

## New Ascomycetous Fungi on Bush cinquefoil from Xinjiang, China\*

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*Discostroma fruticosum*, *Massarina episporiata*, *Melanomma cucurbitarioideum* and *Trichometasphaeria papillisetosa* are described from *Pentaphylloides fruticosa* (Bush cinquefoil) collected in Xinjiang, China.

Keywords: ascomycetes, *Pentaphylloides fruticosa*.

*Pentaphylloides* Ducham. is a small genus of approx. 10 species worldwide in Rosoideae, Rosaceae. *P. fruticosa* (L.) O. Schwarz (= *Potentilla fruticosa* L.) is a shrubby plant up to 80 cm high, with yellow flowers and lanceolate or oblong-ovate compound leaves. It is common on Tianshan Mountain at 1700 m above sea level in Xinjiang. According to the available literature, few ascomycetous fungi have been found on this plant species. The discomycetes, *Cenangella potentilla* (Hazsl.) Sacc. and *Sphaeropezia coloradensis* Ellis & Everh. were reported from this host by Saccardo (1898). Two new taxa, *Melanomma distinctum* Vassil. and *Diaporthe magnifica* Vassil. were proposed on the same host from the former USSR (Vassilieva, 1987). Farr et al. (1989) reported *Erysiphe polygoni* DC. and *Sphaerotheca macularis* (Wallr.: Fr.) Lind, and Barr (1990) recorded *Strickeria incisa* (Ellis & Everh.) M. E. Barr from North America. No other ascomycetes have been recorded on this host in China (Eriksson & Yue, 1988; Tai, 1979; Teng, 1963). Four species collected on this host from Tianshan Mountain, Xinjiang are presented here as new.

Type material is deposited in the National Herbarium of Canada in Ottawa (DAOM) and isotypes in the Herbarium of Mycology, August 1st Agricultural College (HMAAC), Urumqi, Xinjiang, China and in the New York Botanical Garden (NY).

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***Discostroma fruticosum*** Z. Q. Yuan & M. E. Barr, sp. nov. – Fig.1a-1e.

Ascomata erumpentia ad superficialia, discreta vel gregaria demum serialiter vel catervatim ordinata, sphaerica, 200–250(–350)  $\mu\text{m}$  diam, vertice papillato, ostiolo periphysato. Peridium 40–50  $\mu\text{m}$  crassum, strato interno cellulis applanatis parietibus tenuibus hyalinisque et strato externo cellulis rotundatis parietibus crassis brunneisque compositum. Asci 90–130(–150)  $\times$  9–11(–15)  $\mu\text{m}$ , octospori, cylindrici, unitunicati; annulus apicalis tenuis, refringens, amyloideus; pulvillo paululo, chitinoideo. Paraphyses parietibus tenuibus, ad 2.5–3  $\mu\text{m}$  latae, 150  $\mu\text{m}$  longae. Ascospores 18–26  $\times$  6–8  $\mu\text{m}$ , oblique vel superimpositae uniseriatae, hyalinae, oblongatae, extremis acutulis, (1–) 3 (–5) septatae, ad septa constricta, exosporio laevi.

Holotypus in ramulis decorticatis *Pentaphylloides fruticosae* (L.) O. Schwarz, in montibus 'Tianshan' dictis, Urumqi, provincia Xinjiangensis, Sina, 10. V. 1991, Z.Q. Yuan 910148 (DAOM; Isotypi: HMAAC 800, NY).

**E t y m o l o g y .** – Refers to the host plant.

**A s c o m a t a** erumpent to superficial, separate or gregarious in rows or in groups, spherical or sphaeroid, 200–250(–350)  $\mu\text{m}$  diam, papillate, ostiolo periphysate. – **P e r i d i u m** 40–50  $\mu\text{m}$  wide, composed of two parts, inner part ca. 20  $\mu\text{m}$  wide, with hyaline, compressed cells, outer part 20–30  $\mu\text{m}$  wide, with dark-brown, thick-walled, rounded cells. – **A s c i** 90–130(–150)  $\times$  9–11(–15)  $\mu\text{m}$ , 8-spored, cylindric, unitunicate, apical ring shallow, amyloid, pulvillus small, chitinoide. – **P a r a p h y s e s** thin-walled, up to 2.5–3  $\mu\text{m}$  wide, 150  $\mu\text{m}$  long. – **A s c o s p o r e s** 18–26  $\times$  6–8  $\mu\text{m}$  (mean: 21.1  $\times$  7.7  $\mu\text{m}$ , N=100), obliquely uniseriate or upright overlapping uniseriate, hyaline, oblong, with ends somewhat acute, (1–) 3 (–5) septate, constricted at the septa, with smooth walls.

According to Brockmann (1976), *Discostroma* Clem. in Amphisphaeriaceae (s. lat.) includes species with ascomata immersed in an erumpent stroma and with ascospores hyaline to brown, one- to multi-septate to muriform. More than 10 species have been described in the genus (Brockmann, 1976; Barr, 1983, 1993). Of the known species in the genus, both *D. fuscillum* (Berk. & Broome) S. Huhndorf [= *D. corticola* (Fuckel) Brockmann], and *D. rubicola* (Ellis & Everh.) M. E. Barr are close to our collection in ascospore size (15.5–24  $\times$  6.5–9  $\mu\text{m}$  in *D. rubicola*, fide Barr, 1993), but have ellipsoid, blunt-ended ascospores that are not constricted at the septa. Because our collection on *Pentaphylloides* cannot be accommodated in any of the existing species of the genus, it is described as new.

***Massarina episporiata*** Z. Q. Yuan & M. E. Barr, sp. nov. – Fig.1f-1j.

Ascomata fere superficialia, discreta, conoideo-sphaeroidea, 350–600  $\mu\text{m}$  lata, 250–450  $\mu\text{m}$  alta; vertice papillato, peridio setoso; setae ca. 6–16  $\times$  4  $\mu\text{m}$ , brunneae,



Fig. 1. a-e. - *Discostroma fruticosum*. - a. ascus, b. ascus apex, c. ascospores, d. detail of ascoma ostiole, e. ascomata in vertical section. - f-j. *Massarina episporiata*. - f. seta, g. detail of peridium, h. ascoma in vertical section, i. ascospores, j. ascus. - a-c, f: same scale; e, h: same scale; i, j: same scale.

simplices, multiseptatae. Peridium laterale 40–60  $\mu\text{m}$ , superficiem substrati versus ad 110  $\mu\text{m}$  crassum; strata externa cellulis parietibus brunneis incrassatis scleroticisque composita, strata interna pseudoparenchymatica; peridium basale reductum, cellulas substrati includens. Asci (100–)136–160(–190)  $\times$  (14–)16–20  $\mu\text{m}$ , octospori, cylindrici. Pseudoparaphyses angustae, septatae, 200  $\times$  2  $\mu\text{m}$ . Ascospores 22–30  $\times$  10–14  $\mu\text{m}$ , uniseriatae, hyalineae, in statu senescente brunneolae ad brunneae, ellipsoideae ad oblongati-fusoideae, extremis obtusis, 3-septatae, ad septum medium constrictae, exosporio laevi, episporio gelatinoso, compacto, 1.5–2  $\mu\text{m}$  crasso.

Holotypus in ramulis decorticatis *Pentaphylloids fruticosae* (L.) O. Schwarz, in montibus 'Tianshan' dictis, Urumqi, provincia Xinjiangensis, Sina, 9. VII. 1991, Z.Q. Yuan 910329 (DAOM; Isotypi: HMAAC 792, NY).

**E t y m o l o g y.** – Refers to the episporium.

**A s c o m a t a** nearly superficial with base seated on decorticated twigs, separate, sphaeroid, 350–600  $\mu\text{m}$  wide, 250–450  $\mu\text{m}$  high, papillate; surface covered with short setae; setae ca. 6–16  $\times$  4  $\mu\text{m}$ , brown, simple or multiseptate. – **P e r i d i u m** 40–60  $\mu\text{m}$  wide, but up to 110  $\mu\text{m}$  near base which is thin and integrated with host tissue, dark-brown, of small pseudoparenchymatous cells; cells in outer layers with thickened sclerotial walls. – **A s c i** (100–)136–160(–190)  $\times$  (14–)16–20  $\mu\text{m}$ , 8-spored, cylindric. – **P s e u d o p a r a p h y s e s** narrowly cellular, 200  $\times$  2  $\mu\text{m}$ . – **A s c o s p o r e s** 22–30  $\times$  10–14  $\mu\text{m}$  (mean: 27.5  $\times$  11.9  $\mu\text{m}$ , N=100), overlapping uniseriate, hyaline, becoming light-brown or brown when mature, ellipsoidal to oblong-fusoid with ends obtuse, 3-septate, constricted at the median septum; wall smooth, with firm gel episporium, 1.5–2  $\mu\text{m}$ .

Species of the genus *Massarina* Sacc. have ascomata gregarious, immersed to superficial and have ascospores hyaline, becoming yellow to brown at maturity, fusiform or ellipsoid-fusiform, 1-many transversely septate, with gel coating. The genus was placed in Pleosporaceae (von Arx & Müller, 1975) or in Massarinaceae (Eriksson & Hawksworth, 1987). The latter family has been included within Lophiostomataceae by Barr (1987). The European species of *Massarina* have been surveyed by Bose (1961), Müller & von Arx (1962), Sivanesan (1984) and Leuchtman (1984). Fifteen north American species were described by Barr (1992). Our collection agrees well with the concept of the genus in morphological features, except for the ascomata covered by the setae. Species with the above characters combined should be best included here in the genus *Massarina*, Pleosporaceae (*sensu* von Arx & Müller) or Lophiostomataceae (*sensu* Barr, 1987), Pleosporales. This collection has large and 3-septate ascospores that have a firm episporium as in *M. grumata* (Ellis & Everh.) M. E. Barr, but the ascomata are nearly superficial as in *M. eccentrica* M. E. Barr and *M. myricae* (Peck) Berl.,

both with narrower (20–30 x 7–10  $\mu\text{m}$  and 26–30.5 x 7–9  $\mu\text{m}$  respectively, *vide* Barr, 1992) and 1-septate ascospores. In terms of ascospore morphology, this collection is much closer to *M. cisti* Bose, which has ascospores similar in size, shape, septation etc. (Sivanesan, 1984), but the mature ascospores of *M. cisti* lack a firm gel coating. In addition, the short, dark setae that cover the surface of ascomata provide another unique character for this collection (Fig. 1f–1h).

***Melanomma cucurbitarioideum*** Z. Q. Yuan & M. E. Barr, sp. nov. – Fig. 2a–2d.

Ascomata hypostromati ad plures centimetros longo insidentia ad immersa, conferta, sphaerica vel leviter elongata, 160–400  $\mu\text{m}$  in diametro. Peridium 24–50  $\mu\text{m}$  crassum, pseudoparenchymaticum, cellulis isodiametricis ad applanatis parietibus brunneis, compositum. Asci 90–120 x 8–12  $\mu\text{m}$ , quadri- vel octospori, cylindracei-clavati. Pseudoparaphyses trabeculatae. Ascosporae 14–20 x 5–6  $\mu\text{m}$ , oblique uniseriatae vel in parte superiore asci biseriatae, ellipsoidei-fusiformes, (2–)3–(4–) septatae, constrictae, brunneolae vel brunneae, exosporio laevi.

Holotypus in ramulis decorticatis *Pentaphylloides fruticosae* (L.) O. Schwarz, in montibus 'Tianshan' dictis, Urumqi, provincia Xinjiangensis, Sina, 8. VII. 1991, Z.Q. Yuan 910373 (DAOM; Isotypi: HMAAC 789, NY).

**Etymology.** – Refers to the similarity of the ascomatal aggregates to those of *Cucurbitaria*.

**Ascomata** in large groups on or in a hypostromatic base, up to several cm along twigs, spherical or slightly elongated, 160–400  $\mu\text{m}$  diam. – **Peridium** 24–50  $\mu\text{m}$  wide, of brown isodiametric to compressed small pseudoparenchymatous cells. – **Asci** 90–120 x 8–12  $\mu\text{m}$ , 4- or 8-spored, cylindric-clavate. – **Ascospores** 14–20 x 5–6  $\mu\text{m}$  (mean: 16.6 x 5.8  $\mu\text{m}$ , N=100), obliquely uniseriate, or biseriata in upper part of ascus, ellipsoid-fusiform, (2–)3–(4–) septate, constricted, especially at the median septum, light-brown to brown; wall surface smooth or foveolate.

**Additional specimens examined.** – CHINA, Urumqi, Tianshan Mountain, in twigs of *P. fruticosa*, 3 VII 1990, Z.Q. Yuan HMAAC 806; 10 V 1991, Z.Q. Yuan 910130 (HMAAC 807); 14 VII 1991, Z.Q. Yuan 910355 (HMAAC 808).

The genus *Melanomma* Nits. ex Fuckel, a typical member of Melanommataceae (*sensu* Eriksson & Hawksworth, 1987; Barr, 1990), is characterized mainly by the ascomata which are usually erumpent to superficial, densely aggregated with a broad base and the ascospores are mostly 3-septate and pigmented. About 20 species have been described in this genus (Chesters, 1938; von Arx & Müller, 1975) and several additional species were added to the genus (Vassilieva, 1987; Vasyagina & al., 1987; Barr, 1990). Our species fits well with the

concept of *Melanomma*, but is hardly conspecific with the known species in the genus. This species has asci and ascospores much as in *M. pulvis-pyrius* (Pers.: Fr.) Fuckel, but the well-developed stromatic base on which ascomata are grouped is more like that in *M. conjunctum* (Petr.) L. Holm, which has larger ascospores (15–22 x 6–7.5  $\mu\text{m}$ , *vide* Barr, 1990), or like that in *M. rhododendri* Rehm which has more obtuse-ended ascospores.

*M. distinctum*, the species proposed by Vassilieva (1987) on the same host has similar 3-septate ascospores to our new species, but differs in the ascomata which are not aggregated in large groups on or in hypostromatic base as well as in the ascospores which are ellipsoidal, surrounded by a gel coating (rather than ellipsoid-fusiform, without gel coating) and measure 33–36 x 12–13.5  $\mu\text{m}$  (those of *Melanomma cucurbitarioideum* are much smaller, 14–20 x 5–6  $\mu\text{m}$ ).

***Trichometasphaeria papillisetosa*** Z. Q. Yuan & M. E. Barr, sp. nov. – Fig. 2e–2i.

Ascomata superficialia, discreta vel gregaria, sphaerica vel sphaeroidea, 280–400  $\mu\text{m}$  lata, 240–360  $\mu\text{m}$  alta; in vertice setis fuscis papillam imitantibus ornata; setae 70–130 x 3–4  $\mu\text{m}$ , fuscae apicibus pallidulis, septatae, rectae vel curvatae. Peridium 36–50  $\mu\text{m}$  crassum, pseudoparenchymaticum, cellulis parietibus fuscis compositum. Asci 110–130 x 16–20  $\mu\text{m}$ , octospori, clavati. Pseudoparaphyses ca. 160 x 2  $\mu\text{m}$ , angustae, septatae, ramosae. Ascosporae 30–40 x 7–9  $\mu\text{m}$ , biseriatae, ellipsoidei-fusiformes, 1–3–5-septatae, ad septum medium constrictae, hyalinae, in statu senescente brunneolae, extremis pallidulis et exosporio verruculoso.

Holotypus in ramulis decorticatis *Pentaphylloidis fruticosae* (L.) O. Schwarz, in montibus 'Tianshan' dictis, Urumqi, provincia Xinjiangensis, Sina, 9. VII. 1991, Z.Q. Yuan 910343 (DAOM; Isotypi: HMAAC 790, NY).

**E t y m o l o g y .** – Refers to the apical papilla of the ascoma being composed of setae.

**A s c o m a t a** superficial with bases seated on decorticated twigs, separate to gregarious, spherical or spheroid, 280–400  $\mu\text{m}$  wide, 240–360  $\mu\text{m}$  high, with small apical papilla composed of setae; setae 70–130 x 3–4  $\mu\text{m}$ , dark brown with tip paler, septate, erect or curved. – **P e r i d i u m** 36–50  $\mu\text{m}$  wide, of small dark brown pseudoparenchymatous cells. – **A s c i** 110–130 x 16–20  $\mu\text{m}$ , 8-spored, clavate. – **P s e u d o p a r a p h y s e s** narrowly cellular, septate, branched, ca. 160 x 2  $\mu\text{m}$ . – **A s c o s p o r e s** 30–40 x 7–9  $\mu\text{m}$  (mean: 37 x 8.3  $\mu\text{m}$ , N=100), overlapping biseriate, ellipsoid-fusiform, some curved or vermiform, 1–3–5-septate, constricted at median septum, hyaline, becoming light-brown at maturity, with two end cells paler; wall verruculose.

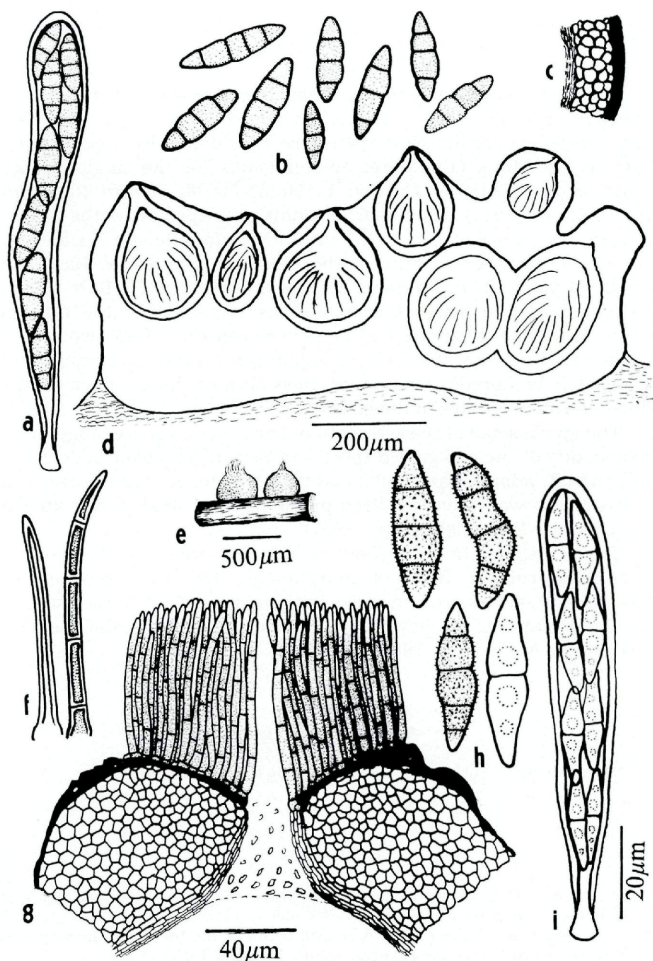


Fig. 2. a-d. *Melanomma cucurbitarioideum*. - a. ascus, b. ascospores, c. detail of peridium, d. ascomata in vertical section. - e-i. *Trichometasphaeria papillisetosa*. - e. habit of ascomata, f. setae, g. detail of ascoma ostiole, h. ascospores, i. ascus. - a, b, f, h, i: same scale; c, g: same scale.

Additional specimens examined. – CHINA, Urumqi, Xinjiang, Tianshan Mountain, on twigs of *P. fruticosa*, 14 VII 1991, Z. Q. Yuan 910357 (HMAAC 804); 1 VII 1990, Z. Q. Yuan, HMAAC 805.

The genus *Trichometasphaeria* has ascomata with short papillae formed of or covered by short setae. Ascospores are hyaline, becoming light dull brown, multi-septate and are surrounded by a gel coating (Barr, 1992). Munk (1953) erected this genus for the single species *T. gloeospora* (Berk. & Currey) L. Holm [as *T. dianthi* (Rostrup) Munk]. Holm (1957) described six additional species in the genus. However, the genus was included within *Keissleriella* von Hoehnel by Bose (1961) and then by other authors (Müller & von Arx, 1962; von Arx & Müller, 1975; Eriksson & Hawksworth, 1987). Barr (1990) considered that although this genus has setae within the ostioles similar to those of *Keissleriella*, the ascoma centrum of the two genera is different. She separated *Trichometasphaeria* from *Keissleriella* and arranged it in Lophiostomataceae, Pleosporales. Later, Barr (1992), added one more species to the genus.

The apical setae of the ascomata in our collections are longer than those in any of the recognized species in *Trichometasphaeria* (e.g. 60–100 µm in *T. populi*; Barr, 1992) and the much longer ascospores with a verruculose wall have not been previously recorded in any known species (Barr, 1990, 1992; Holm, 1957).

The ascospores in our collections are also similar to those of the genus *Passeriniella* Berl. in morphology, but the ascomata of *Passeriniella* species are immersed, without setae on or in the ostioles, and the ascospores are heavily pigmented in the mid cells (Berlese, 1894; Apinis & Chesters, 1964).

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