

## A new species of *Cordyceps* from Gansu, China

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Key Words—*Cordyceps gansuensis*; *Megalocordyceps*; Gansuchongcao; entomogenous ascomycete; *Hepialus*.

### Summary

A new entomogenous ascomycete, which has been found in the alpine and subalpine regions about 3,600–3,800 m above the sea level in Gannan and Linxia Districts of Gansu Province of China, resembles very closely *Cordyceps sinensis* in appearance. The new taxon differs from it in having subglobose perithecia and cylindrical asci containing ellipsoidal or oblong, 6 or 8 ascospores. Therefore, it is named *Cordyceps gansuensis* K. Zhang, C. Wang et M. Yan, sp. nov. Moreover, on account of the fact that the perithecia of this new fungus are superficial and the ascospores are ellipsoidal or oblong differing distinctly from other known species of *Cordyceps*, the authors propose a new subgenus *Megalocordyceps* K. Zhang, C. Wang et M. Yan, subgen. nov. be set up in the genus *Cordyceps*.

A new entomogenous ascomycete fungus has been collected from Gannan and Linxia Districts of Gansu Province in the northwest of China. This fungus resembles very closely *Cordyceps sinensis* (Berk.) Sacc. in appearance, but differs from the latter in having subglobose perithecia and cylindrical asci containing ellipsoidal or oblong, 6 or 8 ascospores. The Latin and English descriptions have been given for the new species, *Cordyceps gansuensis* K. Zhang, C. Wang et M. Yan, sp. nov.

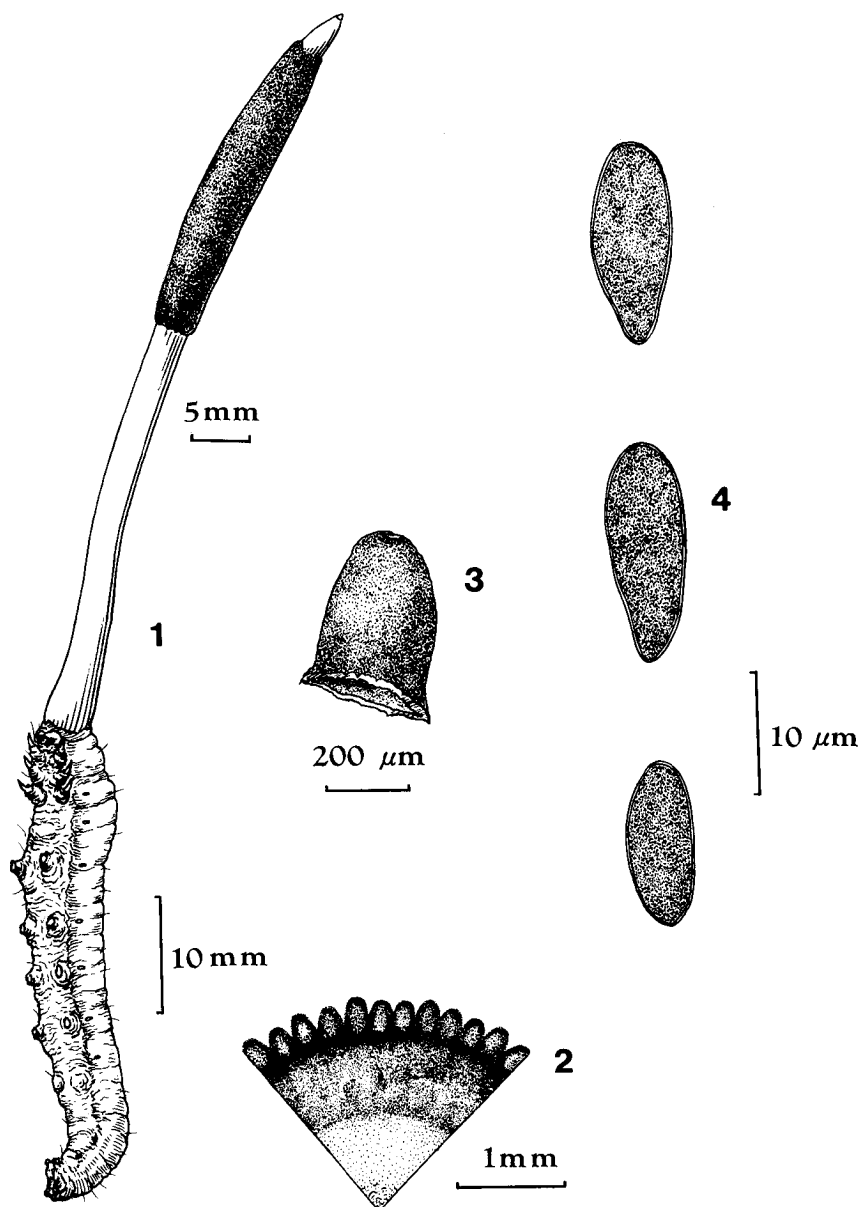
The holotype specimen of *C. gansuensis* (Wang et al. 11888) is deposited in the Herbarium of the Institute of Botany, the Northwestern Teachers University, Lanzhou, China.

### Descriptions

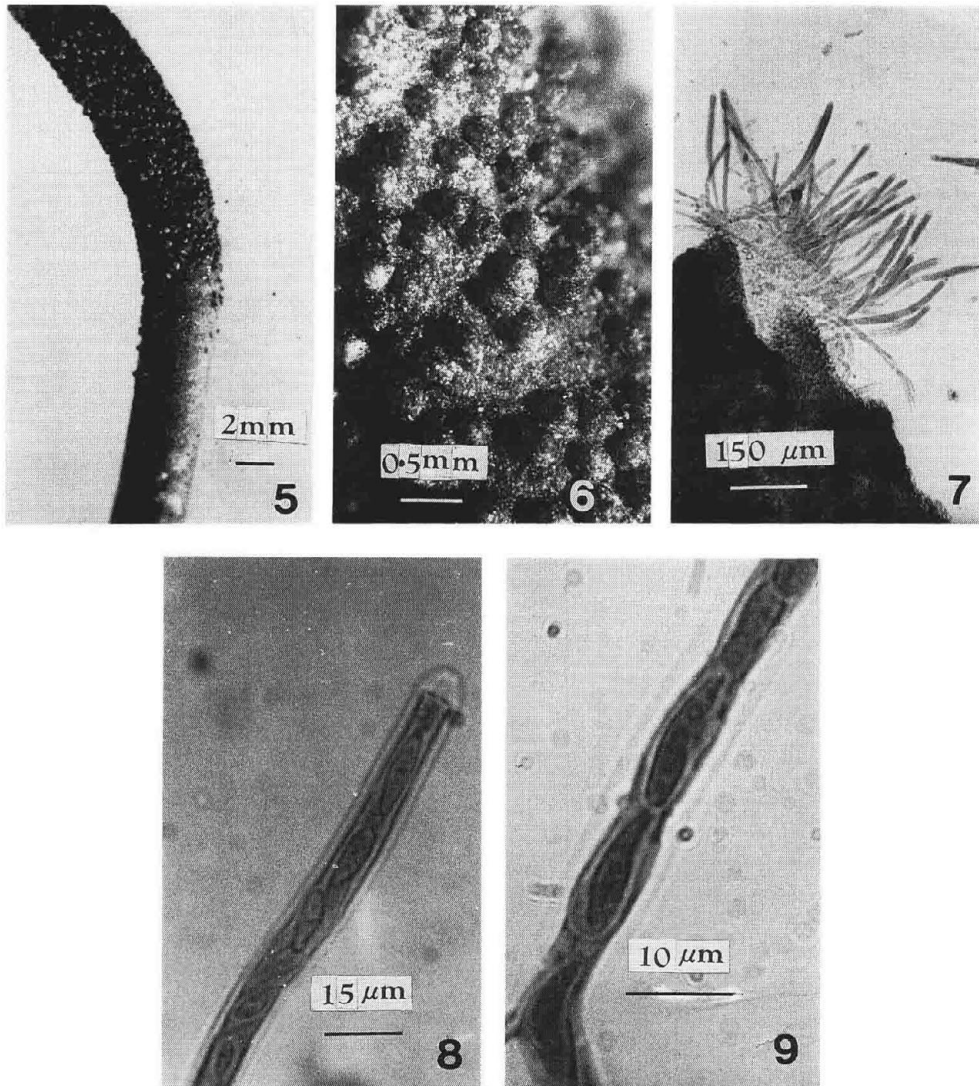
*Cordyceps gansuensis* K. Zhang, C. Wang et M. Yan, sp. nov. [Pyrenomycetes]

Figs. 1–8

Species habitu *C. sinensis* (Berk.) Sacc. similis, sed peritheciis superficialibus subglobosis atrobrunneis; ascis cylindricis 6 vel 8 ascosporis; ascosporis ellipsoideis vel



Figs. 1-4. *Cordyceps gansuensis* (Wang et al. 11888). 1. habit; 2. a part of transverse section of a stroma; 3. a perithecium; 4. ascospores.



Figs. 5-9. *Cordyceps gansuensis* (Wang et al. 11888). 5. stipe and fertile part of a stroma; 6. enlarged view of the fertile part of a stroma showing perithecia; 7. a perithecium and asci; 8. an ascus with immature ascospores; 9. an ascus with mature ascospores.

oblongis; stromatis parte sterili cornata post maturitatem ascosporae irregulariter stellatolobata bene distincta.

Stromata a hospitem capitulis genita, solitaria vel raro ramosa, carnosae, cylindrica vel clavata, 5-8 cm longa, 2.5-5 mm crassa. Stipes plerumque rectus aut subcurvatus, 2.5-3.5 cm longus, laevigatus, brunneus, ex cortice pseudo-parenchymatico compositus. Capitulum fertile cylindricum, 2.5-3 cm longum, 3-5 mm crassum, atrobrunneum;

apice parte sterili cornata, 3–6 mm longa, brunnea, laevigata, deinde irregulariter stellatolobata, intus albescens. Perithecia superficialia, subglobosa, ca.  $320\text{--}350 \times 270\text{--}300 \mu\text{m}$ , atrobrunnea, tuberculata, spadiciformia; apice ostiolis ante dehiscencias verruculosas obscure atrobrunneis, post dehiscencias orbiculatis ca.  $37 \mu\text{m}$  in diam. Paraphyses simplices septatae, ascis subaequilongae. Asci hyalini, cylindrici, unitunicati, uniseriati, 6 vel 8 ascosporis,  $213\text{--}284 \times 8.5\text{--}13.5 \mu\text{m}$ ; apice appendicibus capitatis hemisphaericis, inflatis,  $7.7\text{--}14.0 \times 8.4\text{--}13.3 \mu\text{m}$ , non amyloideis, hyalinis, basin versus attenuatis. Ascospores unicellulares, hyalinae, laevigatae, ellipsoideae vel oblongae,  $12.8\text{--}21.3 \times 6.3\text{--}8.5 \mu\text{m}$ .

Status anamorphus: incognitus.

Hab. In larvis *Hepiali*. Gansu: Maqu Xian, Dashui, alt. 3,600–3,800 m, in pratis subalpinis, 13 June 1986, C. Wang, K. Zhang et M. Yan 11888 (Holotypus); ibid. 27 May 1987, Wang 11896; Jishi Shan Xian, Leiji Shan, alt. 3,700 m in pratis subalpinis, 13 May 1986, Wang 11816.

Chinese name: *Gansuchongcao*

Stromata born on the head of the host larva solitary or rarely branched, fleshy, cylindrical or clavate, 5–8 cm long and 2.5–5 mm wide. Stipes vary frequently straight or somewhat curved, 2.5–3.5 cm long, smooth, brown. Peridial layer of the stipe composed of pseudoparenchyma. Fertile part cylindric, dark brown, 2.5–3 cm long, 3–5 mm wide; sterile part horn-shaped, brown, then irregular stellate lobes, 3–6 mm long. Perithecia superficial, subglobose  $320\text{--}350 \times 270\text{--}300 \mu\text{m}$ , dark brown, tuberculate; ostiole before dehiscence covered with small wartlike outgrowths, dark brown, after dehiscence orbicular about  $37 \mu\text{m}$  in diam. Paraphyses simple septate, almost equalling the asci in length. Asci cylindric, hyaline, unitunicate, uniseriate, 6 or 8 ascospores,  $212\text{--}284 \times 8.5\text{--}13.5 \mu\text{m}$ . Capitulate appendage hemispherical, inflated,  $7.7\text{--}14.0 \times 8.4\text{--}13.3 \mu\text{m}$ , not amyloid, hyaline. Ascospores ellipsoidal to oblong, 1-celled, hyaline, smooth,  $12.8\text{--}21.3 \times 6.3\text{--}8.5 \mu\text{m}$ . Anamorph unknown.

## Discussion

The new species *Cordyceps gansuensis* is very similar to *C. sinensis* in appearance and the host insect of both fungi is the larvae of *Hepialus* (Lepidoptera). When the former fungus is used as Chinese medicine after drying, it is larger in size and fatter with a plump body than the latter fungus. Owing to its excellent quality, therefore, it can be used as a kind of tonic Chinese medicine in Gansu like *C. sinensis* (Zhang, 1987).

According to Kobayasi (1982, 1983), the genus *Cordyceps* can be divided into three subgenera i.e., subgen. *Ophiocordyceps* (Petch) Y. Kobayasi, subgen. *Eucordyceps* Y. K., subgen. *Neocordyceps* Y. K. On the basis of the morphological characteristics of the new species, particularly of the ascospore morphology, the authors propose a new subgenus *Megalocordyceps* be set up in the genus *Cordyceps*.

Subgenus ***Megalocordyceps*** K. Zhang, C. Wang et M. Yan, subgen. nov.

*Perithecia superficialia*, subglobosa. Asci cylindrici, apice appendicibus capitatis hemisphaericis. Ascosporae unicellulares, hyalinae, laevigatae, ellipsoideae vel oblongae.

Typus subgeneris: *C. gansuensis* K. Zhang, C. Wang et M. Yan.

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### 摘 要

中国・甘肅省産 *Cordyceps* 属の1新種

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中国・甘肅省甘南藏族自治州と臨夏回族自治州地域の亜高山及び高山帯の海拔 3,600–3,800 m に産する *Cordyceps* 属菌の1種はその外観が中国冬虫夏草 *Cordyceps sinensis* にきわめてよく似ているが、その子のう殻は表在生、垂球形であり、子のうは円筒形で6あるいは8個の楕円体形～長楕円体形の子のう胞子を内生する点などで異なる。これを新種と認め、*Cordyceps gansuensis* K. Zhang, C. Wang et M. Yan, sp. nov. (中国名：甘肅虫草) と命名した。また、本種の子のう殻が表在生であり、子のう胞子が既知種には見られない楕円体形～長楕円体形であることに基づいて、新亜属 *Megalocordyceps* K. Zhang, C. Wang et M. Yan, subgen. nov. を提唱した。