М И К О Л О Г И Я И Ф И Т О П А Т О Л О Г И Я

Том 32 1998 Вып. 2

УДК 582 : 001.4 : 582.282.16

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THE GENERA *COPROTUS*, *ASCOZONUS*, *THELEBOLUS* AND *TRICHOBOLUS* (*PEZIZALES*): THE KEYS TO IDENTIFICATION OF SPECIES

ПРОХОРОВ В. П. РОДЫ *COPROTUS*, *ASCOZONUS*, *THELEBOLUS* И *TRICHOBOLUS* (*PEZIZALES*): КЛЮЧИ ДЛЯ ОПРЕДЕЛЕНИЯ ВИДОВ

Till recently very little works have been carried out on coprophilous discomycetes in Russia and neighbouring countries. Some genera and species have been known only. To recent time in our mycological literature a few species from genera *Ascobolus*, *Saccobolus*, *Thelebolus* and *Cheilymenia* may be found (Наумов, 1964; Смицкая, 1980). However by that time about 20 genera of dung inhabiting discomycetes have been described. At that period nobody from our mycologists investigate the fimicolous discomycetes especially. Therefore in mycological literature of former USSR there are not any keys for these fungi.

Intensive study of coprophilous discomycetes has been carried out from 1977 to 1990 at vast territory of former USSR and more hundred species belonging to 15 genera have been founded. As result of that investigation the keys for identification of coprophilous genera (Prokhorov, 1994a), to species of *Ascobolus* (Prokhorov, 1994b) and to *Saccobolus* species (Prokhorov, 1994c) were publicated.

Present paper are continued the publication of keys for identification of species from genera *Coprotus*, *Ascozonus*, *Thelebolus* and *Trichobolus*. The species which were founded in Russia and neighbouring countries are marked by asterisk.

The genus *Coprotus* was established by Korf and Kimbrough (Kimbrough, Korf, 1967) on base of species placed by Boudier within genera *Ascophanus* and *Rhyparobius* (Boudier, 1869).

Apothecia of *Coprotus* species are discoid at maturity, short cylindrical or pulvinate, sessile, superficial or slightly immersed, white, yellowish to bright orange, 0.1—0.3 mm in diam. Ectal excipulum is formed usually from angular, rarely globose cells or sometimes has intermediate type of excipular structure. Asci are operculate, non amyloid, narrowly clavate to broadly clavate. Ascus wall is two layered. Outer lay staining in Congo red and the inner staining in acid fuchsin. Asci of various species contain from 8 to 256 spores. All spores contain one gaseous de Bary bubble when mounted in cotton blue in lactic acid or in other mounting media. The spores of *Coprotus* are ellipsoid, broadly ellipsoid or globose. Paraphyses are simple of branched, cylindrical, enlarged of strongly uncinate at tips, hyaline or with orange oil droplets.

The key to species of *Coprotus*

1. Apothecia white or whitish 2
1*. Apothecia yellow, ochraceous or orange 16
2. Asci 8-spored 3
2*. Asci polysporous 11
3. Spores broadly ellipsoid to globose . . . . . *C. sphaerosporus* Gibson et Kimbr.
3*. Spores ellipsoid 4
4. Paraphyses filamentous or slightly enlarged at tips 5
4*. Paraphyses uncinate . . . . . **C. glaucellus* (Rehm) Kimbr.
5. Spores less than 10 mkm long 6
5*. Spores more long 8
6. Asci 69—80 mkm long; spores 7—8.5 mkm long; paraphyses slightly uncinate with yellowish oil droplets . . . . . *C. baeosporus* Jeng et Krug.
6*. Asci more large 7
7. Asci 75—90 mkm long, apothecia white . . . . . **C. lacteus* (Cooke et Phill.) Kimbr., Luck-Allen et Cain.
7*. Asci 80—100 mkm long; apothecia with yellowish margin; spores narrowly ellipsoid . . . . . **C. marginatus* Kimbr., Luck-Allen et Cain.
8. Asci more long that 100 mkm 9
8*. Asci less than 100 mkm long 10
9. Paraphyses apically branched, with few oil droplets; spores 11—13 mkm long . . . **C. dextrinoides* Kimbr., Luck-Allen et Cain.
9*. Paraphyses simple, without droplets; spores 14—18 mkm long . . . . . **C. leucopocillum* Kimbr., Luck-Allen et Cain.
10. Asci to 55 mkm long; paraphyses weakly inflated (to 5—8 mkm) at tips, spores 11—14 mkm long . . . . . **C. granuliformis* (Cr. et Cr.) Kimbr.
10*. Asci to 90 mkm long; paraphyses not inflated, spores 12—13.5 mkm long . . . . . **C. disculus* Kimbr., Luck-Allen et Cain.
11. Asci 16-spored 12
11*. Asci more than 16-spored 13
12. Spores 7—10 mkm long; paraphyses apically branched; asci 70—90 mkm long . . . . . **C. duplus* Kimbr., Luck-Allen et Cain.
12*. Spores 11—16 mkm, asci 85—140 mkm long; paraphyses slightly uncinate . . . . . **C. sexdecimsporus* (Cr. et Cr.) Kimbr.
13. Asci 32-spored 14
13*. Asci more than 32-spored 15
14. Spores 13.5—17.5 mkm long; asci 120—175 mkm long . . . . . *C. rhyparobioides* (Heimerl) Kimbr.
14*. Spores 10—12 mkm, asci 75—100 mkm long . . . . . *C. albidus* (Boud.) Kimbr.
15. Asci 64-spored, 80—130 mkm, spores 8—12 mkm long . . . . . **C. niveus* (Fuckel) Kimbr., Luck-Allen et Cain.
15*. Asci 256-spored, 160—210 mkm, spores 10—11 mkm long . . . . . *C. winteri* (Marchal) Kimbr.
16. Asci less than 100 mkm long 17
16*. Asci more long 19
17. Spores 9—10 mkm, asci 60—80 mkm long; apothecia rose or pale orange . . . . . **C. luteus* Kimbr., Luck-Allen et Cain.
17*. Spore more large 18
18. Spores 12—16 × 8.5—12 mkm; asci 45—60 mkm long; excipulum of textura angularis . . . . . *C. breviascus* (Vel.) Kimbr., Luck-Allen et Cain.
18*. Spores 12—14 × 6—8.5 mkm; asci 40—65 mkm long; excipulum of textura globulosa, apothecia orange-yellowish . . **C. aurora* (Cr. et Cr.) Kimbr., Luck-Allen et Cain.
19. Asci 65—100 mkm, spores 17—25 mkm long . . . . . *C. vicinus* (Boud.) Kimbr., Luck-Allen et Cain.

19*. Asci more long 20
20. Asci 100—200 mkm, spores 14—17 mkm long . . . . . *C. subcylindrosporus* J. Moravec.
20*. Asci to 150 mkm long, spores 14—18 mkm long . . . . . **C. ochraceous* (Cr. et Cr.) Larsen.

The other coprophilous genus *Ascozonus* is poorly known in our country till now. At the world 3 species from that genus are discribed. All species were founded in Russia and neighbouring countries.

They apothecia are superficial, sessile or with short, broad stipe-like base, solitary or in small groups, obconical, shortly cylindrical, 0.15—0.2 mm in diam., whitish, greyish-white, semitransparent, glabrous, sometimes with fimbriate margin. Ectal excipulum is textura angularis. Asci are clavate with conical, papillate apex and obvious subapical ring., (16—)32—128 spored, non amyloid, opening by vertical slit. In Congo red apical part of ascus wall above the ring remains hyaline, whereas the rest af ascus wall is stained uniformely. Ascospores are fusiforme, hyaline, smooth, without inclusions. Paraphyses are filamentous, simple, septate, hyaline.

The key to species of *Ascozonus*

1. Asci 16—32-spored . . . . . **A. crouanii* (Renny) Boud.
1*. Asci more than 32-spored 2
2. Asci 64-spored . . . . . **A. cunicularis* (Boud.) Boud.
2*. Asci 128-spored . . . . . **A. woolhopensis* (Berk. et Br.) Boud.

The genus *Thelebolus* is more well-known among fimicolous fungi. It was described by Tode at 1790. That genus includs 5 species.

Its fruit bodies are tiny, 0.1—0.3 mm in diam. Receptacle is pale yellowish, yellow-brownish or pale brown-greenish, externally glabrous. Ectal excipulum is textura angularis. Apothecia contain from 1 to about 100 asci with 8 to more 1000 spores. Asci operculate, clavate or subovate, non amyloid. Ascospores are ellipsoid, hyaline, without inclusions. Paraphyses are filamentous, septate, hyaline or abruptly inflated at tips and in that case with greenish content.

The key to species *Thelebolus*

1. Asci 8-spored, cylindrical to narrowly clavate; apothecia semiglobose to short cylindrical, golden-yellow to yellow-brownish with 80—100 asci; paraphyses abruptly inflated at apex with yellow-greenish content . . . . **T. microsporus* (Berk. et Br.) Kimbr.
1*. Characteres not as above 2
2. Asci 32-spored, broadly clavate; apothecia discoid, yellow-brown with 40—50 asci; paraphyses filamentous, hyaline . . . . . **T. caninus* (Auersw.) Jeng et Krug.
2*. Characteres not as above 3
3. Asci 64-spored, broadly clavate with thickened apex; apothecia numerous, gregarious, yellow-brown with 5—12 asci . . . . . **T. crustaceus* (Fuckel) Kimbr.
3*. Characteres not as above 4
4. Asci 256-spores, ovoid or saccate; apothecia with 3—5(—7) asci, cylindrical-ovoid to subglobose; paraphyses filamentous, hyaline . . . . . **T. polysporus* (Karst.) Otani et Kanzawa.
4*. Apothecia aggregate, broadly ovoid, yellow-greenish, green-brownish with one broadly ovoid or subglobose ascus and 1000—2500 spores per ascus . . . . . **T. stercoreus* Tode : Fr.

The genus *Trichobolus* previously was considerated as section of *Thelebolus*. To generic level it was raised by Kimbrough and Cain (Kimbrough, Korf, 1967). Now the genus *Trichobolus* includs 4 species which were unknow in our country in the past.

The fruit bodies of *Trichobolus* species are cylindrical or ovate, rather like to *Thelebolus* ones but they are provided with hyaline, septate, stiff, pointed setae. Ectal excipulum is textura angularis. Apothecia contain 1 to 40 ovoid or cylindrical-clavate, operculate, non amyloid, 8- or polysporous asci. Ascus wall uniformely stained in Congo red. Paraphyses filamentous, simple, septate, hyaline or absent.

At Russia and neighbouring countries have been founded 2 species.

The key to species of *Trichobolus*

1. Apotecia with one, polysporous ascus; spores subglobose to globose . . . . . **T. sphaerosporus* Kimbr.

1*. Apothecia with more than 1 ascus 2

2. Apothecia with 3 polysporous asci which matured in turn . . . . . *T. pilosus* (Schroet.) Kimbr.

2*. Apothecia with 40—50 octosporous asci 3

3. Asci 110—130 mkm long, almost cylindrical; spores broadly ellipsoid, 16 × 11 mkm . . . . . **T. octosporus* Krug.

3*. Asci 60—70 mkm long, broadly clavate; spores globose . . . . . *T. vanbrummelenii* Valdosera et Guarro.

The study was supported in part by the Russian Foundation for fundamental investigations, the Program of Biodiversity of Russia, and the Universities of Russia.

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Received 19 V 1997

РЕЗЮМЕ

В микологической литературе бывшего СССР большинство видов копрофильных дискомицетов и даже многие роды копрофильных дискомицетов были неизвестны. Более 100 видов, относящихся к 15 родам порядка *Pezizales* было выявлено во время исследований видового разнообразия дискомицетов, обитающих на помете животных. В этой работе представлены ключи, составленные для определения 21 вида рода *Coprotus*, 3 — *Ascozonus*, 5 — *Thelebolus* и 4 видов *Trichobolus*. Ключи содержат как уже обнаруженные в России и сопредельных странах, так и еще не найденные виды.

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