Genus *Vaucheria* in Northern India.

By

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With 4 figures in the text.

During his collections of the algae of Northern India the author came across a number of interesting species of *Vaucheria* which it is desired to record in this paper. In all 6 species are described out of which 1 is a new species, and 1 a new variety.

In Northern India *Vaucheria uncinata* was found to be purely aquatic in habit being exclusively confined to freshwater streams, and *V. sessilis* was found to be both terrestrial and aquatic in habit, being found growing in lawns and fields and also free-floating along with members of Zygnemales in sluggish freshwater rivulets. *V. amphibia* sp. nov. has a unique habitat; unlike other species of *Vaucheria* it is neither exclusively terrestrial nor exclusively aquatic but is always found growing in radial patches, dark blue-green in colour, just at the edge of a tributary of Sarju river where it is periodically washed by waves produced by the action of wind. In fact it is a truly amphibious alga with one foot on land and the other in water. *V. polyandra* is the only species which is found in all sorts of places, it was found growing on stones in a swiftly flowing freshwater stream in Bharatpur State by Mr. Babu Lal Gupta and collected by the author free-floating in a sluggish stream and also growing on moist mud at the sides of Sarju river.

Like species of *Zygnema*, *Spirogyra*, and *Oedogonium* those of *Vaucheria* observed by the present author in the Punjab and United Provinces of Agra and Oudh, produce sex organs in the winter months of December, January and February, while the spores ripen in the latter part of February and March when ponds and freshwater streams begin to dry up due to heat and lack of rain.

Systematic Enumeration of Species.

Vaucheria de Candolle, 1805.

1. ***Vaucheria sessilis*** (Vauch.) de Candolle (Fig. 1).

Filaments 40—110 μ diam, oogonia usually single, sessile, oblong-ovoid or mango-shaped, 50—65 μ broad, and 70—85 μ long, oblique with a short beak. Antheridium opposite the single oogonium on a short pedicel, hooked or circinate. Ripe oospore has a dark spot and triple membrane, and it completely fills the oogonium.

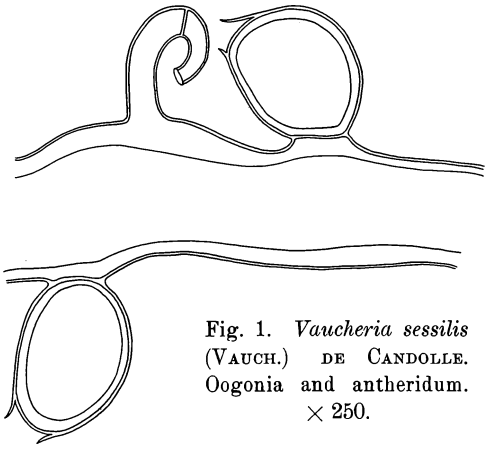

Fig. 1. *Vaucheria sessilis* (Vauch.) de Candolle. Oogonia and antheridum. × 250.

Habit.: Collected from the lawns of Gol Bagh gardens Lahore growing in the form of green felt-like mats in January 1930, and free-floating in water mixed with *Spirogyra* sp. in a freshwater stream near Lucknow in January, 1937.

2. ***Vaucheria geminata*** (Vauch.) de Candolle.

Filaments 35—118 μ diam; oogonia 1—4, 50—60 μ broad, and 60—72 μ long, irregularly ellipsoid, usually found in pairs, shortly stipitate at the end of a short branch. Antheridium cylindrical, hooked, surrounded by the oogonia. Ripe oospore completely fills the oogonium, has a conspicuous brown spot in the middle and has a triple membrane.

Habit.: Found mixed with *Oedocladium* sp. growing on moist mud on the sides of a pond near V. Bhadarsa, district Fyzabad U. P., in February 1939.

3. ***Vaucheria uncinata*** Kützing (Fig. 2).

Filaments 80—100 μ in diameter. Oogonia on side-branches 4—6 in number, surrounding a central antheridium which is borne on a short stalk in some cases. Mature oospores 60—68 μ in diameter and 80—90 μ long (Fig. 2 A).

Cyst formation: A peculiar type of cyst-formation similar to that seen by Stahl and Puymaly in *Vaucheria geminata* and *V. hamata*

was observed in some samples collected from a drying pond near V. Bodal, district Hoshiarpore, Punjab in 1929. In this case the alga was found growing in the form of a thick felt-like mat partly free-floating in water, and partly exposed to air. Specimens were taken separately from both the parts and examined. While the filaments collected from the water of the pond were laden with oospores and antheridia, in the filaments taken from the exposed part septation resulting in the formation of brick-shaped cysts 90—200 μ in length was observed (Fig. 2 B and C). Some of these cysts were found to

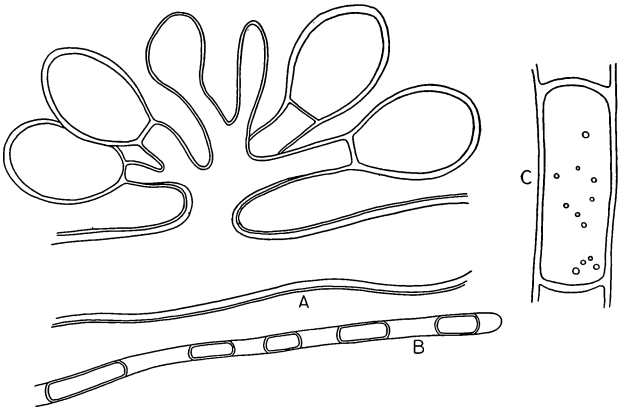

Fig. 2. *Vaucheria uncinata* Kütz. A. shows a lateral branch bearing numerous oospores. B. A filament with numerous cysts. C. A cyst shown enlarged. Figs. A and C are $\times 250$ and B is $\times 69$.

be full of rounded spore-like bodies, 16—18 μ in diameter, each covered with a thick wall. It cannot be said with certainty whether these rounded bodies are aplanospores or some unicellular fungi. In some cases even oogonia were found containing these spore-like bodies. Their number in each cyst varies from 8 to 45.

Habit.: Collected from a pond near V. Bodal, district Hoshiarpore, Punjab in February 1930.

4. ***Vaucheria polysperma*** Hassal var. ***indica*** var. nov. (Fig. 3).

Filaments are 34—56 μ in diameter, oogonia pedicellate, found in series of 2—4 on one or both sides of the filaments, obliquely ovoid, 50—60 μ in diameter. Oospores globose 46—54 μ in diameter. Antheridium single, usually straight or very slightly curved.

In one case it was seen that a sperm instead of escaping from the antheridium and fusing with an ovum, had remained in the antheridium and developed into a thick-walled parthenospore (Fig. 3 p).

Affinities: This alga differs from the type in the broader size of its vegetative filaments, and the position of oogonia which make an acute angle in the type while in this form their lower wall is almost parallel with the filament.

Habit.: Collected by the author free-floating from a slowly flowing tributary of Sarju river near V.Mubarakpur, district Fyzabad U. P., India mixed with a species of *Spirogyra* on 10th March 1938 and growing on moist mud on the banks of Sarju river near Guptar Ghat Fyzabad on 15th February 1939. This alga was also collected by Mr. Babu Lal Gupta attached to stones in a swiftly running rivulet in Bharatpur State, during the first week of February 1939.

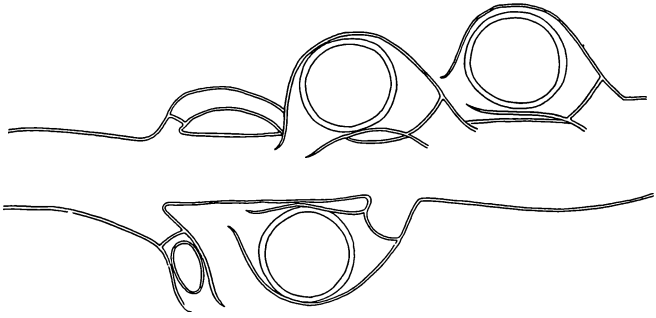

Fig. 3. *Vaucheria polysperma* HASS. var. *indica.* var. nov. A. Filament bearing oogonia with ripe oospores and antheridia. × 250.

5. ***Vaucheria amphibia*** sp. nov. (Fig. 4).

This remarkable species of *Vaucheria* was first discovered and collected by the author's wife during winter tour in January 1938 from the banks of a tributary of river Sarju near Village Mubarakpur in tehsil Tanda, district Fyzabad U. P. Later on it was collected by the author from V. Phulpur also at the sides of the same stream in February and March 1938.

In early stages the alga grows in the form of dark blue-green leathery circular patches 3 to 7 inches in diameter about 10—15 inches from the water-level. As the action of wind produces waves in the slowly-flowing stream the alga is periodically washed by the currents of water: however it is never found submerged under water, and is truly amphibious in habit. As the water-level falls in the stream with increasing drought in the month of March the alga loses its circular shape and is found growing towards the water-line in the form of an irregular bluish-green mass. Mixed with it were species of *Zygnema* and *Spirogyra.* This alga produces oogonia and

antheridia plentifully in January and February, and ripe oospores are seen in March, at the end of which month it finally disappears.

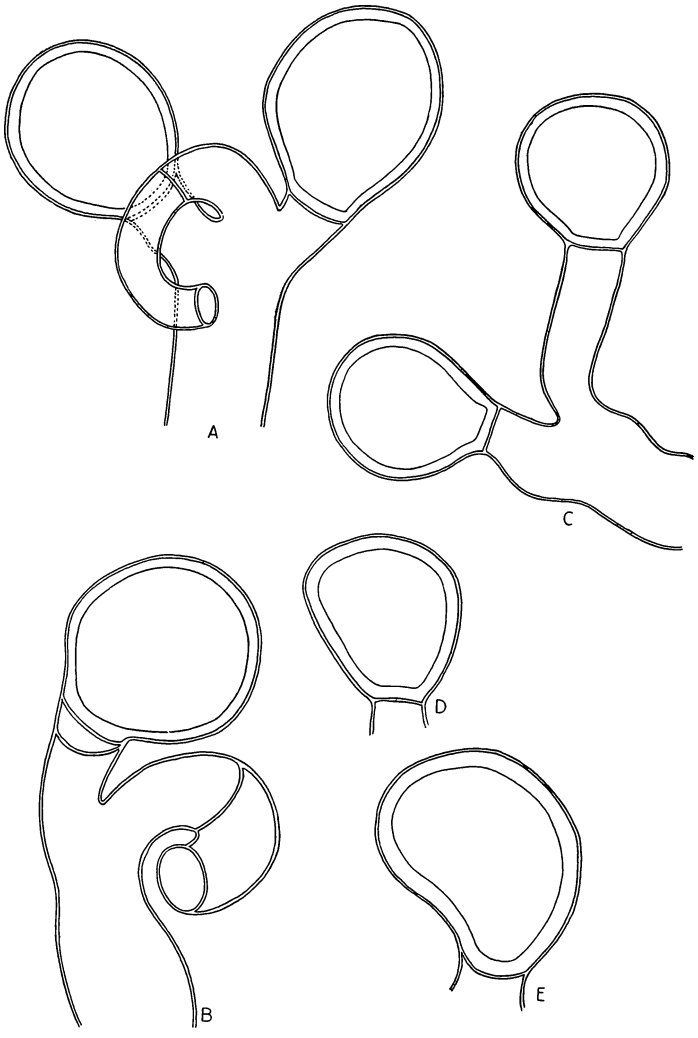

Fig. 4. *Vaucheria amphibia* sp. nov. A. Terminal part of a filament showing an antheridium surrounded by two oogonia. B. A filament with a lateral antheridium and an oogonium. C. A filament showing two terminal oogonia with ripe oospores. D and E show solitary terminal oogonia pyriform in appearance. All $\times 250$.

Filaments are 42—66 μ in diameter. Oogonia are usually found in pairs on short lateral branches surrounding a terminal antheridium (Fig. 4 A). In some cases no such antheridia were seen and ripe

oospores were seen on ends of short branches as terminal structures (Fig. 4 C). Occasionally a solitary oogonium was found pushed on one side with an antheridium on the opposite side (Fig. 4 B). Oogonia are globose to pear-shaped in appearance, are 72—110 μ broad and 80—120 μ long. Oospores are of the same shape as the oogonia which they completely fill, are 70—106 μ broad and 78—116 μ long, and are dark in colour. Antheridia are terminal or lateral in position, are slightly curved and 30—44 μ in diameter.

Affinities: The author sent samples of this species to Mrs. Stanley W. Bromley of Ohio University, U.S.A., who very kindly informed him that it is a very unusual and interesting species and is definitely new. The nearest related species is *Vaucheria terrestris* (Vauch.). de Candolle from which it differs in its peculiar habitat, in the spherical shape of its oogonia and oospores, occurrence of oogonia in pairs, their terminal position, and less curved nature of its antheridia. In shape oogonia of this species resemble those of *Dichotomosiphon tuberosus.*

Habit.: Collected from the banks of a tributary of Sarju river near villages Mubarakpur and Phulpur, district Fyzabad U. P. India in the months of January, February and March 1938.

6. *Vaucheria hamata* (Vauch.) de Candolle.

Filaments 32—74 μ in diameter, oogonia usually in pairs or solitary 50—62 μ broad and 60—76 μ long, ovoid. Antheridium 14—16 μ broad, hooked, surrounded by the oogonia or lateral borne on the longer division of an apparently forking branch. Oospore closely filling the oogonium with a dark central spot.

Habit.: Found growing in lawns, drying ponds, and drains at Fyzabad U. P. from middle of January to middle of March 1939.

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