

THE GENUS *COSMARIUM* CORDA FROM CROP-FIELDS OF KUMAON HILLS, U.P., INDIA

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ABSTRACT

The paper presents a resume of earlier work done on algal flora of Kumaon hills (U.P.) region of the Himalayas and describes twenty-five taxa of desmids (Chlorophyceae) belonging to the genus *Cosmarium* Corda collected from different crop-fields situated in Pithoragarh district, Uttar Pradesh. All these taxa are being recorded for the first time from this Himalayan region.

INTRODUCTION

The Kumaon area consists of districts of Nainital, Almora and Pithoragarh, in the north of Uttar Pradesh. The region embraces the outer (southern) and middle Himalayan region extending up to the high snow region. A perusal of literature on Kumaon hills algal flora reveals only a single report (Singh 1960a) describing six species of *Cosmarium* Corda. None of the taxa, described here, have been recorded even by Singh (1960) from this region. During the course of our studies on the algal flora of crop fields of this area, a number of desmids were encountered, constituting an important segment of the total algal flora, both in variety and numbers. It is, therefore, considered desirable to record the Desmidiaceae of this region in parts. In the present communication, twenty-five taxa of the genus *Cosmarium* Corda are being described. All these taxa were collected from shallow and small puddles within crop-fields as mentioned under habitat and locality of the respective taxa.

TAXONOMIC DESCRIPTIONS

1. *Cosmarium angulosum* Bréb. Fig. 24.
West, W. & West, G.S., 1908. p. 93,

pl. 72. figs. 35 & 36.

Cells small, longer than broad, distinctly constricted, sinus narrow, linear, slightly dilated at extremity; semicells sub-rectangular angles scarcely rounded, sides straight parallel, apex straight truncate; cell-wall smooth; chloroplast single, axial in each semicell bearing single central pyrenoid.

Length, 28 μ m; breadth, 21 μ m; breadth of isthmus, 10 μ m.

Habitat & Locality : *Oryza sativa* field; Bharkatia, Pithoragarh, U.P.

Coll. No. & Date : 2470 (20-10-1984).

2. *Cosmarium angulosum* Bréb. var. *concinnum* (Rabenh.) West & West, G.S.

Fig 4.

West, W. & West, G.S., 1908. p. 94, pl. 72, figs. 37 & 38.

Cells small, longer than broad, constricted, sinus narrow, linear; semicells sub-quadrate, inferior angles scarcely rounded, sides straight, parallel, superior angles obliquely flat, apex straight truncate; cell wall smooth; chloroplast, single with single central pyrenoid in each semicell.

Length 17 μ m; breadth, 10 μ m, breadth of isthmus, 3 μ m.

Habitat & Locality : *Oryza sativa* field ; Kotili, Pithoragarh, U.P.

Coll. No. & Date : 2472 (21-10-1984).

3. *Cosmarium bioculatum* Bréb. ex Ralfs
var. *depressum* (Schaarschm.) Schmidle.
Fig. 21.

Krieger, W. & Gerloff, J., 1962. p. 61, pl. 15, fig. 6; Förster, V.K. 1982. p. 170, pl. 20, fig. 15.

Cells small, almost as long as broad, distinctly constricted, sinus narrow, linear, opening outward; semicells elliptic-subreniform, basal and apical angles rounded, lateral and apical regions broadly elliptic; cell wall smooth; chloroplast single, axial in each semicell bearing a single central pyrenoid.

Length, 26 μm ; breadth, 23 μm ; breadth of isthmus, 7 μm .

Habitat & Locality : *Oryza sativa* field; Hurati, Pithoragarh, U.P.

Coll. No. & Date : 2461 (16-10-1984)

4. *Cosmarium biretum* Ralfs Fig. 16.

West, W. & West, G.S.; 1912. p. 25, pl. 101, figs. 1-8.

Cells, almost as long as broad, deeply constricted, sinus narrow, linear, dilated at apex; semicells subrectangular, basal and apical angles rounded, sides convex, apex somewhat straight truncate; cell wall granulated, granules small, irregularly arranged, seen only at the margins of a semicell; chloroplast single axial, with two prominent pyrenoids in each semicell.

Length, 44 μm ; breadth, 40 μm ; breadth of isthmus, 11 μm .

Habitat & Locality : *Oryza sativa* field; Hurati, Pithoragarh, U.P.

Coll. No. & Date : 2461 (16-10-1984)

5. *Cosmarium circulare* Reinsch var. *messikommeri* Krieger & Gerloff
Fig. 2.

Krieger, W. & Gerloff, J. 1962. p. 2, pl. 1, fig. 3.

Cells small, longer than broad, deeply constricted, sinus narrow, linear, dilated at extremity; semicells semi-circular with rounded basal angles; cell wall smooth; chloroplast single axial in each semicell bearing two prominent pyrenoids.

Length, 58 μm ; breadth, 48 μm ; breadth of isthmus, 15 μm .

Habitat & Locality : *Oryza sativa* field; Chandak, Pithoragarh, U.P.

Coll. No. & Date : 2465 (16-10-1984).

6. *Cosmarium clepsydra* Nordst. var. *dissimile* Krieger & Gerloff Fig. 9.

Krieger, W. & Gerloff, J. 1965. p. 145, pl. 30, fig. 9.

Cells small, longer than broad, distinctly constricted, sinus narrow, linear slightly dilated at apex; semicells sub-semicircular; cell wall smooth; chloroplast single, axial, with a single centrally placed pyrenoid in each semicell.

Length, 20 μm ; breadth, 13.5 μm ; breadth of isthmus, 4 μm .

Habitat & Locality : *Oryza sativa* field; Hurati, Pithoragarh, U.P.

Coll. No. & Date : 2464 (16-10-84).

7. *Cosmarium constrictum* Delp. var. *minus* Fritsch & Rich Fig. 6.

Krieger, W. & Gerloff, J. 1965, p. 169, pl. 35, fig. 3.

Cells small, deeply constricted, sinus narrow, linear with swollen tips; semicells sub-semicircular, lateral margins convex converging into rounded apex; cell wall smooth; chloroplast single axial in each semicell; pyrenoid single, central.

Length, 25 μm ; breadth, 16 μm ; breadth of isthmus 6 μm .

Habitat & Locality : *Oryza sativa* field; Pandegaon, Pithoragarh, U.P.

Coll. No. & Date : 2468 (20-10-1984).

8. *Cosmarium cucurbita* Breb. in Desm.
ex Ralfs f. *major* West & West, G.S.
Fig. 11.

West, W. & West, G.S., 1908. p. 107, pl. 74, fig. 2.

Cells cylindrical about twice as long as broad, slightly constricted, sinus represented by a slight notch; semicells subquadrate, lateral margins slightly convex, gradually attenuated into truncate slightly convex apex; cell wall punctate, punctae irregularly distributed; chloroplast single, axial with a single pyrenoid in each semicell.

Length, 63 μ m; breadth, 35 μ m; breadth of isthmus, 28 μ m.

In present alga is broader than the type (West & West, 1908).

Habitat & Locality : *Oryza sativa* fields; Pandegaon, Pithoragarh, U.P.

Coll. No. & Date : 2468 (20-10-1984).

9. *Cosmarium dispersum* John. Fig. 13.

Krieger, W. & Gerloff, J. 1962. p. 45, pl. 12, fig. 7.

Cells small, longer than broad, deeply constricted, sinus narrow, linear, slightly dilated at extremity; semicells sub-semicircular; basal angles rounded margins irregularly undulate; cell wall finely punctate, punctae irregularly arranged.

Length, 42 μ m; breadth, 37 μ m; breadth of isthmus, 11 μ m.

Habitat & Locality : *Oryza sativa* field; Chandak, Pithoragarh, U.P.

Coll. No. & Date : 2465 (16-10-1984).

10. *Cosmarium formosulum* Hoff. ex Nordst. Fig. 12.

West, W. & West, G.S., 1908. p. 240, pl. 88, figs. 1-3.

Cells small, longer than broad, deeply constricted, sinus narrow, linear, dilated at extremity; semicells sub-semicircular, basal angles rounded, sides convex with 6-7 crenations, apical region somewhat

flat having 3-4 crenations; cell wall granulated margins with minute granules arranged radially, central-region with 8 vertical series of granules which are comparatively larger; chloroplast single axial in each semicell, bearing two pyrenoids.

Length, 43 μ m; breadth, 37 μ m; breadth of isthmus, 11 μ m.

Habitat & Locality : *Oryza sativa* field; Siloli, Pithoragarh, U.P.

Coll. No. & Date : 2466 (16-10-84).

11. *Cosmarium garrolense* Roy & Bisset in Roy var. *crassum* Jao Fig. 22.

Krieger, W. & Gerloff, J. 1962. p. 44, Pl. 22, fig. 8.

Cells longer than broad, deeply constricted, sinus narrow, linear, dilated at apex; semicells truncate-trapeziform, basal and apical angles rounded, sides gradually attenuated, crenate, having five crenation on each side, apex flat truncate; cell wall finely punctate, punctae irregularly arranged; chloroplast single, axial in each semicell, pyrenoid single central.

Length, 42.5 μ m; breadth, 31 μ m; breadth of isthmus, 11 μ m.

Habitat & Locality : *Triticum aestivum* fields; Merapur, Pithoragarh, U.P.

Coll. No. & Date : 2488 (11-1-1985).

12. *Cosmarium granatum* Ralfs Fig. 25.

Suxena, M. R. & Venkateswarlu, V. 1966. p. 56, pl. 2, fig. 29; Krieger, W. & Gerloff, J. 1965. pl. 24, figs. 2 a-d.

Cells longer than broad, distinctly constricted, sinus narrow, linear; semicells trapeziform, basal and apical angles rounded, sides slightly convex, gradually attenuated into truncately rounded apex; cell wall irregularly punctate.

Length, 36 μ m; breadth, 27 μ m; breadth of isthmus, 7.4 μ m.

Habitat & Locality : *Triticum aestivum* field; Merapur, Pithoragarh, U.P.

Coll. No. & Date : 2488 (11-1-1985).

13. *Cosmarium humile* (Gay) Nordst. var. *substriatum* (Nordst.) Sch. Fig. 18.

West, W. & West, G.S., 1908. p. 224, pl. 85, fig. 20.

Cells small, almost quadrate, deeply constricted, sinus narrowly linear with dilated extremity; semicells trapezoidal, broader at the base than at the apex, basal angles scarcely rounded, lateral sides convex having two undulations, upper part retuse with truncate apex, apical angles rounded; cell wall granulated, granules in two series within the margin granules within the sides more clustered and restricted only below undulations; chloroplast single, axial with a single central pyrenoid in each semicell.

Length, 25 μm ; breadth, 22 μm ; breadth of isthmus, 7 μm .

Habitat & Locality : *Brassica campestris* field; Badari-bux. Pithoragarh, U.P.

Coll. No. & Date : 2487 (10-1-85).

14. *Cosmarium nitidulum* De Not. Fig. 20.

West, W. & West, G.S. 1905. p. 197, pl. 64, figs. 1-3.

Cells small, longer than broad, deeply constricted, sinus narrow, linear, slightly dilated at extremity; semicells pyramidal, basal angles broadly rounded, lateral margins slightly convex converging into convex truncate apex; cell wall smooth; chloroplast single axial with single central pyrenoid in each semicell.

Length, 34 μm ; breadth, 28 μm ; breadth of isthmus, 8 μm .

Habitat & Locality : *Oryza sativa* field; Hurati, Pithoragarh, U.P.

Coll. No. & Date : 2463 (16-10-84).

15. *Cosmarium obsoletum* (Hantzsch in Rabenh.) Reinsch Fig. 10.

West, W. & West, G.S., 1905. p. 133, pl. 56, figs. 1-3.

Cells small, broader than long, transversely elliptical, deeply constricted, sinus

narrow, linear with dilated apex; semicells semi-elliptic; cell wall punctulate, punctae transversely arranged; chloroplast single, axial with two prominent pyrenoids in each semicell.

Length, 44 μm ; breadth, 50 μm ; breadth of isthmus, 21 μm .

Habitat & Locality : *Triticum aestivum* field; Merapur, Pithoragarh, U.P.

Coll. No. & Date : 2488 (11-1-85).

16. *Cosmarium ocellatum* Eichler & Gutw. Fig. 8.

West, W. & West, G.S., 1905. p. 144, pl. 58, fig. 6.

Cells small, about twice as long as broad, deeply constricted, sinus narrow, linear, dilated towards the apex; semicells pyramidal, basal angles and apex rounded; cell wall very finely punctate, punctae irregularly arranged; chloroplast single, axial with a single central pyrenoid in each semicell.

Length, 24 μm ; breadth, 14-15 μm ; breadth of isthmus, 4.5 μm .

Habitat & Locality : *Oryza sativa* field; Hurati, Pithoragarh, U.P.

Coll. No. & Date : 2464 (16-10-84).

17. *Cosmarium ovale* Ralfs ex Ralfs Fig. 23.

West, W. & West, G.S., 1908. p. 267, pls. 93 & 94, figs. 1 & 1; Forster, V.K. 1982. p. 234, pl. 33, fig. 7.

Cells large, longer than broad, distinctly constricted, sinus narrowly linear with apex dilated; semicells ovate, trapezoidal, basal and apical angles rounded, lateral sides convex gradually converging towards subtruncate apex having 3-4 conical granules, lateral margins with one or two rows of 19-20 conical projections; cell wall scrobiculated; chloroplast parietal in each semicell forming 4 irregular bands bearing numerous small, irregularly placed pyrenoids.

Length, 150 μm ; breadth, 56 μm ; breadth of isthmus, 45 μm .

Habitat & Locality : *Triticum aestivum* field; Merapur, Pithoragarh, U.P.

Coll. No. & Date : 2488 (11-1-85).

18. *Cosmarium praecisum* Borge Fig. 17.

Krieger, W. & Gerloff, J., 1962. p. 92, pl. 20, fig. 8.

Cells small, almost as long as broad, deeply constricted, sinus narrow, linear; semicells subelliptic with convex sides and truncate slightly convex, straight apex, angles rounded; cell wall smooth; chloroplast axial, one in each semicell, pyrenoid single central.

Length, 10 μm ; breadth, 12 μm ; breadth of isthmus, 2 μm .

Habitat & Locality : *Oryza sativa* field ; Hurati, Pithoragarh, U.P.

Coll. No. & Date : 2461 (16-10-84).

19. *Cosmarium quadrum* Lundell Fig. 1.

West, W. & West, G.S., 1912. p. 20, pl. 100, figs. 3-6.

Cells little longer than broad, deeply constricted, sinus narrow, linear, with dilated apex; semicells sub-rectangular with somewhat parallel sides and broadly rounded apices, angles rounded; cell wall granulated, granules arranged in oblique rows; chloroplast single axial with two pyrenoids in each semicell.

Length, 61 μm ; breadth, 53 μm ; breadth of isthmus, 19 μm .

Habitat & Locality : *Oryza sativa* field ; Hurati, Pithoragarh, U.P.

Coll. No. & Date : 2462 (16-10-84).

20. *Cosmarium rectangulare* Grun. var. *cambrense* (Turn.) West & West, G.S. Fig. 7.

West, W. & West, G.S., 1908. p. 55, pl. 70, fig. 3.

Cells small, longer than broad, deeply constricted, sinus narrow, linear, slightly dilated at extremity; semicells somewhat elongated hexangular, basal and apical angles rounded lateral sides parallel, apex truncately rounded; cell wall smooth; chloroplast single, axial in each semicell, pyrenoid, single, central.

Length, 32 μm ; breadth, 20 μm ; breadth of isthmus, 5 μm .

Habitat & Locality : *Brassica campestris* field ; Badari-bux, Pithoragarh, U.P.

Coll. No. & Date : 2487 (10-1-85).

21. *Cosmarium retusifforme* (Wille) Gutwinski var. *acutum* (Turner) Krieger & Gerloff fig. 19.

Krieger, W. & Gerloff, J. 1962. p. 94, pl. 20, fig. 124.

Cells small, very slightly longer than broad, deeply constricted, sinus narrow, linear, slightly dilated at apex; semicells pyramidal-trapeziform with broad base and slightly retuse apex, basal angles rounded, apical angles obtuse; cell wall smooth; chloroplast single, axial with a single pyrenoid in each semicell.

Length, 24 μm ; breadth, 23 μm ; breadth of isthmus, 6 μm .

Habitat & Locality : *Oryza sativa* field ; Hurati, Pithoragarh, U.P.

Coll. No. & Date : 2462 (16-10-84).

22. *Cosmarium sexangulare* Lundell f. *minima* Nordst. Fig. 5.

West, W. & West, G.S., 1908. p. 82, pl. 72, figs. 4 & 5.

Cells small, longer than broad, deeply constricted, sinus small narrow, dilated at extremity; semicells sub-hexangular, angles rounded, lateral margins straight, apex straight truncate; cell wall smooth; chloroplast single axial with single central pyrenoid in each semicell.

Length, 19 μm ; breadth, 14-15 μm ; breadth of isthmus, 3 μm .

Habitat & Locality : *Oryza sativa* field ; Hurati, Pithoragarh, U.P.

Coll. No. & Date : 2463 (16-10-84).

23. *Cosmarium sexnotatum* Gutw. var. *tristriatum* (Lütkem.) Schmidle Fig. 15.

West, W. & West, G.S., 1908. p. 228, pl. 86, figs. 8 & 9.

Cell small, almost as long as broad, deeply constricted, sinus narrow, linear with dilated extremity; semicells trapeziform, basal and apical angles rounded; lateral margins with three gradually attenuated undulations ending into truncate apex; cell wall granulated having a single series of small granules below the margin and three large central granules, middle granule of central granules divided in a larger and smaller portion; chloroplast single, axial in each semicell having a single central pyrenoid.

Length, 28.5 μm ; breadth, 28 μm ; breadth of isthmus, 9 μm .

Habitat & Locality : *Triticum aestivum* field; Merapur, Pithoragarh, U.P.

Coll. No. & Date : 2488 (11-1-85).

24. *Cosmarium subcrenatum* Hantzsch in Rabenh. Fig. 14.

West, W. & West, G.S., 1908. p. 228, pl. 86, figs. 10-14.

Cells small, slightly broader than long, deeply constricted, sinus narrow, linear with dilated apex; semicells sub-semicircu-

lar, margins crenate, having binate granules immediately within each crenation and below this lies one series of minute granules, central region above isthmus furnished with five vertical rows of granules, 4-5 granules in each row; chloroplast single, axial in each semicell having a single pyrenoid.

Length, 40 μm ; breadth, 31 μm ; breadth of isthmus, 11 μm .

Habitat & Locality : *Triticum aestivum* field; Merapur, Pithoragarh, U.P.

Coll. No. & Date : 2488 (11-1-1985).

25. *Cosmarium trilobulatum* Reinsch var. *depressum* Printz Fig. 3.

Krieger, W. & Gerloff, J. 1962. p. 99, pl. 21, fig. 3.

Cells small, as long as broad, deeply constricted, sinus narrow, linear, dilated at apex; semicells somewhat three lobed, basal and apical angles rounded, sides concave, apex truncately concave; cell wall smooth; chloroplast single, axial with a single central pyrenoid in each semicell.

Length, 17 μm ; breadth, 16 μm ; breadth of isthmus, 4 μm .

Habitat & Locality : *Oryza sativa* field; Hurati, Pithoragarh, U.P.

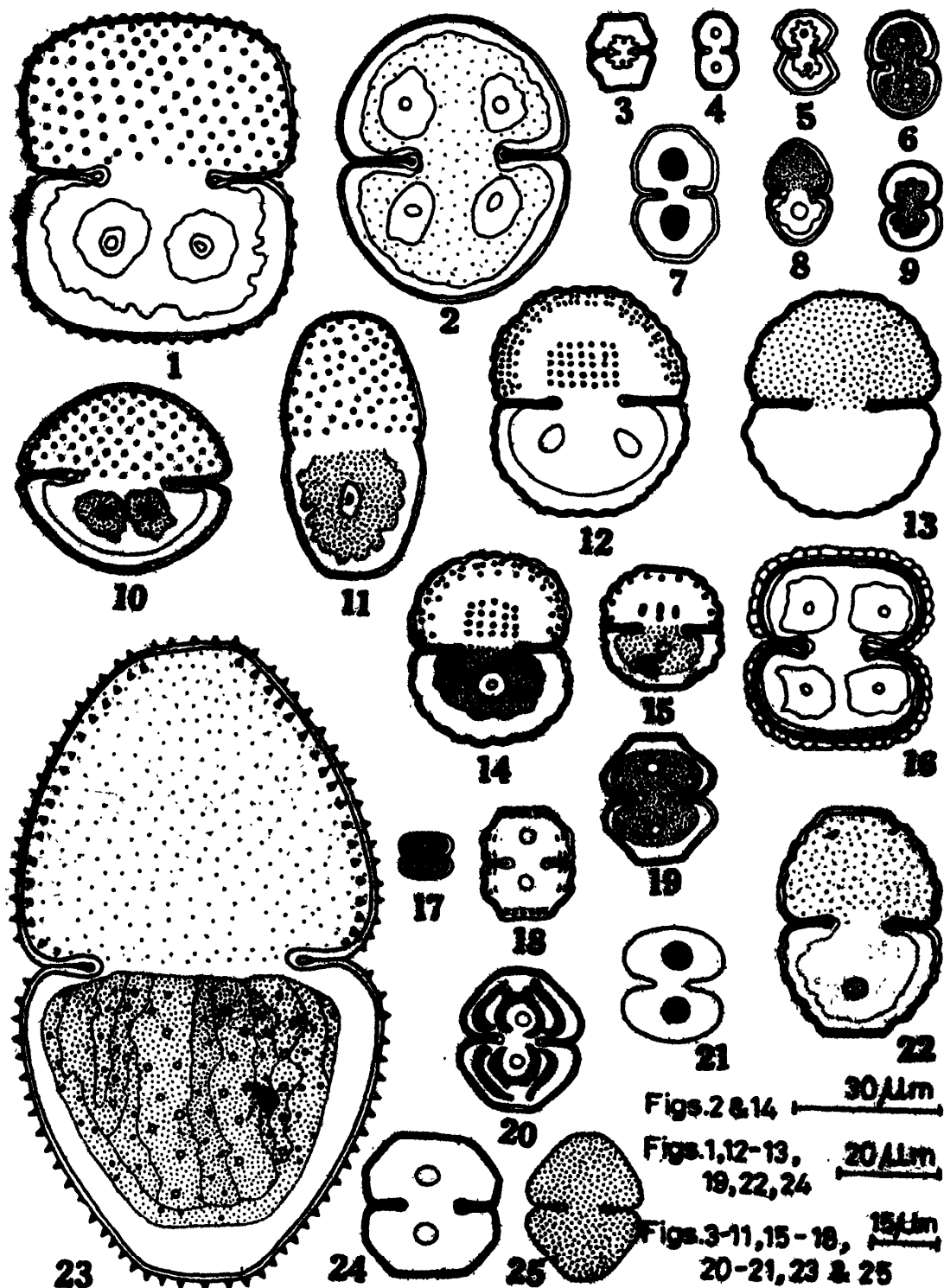
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Figs. 1—25 : 1. *Cosmarium quadrum* Lund. 2. *C. circulare* Reinsch var. *messikommeri* Krieger & Gerloff. 3. *C. trilobulatum* Reinsch var. *depressum* Printz. 4. *C. angulosum* Bréb. var. *concinnum* (Rabenh.) West & West, G.S. 5. *C. sexangulare* Lund. f. *minima* Nordst. 6. *C. constrictum* Delp. var. *minus* Fritsch & Rich. 7. *C. rectangulare* Grun. var. *cambrense* (Turn.) West & West, G.S. 8. *C. ocellatum* Eichler & Gutw. 9. *C. clepsydra* Nordst. var. *dissimile* Krieger & Gerloff. 10. *C. obsoletum* (Hantzsch in Rabenh.) Reinsch. 11. *C. cucurbita* Bréb. in Desm. ex Ralfs f. *major* West & West, G.S. 12. *C. formosulum* Hoff. ex Nordst. 13. *C. dispersum* Johnson. 14. *C. suborenatum* Hantzsch in Rabenh. 15. *C. sexnotatum* Gutw. var. *tristriatum* (Lütken.) Schmidle. 16. *C. biretum* Ralfs. 17. *C. praecisum* Borge. 18. *C. humile* (Gay) Nordst. var. *substriatum* (Nordst.) Schmidle. 19. *C. retusiforme* (Wille) Gutwinski var. *acutum* (Turner) Krieger & Gerloff. 20. *C. nitidulum* De Not. 21. *C. bioculatum* Bréb. ex Ralfs var. *depressum* (Schaarschm.) Schmidle. 22. *C. garrolense* Roy & Bisset in Roy. var. *crassum* Jao. 23. *C. ovale* Ralfs ex Ralfs. 24. *C. angulosum* Bréb. 25. *C. granatum* Ralfs.