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## Research Article

### A NEW SPECIES *CHLAMYDOMONAS* EHRENBERG (CHLAMYDOMONADALES, CHLOROPHYTA) FROM BULGARIA

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#### ABSTRACT

The genus *Chlamydomonas* is one of the largest green algal genera. In a temporary street puddle of melting snow in the trodden soil in Plovdiv, Bulgaria we came across a "blooming" caused by a mass developed species *Chlamydomonas pumilioniformis*, *Chlamydomonas asymmetrica* var. *triangularis*, *Chlamydomonas* sp., *Euglena viridis*, *Pandorina charkoviensis*. Among them was dating a species with "H"-shaped chloroplast, and particularly with its annular pyrenoid located in the crosspiece of the chloroplast and with its coarse papilla. The new species *Chlamydomonas cyclopyrenoidosa* spec. nova was described and compared with related algae.

**Keywords:** Chlorophyta, *Chlamydomonas*, new taxa

## INTRODUCTION

The genus *Chlamydomonas* Ehrenberg is one of the largest green algal genera comprising more than 450 described species<sup>1</sup>. *Chlamydomonas* is a genus of green algae consisting of unicellular flagellates, found in stagnant water and on damp soil, in freshwater, seawater, and even in snow as "snow algae". *Chlamydomonas* is used as a model organism for molecular biology, especially studies of flagella motility and chloroplast dynamics, biogenesis, and genetics. One of the many striking features of *Chlamydomonas* is that it contains ion channels that are directly activated by light<sup>2</sup>. *Chlamydomonas* is the only known eukaryote in which the nuclear, chloroplast and mitochondrial genomes can all be transformed, and studies of photosynthesis have made extensive use of this<sup>3</sup>.

## MATERIAL AND METHODS

During the winter of 31.01.2012 in ephemeral basin in Plovdiv, Bulgaria (43 ° 12'074" N 25 ° 46'125" E) we came across of an interesting species of the genus *Chlamydomonas*. The study of the material collected was performed with a microscope "Olympus CX31" in the department "Biology and Aquaculture" in Trakia University. Morphological characters were recorded from this alga material and the relevant literature sources<sup>4-8</sup>.

## RESULTS AND DISCUSSION

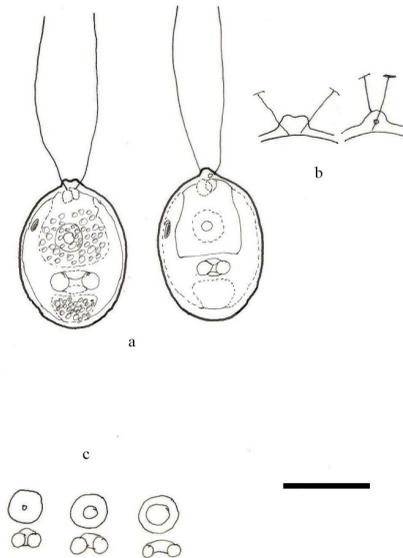
In a temporary street puddle of melting snow in the trodden soil in Plovdiv, Bulgaria we came across a "blooming" caused by a mass developed species *Chlamydomonas pumilioniformis* Peterfii, *Chlamydomonas asymmetrica* var. *triangularis* Ettl, *Chlamydomonas* sp., *Euglena viridis*

Ehrenberg, *Pandorina charkoviensis* Korsch. Among them was dating a species with "H"-shaped chloroplast, and particularly with its annular pyrenoid located in the crosspiece of the chloroplast and with its coarse papilla. At the made literature search<sup>4-7</sup> of the genus *Chlamydomonas* with similar of our species "H"-shaped chloroplast are the following species - *Chl. pseudagloë* Pascher, *Chl. klebsii* Pascher, *Chl. chlamydogama* Bold, *Ch. cingulata* Pascher, *Chl. acutiformis* Pascher et Jahoda, *Chl. chodati* Pascher, *Chl. glans* Pascher, *Chl. bacillus* Pascher et Jahoda, *Chl. cylindrica* Chodat, *Chl. inchabilis* Pascher., *Chl. pseudomutabilis* Ettl. Only one of aforementioned species *Ch. cingulata* Pascher 1927 (syn. *Ch. monadina* var. *cingulata* (Pascher) Korschikov 1938) is with pyrenoid annular, but it is distinguished by important taxonomic scars that can be seen in Table 1. First in the differences between the two species will indicate: 1. Shape of chloroplast – cup-shaped in *Chl. cingulata*, and a "H"-shaped in our species; 2. The place of a pyrenoid - in *Chl. cingulata* is in the middle of the cup-shaped chloroplast, and in our species is in the transverse part of the "H"-shaped chloroplast; 3. Shape and location of the eyespot - in *Chl. cingulata* is linear, located in the middle of the chloroplast and in the newly described species is ellipsoidal in the front half of the chloroplast; 4. The place of the nucleus - located in the middle of the cell in *Chl. cingulata*, and in our species in the front half of the cell; 5. There are differences in the cell shape, the length of the flagella, and the shape and size of the papilla.

In conclusion we consider that this is an interesting new about science taxon and given several important (listed above) the scar which characterize it, we give the species rank, with the name:

Table 1: A comparison between *Chl. cingulata* and *Chl. cyclopyrenoidosa* sp. nov.

	<i>Chl. cingulata</i> Pascher 1927	<i>Chl. cyclopyrenoidosa</i> sp. nov.
Cell shape	spherical	ellipsoidal
Cell - size	8 - 35 µm	17.5-(23.0)-27.5 µm length 11.5-(16.4)- 22.0 µm width
Cell wall	thick	particularly thick
Papilla	frustoconical	concave saddle
Flagella	length of the cell X 1.5	almost equal of the length of the cell
Chloroplast	cup-shaped, large	"H"-shaped
Pyrenoid	annular in the middle of the cup-shaped chloroplast	annular in the transverse part of the "H"-shaped chloroplast
Eyespot	linear in the middle part of the chloroplast	ellipsoidal in the front half of the chloroplast
Nucleus	located in the middle of the cell	located in the front half of the cell
Contractile vacuole	two, apical	two, apical
Habitat	in the plankton of the marshes	in a pool of melting snow, on the soil

Figure 1: *Chlamydomonas cyclopyrenoidosa*: a – vegetative cells; b – papilla; c – pyrenoid viewed from the rear and laterally (scale 10µm)***Chlamydomonas cyclopyrenoidosa* sp. nov.****Description**

The cells broadly or narrowly ellipsoidal with rounded poles, length - 17.5 - (23.0) - 27.5 µm and width 11.5 - (16.4) - 22.0 µm, the cell wall - medium thick in the front end with a distinct or a concave saddle papilla reaching a height of 1.5 µm and width up to 2.5 µm (Figure 1-b). The flagella come out of the channels which are situated on the narrow side of the nose. Their length is equal to that of the cell (Figure 1-a). The chloroplast is "H"-shaped, occupies almost the entire cell, with gentle front and back. The pyrenoid is located in the middle part of the cell, annular, not with the same diameter of the opening (Figure 1-c). The nucleus is large, located in front half of the cell, over the transverse bulkhead of the chloroplast (Figure 1-a). The eyespot is a bright red, ellipsoidal - 2.2-3.2 µm length in the front half of the cell. Reproduction was not observed.

**Iconotypus** - Figure 1.

**Type locality:** Plovdiv, Bulgaria - in a temporary puddle in soil formed by melting snow (31.01. 2012).

**Diagnosis.** Cellulae ellipsoideae, polis utrisque latae rotundatis; membrana modicae crassa; papilla clara truncata; flagellis cellulae aequilongis vel paulum longioribus; chloroplasto principio H-forme, parte transversa, quo loco

pyrenoidae cyclicus praedito; nucleo supra mediam in excavatione anteriori chloroplasto; stigmatae rubra, supramediter affixo 2.2 – 3.2 mkm longa; binis vacuolis contractilis apicalibus. Dimensiones cellulae: 17.5 - (23.0) – 27.5 µm longe 11.5 - (16.4) – 22.0 µm latae. Propagatio non observata.

**Iconotypus:** Figura nostra 1.

**Habitatio:** in Plovdiv, Bulgaria (locus classicus) – temporariis formatur admoto nives in terra, 31.01. 2012.

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