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## *Cordyceps* Species from Japan 5\*

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1. *Cordyceps pseudoatrovirens* Y. KOBAYASI et D. SHIMIZU, sp. nov.

Figs. 1, 14A.

Mycelia superficiem hospitem non contegentia. Stromata 14 mm longa, ex capite hospitis oriunda, carnosae. Stipes cylindricus, 7 × 1–1.5 mm, citrinus, basi olivaceus, glaber, textu ex hyphis 3–4 μ crassis composito, sine peridio. Pars fertilis fusoidea vel ovoidea, 5–7 × 2–2.5 mm, olivacea, cortice pseudoparenchymatico.

Perithecia immersa, ovoidea, 520–550 × 250–320 μ. Asci 4–5 μ crassi, capitibus 3 μ in diam. Ascospores acerosae, 50 × 2.5 μ, 8 septatae, in articulos secedentes.

Nom. Jap. Towada-midori-kuchikimushitake.

Hab. Larva of Coleoptera. Aomori Pref., Towada, Oirase (D. SHIMIZU, Sept. 13, 1979, TA 225—Type in TNS).

The present new species has same appearances with *C. atrovirens*, differing, how-

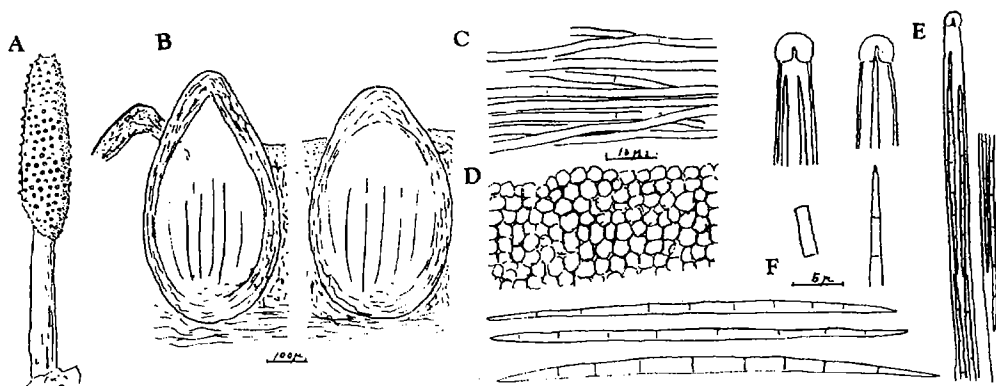


Fig. 1. *Cordyceps pseudoatrovirens* A. Stroma × 2.8. B. Longitudinal section of head. C. Inner tissue of stalk. D. Peridial layer of head. E. Asci. F. Ascospores and sec. ascospores.

\* Continued from *Bull. Natn. Sci. Mus., Tokyo, Ser. B, 8: 79–91 (1982)*

ever, in the destitution of ellipsoidal cells in cap, wholly imbedded ostiola and unoblique arrangement of perithecia.

2. *Cordyceps ampullacea* Y. KOBAYASI et D. SHIMIZU, sp. nov. Figs. 2, 14B.

Mycelia superficiem hospitem non contegentia. Stromata gregaria, 6–8 mm longa, carnosae, lateritia. Stipes brevis, 1.8–2.5 × 0.7–1 mm, glabra, textu ex hyphis composito, sine peridio. Pars fertilis clavata, 3.8–6 × 1–1.8 mm, cortice pseudoparenchymatico.

Perithecia omnino immersa, ampullacea, 350–360 × 100–120  $\mu$ . Asci 3–4  $\mu$  crassi, capitibus 2  $\mu$  in diam. Ascospores acerosae, 23–30 × 1  $\mu$ , 3–6 septatae, in articulos secedentes.

Nom. Jap. Iragano-benisanagitake.

Hab. Cocoon of Lepidoptera. Chichibu, Mt. Ryogami (D. SHIMIZU, Sept. 30, 1949, no. 179—Type in TNS).

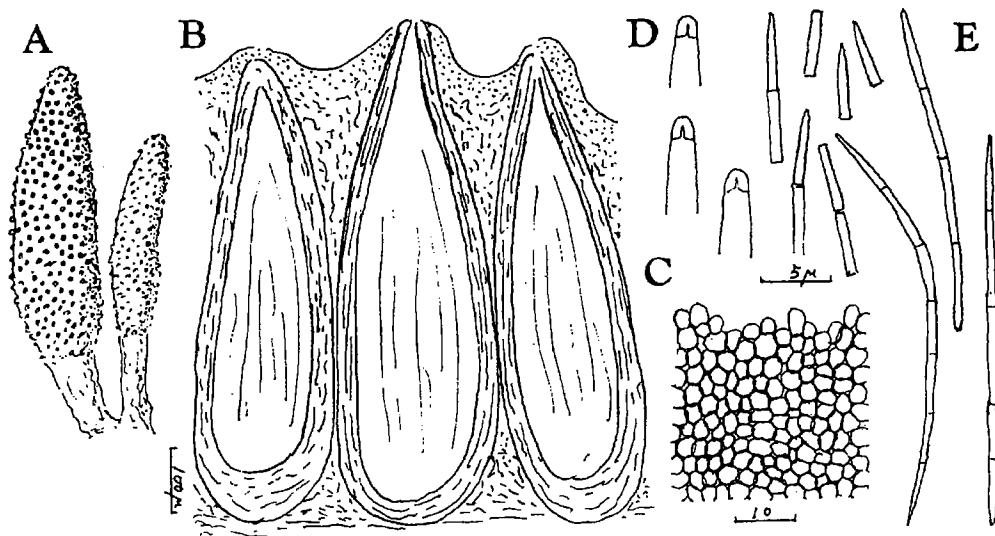


Fig. 2. *Cordyceps ampullacea* A. Stromata  $\times 6$ . B. Section of head. C. Peridial layer of head. D. Apical part of asci. E. Ascospores and sec. ascospores.

3. *Cordyceps rosea* Y. KOBAYASI et D. SHIMIZU, sp. nov. Figs. 3, 14 C.

Mycelia superficiem hospitem non contegentia. Stromata 11 mm longa, carnosae, ex capite hospitis oriunda, roseae. Stipes cylindricus 1 mm in diam., glaber; textu ex hyphis 2.5–4  $\mu$  crassis composito. Pars fertilis irregulariter clavata, ex stipite obsculiter definita, peridio pseudoparenchymatico.

Perithecia penitus immersa, ovoidea, 330–380 × 160–230  $\mu$ . Asci 100 × 3–4  $\mu$ , capitibus 2–5  $\mu$  in diam. Ascospores acerosae, 120 × 1–1.5  $\mu$ , 8–10 septatae, in articulos non secedentes. Conidia ex ascosporis oriunda, naviculata, 4–5 × 1  $\mu$ , laevia, hyalina.

Nom. Jap. Usuaka-shakutorimushitake.

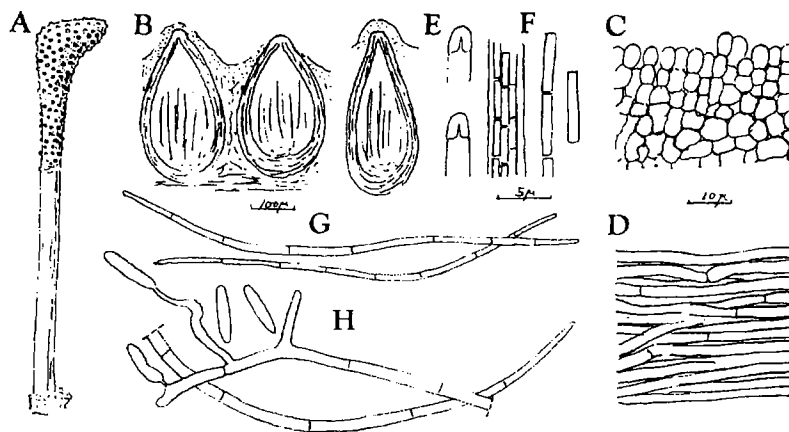


Fig. 3. *Cordyceps rosea* A. Stroma  $\times 3$ . B. Section of perithecia. C. Peridium of head. D. Inner tissue of stalk. E. Apical part of asci. F. Sec. ascospores. G. Ascospores. H. Conidia germinated from ascospores.

Hab. Larva of Lepidoptera. Yamagata Pref., Yonezawa, Tsunagi (D. SHIMIZU, July 1, 1959, no. 49 —Type in TNS).

4. *Cordyceps pallidiolivacea* Y. KOBAYASI et D. SHIMIZU, sp. nov. Figs. 4, 14 D.

Mycelia superficiem hospitem non contegentia. Stromata 8–10 mm longa, ex hospitis lateraliter oriunda, carnosa, pallide olivacea. Stipes brevis, cylindricus, 2–4 mm longus, 1–3 mm in diam., longitudinaliter sulcatus, textu ex hyphis 2.5–4  $\mu$  crassis composito. Pars fertilis ovoidea vel irregularis 4–8  $\times$  1.5–2.5 mm, glabra, sulcata. Perithecia immersa, pyriforme, 520–580  $\times$  220–250  $\mu$ . Asci 70  $\times$  3  $\mu$ , capitibus 2.5  $\mu$  in diam. Ascosporae acerosae, 27–35  $\times$  1  $\mu$ , 6 septatae, in articulos secedentes.

Nom. Jap. Shirohime-sanagitake.

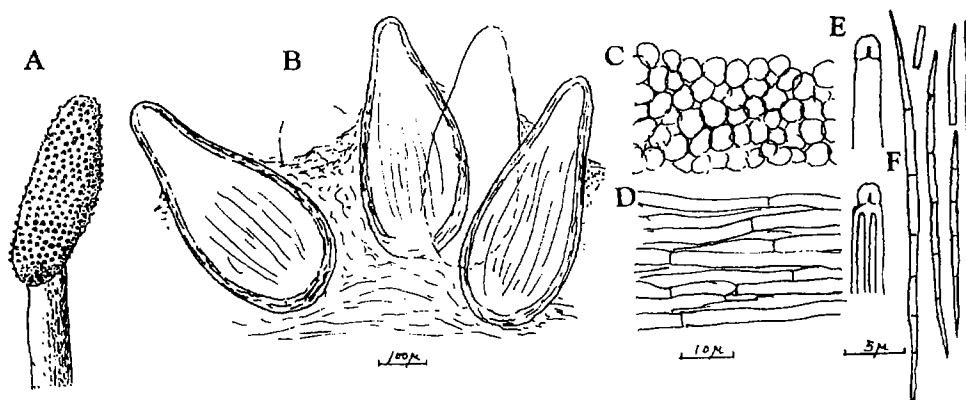


Fig. 4. *Cordyceps pallidiolivacea* A. Upper part of stroma  $\times 3.6$ . B. Section through head. C. Peridium of head. D. Inner tissue of stalk. E. Apical part of asci. F. Ascospores.

Hab. Cocoon of Lepidoptera. Chichibu, Mt. Ryogami (D. SHIMIZU, Aug. 27, 1949, no. 130—Type in TNS).

5. *Cordyceps alba* Y. KOBAYASI et D. SHIMIZU, sp. nov. Figs. 5, 14 E.

Mycelia superficiem hospitem non contegentia. Stromata sparsa, 6 mm longa, carnosa, pure alba. Stipes 0.6 mm in diam., laevis, textu ex hyphis 4–8  $\mu$  crassis composito. Pars fertilis ovoidea vel pulvinata, 3  $\times$  1.5 mm.

Perithecia omnino superficialia, pyriformia, 500–530  $\times$  220–250  $\mu$ , ex hyphis 5  $\mu$  crassis, multiseptatis obtecta. Asci 4–5  $\mu$  crassi, capitibus 2.5–3  $\mu$  in diam. Ascospores acerosae, 35–40  $\times$  1–1.5  $\mu$ , 5 septatae, in articulos non secedentes.

Nom. Jap. Minomushi-shirosanagitake.

Hab. Cocoon of Lepidoptera. Chichibu, Mt. Ryogami (D. SHIMIZU, Sept. 29, 1949, no. 174—Type in TNS).

The present species seems to be near *C. shimaensis*, differing, however, in not orange colour of stroma.

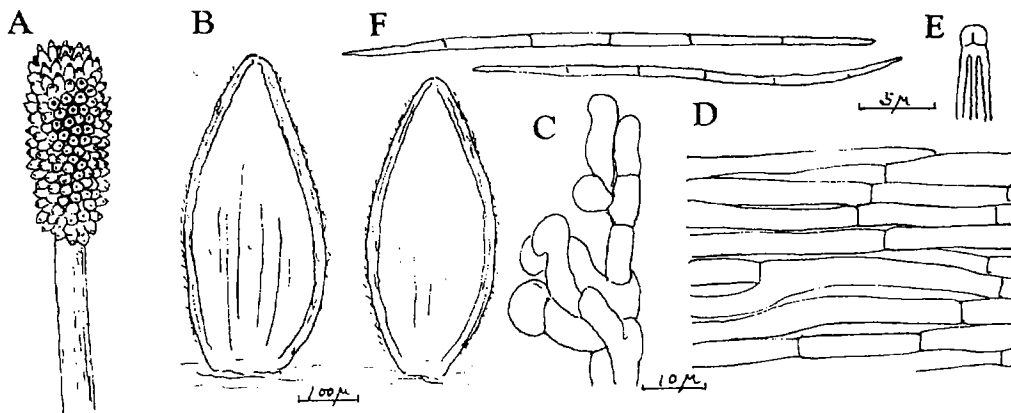


Fig. 5 *Cordyceps alba* A. Upper part of stroma · 7.6. B. Perithecia. C. Hair-like hyphae on wall of perithecia. D. Inner tissue of stalk. E. Apical part of ascus. F. Ascospores.

6. *Cordyceps obliquiordinata* Y. KOBAYASI et D. SHIMIZU, sp. nov. Figs. 6, 15 B.

Mycelia superficiem hospitem non contegentia. Stromata 75 mm longa, tenuiter cylindrica, carnosa. Stipes per rhizoideum columnatim continentes, textu ex hyphis 2.5–5  $\mu$  crassis composito. Pars fertilis cylindrica, 40  $\times$  2–2.5 mm attenuata, luteola, peridio pseudoparenchymatico.

Perithecia omnino et oblique immersa, 300–330  $\times$  420–480  $\mu$ , ostioliis brevibus curvatis. Asci 3–4  $\mu$  crassi, capitibus 2.5–3  $\mu$  in diam. Articuli ascosporarum 7–8  $\times$  1  $\mu$ , utrinque truncati.

Nom. Jap. Kengata-koganemushitake.

Hab. Larva of Scarabaeidae, Coleoptera. Yamagata Pref., Kamabuchi (R. YAHAGI, Aug. 8, 1979, TY 213 —Type in TNS).

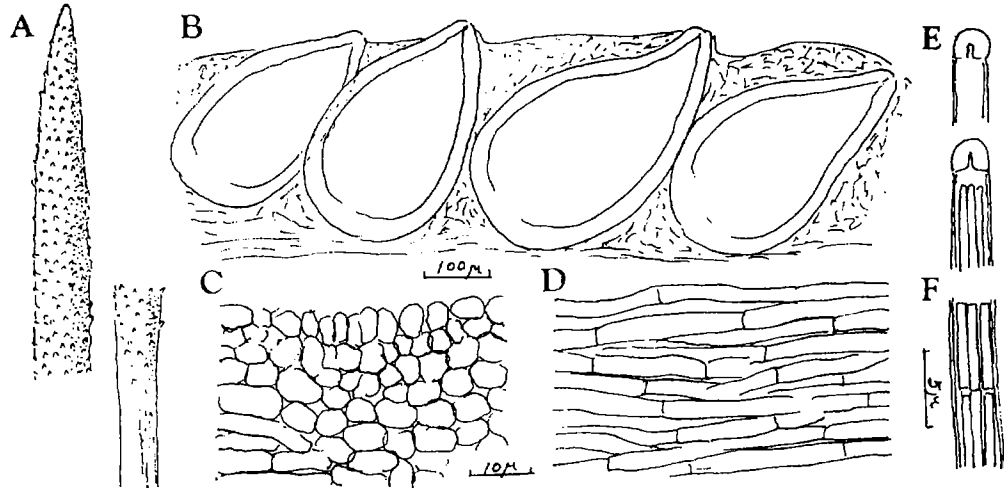


Fig. 6. *Cordyceps obliquiordinata* A. Part of stroma  $\times 2.5$ . B. Section through head. C. Peridium of head. D. Inner tissue of stalk. E. Apical part of asci. F. Sec. ascospores in ascus.

7. *Cordyceps martialis* SPEG., in Bol. Acad. Nac. Cordova 11 (1889); PETCH, in Trans. Brit. Myc. Soc. 18: 57 (1933); MARTIN, in Mycologia 50: 196 f. 23, 24 (1958); KOVAL, Entomog. fungi of SSSR p. 110 f. 92 (1974); Y. KOBAYASI, in Journ. Jap. Bot. 53 (11): 338 (1978). Figs. 7, 15 A.

Mycelia not covering host body. Stromata 50 mm long, coriaceous or carneous. Stalk cylindrical, irregularly verrucose, dark brown to paler,  $35 \times 1.5-2$  mm, composed of  $2-3 \mu$  thick, septate hyphae, without special cortical layer. Fertile part cylindrical or irregularly deformed, with pseudoparenchymatous outer layer. Perithecia obliquely immersed,  $570-630 \times 250-300 \mu$ . Asci  $7-8 \mu$  thick, cap  $3-3.5 \mu$  in diam. Sec. ascospores  $3-4 \times 1 \mu$ , truncated at both ends.

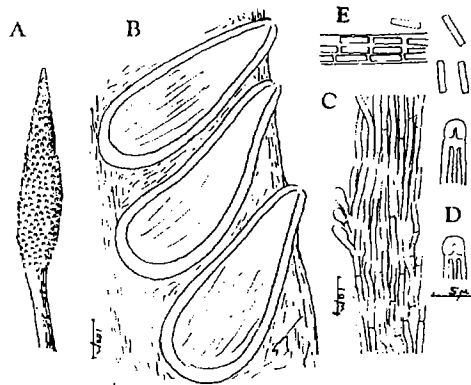


Fig. 7. *Cordyceps martialis* A. Upper part of stroma  $\times 2$ . B. Section through head. C. Peridium of head. D. Apical part of asci. E. Sec. ascospores.

Anamorph: *Cephalosporium*.

Hab. Larva of Coleoptera. Chichibu, Mt. Ryogami & Oochigawa (D. SHIMIZU, Jul. 31, 1949).

Distr. Brazil (T.L.), British Honduras, British Guiana, China, Far East of USSR.

8. *Cordyceps nigripoda* Y. KOBAYASI et. D. SHIMIZU., sp. nov. Fig. 8.

Mycelia superficiem hospitem non contingentia. Stromata cylindrica, attenuata 25–30 × 1 mm, coriacea, glabra, obscure nigra, sursum fusca, appendicem recurvatem uromorpham praedita, textu ex hyphis 2.5–4  $\mu$  crassis composito. Pars fertilis lateralis pulvinata, 2–3 mm longa, pallide fuscata.

Perithecia omnino immersa, ovoidea, 320–350 × 150–180  $\mu$ , peridio pseudoparenchymatico. Asci 115–140 × 10  $\mu$ , capitibus 4–5 in diam. Ascosporae acerosae, 57–90 × 3  $\mu$ , 3–5 septatae, in articulos non secedentes.

Nom. Jap. Ashiguro-kubioretake.

Hab. Larva of Coleoptera. Aomori Pref., Towada, Oirase (D. SHIMIZU, July 21, 1981, TA 98—Type in TNS).

Among the six species of this group, *C. corallomyces* MÖLLER has some similar appearance with the present new species, but the latter has the larger perithecia and the other kind of host insect.

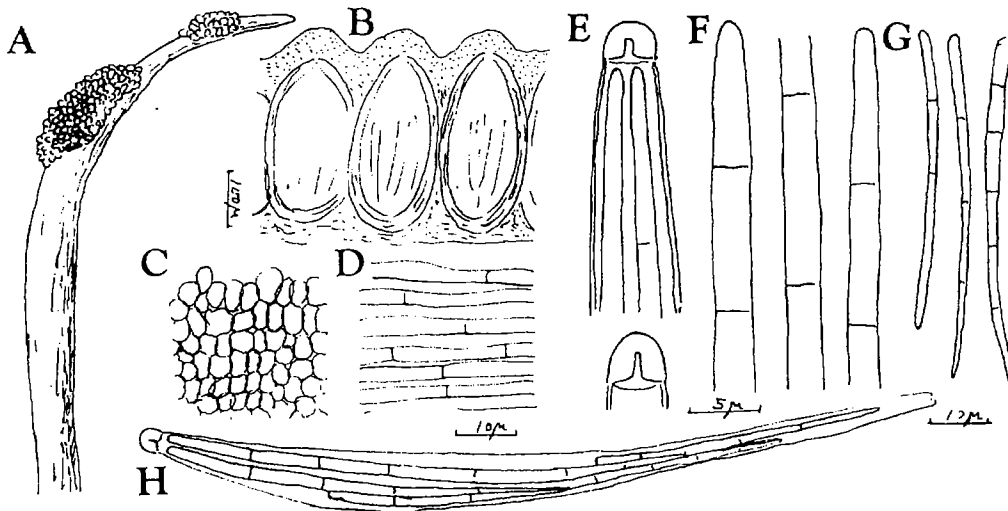


Fig. 8. *Cordyceps nigripoda* A. Upper part of stroma  $\times 5$ . B. Section through head. C. Peridium of head. D. Inner tissue of stalk. E. Apical part of asci. F, G. Ascospores. H. Ascus.

9. *Cordyceps intermedia* IMAI, in Proceed. Imp. Acad. 10: 677 f. 1–6 (1934); Y. KOBAYASI, in Bull. Nat. Sci. Mus. 5 (2): 84, pl. 6, 10 f. Q (1960). Figs. 9, 15 C.

forma *michinokuensis* Y. KOBAYASI et D. SHIMIZU f. nov.

A typo stromatibus minoribus, obscure olivaceis differt.

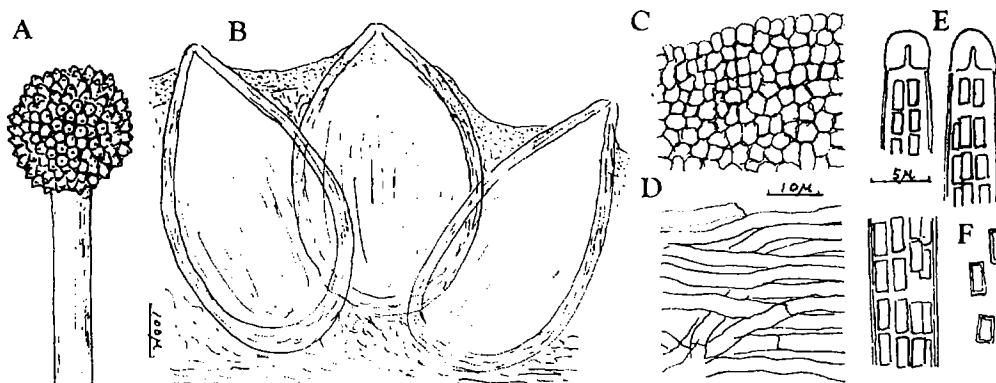


Fig. 9. *Cordyceps intermedia* f. *michinokuensis* A. Upper part of stroma  $\times 5$ . B. Section through head. Peridium of head. C. Peridium of head. D. Inner tissue of stalk. E. Apical part of asci. F. Sec. ascospores.

Nom. Jap. Miyama-tampotake.

Hab. *Elaphomyces*. Miyagi Pref., Inego (D. SHIMIZU, Sept. 24, 1961, no. 123—Type in TNS).

Stroma 35–40 mm long. Cap 3 mm in diameter, dark olivaceous. Stalk 1 mm thick, pale yellow. Perithecia  $470\text{--}530 \times 250\text{--}300 \mu$ . Sec. ascospores  $2.5\text{--}3 \times 1.5 \mu$ .

10. *Cordyceps minazukiensis* Y. KOBAYASI et D. SHIMIZU, sp. nov. Figs. 10, 16 A. Stromata 50–120 mm longa. Stipes 4–6 mm crassus, pallide cinereus, sursum cum myceliis transversaliter percursis, textu ex hyphis  $4\text{--}5 \mu$  crassis composito. Caput depresso-globosum, 5–12 mm in diam., obscure cinereum; peridio pseudoparenchymatico.

Perithecia omnino immersa, ampullacea,  $900\text{--}930 \times 220\text{--}250 \mu$ . Asci  $10 \mu$  crassi,

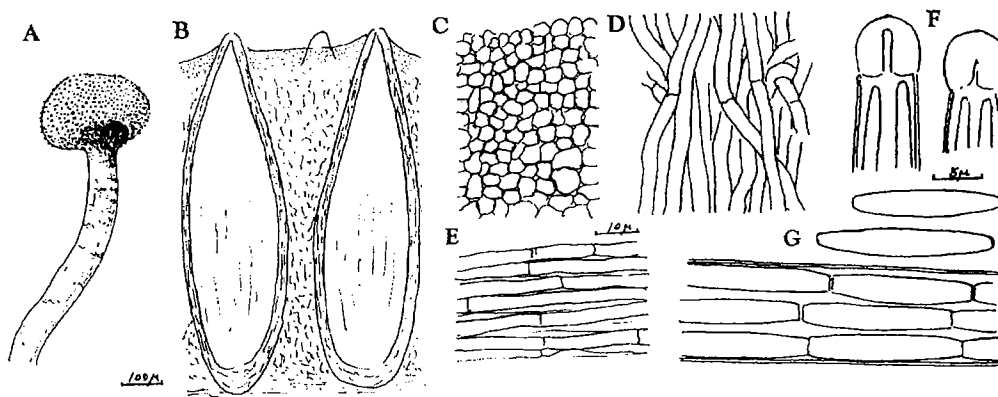


Fig. 10. *Cordyceps minazukiensis* A. Apical part of stroma  $\times 2.2$ . B. Section through head. C. Peridium of head. D. Inner tissue of stalk. E. Transverse tissue of stalk. F. Apical part of asci. G. Sec. ascospores.

capitibus 6–7  $\mu$  in diam. Articuli ascosporarum fusoides, 16–18  $\times$  3  $\mu$ .

Nom. Jap. Minazuki-tampotake.

Hab. *Elaphomyces*. Fukushima Pref., Oosasao (D. SHIMIZU, June 7, 1979, TF 197—Type in TNS).

The present species has some resemblances with *Cordyceps capitata*, differing, however, in the ampullaceous perithecia.

11. *Cordyceps miomoteana* Y. KOBAYASI et D. SHIMIZU, sp. nov. Figs. 11, 16 B. Stromata 65 mm longa. Stipes 3–4 mm crassus, albus, basi rhizoideus, textu ex hyphis 3.5–5  $\mu$  crassis contexto. Caput globosum, 6 mm in diam., obscure cinereum, peridio pseudoparenchymatico. Perithecia ovoidea, 770–800  $\times$  350–430  $\mu$ , ostiolis conicis protrudentia. Asci 400  $\times$  4  $\mu$ , capitibus 6  $\mu$  in diam. Articuli ascosporarum 8–11  $\times$  1.5–2  $\mu$ , utrinque truncati.

Nom. Jap. Miomote-tampotake.

Hab. *Elaphomyces*. Niigata Pref., Miomote (D. SHIMIZU, June 15, 1961, no. 119—Type in TNS).

Compared with *Cordyceps capitata*, the present fungus has shorter sec. ascospores.

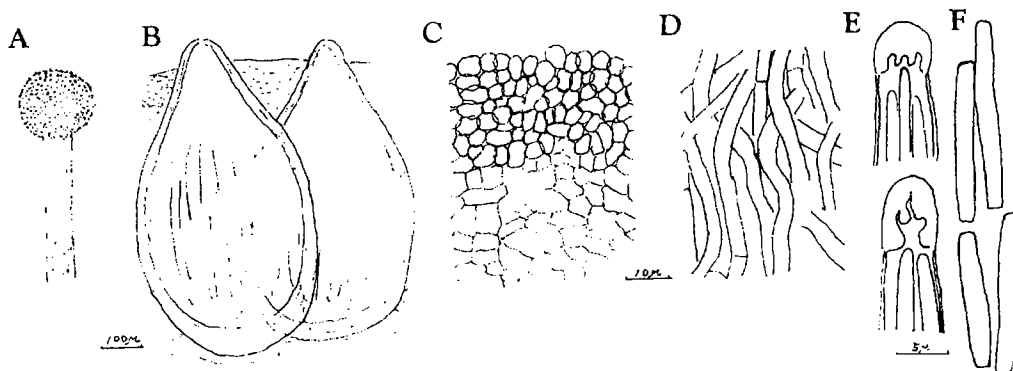


Fig. 11. *Cordyceps miomoteana*. A. Upper part of stroma  $\times$  16.6. B. Section through head. C. Peridium of head. D. Inner tissue of stalk. E. Apical part of asci. F. Sec. ascospores.

12. *Cordyceps paradoxa* Y. KOBAYASI, in Bull. Biogeogr. Soc. Japan 9: 156 f. 1–4 B, 6–8 (1939) et Gen. *Cordyceps* p. 137 f. in p. 138 (1941). Figs. 12, 16 C.

Stromata 10 cm long, simple or forked, attached to host by whitish mycelial strands. Stalk cylindric, pale purple, smooth, destitute of special peridium. Cap flattened clavate, 25  $\times$  9 mm, dark purple, peridium pseudoparenchymatic. Perithecia wholly immersed, ovoid, 480–500  $\times$  300–350  $\mu$ . Asci 9–10  $\mu$  thick, cap 4  $\mu$  in diam. Sec. ascospores 3–4  $\times$  2  $\mu$ .

Nom. Jap. Umemura-semitake.

Hab. Cicada. Yamagata Pref., Takahata-machi, Mt. Kanazawa (Yasuo SUZUKI, June 29, 1980).



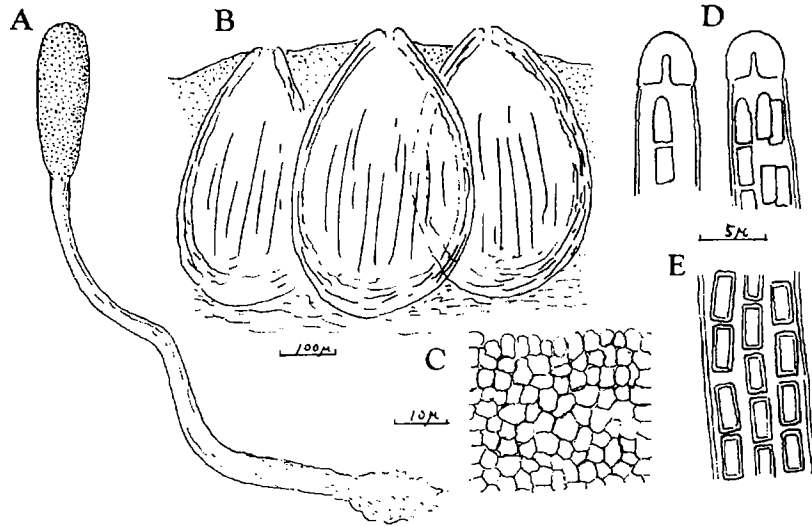


Fig. 12. *Cordyceps paradoxa* A. Stroma  $\times 6.7$ . B. Section through head. C. Peridium of head. D. Apical part of asci. E. Sec. ascospores in ascus.

Distr. Owari, Nagoya.

13. *Cordyceps pseudolongissima* Y. KOBAYASI et D. SHIMIZU, sp. nov.

Figs. 13, 16 D.

Mycelia superficiem hospitem non contegentia. Stromata cylindrica, 55 mm

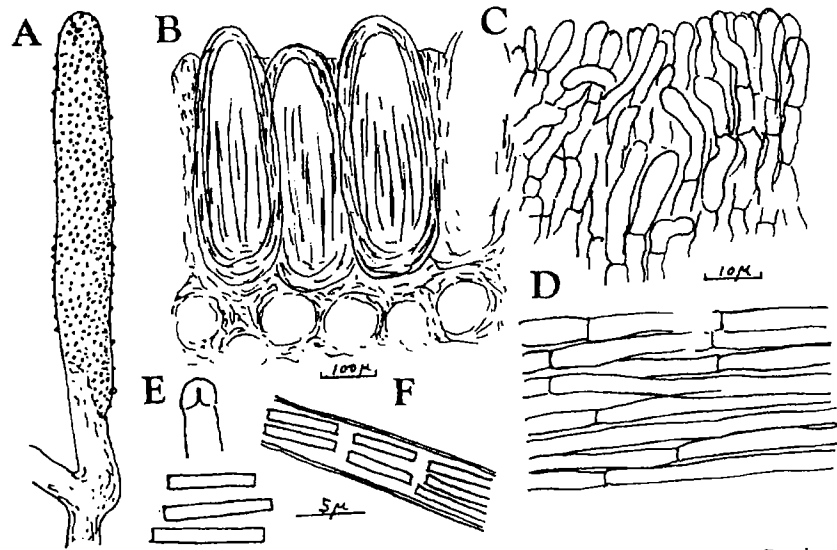


Fig. 13. *Cordyceps pseudolongissima* A. Apical part of stroma  $\times 3.7$ . B. Section through head. C. Peridium of head. D. Inner tissue of stalk. E. Apical part of ascus. F. Sec. ascospores.

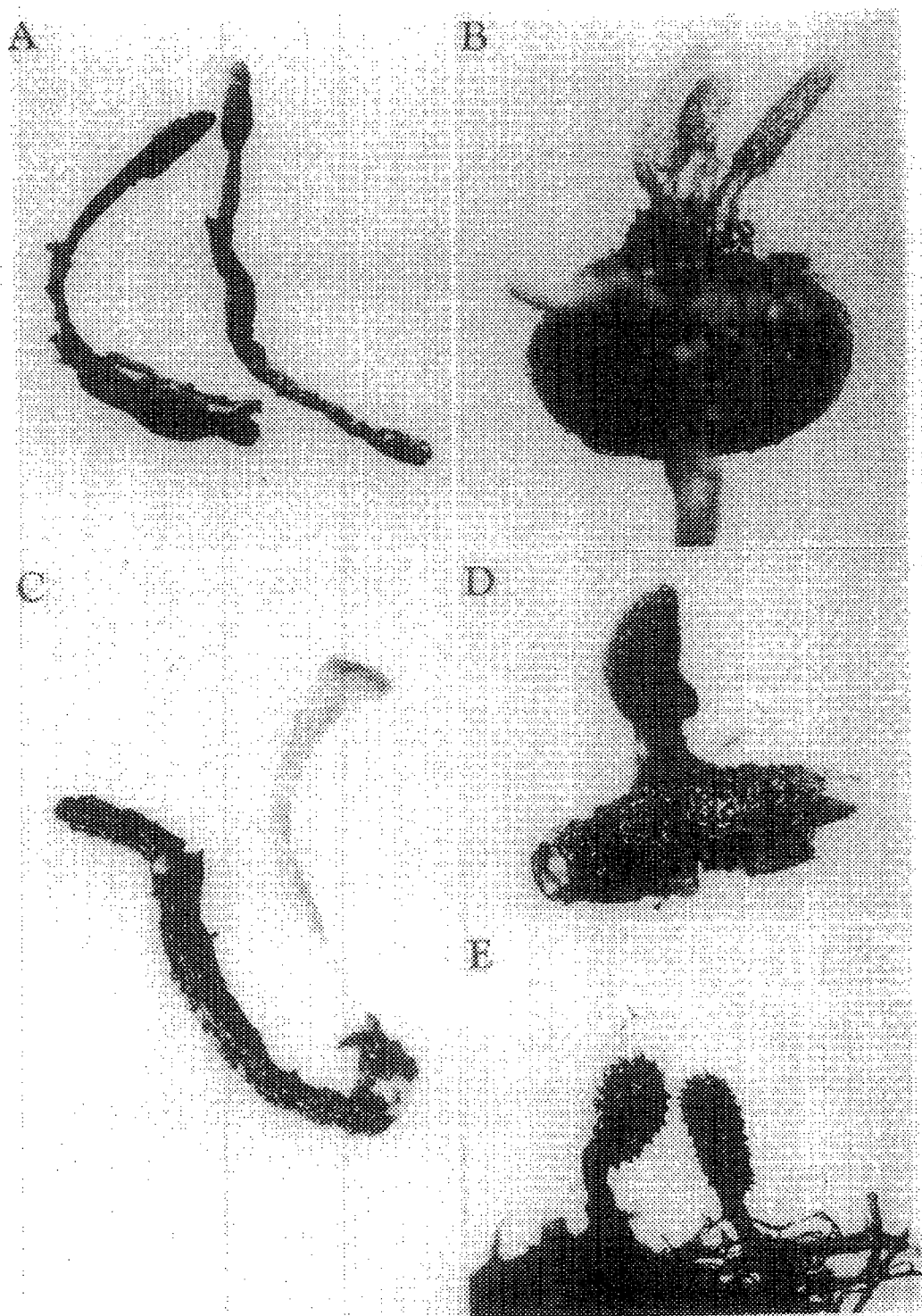


Fig. 14. A. *Coelocleps pseudocroceipes*  $\times 11$ . B. *C. nanaulacea*  $\times 18$ . C. *C. fovea*  $\times 3$ .  
 D. *C. pallidobolivaca*  $\times 3$ . E. *C. alba*  $\times 12$ .

longa, pallide rubiginosa. Stipes parte hypogaea, ex parte epigaea distincta; parte hypogaea coriacea tortuosa, parte epigaea divida, glabra, 1-1.5 cm longa, ex hyphis 2.5-5  $\mu$  composita. Pars fertilis cylindrica, 9-12  $\times$  2 mm, peridio pallissadim composito.

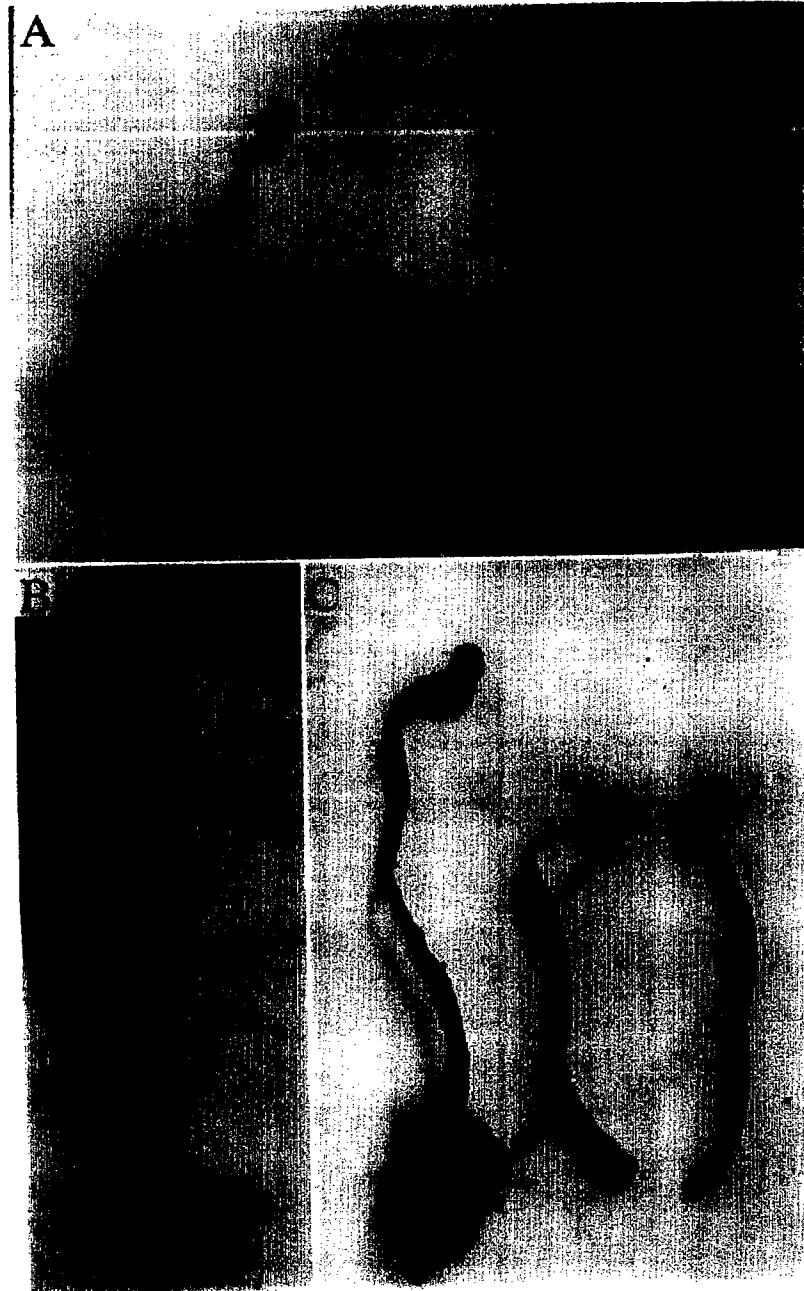


Fig. 15. A. *Cordyceps martialis*  $\times$  1. B. *C. obliquiordinatis*  $\times$  1. C. *C. intermedia* f. *michino-kuensis*  $\times$  1.

longa, pallide rubiginosa. Stipes parte hypogaea, ex parte epigaea distincta: parte hypogaea coriacea tortuosa, parte epigaea divida, glabra, 1-1.5 cm longa, ex hyphis 2.5-5  $\mu$  composita. Pars fertilis cylindrica, 9-12  $\times$  2  $\mu$ mi, peridio pallissimum composito.

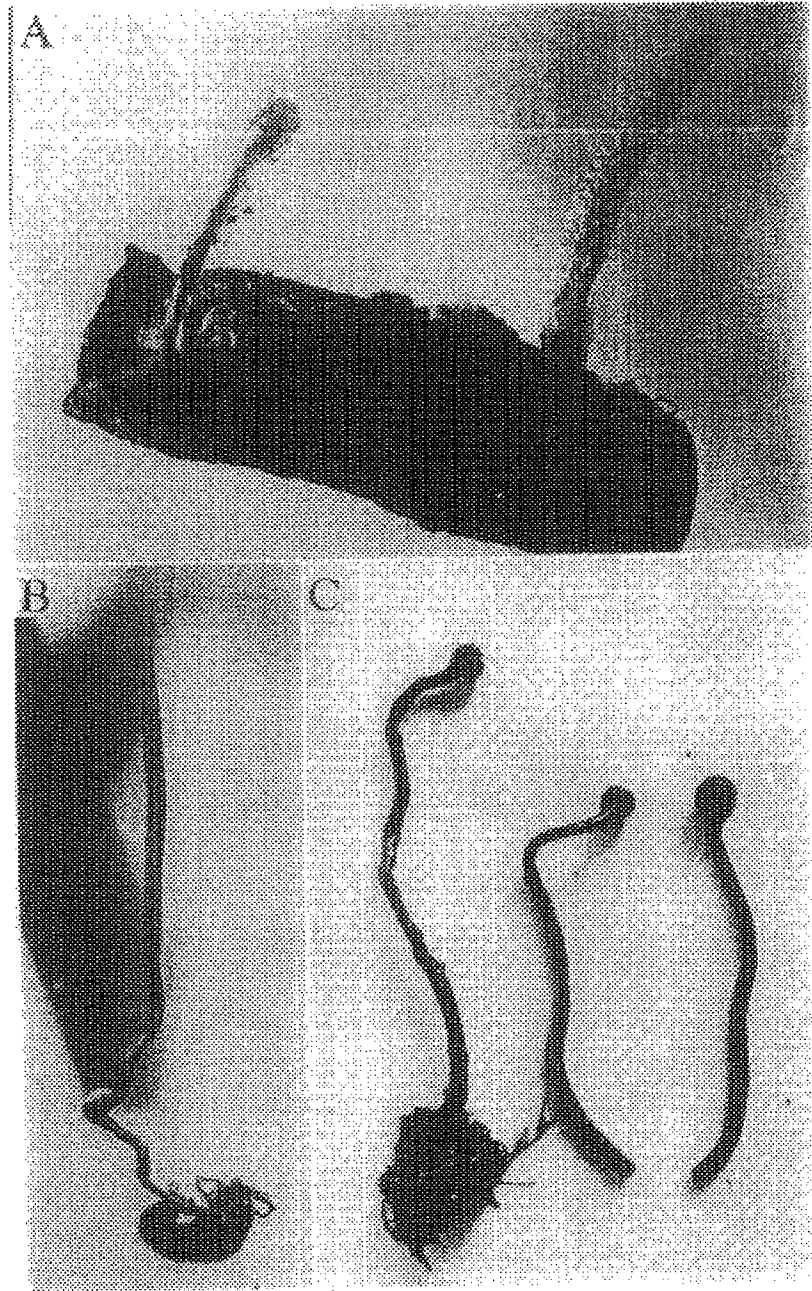


Fig. 15. A, *Cordyceps martialis* - 1. B, *C. obliquiorfinans* - 1. C, *C. intercedella* f. *nichino-tuensis* - 1.

*Perithecia immersa*, oblongo-ellipsoidea,  $470-500 \times 150-180 \mu$ . Asci  $4 \mu$  crassi, capitibus  $3 \mu$  in diam. Articuli ascosporarum  $8-11 \times 1 \mu$ , utrinque truncati.

Nom. Jap. Iriomote-semitake.

Hab. Cicada. Ryukyu Isls., Isl. Iriomote, Urauchi River (D. SHIMIZU, June 3, 1972, no. 01-66—Type in TNS).

In appearance and colour of stroma, the present species is near *C. longissima*.

Fig. 16. A. *Cordyceps minazukiensis*  $\times 1$ . B. *C. miomoteana*  $\times 1.2$ . C. *C. paradoxa*  $\times 4/3$ .  
D. *C. pseudolongissima*  $\times 5/3$ .