

Solenostoma comatum (Nees) C. Gao (Jungermanniaceae) - an addition to western Himalayan bryoflora

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ABSTRACT

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Solenostoma comatum (Nees) C. Gao (Jungermanniaceae), previously known from eastern Himalaya only, has been collected from Lohaghat in Champawat district, Uttarakhand. This is the first report of the taxon from western Himalaya showing extended distribution in Himalayan territory. The plants are described and illustrated herewith.

Key-words: *Solenostoma comatum*, Jungermanniaceae, new record, western Himalaya.

INTRODUCTION

Jungermannia L. includes a number of species which were usually described under four subgenera: *Jungermannia*, *Solenostoma*, *Plectocolea* and *Luridae* (Amakawa 1959, 1960, Vána 1973, Grolle 1983, Paton 1999, Grolle & Long 2000, Damsholt 2002, Frahm & Frey 2004, Schumaker & Vána 2005). However, Kashyap (1932) and Schuster (1969) recognized *Solenostoma* and *Plectocolea* also as genera. On the basis of molecular studies, three genera: *Jungermannia*, *Solenostoma* (including *Plectocolea*) and *Liochlaena* have been recognized (Hentschel et al. 2007, Roo et al. 2007, Crandall-Stotler et al. 2008, 2009). Vána and Long (2009) provided various new combinations required for the taxon as *Jungermannia* s.l. now comprises three genera: *Jungermannia* L. s.str., *Liochlaena* Nees, *Solenostoma* Mitt. (including *Plectocolea*).

Twenty-four taxa have so far been reported from western Himalaya under the generic name

Jungermannia s.l. (Srivastava & Amakawa 1991, Bapna & Kachroo 2000, Alam et al. 2007, Singh & Singh 2007, Srivastava 2008, Vána and Long 2009, Nath et al. 2010, Bahuguna et al. 2011, Sahu & Asthana 2013).

In a recent collection of liverworts from Lohaghat in Champawat District, Uttarakhand, western Himalaya, some interesting plants referable to *Solenostoma comatum* (Nees) C. Gao have been observed, which is an addition to the western Himalayan bryoflora. Earlier, *S. comatum* was known from eastern Himalaya only (Amakawa 1970, Barbhuiya & Singh 2012, Vána 1972). With this report, the total number of taxa of *Jungermannia* s.l. is raised to twenty-five. Of these, twenty-one taxa are under the generic name *Solenostoma*, two taxa under the generic name *Jungermannia* s.str., and two taxa under the generic name *Liochlaena* (Table 1). In addition to the above, *Jungermannia oblongifolia* Kash., *J. humilis* Kashyap and *J. viridis* Kashyap reported

Table 1. List of taxa of the genus *Solenostoma*, *Jungermannia* and *Liochlaena* distributed in Western Himalaya.

Sl. No.	Name of the Species	Distribution
I Jungermannia L.		
1.	<i>Jungermannia exsertifolia</i> Steph. subsp. <i>exsertifolia</i>	WH (U): Uttarakhand: Kumaun Himalaya, Bageshwar (Bapna & Kachroo 2000, Srivastava 2008, Vána & Long 2009).
2.	<i>Jungermannia gollanii</i> Steph.	EH, WH (U): Uttarakhand: Kumaun Himalaya, Dehradun, Mussoorie (Amakawa 1966, Bapna & Kachroo 2000, Chopra 1943, Kashyap 1932, Mizutani et al. 1995, Srivastava 2008, Stephani 1917-1925, Tewari & Pant 2002, Singh & Singh 2007, Vána & Long 2009).
II Liochlaena Nees		
3.	<i>Liochlaena subulata</i> (A. Evans) Schljakov	EH, SI, WH (H & U): Himachal Pradesh: Simla; Uttarakhand: Nainital, Pithoragarh, Mukteshwar (Bapna & Kachroo 2000, Srivastava 2008, Vána & Long 2009, Sahu & Asthana 2013, Tewari & Pant 2002).
4.	<i>Liochlaena lanceolata</i> Nees	EH, SI, WH (H): Himachal Pradesh: Alwas-Silrundi Road (Kashyap 1932, Bapna & Kachroo 2000, Singh & Singh 2007).
III Solenostoma Mitt.		
5.	<i>Solenostoma appressifolium</i> (Mitt.) Vána et Long	EH, WH (U): Uttarakhand: Kumaun region, Mussoorie, Dehradun, Valley of Flowers, Champawat (Nath et al. 2010, Srivastava 2008, Srivastava et al. 2003, Stephani 1917-1925, Vána & Long 2009, Bapna & Kachroo 2000, Singh & Singh 2007).
6.	<i>Solenostoma ariadne</i> (Taylor ex Lehm.) Schuster ex Vána et Long	EH, WH (U): Uttarakhand: Kumaun Himalaya (Bapna & Kachroo 2000, Srivastava 2008, Singh & Singh 2007).
7.	<i>Solenostoma breviflorum</i> Kashyap	WH (H): Himachal Pradesh: Simla (Chopra 1943, Kashyap 1932, Vána & Long 2009, Bapna & Kachroo 2000).
8.	<i>Solenostoma champawatensis</i> (SN Srivastava et Amakawa) Vána et Long	WH (U): Uttarakhand: Champawat (Srivastava 2008, Srivastava & Amakawa 1991, Vána & Long 2009, Singh & Singh 2007, Bapna & Kachroo 2000).
9.	<i>Solenostoma comatum</i> (Nees) Gao	EH, WH (U): Uttarakhand: Lohaghat (New report for W. Himalaya).
10.	<i>Solenostoma confertissimum</i> (Nees) Schljakov	WH (J & K, U): Jammu & Kashmir: Gumbliali, Gulmarg; Uttarakhand: Kumaun Himalaya (Amakawa 1967, Gao & Bai 2001, Kashyap 1932, Vána & Long 2009, Bapna & Kachroo 2000, Srivastava et al. 2003, Tewari & Pant 2002, Srivastava 2008, Chopra 1943, Singh & Singh 2007).
11.	<i>Solenostoma faurieanum</i> (Beauv.) R. M. Schust.	EH, WH (U): Uttarakhand: Gaumukh (Srivastava & P. Singh 1988, Bapna & Kachroo 2000).
12.	<i>Solenostoma glaucum</i> (Amakawa) Vána et Long	EH, WH (H & U): Uttarakhand: Mussoorie; Himachal Pradesh: Simla (Vána & Long 2009, Bapna & Kachroo 2000, Singh & Singh 2007).
13.	<i>Solenostoma gracillimum</i> (Sm.) Schuster	EH, WH (H): Himachal Pradesh: Kullu Valley (Chopra 1943, Kashyap 1932, Vána & Long 2009).
14.	<i>Solenostoma indrodayanum</i> (Singh et Singh) Vána et Long	WH (H): Himachal Pradesh: Rotley Pass (Singh & Singh 2007, Vána & Long 2009).
15.	<i>Solenostoma infuscum</i> (Mitt.) Hentschel	EH, WH (H): Himachal Pradesh: Kullu (Singh & Singh 2007, Vána & Long 2009)
16.	<i>Solenostoma kashyapii</i> (SC Srivastava, S. Srivastava et Sharma) Vána et Long	WH (U): Uttarakhand: Valley of flowers (Srivastava et al. 2003, Vána & Long 2009, Singh & Singh 2007).
17.	<i>Solenostoma lanigerum</i> (Mitt.) Vána et Long	EH, WH (U): Uttarakhand: (Srivastava et al. 2003, Vána & Long 2009).
18.	<i>Solenostoma nilgiriensis</i> (Alam, Kumar & Srivastava) Vána et Long	EH, SI, WH (U): Uttarakhand: Almora (Alam et al. 2007, Vána & Long 2009).
19.	<i>Solenostoma polyrhizoides</i> (Grolle ex Amakawa) Vána et Long	EH, WH (H, U): Himachal Pradesh: Simla; Uttarakhand: Mussoorie (Vána 1974, Vána & Long 2009, Singh & Singh 2007).
20.	<i>Solenostoma pseudocyclops</i> (Inoue) Vána et Long	EH, WH (U): Uttarakhand: Valley of Flowers (Nath et al. 2010).
21.	<i>Solenostoma purpuratum</i> (Mitt.) Steph.	EH, SI, WH (H, U): Himachal Pradesh: Simla, Silrundi; Uttarakhand: Kedarnath Wild Life Sanctuary (Amakawa 1967, Kashyap 1932, Vána & Long 2009, Bahuguna et al. 2011, Bapna & Kachroo 2000, Singh & Singh 2007).
22.	<i>Solenostoma sanguinolentum</i> (Griff.) Steph.	EH, WH (U): Uttarakhand: Kumaun Himalaya (Bapna & Kachroo 2000, Srivastava 2008, Vána & Long 2009, Singh & Singh 2007).
23.	<i>Solenostoma subrubrum</i> (Schiffn. ex Steph.) Vána et Long	EH, WH (H, U): Himachal Pradesh: Kullu; Uttarakhand: Kedarnath Wild Life Sanctuary (Bahuguna et al. 2011, Singh & Singh 2007, Vána & Long 2009).
24.	<i>Solenostoma tetragonum</i> (Lindenb.) Schuster ex Vána et Long	EH, SI, CI, A&N, WH (U): Uttarakhand: Mussoorie, Dehradun, Pithoragarh (Srivastava 2008, Amakawa 1968, Bapna & Kachroo 2000, Singh & Singh 2007).
25.	<i>Solenostoma truncatum</i> (Nees) Schuster ex Vána et Long	EH, SI, WH, (J&K, U): Jammu & Kashmir; Uttarakhand: Kumaon region, Champawat, Kedarnath Wild Life Sanctuary, Pithoragarh (Bahuguna et al. 2011, Chopra 1943, Srivastava 2008, Vána & Long 2009).

EH: Eastern Himalaya, WH: Western Himalaya, CI: Central India, SI: South India, A&N: Andaman & Nicobar, (H): Himachal Pradesh, (J&K): Jammu & Kashmir, (U): Uttarakhand.

from western Himalaya have been regarded as doubtful taxa (Kashyap 1932, Srivastava & P. Singh 1995, Váňa & Long 2009).

TAXONOMIC DESCRIPTION

Solenostoma comatum (Nees) C. Gao,
Fl. Hepat. Chin. Boreali-Orient. 73. 1981.

Text-figures 1-14, Plate 1, figures 1-6

Description: Plants light green, up to 10-22 mm long, 2-3 mm wide with leaves, growing in close mats. Stem 0.15-0.22 mm in diameter, prostrate, sometimes branched, 10-16 cells across, cortical cells large, 12-27x9-20 μm , medullary cells small, 7-22x7-17 μm . Rhizoids numerous, present on the stem (base) and leaf bases, leaf rhizoids present in bunch, lighter in colour, stem rhizoids long, dark, pigmented and swollen at tips. Leaves somewhat distant towards the base, approximate-imbricate towards the apex, obliquely to horizontally spreading, obliquely inserted with wide base, entire, succubous, ligulate, ovoid to obovoid, 0.8-1.3x0.6-0.9 mm, normally longer than broad, antical margin or sometimes postical margin recurved ventrally, convex, apex rounded. Apical (marginal) leaf-cells 21-37x12-25 μm , median leaf-cells 20-41x16-21 μm , basal leaf-cells 17-52x14-30 μm , walls thin, trigones distinct, more prominent in the middle while indistinct at the base. Cuticle verrucose, verrucae prominent, spherical-oval or of variable size, 5-13x5-10 μm . Oil-bodies not seen. Plant dioicous. Androecium (male inflorescence) intercalary, male bracts in 9-10 pairs, saccate. Gynoecium (female inflorescence) terminal. Perianth exserted, cylindrical, long, 2.1-2.5 mm long and 0.7-0.8 mm wide, mouth crenulate.

Habitat: The plants grow on moist and shady soil surface in association with Mosses.

Range: Bonin, Burma, Ceylon, China, Formosa, India, Japan, Java, Korea, Malay Penins, Malayasia, Nepal, New Guinea, Philippines, Sumatra, Taiwan, Thailand and Trenate (Amakawa 1960, 1970, Bapna & Kachroo 2000, Singh & Singh 2007, Váňa 1972, 1973, Váňa & Long 2009).

Distribution in India: Assam, Meghalaya (Khasi Hills), Sikkim (Pungjo Valley), West Bengal (Darjeeling), (Amakawa 1970, Bapna & Kachroo 2000, Singh & Nath 2007, Stephani 1917-1925, Váňa 1972, Váňa & Long 2009, Barbhuiya & Singh 2012).

Specimen examined: India- Western Himalaya, Uttarakhand, Champawat District, Lohaghat, N-29°23.420' Latitude, E-080°04.33' Longitude, 2018 m Altitude, 21 October, 2011, G. Asthana and Party, LWU 22008/ 2011.

DISCUSSION

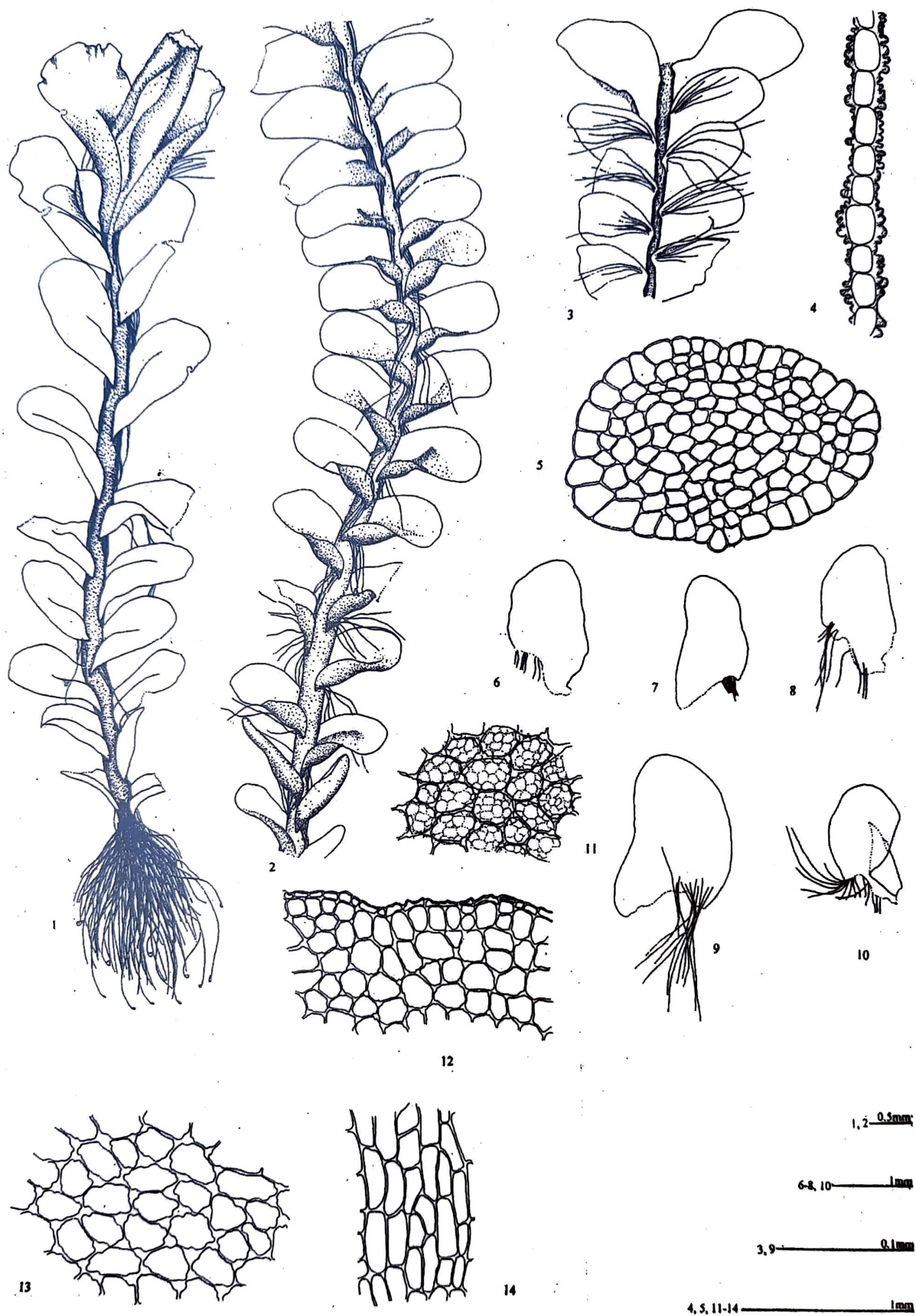
Solenostoma comatum (Nees) C. Gao was earlier known from Assam, Meghalaya, Sikkim and West Bengal in India (Eastern Himalaya) as *Jungermannia comata* (Stephani 1917-1925, Amakawa 1970, Váňa 1972, Mizutani et al. 1995, Bapna & Kachroo 2000, Gao & Bai 2001, Singh & Nath 2007, Váňa & Long 2009, Barbhuiya & Singh 2012). In recent study, the taxon has been observed in Uttarakhand also showing extension in range of distribution in Himalayan region. The plants are very much characteristic in having verrucose cuticle (Text-figures 4, 11, Plate 1, figures 4-6), prominent trigones (Text-figure 13) and dioecious sexuality (Text-figures 1, 2).

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Text-figures 1-14. *Solenostoma comatum* (Nees) C. Gao. 1. A female plant. 2. A portion of male plant. 3. A portion of plant (ventral view). 4. Cross-section of leaf showing verrucae. 5. Cross-section of Stem. 6-10. Leaves. 11. Leaf-cells showing verrucae. 12. Marginal leaf-cells. 13. Median leaf-cells. 14. Basal leaf-cells. (All figure drawn from LWU 22008/ 2011).

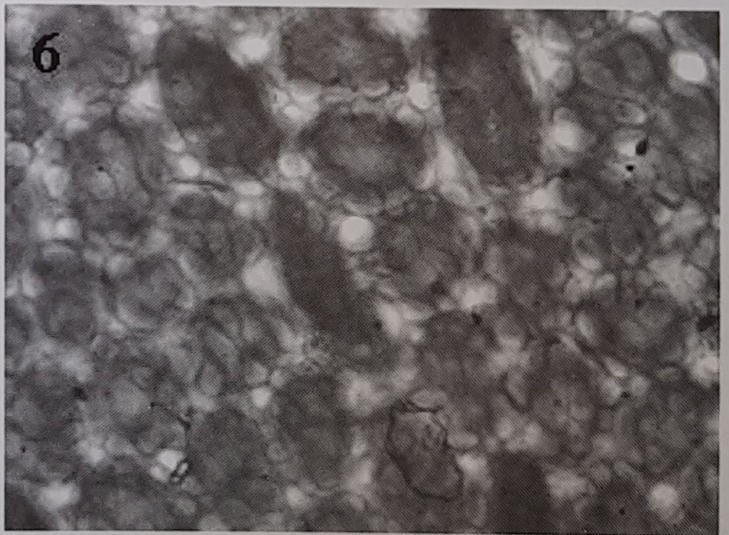
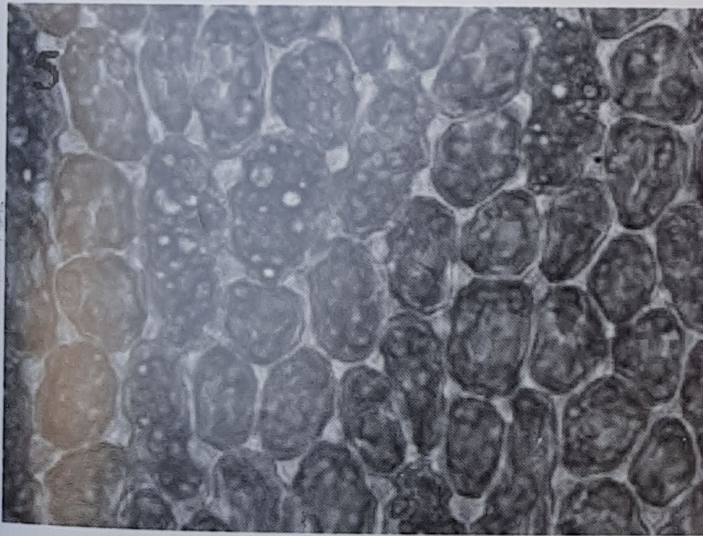
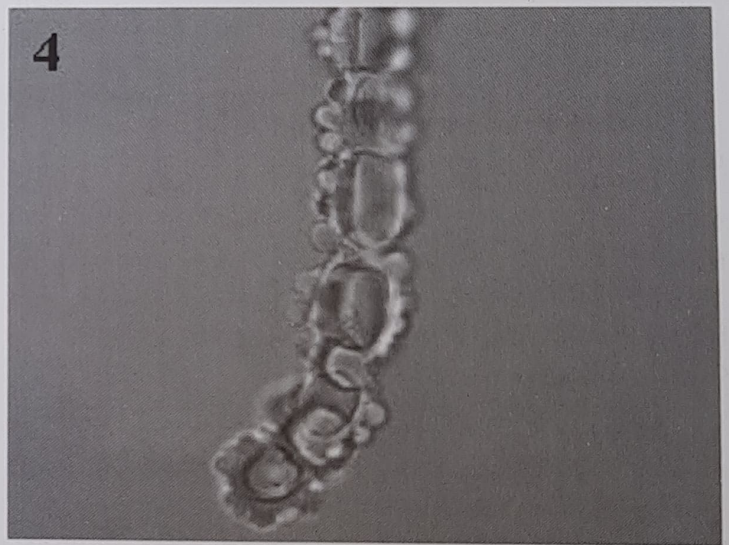
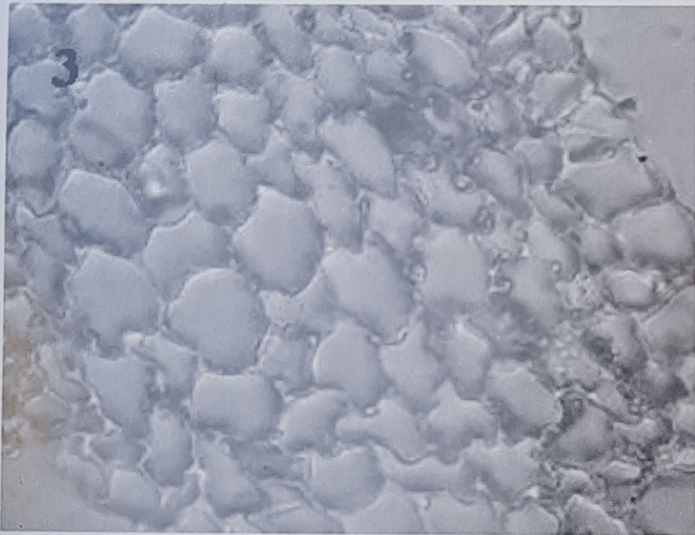
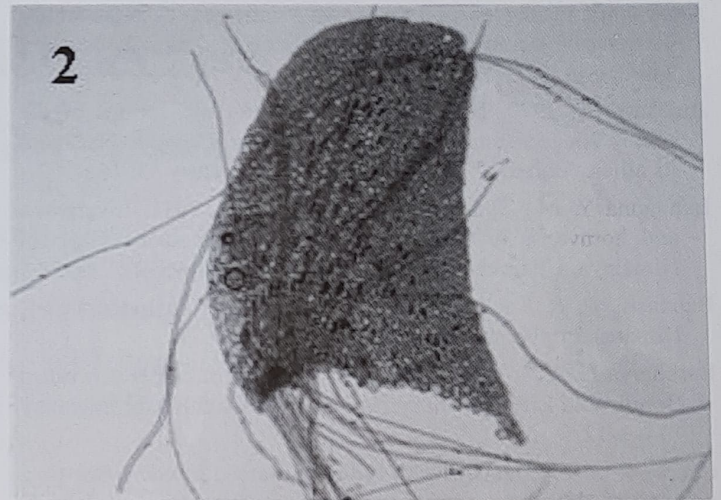


Plate 1

Solenostoma comatum (Nees) C. Gao. 1. Plant habitat. 2. Leaf. 3. Cross-section of stem. 4. Cross-section of leaf. 5, 6. Leaf cells showing trigones and verrucae. (All photographs taken from LWU 22008/ 2011)

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