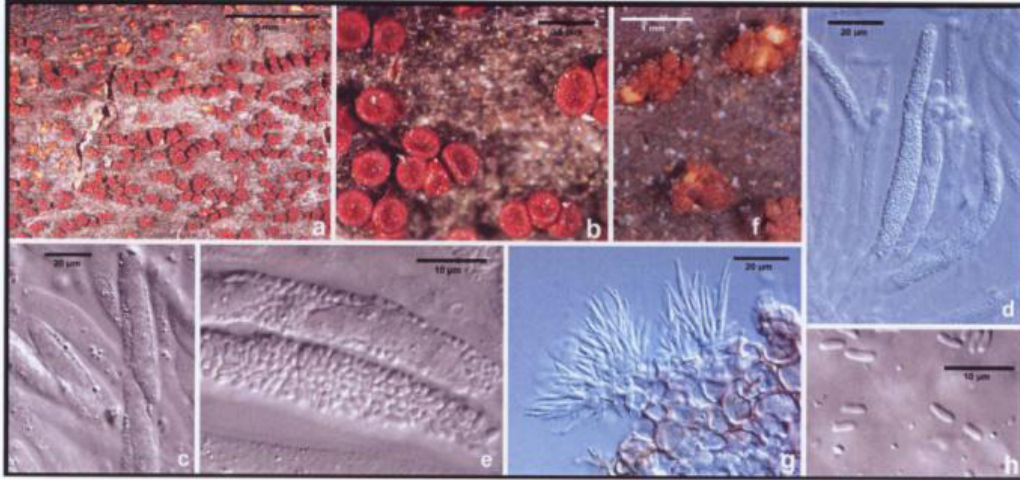


Nectria balsamea Cooke & Peck

Nectriaceae

Anamorph: *Zythiostroma* sp. (pycnidial)



Habitat: Erumpent through needle scars and on twigs and branches of recently killed conifers.

Known distribution: Known primarily from North America, also reported from Europe.

Description:

Perithecia (a, b) in groups of up to 20, superficial on a well-developed stroma, often erumpent through needle scars on small twigs, scarlet, becoming dark with age, KOH+ purple, globose to subglobose, cupulate when dry, 300–425 μm diam, often with sunken apex and surrounded by darkened area, with short papilla; outer surface with scurf that varies from white to pure yellow, greenish-yellow or concolourous with wall. Asci (d, e) 75–120 \times 6–10.5 μm , 1–4 spored. Ascospores (c–e) 17–26 \times (3–)5–6 μm , ellipsoid to fusoid, irregularly 3–5 septate with one irregular longitudinal, often oblique septum, smooth, budding early. Ascoconidia filling asci early (e), 3–4 \times 1 μm , ellipsoid to allantoid, unicellular, hyaline, smooth. Anamorph stromatic, pycnidial (f), appearing before perithecia but similar in colour, somewhat irregular in shape. Phialides (g) lining interior of pycnidial wall. Conidia (h) bacillar to allantoid, minute.

Notes: *Nectria balsamea* is identical to *N. cucurbitula* except for the much longer ascospores of *N. cucurbitula*. The shape and septation of the ascospores are obscured at maturity by the production of numerous ascoconidia.

- Nectria balsamea* Cooke & Peck in Cooke, *Grevillea*, xii, p. 81, 1884, et nomen in Peck, *N. York State Mus. Ann. Rept.* xxvi, p. 81, 1874.
Calonectria balsamea (Cooke & Peck) Sacc. *Syll. Fung.*, ix, p. 986, 1891.
Pleonectria pinicola Kirschstein, *Abh. Bot. Ver. Prov. Brandenburg*, xviii, p. 59, 1906. (Teste Ehrlich in litt.)
Ophionectria cylindrospora (Sollm.) Berl. & Vogl. var. *tetraspora* Weese, *Zbl. Bakt.*, 2 Abt. xlii, p. 598 and 602, 1914. [Weese applies this name to *Pleonectria pinicola*.]
Pleonectria calonectrioides Wollenw. *Z. Parasitenk.*, iii, p. 493, 1931. (Teste Ehrlich in litt.)

DESCRIPTION

Under natural conditions, pycnidia are the first observable fructifications to develop on the host. These form on the surface of a stroma which develops in the cortex and ruptures the overlying peridium. It has a homogeneous pseudo-



FIG. 4. *Thyronectria balsamea*. A, asci with ascospores and ascoconidia; B, ascospores forming ascoconidia; C, conidia and conidiophores from culture.

parenchymatic structure formed of elongate cells $10-16 \times 6-9 \mu$. The pycnidia are globose, deep red in colour with a dark-edged ostiole, and measure $350-600 \mu$ in diameter. In section, the wall is $25-30 \mu$ thick with 5-6 layers of cells. These tend to be compressed in the mature pycnidia but originally measured $7-9 \times 5-7 \mu$. The inner wall is especially convoluted in the basal region, and the whole

surface of the inner wall is covered with hyaline phialides $10-16 \times 2 \mu$ at the base. Conidia are hyaline, allantoid, $3-4 \times 1-1.5 \mu$.

The perithecia generally develop round the pycnidia on the same stroma and are $250-400 \mu$ in diameter, globose, with a rough outer wall covered with a furfureous coating, although this covering may be absent. They undergo pomiform to cupulate collapse on drying. The lateral wall is $50-60 \mu$ thick and in the early stages of development has a homogeneous structure with the cells of the stroma; later it shows a gradation from the outer layers of thick-walled globose cells $8-10 \times 6-8 \mu$ to the thinner-walled and more elongate cells of the inner layers where the cells measure $9-12 \times 4-6 \mu$. Elongate cells with thin walls line the perithecial cavity and these measure $12-18 \times 2-3 \mu$.

The asci are cylindrical to clavate with a rounded apex and measure $70-130 \times 8-10 \mu$, usually with four monostichous ascospores.

The ascospores are dictyospores with irregular septation and are hyaline, broadly fusiform, $17-26 \times 4-6 \mu$. Whilst still within the ascus they produce ascoconidia from short phialides or pores at each end of the spore. These ascoconidia are hyaline, allantoid, $3-4 \times 1 \mu$, and soon fill the whole lumen of the ascus, the ascospores finally disintegrating.

CULTURES

When isolated on to malt or potato dextrose agar the ascoconidia germinate to form hyphae which soon produce a sparse and somewhat floccose mycelium over the surface of the agar. From the hyphae short lateral pegs $2-3 \mu$ long form in 5-6 days at 22°C . in the light; these small phialides form hyaline, allantoid microconidia, $4-5 \times 1 \mu$. The superficial hyphae soon give rise to dark stromatic pustules $1-1.5 \text{ mm}$. in diameter. In 5-6 weeks pycnidia begin to form as locules in the stroma and not as separate pycnidia. Each locule is lined by short-branched conidiophores which terminate in flask-shaped phialides $6-20 \times 1-1.5 \mu$. The only agar discoloration is a slight yellow tinge in the young cultures and a general darkening with age.

Most frequently recorded on dead bark of twigs and branches of *Abies balsamea*, but also on *Pinus sylvestris*, *P. strobus*, and *Paula canadensis*.

SPECIMENS EXAMINED

Nectria balsamea folder Herb. R.B.G. Kew

Co-type; (ex Herb. Cooke) *Nectria balsamea* Cooke & Peck, on bark of dead balsam trees (*Abies balsamea*), North Elba, N.Y., July [1873]. Ex Herb. New York Bot. Gard., *Calonectria balsamea* (Cooke & Peck) Ellis & Everhart, on *Abies balsamea*, North Elba, N.Y., C. H. Peck.

Thyronectria balsamea folder Herb. I.M.I.

On *Abies balsamea*, Vermont, U.S.A., J.E., Aug. 34 (52268); Clear Lake, Dorset, Ontario, M. K. Nobles, Oct. 54 (DAOM 44894, I.M.I. 58091); loc. cit. Oct. 54 (DAOM 44897, I.M.I. 58092).

Thyronectria lamyi (Desm.) Seeler, *J. Arnold Arbor.*, xxi, p. 449, 1940.

Sphaeria lamyi Desm., *Pl. Crypt. Fr.*, No. 389, 1836; *Ann. Sci. Nat.*, 2, VI, p. 246, 1836.