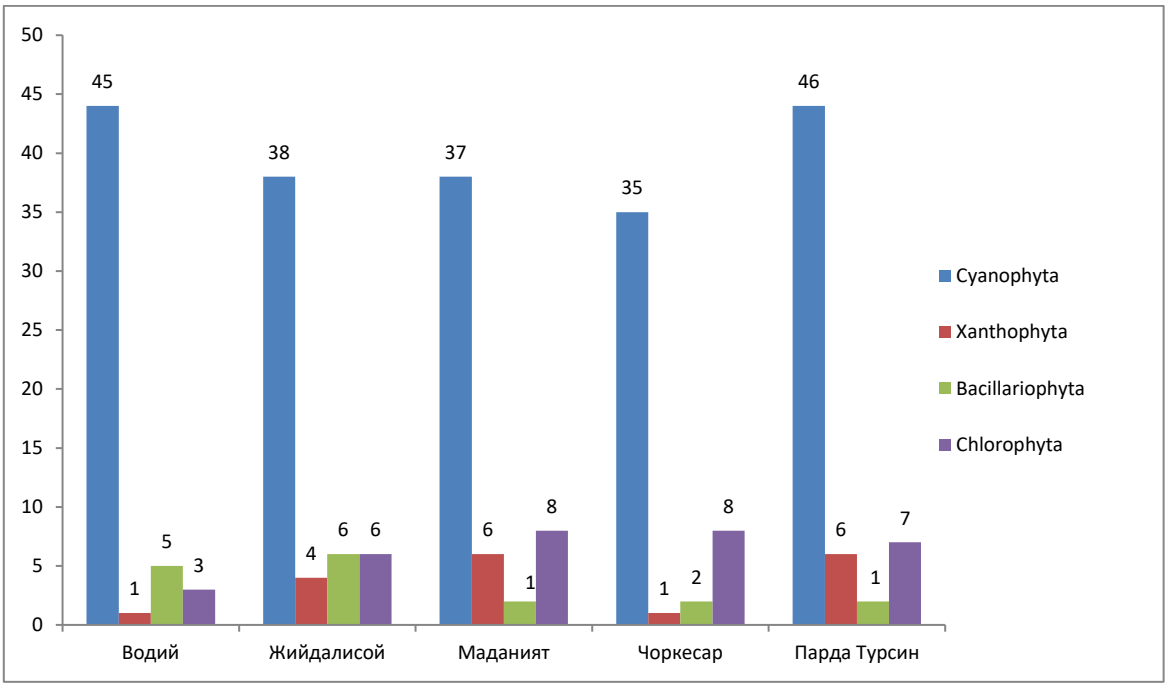

Figure 6. Indicator of distribution of soil algae in the western part, the amount of algae

Species belonging to the Navicula and Nitzschia families were observed to be more common than members of other families. Species and species of the chlorophyta division were also found to occur at different levels at the observation points. Many species of this section were encountered in the fall. In general, at observation point 8-9, ie around the villages of Madaniyat and Chorkesar, the soil composition is urea, rocky, rocky-gravelly, with many slopes and slopes, soil erosion, as well as low vegetation cover caused by the encounter. As a result of our observations, it was determined that the species and species belonging to the Cyanophyta division were dominant. The following species such as Chlorogloea microcystoides, Nostoc

punctiforme, N.verrucosum, Oscillatoria lemmermannii, Symploca cartilaginea, Schizothrix arenaria, Sch.muelleri have been reported to occur in the western part. The remaining species were observed to vary in size (Figures 7 and 8).

Figure 7. *Schizothrix muelleri* Nägeli ex Gomont.

Figure 8. *Nostoc verrucosum* Vaucher ex Bornet & Flahault

Species belonging to the Chlorophyta division have 3 species at 6 observation points (Protococcus viridis, Scenedesmus bijugtus, and Bulbochaete setigera); 6 species at 7 observation points (Hypnomonas schizochlamys, H.tuberculata, Apiococcus consociatus, Chlorococcum dissectum, Chlorosarcina minor and Scenedesmus bijugtus); 8 species at 8 observation points (Apiococcus consociatus, Dictyococcus mucosus, Trebouxia arboricola, Palmadictyon variede, Palmella miniata, Binuclearia tatrana, Oedogonium acrosporum and O.macrandrium); 8 species (Hypnomonas tuberculata, Apiococcus consociatus, Chlorococcum dissectum, Dictyococcus pseudovarians, D.Irregulars, Hydrianum horizontale, Protococcus viridis and Trebouxia arboricola) at 9 observation points; Seven species (Chaetopeltis orbicularis, Apiococcus consociatus, Chlorococcum dissectum, Palmadictyon variede, Palmella miniata, Scenedesmus bijugtus, and Chlorolobion lunulatum) were found at 10 observation points.

Representatives of 5 species of Bacillariophyta at 6 observation points (Diploneis late-elliptica, Navicula Americana, N.hungarica, Denticula elegans and Nitzschia distans), 6 species at 7 observation points (Melosira undulate, Frustulia vulgaris, Nitzschia epithemioides, N. Clausii and Surirella linearis), 2 species at 8 observation points (Achnanthes ientzschii and Navicula cryptocephala var. Exilis), 2 species at 9 observation points (Achnanthes marginulata and Navicula cryptocephala var. Exilis), 10 Nitzschia stagnorum species at 10 observation points. No common species specific to all of these observation points were noted.

Species belonging to the genus Xanthophyta 6 species Botrydiopsis eriensis at 6 observation points, 4 species at 7 observation points (Pleurochloris imitans, Botrydiopsis eriensis, Botryochloris minima, Bumilleriopsis brevis), 6 species at 8 observation points (Botrydiopsia Briryis, Botrydiopsia Triens, Botrydiopsis eriensis) intermixtum, Heterococcus caespitosus), Botrydiopsis eriensis type at 9 observation points and 4 species at 10 observation points (Botrydiopsis eriensis, Bumilleria klebsiana, Tribonema monochloron, T.vulgare, T.intermixtum, Heterococcus caespit).

Summary

At some observation points, an increase in air and soil temperature, a decrease in humidity and fertility, a decrease in the number of soil algae due to seasonal precipitation, erosion were detected. Conversely, an increase in organic and mineral matter is explained by an increase in the number of soil algae in irrigation and the transfer of algae from groundwater to the soil. Due to seasonal changes in soil and air temperature,

there are 105 species (42.51%) in spring, 81 (32.79%) in summer, 115 (46.56%) in autumn, and 78 (31.58%) in winter, of which eurytherm 29 (11.74%), stenothermic group 218 (89.06%) species occur.

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