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O.S. GORBULIN, B. ZAREI
V.N. Karazin Kharkov National University
4 Svobody sq., Kharkov, 61077, Ukraine

XANTHOPHYTA OF POLYTYPIC RESERVOIRS OF IRAN

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О.С. ГОРБУЛІН, Б. ЗАРЕІ

XANTHOPHYTA РІЗНИХ ВОДОЙМ ІРАНУ

Харківський національний університет ім. В.Н.Каразіна
пл. Свободи, 4, Харків, 61077

Подано інформацію про першу знахідку жовто-зелених морських водоростей (*Xanthophyta*) в різних регіонах Ірану. 48 видів і 2 різновидності, що належать до 5 порядків, 8 родин і 22 родів виявлені й визначені в різних водоймах. Наведено список Xanthophyta з вказівкою для кожного виду середньої частоти трапляння відповідно до типів водойм та екологічних угруповань.

Information about *Xanthophyta* of Iran reservoirs is completely absent from the publications. Besides the common poor level of scrutiny of the algal flora of Iran continental reservoirs, such situation might be explained by peculiarities of the representatives of this group of algae. More often they remain outside of a field of vision of researchers as they have significant morphologic parallelism with *Chlorophyta*, on the one hand, and seldom give mass development in natural populations, on the other hand [2]. The present article contains the first information about *Xanthophyta* of Iran reservoirs.

Material and methods

As the material for work, 187 tests of phytoplankton and microphytobenthos have served. They were sampled during 2000-2003 from 8 rivers (Atrak, Qomrud, Zābe-e Kucak, Zāyanderud, Karaj, Mahābād, Mināb, Halil rud), 19 reservoirs (Amirkabir, Aras, Vošmgir, Qešlāq, Golestān, Golestān (Mašhad), Golpāyegān, Jiroft, Zāyanderud, Kārun, Karxeh, Mahābād, Mināb, Pānzdah-e Xordād, Sefidrud, Torog, Hasanlu, Ceqāxor, Šahnāz), 5 ponds (Dizine, Robāt-e Xān, Suleqān, Šādegān, Šatt-e Mongār), two swamps (Gāvxuni, Anzali) and reservoirs of clearing constructions (Southern and Northern Esfahān, Fulād šahr, Šāhin šahr). Processing of the collected materials was carried out by standard methods in the laboratory of faculty of botany of the V.N.Karazin Kharkov National University [9]. A specific attribute was defined using the corresponding manuals [3, 4, 7]. When drawing up the general list of species T.V.Dogadina's system [2, 6] was used. For each species, average frequency of occurrence (by K.Starmach) was calculated from the results of procession of all samples from each type of reservoir and corresponding ecological grouping.

Results and discussion

As a result of processing of the materials collected in reservoirs of Iran it has

been revealed and determined 48 species and 2 varieties yellow-green algae (table). From the general quantity of the revealed species 21 have been specified for Asia reservoirs for the first time. Besides, 6 more species were known only from soils and were discovered during soil-algal researches in the Asian part of Russia, the countries of Central Asia (Kazakhstan, Tajikistan, Turkmenistan, Uzbekistan) and India, China, Japan as well. For soils of Southern Iran *Chloridella neglecta* was given [5]. Other species are widespread enough and marked in reservoirs of different countries of Asia [3, 6, 8].

Distribution of the revealed specific variety among the basic taxa was the following. The maximal number of species represents the order *Mischococcales*, the central order in the structure of *Xanthophyta*. From *mischococcous* it has been found 30 species and 1 variety, they make 62% of the general specific variety. From order of *Tribonematales* it is revealed 9 species (18%), *Ophiocytiales* – 7 species (14%), the small number of species represent the orders of *Vaucheriales* – 2 (4%) and *Rhizochloridales* – 1 species (2%). *Characiopsis* Borzi and *Tribonema* Derb.et Sol. each of 8 species, *Trachychloron* Pasch. and *Tetraedriella* Pasch each of 4 species have been included in the leading genera.

Distribution of the revealed specific structure of yellow-green algae on types of reservoirs shows the following features.

Maximal number of *Xanthophyta* is revealed in reservoirs – 38 species and varieties. Among them, first of all, it is necessary to note the forms revealed only in this type of reservoirs. These are such species as: *Botrydiopsis arhiza*, *Tribonema regulare* and *T. taeniatum*. The greatest values of frequency of occurrence had *Tetraedriella limbata*, *Tetraplektron acutum* f. *laevis*, *Goniochloris parvula*, *G. spinigera*, *Characiopsis sublinearis*, *Tribonema spirotaenia*. Rare in phytoplankton, but frequently met in phytobenthos were *Trachydiscus quadratus*, *Trachychloron biconicum*, *T. chlorallantoides*, *Tetradriella spinigera*, *Characiopsis obovoidea, Centritractus belonophorus* etc. It is marked, that yellow-green algae are met more often and are more variously represented in small reservoirs (Golestãn, Ceqãxor, Šahnãz), especially in their upper parts, which usually overgrow with the higher water vegetation and slightly become boggy.

At inspection of swamps it was revealed 27 species of *Xanthophyta*. Anzali Swamp has the greatest specific variety of yellow-green algae [1]. Among specific marsh forms it is necessary to name representatives of *Ophiocytium, Characiopsis, Tribonema* sorts. Besides the usual, widely widespread species, rare species were also revealed in swamps: *Stipitococcus poculum, Centritractus rotundatus*. In these reservoirs *Chloridella neglecta, Trachychloron regulare, Tribonema ambiguum, T. spirotaenia, T. viride, T. vulgare* were characterized by the maximal frequency of occurrence.

In ponds the general number of yellow-green algae species makes 30 (also those species which were revealed in biological ponds of clearing constructions [10] are included here: *Characiopsis rossica* (with average frequency of occurrence – in plankton 1,2/3,2 in benthos), *Ch. subulata* (1,3/4,2), *Centritractus belonophorus* var. *skujae* (2,1/4,33).

It is necessary to note, that in tests of phytobenthos from ponds frequency of occurrence was maximal for many species and reached 5 in all scanned mounts.

The minimal number of *Xanthophyta* species was revealed in the rivers - 18 or 36% of the general number of the revealed species. All of them had small frequency of occurrence in phytoplankton; in microphytobenthos only some species are met often enough: *Chloridella simplex*, *Tetraedriella acuta*, *T. spinigera, Tribonema vulgare*. On filamentous algae here, *Characiopsis falx* species was found more often than others, and, only in the rivers, *Chytridiochloris scherffelii* was marked.

Table.

The frequency of occurrence (phytoplankton/phytobenthos) of *Xanthophyta* species in polytypic reservoirs

	Taxa	Rivers	Reservoirs	Bogs	Ponds
	Xanthophyceae				
	Rhizochloridales				
	Stipitococcaceae				
**	*Stipitococcus poculum* Ettl	1/2		1/1	
	Mischococcales				
	Pleurochloridaceae				
*	*Chloridella neglecta* (Pasch. et Geitl.) Pasch.		1.8/2	5/3	3/2
*	*C. simplex* Pasch.	1,2/5	1/3	1/2	0,5/4
*	*Botrydiopsis arhiza* Borzi		1/1		
**	*Monodus coccomyxoides* Pasch.		1/3		1/2
**	*Trachydiscus quadratus* Ettl		2,5/4	-/2	1/2
**	*Vischeria stellata* (Chod.) Pasch.	2/3		2/2	
**	*Arachnochloris striata* Pasch.				2/5
**	*Trachychloron biconicum* Pasch.	0,7/2	1,5/3,7		2/5
**	*T. chlorallantoides* Pasch.		1,9/3,8	1/3	2/-
	T. regulare Pasch.	1/2	2,3/2,3	2/4	
*	*T. simplex* Pasch.		2,3/3	2/3	
**	*Tetraedriella acuta* Pasch.	2/4	2,3/2,8	2/4	3/3
**	*T. impressa* Pasch.		2/3	1/2	
**	*T. limbata* Pasch.		3/4	-/4	
	T. spinigera Skuja	-/4	1,5/3,8	1/3	3/5
	Tetraplektron acutum (Pasch.) Fott f. *laevis* (Bourr.) Ded. - Stscheg.		3/3	-/3	-/1
	Goniochloris parvula Pasch.		3,5/4	-/3	1/1
	G. smithii (Bourr.) Fott	1/3	1,6/2,6	1/3	
**	*G. spinosa* Pasch.		3/4,5	-/2	1/+
	Characiopsidaceae				
**	*Chytridiochloris natrophilum* (Hortobagyi) Starmach	-/3			1/5

Continuation of table.

**	*Ch. scherffelii*	-/4			
**	*Characiopsis falx* Pasch.	1/4		1/2	
**	*Ch. korschikovii* Matv.				2/5
	Ch. minuta (A. Br.) Lemm.		1,6/2,2	+/1	3/4
**	*Ch. obovoidea* Pasch.		1/5		1/5
**	*Ch. rossica* (Elenk.) Ded.-Stscheg.				1,2/3,2
	Ch. sphagnicola Pasch.				1,5/4
	Ch. sublinearis Pasch.		3/5		3/5
	Ch. subulata (A. Br.) Borzi				1,3/4,2
	Botryochloridaceae				
	Heterodesmus bichloris Ettl		1/2		1/3
	Gloeobotrydaceae				
	Gloeobotrys coenococcoides Fott	1/2	1/2		
	Ophiocytiales				
	Ophiocytiaceae				
	Centritractus belonophorus Lemm.		1,5/3,6	1/2	1,5/2
**	*C. belonophorus* Lemm. var. *skujae* Kirjkov				2,1/4,33
**	*C. rotundatus* Pasch.		1/4	-/3	1/3
	Pseudotetraedron neglectum Pasch.		1/3		-/3
*	*Bumilleriopsis megacystis* Skuja		1/4		1/4
*	*B. terricola* Matv.		2/2	-/2	2/3
	Ophiocytium cochleare A.Br.	1/3	2,9/3,5	-/2	-/2
	Tribonematales				
	Tribonemataceae				
**	*Heterothrix constricta* Ettl	1/3	1/3		-/3
	Tribonema ambiguum Skuja		2,6/4,1	5/3	
	T. minus (Klebs) Hazen	1/3,5	1,8/3,6	-/4	1/3,5
	T. regulare Pasch.		2,5/4		
	T. spirotaenia Ettl		4/4	5/3	
	T. subtilissimum Pasch.				1/3
	T. taeniatum Pasch.		1,5/4,5		
	T. viride Pasch.	1/3	1,6/3,8	5/1	+/1
	T. vulgare Pasch	1/4	1,9/4,6	5/2	
	Vaucheriales				
	Vaucheriaceae				
	Vaucheria dichotoma Ag.		1/2		-/2
**	*V. thuretii* Woronin	1/2	2/4		

* – species known from soils, indicated for the first time for Asia reservoirs;
** – species indicated for the first time for Asia.

Conclusion

The analysis of the first data about *Xanthophyta* of Iran reservoirs allows assuming that this group is represented in researched region rather variously. In the ecological relation the basic ecotopes, characteristic of *Xanthophyta* as a whole, are confirmed. Alongside with widely widespread, cosmopolitan species, rare forms have also been revealed the number of which can be increased during the further algofloristic works on reservoirs of Iran.

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