

Three new species of *Arnium*¹

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Three new species of *Arnium* Nits. in Fuckel are described and illustrated. These are *A. ovale* on dung of deer, goat, and horse from British Columbia and Saskatchewan, Canada, and San Luis Potosi, Mexico; *A. subtile* on cow dung from Ontario, Canada, and Oklahoma, United States; and *A. villosum* on dung of burro and goat from Durango, Jalisco, and San Luis Potosi, Mexico.

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Trois nouvelles espèces d'*Arnium* Nits. in Fuckel sont décrites et illustrées. Ce sont *A. ovale* sur crottes de cerf, de chèvre et de cheval, venant de Colombie Britannique et de Saskatchewan, Canada, et de San Luis Potosi, Mexique; *A. subtile* sur crottes de vache, d'Ontario, Canada, et d'Oklahoma, États-Unis; et *A. villosum* sur crottes de burro et de chèvre, de Durango, Jalisco et San Luis Potosi, Mexique.

Introduction

During a study of coprophilous fungi three undescribed species of the genus *Arnium* Nits. in Fuckel (1872) have been found. These are illustrated and described. *Arnium* is a segregate of *Podospora* Cesati and is characterized by dark, one-celled ascospores that rarely become two-celled late in their ontogeny. The ascospores have no hyaline cells but are equipped with gelatinous appendages. In some species there is a single germ pore located in the apex of the ascospore, in others there are two germ pores, one at each end. There seems to be no correlation between the various specific characters and the presence of either one or two germ pores.

For a more extensive treatment of the genus *Arnium* see Lundqvist (1971) and Krug and Cain (1972).

1. *Arnium ovale* Cain & Mirza sp. nov.

Figs. 1–6

Perithecia immersa, dispersa, 600–700 × 400–550 μ, pyriformia vel subglobosa pilis paucis, longis, flexuosis, brunneis, remote septatis praedita vel paene nuda; collum peritheci nigrum, papilliforme vel breviter cylindraceum, 150–180 × 140–160 μ, tuberculis opacis et pilis paucis brevis. Peridium peritheci tenue, membraceum, brunneum, semitranslucidum. Asci octo-

spori, clavati, 280–310 × 28–38 μ, superne late rotundati, annulo apicale distincto praediti, inferne in parte in stipitem 100 μ longum attenuati. Paraphyses hyalinae, septatae, numerosae, cum ascis mixtae. Ascosporae unicellulares, biserialis, ovoideae vel ovoideo-ellipsoideae, 24–36 × 17–23 μ, primum hyalinae vel olivaceae, maturitate confirmata atribrunneae et opacae, unum foramen germinale 2 μ diametro crassum ad apicem sito exhibentes; appendices gelatinosae ad utroque apicem asymmetrice dispositae, flagelli-formes, 100 × 6–8 μ; exosporae tenues.

HOLOTYPE: In fimo equino, Canada, Saskatchewan, Cypress Hills Prov. Park, East camp site, 25 July 1962, Cain TRTC 38996. In torontoensis universitatis Cryptogamarum herbario.

ETYMOLOGY: Latin, *ovalis* = oval, ovoid, referring to the shape of the ascospores.

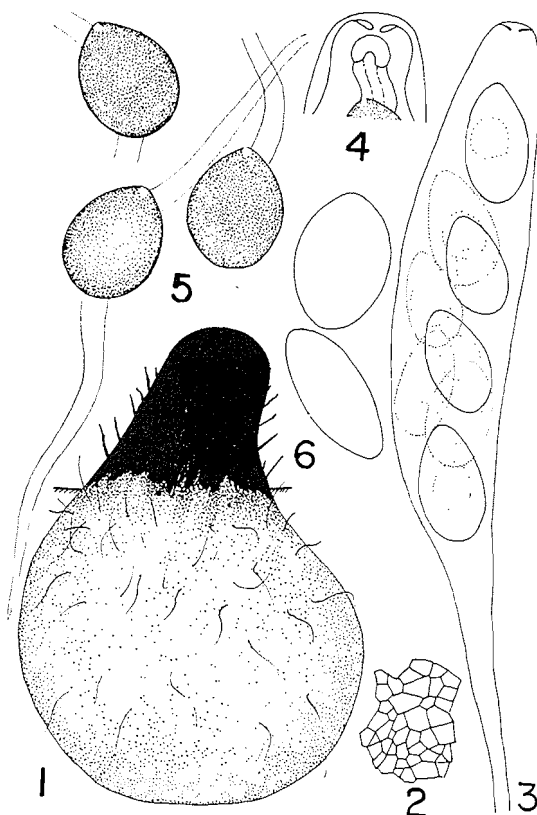
Perithecia immersed, scattered, 600–700 × 400–550 μ, pyriform to subglobose, with a few long, flexuous, brown, remotely septate hairs or almost bare; neck black, papilliform to short cylindrical, 150–180 × 140–160 μ, with densely aggregated black tubercles and sometimes a few short brown hairs, the upper part consisting of elongated, cylindrical, parallel cells, the lower part interrupted by lighter colored bands. *Peridium* thin, membranaceous, brown, semi-transparent, consisting of small, angular, thin-walled cells measuring about 5–15 μ in diameter. *Asci* eight-spored, clavate, 280–310 × 28–38 μ, broadly rounded above with a conspicuous apical ring, tapering below into a slender stipe 100 μ or more in length. *Paraphyses* hyaline,

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thin-walled, septate, 10–15 μ in diameter, abundant, and mixed with asci. *Ascospores* one-celled, biserial excepting single one at apex and at base, ovoid or less commonly ovoid-ellipsoid, 24–36 \times 17–23 μ , length to width ratio variable, elongated and somewhat fusiform when very young, with a large conspicuous oil globule, hyaline when young, ranging through olivaceous to dark brown and opaque at maturity, narrowed toward apex, more broadly rounded below; with a single lash-like gelatinous appendage grooved on one side and measuring 100 μ long and 6–8 μ wide at base, eccentrically placed at each end; outer wall of ascospore about 0.5 μ in thickness, with a single apical germ pore measuring about 2 μ in diameter.

HABITAT: On dung of deer, goat, and horse.



FIGS. 1–6. *Arnium ovale*. Fig. 1. Perithecium, $\times 90$. Fig. 2. Cells of peridium in surface view, $\times 510$. Fig. 3. Ascus with ascospores, $\times 510$. Fig. 4. Apex of ascus in optical section showing apical ring, apex of ascospore with grooved gelatinous appendage, $\times 800$. Fig. 5. Ascospores with gelatinous appendages, $\times 510$. Fig. 6. Outline of two ascospores, gelatinous appendages not shown, $\times 800$.

SPECIMENS EXAMINED: CANADA: British Columbia: Yoho Natl. Park, Chancellor Mtn., on deer dung, 11 Aug. 1962, *Luck-Allen*, TRTC 39571. Saskatchewan: Cypress Hills Prov. Park, East camp site, on horse dung, 25 July 1962, *Cain* TRTC 38996 (TYPE). MEXICO: San Luis Potosi: Ciudad del Maiz, on goat dung, 19 Aug. 1960, *Cain* TRTC 37773.

DISTINGUISHING CHARACTERS: Perithecia immersed, semitransparent with few hairs; asci with conspicuous apical ring; ascospores ovoid, biserial excepting single one at each end, each with two gelatinous, grooved appendages eccentrically located, one at each end, and each with a single germ pore located at the more pointed upper end; the relatively thin outer wall of the ascospores.

2. *Arnium subtile* Cain & Mirza sp. nov.

Figs. 7–13

Perithecia immersa, dispersa, 600–700 \times 400–500 μ , subglobosa; collum perithecii papilliformis vel cylindraceum, nigrum, 60–270 \times 120–140 μ , tuberculis copiosis, cylindraceis, 10 μ longis praeditum. Collum pilis flexuosis, pallide olivaceo-brunneis, remote septatis, circa 20–100 (plerumque 40) \times 1.5 μ praeditum. Peridium perithecii tenue, membraceum, pallide olivaceo-brunneum, translucidum. Asci octospori, clavati, 300–350 \times 30–40 μ , superne late rotundati, anulo apicale vix spectabile praediti, inferne in parte in stipitem 100 μ longum attenuati, evanescentes. Paraphyses ventricosae, evanescentes. Ascospores unicellulares, oblique biserials (in mediam partem), ellipsoideae, 33–38 \times 17–22 μ , primum hyalinae vel olivaceae, maturitate confirmata atribrunneae et opacae, foramen germinale circa 1.5 μ diametro crassum in utroque apice exhibentes; appendices gelatinosae in utroque apicem symmetrice dispositae, flagelli-formes, circa 50 μ longae et in basi 13 μ diametro crassae; exospores tenues.

HOLOTYPE: In fimo vaccino. Canada, Ontario, NW of Palgrave, 15 May 1960, *Cain* TRTC 36934. In torontoensis universitatis Cryptogamarum herbario.

ETYMOLOGY: Latin, *subtilis* = fine, referring to the slender hairs on the neck of the perithecium.

Perithecia immersed, scattered, 600–700 \times 400–500 μ , subglobose, bare excepting the short hairs on the neck and hyphal filaments at base;

neck papilliform to cylindrical, black, $60\text{--}270 \times 120\text{--}140 \mu$, completely covered with a layer of elongated, cylindrical, blunt, tubercles projecting about 10μ ; hairs attached to tubercles, somewhat flexuous, light olivaceous brown, thin-walled, remotely septate, $20\text{--}100$ (mostly 40) $\times 1.5 \mu$, on neck only. *Peridium* thin, membranaceous, light olivaceous brown, transparent with cells thin-walled and clearly visible. *Asci* eight-spored, clavate, $300\text{--}350 \times 30\text{--}40 \mu$, broadly rounded above with an indistinct apical ring, tapering below into slender stipe about 100μ in length, quickly evanescent at maturity. *Paraphyses* ventricose, evanescent. *Ascospores* one-celled, obliquely and partially (central region) biserial, ellipsoidal, $33\text{--}38 \times 17\text{--}22 \mu$, length

to width ratio somewhat variable, narrowed toward each end, hyaline with a large conspicuous oil globule when young, ranging through olivaceous to dark brown and opaque at maturity; with a single lash-like gelatinous appendage measuring $50 \times 13 \mu$, symmetrically placed at each end; wall of ascospore comparatively thin, with two germ pores measuring 1.5μ in diameter, one at each end.

HABITAT: On cow dung.

SPECIMENS EXAMINED: CANADA: Ontario: Peel Co., NW of Palgrave, on cow dung, 15 May 1960, *Cain* TRTC 36934 (TYPE). UNITED STATES: Oklahoma: Delaware Co., Flint, on cow dung, 4 Sept. 1960, *Cain* TRTC 38060.

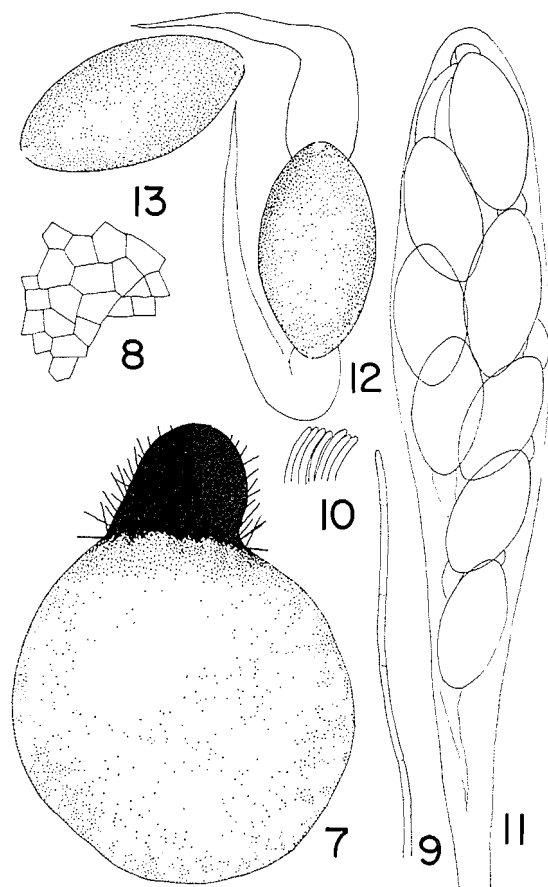
DISTINGUISHING CHARACTERS: The short slender hairs and layer of tubercles on the neck; the thin, transparent, bare peridium; indistinct ring in apex of ascus; ascospores biserial in the central portion of the ascus and possessing two germ pores and two gelatinous appendages symmetrically located.

3. *Arnium villosum* Cain & Mirza sp. nov.

Figs. 14–19

Perithecia paene superficialia dispersa, nigra, villosa, $600\text{--}800 \times 450\text{--}600 \mu$, pyriformia vel subglobosa; collum perithecii cylindraceum vel papilliforme, nigrum, $120\text{--}240 \times 120\text{--}180 \mu$, paene leve et denudatum, tuberculis dense aggregatis, opacis, brunneis praeditum. Peridium perithecii crassum, nigrum, opacum, pilis copiosis, summe longis, flexuosis, atribrunneis, remote septatis, $200\text{--}350 \times 2\text{--}3 \mu$ praeditum. Asci octospori, clavati, $300\text{--}350 \times 34\text{--}40 \mu$, superne late rotundati, annulo apicale distincto praediti, inferne in parte in stipitem 100μ longum attenuati, evanescentes. Paraphyses ventricosae, evanescentes. Ascospores unicellulares, oblique biserialis (in mediam partem), ellipsoideae vel oblongo-ellipsoideae, $34\text{--}41 \times 18\text{--}23 \mu$, in apice rotundatae, primum hyalinae vel olivaceae, maturitate confirmata atribrunneae et opaeae, foramen germinale $2\text{--}3 \mu$ diametro crassum in utroque apice exhibentes; appendices gelatinosae ad utroque apicem symmetrice dispositae, flagelliformes, $50\text{--}80 \mu$ longae et in basi 13μ diametro crassae; exosporae crassae.

HOLOTYPE: In fimo burrici, Mexico, Durango, El Casco, 13 Aug. 1960, *Cain* TRTC 36929. In torontoensis universitatis Cryptogamarum herbario.



FIGS. 7–13. *Arnium subtile*. Fig. 7. Perithecium, $\times 90$. Fig. 8. Cells of peridium, $\times 800$. Fig. 9. Single hair from neck, $\times 800$. Fig. 10. Tubercles from neck, $\times 800$. Fig. 11. Ascus with ascospores, $\times 510$. Fig. 12. Ascospore with gelatinous appendages, $\times 800$. Fig. 13. Ascospore, gelatinous appendages not shown, $\times 800$.

ETYMOLOGY: Latin, *villosus* = hairy, shaggy, referring to the copious hairy covering of the perithecium.

Perithecia superficial or with base partially immersed, scattered, black, exposed part densely covered with long hairs which appear black by reflected light, $600\text{--}800 \times 450\text{--}600 \mu$, pyriform to subglobose; neck black, cylindrical to papilliform, $120\text{--}240 \times 120\text{--}180 \mu$, nearly smooth and bare excepting densely aggregated, cylindrical, very dark brown tubercles; hairs covering exposed part of peridium (except neck), abundant, very long, flexuous, dark brown, remotely septate, thick-walled, $200\text{--}350 \times 2\text{--}3 \mu$, becoming more slender and lighter in color toward apices. *Peridium* thick, nearly black and opaque with

cellular structure very indistinct. *Asci* eight-spored, clavate, $300\text{--}350 \times 34\text{--}40 \mu$, broadly rounded above with distinct apical ring, tapering below into slender stipe about 100μ in length, quickly evanescent at maturity. *Paraphyses* ventricose, evanescent. *Ascospores* one-celled, obliquely and partially (central region) biserial, ellipsoidal or oblong-ellipsoidal, $34\text{--}41 \times 18\text{--}23 \mu$, broadly rounded at each end, hyaline with a large conspicuous oil globule when young, ranging through olivaceous to dark brown and opaque at maturity; with a single lash-like gelatinous appendage measuring $50\text{--}80 \mu$ long and 13μ wide at base, symmetrically placed at each end; wall of ascospore $1\text{--}2 \mu$ in thickness, with two germ pores measuring $2\text{--}3 \mu$ in diameter, one at each end.

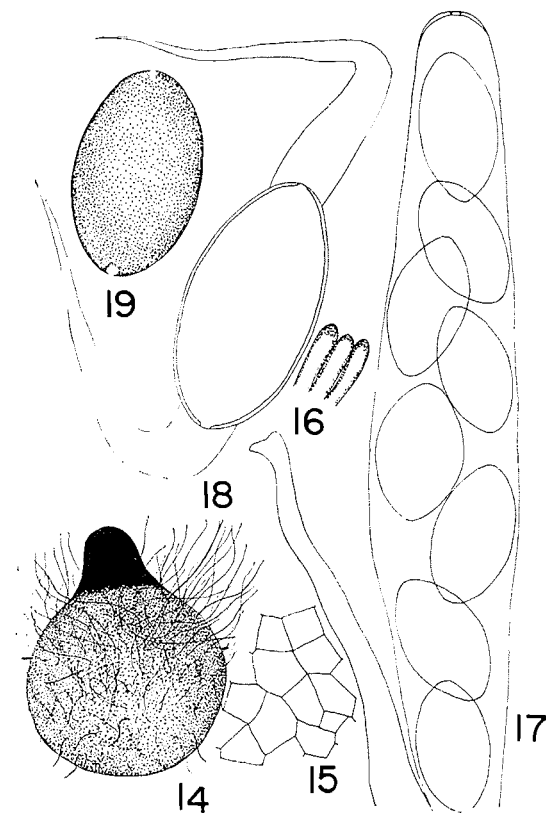
HABITAT: On burro and goat dung.

SPECIMENS EXAMINED: MEXICO: Durango: El Casco, on burro dung, 13 Aug. 1960, Cain TRTC 36929 (TYPE), 41124. Jalisco: W of Tequila, on goat dung, 17 Aug. 1960, Cain TRTC 37418; Zapotlanejo, on burro dung, 18 Aug. 1960, Cain TRTC 37770. San Luis Potosi: Ciudad del Maiz, on burro dung, 19 Aug. 1960, Cain TRTC 36733.

DISTINGUISHING CHARACTERS: The black hairy covering of the exposed portions of the perithecium, the black bare neck, the blackish opaque peridium, the distinct ring in the apex of the ascus; ascospores biserial in the central portion of the ascus and each possessing two germ pores and two gelatinous appendages symmetrically located; the thick wall of the ascospores. In *A. villosum* the ascospores are slightly larger and less pointed at the ends than in *A. subtile*.

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FIGS. 14–19. *Arnium villosum*. Fig. 14. Perithecium, $\times 45$. Fig. 15. Cells of peridium, $\times 800$. Fig. 16. Tips of tubercles from neck, $\times 800$. Fig. 17. Ascus with ascospores, $\times 510$. Fig. 18. Ascospore in optical section with gelatinous appendages, $\times 800$. Fig. 19. Ascospore, gelatinous appendages not shown, $\times 800$.

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