



A. Habit on dead leaf; note prominent diffuse zone line. **B.** Detail of three ascomata, two opened, on dead leaf. **C.** Opened ascoma in mid-point vertical transverse section, showing lip cells lining split, and no obvious down-turned blackened region in split zone. **D.** Asci, showing sequential ripening of asci and few or no paraphyses. **E, F.** Ascus containing ascospores. [**D–F** to same scale.]

Lophodermium oxycocci (Fr.) Duby, *Mémoires de la Société de Physique et d'Histoire Naturelle de Genève* 16(1): 56 (1862) [as 'oxycoccus'].
Hysterium oxycocci Fr., *Systema Mycologicum* 2(2): 588 (1823).

Hypoderma oxycocci (Fr.) Kuntze, *Revisio Generum Plantarum* 3(3): 487 (1898).

Lophodermium oxycocci var. *hypophyllum* Dearn. & House, *Bulletin of the New York State Museum* 266: 65 (1925).

Lophodermium hypophyllum (Dearn. & House) Shear, in SHEAR, STEVENS & BAIN, *USDA Technical Bulletin* 258: 14 (1931).

Leptostroma oxycocci Hilitzer, *Vědecké Spisy Vydávané Československou Akademií Zemědělskou* 3: 147 (1929).

Habit on pale areas of dead attached leaves. *Stroma* sometimes present as broad, rather diffuse reddish zone line. *Conidiomata* present, preceding and accompanying ascomata, scattered, same colour as substratum or slightly darker brown, with narrow darker brown area around circumference and with one or more ostioles visible as slightly darker brown points in centre of surface, later becoming darker brown to black, circular to elliptical, 0.1–0.25 mm diam., occasionally coalescing to form multiple fruit-bodies, not markedly raising surface of leaf or petiole. *In mid-point transverse vertical section* embedded beneath cuticle of substratum, with upper wall and basal fertile layer bearing 1–3-septate, erect, scarcely branched conidiophores up to 35 µm high. *Conidiogenous cells* colourless, thin-walled, smooth, bearing 1 or 2 conidia at apex. *Conidia* colourless, aseptate, thin-walled, smooth, rod-shaped, 4–5 × 1 µm. *Ascomata* erumpent from leaves, more frequent on upper (adaxial) side, scattered, in external appearance elliptical, 0.4–0.6 × 0.35–0.5 mm, shiny, when dry dark grey to black, when wet uniformly black, raising surface of substratum, opening in humid conditions with single longitudinal split lined with white to yellowish lips. *In mid-point transverse vertical section* embedded beneath leaf cuticle, upper wall up to c. 30 µm deep, covering whole ascomata and extending at each side to join lower wall, shallower towards sides, gradually becoming wider towards split zone, composed of brown cells, 4–8 µm diam., forming *textura angularis*, split zone being lined with broad band of colourless cells embedded in thick coat of mucus, forming lips, lower wall of similar structure, but slightly darker and distinctly narrower, up to c. 8–13 µm deep, above which is region of colourless thin-walled *textura intricata*, c. 40–50 µm deep, forming subhymenium. *Paraphyses* colourless, thin-walled, smooth, aseptate or sparsely septate, filiform, 1–1.5 µm wide, not coated in, or with only thin, mucous coat. *Asci* maturing sequentially, cylindrical, thin-walled, (34–)39–52(–68) × 5–7 µm (including rather long tapering stalks), with only one functional wall layer observed, 8-spored, with spores arranged in bundle, apex obtuse, without circumapical thickening, not changing colour in iodine, discharging spores through irregular apical hole or tear. *Ascospores* colourless, thin-walled, aseptate, smooth, filiform, rounded at apex, tapering slightly towards base, 17–25 × 1.5 µm, coated in thin mucous sheath.

DISEASE: Cranberry twig blight. This species can cause serious economic damage to commercial cranberry crops in Oregon and Washington. Disease incidence can exceed 95% with near complete loss of crop in beds where twig blight is allowed to build up. It over-winters as mycelium in last season's leaves. The pathogen kills the one-year-old wood on infected uprights. No crop is produced on blighted uprights. Infected leaves turn from dark brown to bleached tan in late winter and spring and remain attached to the dead uprights. Blighted uprights may be scattered, or they can be in areas ranging from a few feet in diameter to the entire bed. Ascomata begin to form on the lower surfaces of infected leaves in spring. As they mature, they open along a median slit to release spores from early June until harvest in October. These spores are ejected forcibly into the air during mornings and early afternoons on days following rain or irrigation, where wind disperses them. New growth is infected between late June and mid-August, though exactly when varies from year to year. Twig blight may be severe the year after planting. Plants should be checked in the second year and new growth protected if necessary. The disease can slow the establishment of new beds. Yield on infected uprights can be lowered by one third, and the following year's crop can also be affected as infected uprights are less likely to set a mixed bud for the next crop year. Cultural control may be achieved by removing trees overshadowing the cranberry plants, thus decreasing shade and improving air circulation, and when planting by selecting cuttings only from beds known to be disease-free, though the efficacy of these measures has been questioned. Chemical control should be carried out during late bloom, July and early August, the basis being protection of new growth. Research indicates the first spray should be applied 28 days after 50% of the ascomata contain spores. Information about recommended chemical treatments can be found on the selected websites cited at the end of this sheet.

HOSTS: *Vaccinium macrocarpon* (dead leaf, twig), *V. oxycoccus* (dead leaf), *Vaccinium* sp. (dead leaf).

GEOGRAPHICAL DISTRIBUTION: NORTH AMERICA: Canada (British Columbia), USA (Alaska, Maine, Massachusetts, Michigan, New Jersey, Oregon, Washington). ASIA: Russia (Tomsk oblast). EUROPE: Czech Republic, Finland, France, Germany, Great Britain, Poland, Russia (Arkhangel'skaya oblast, Leningradskaya oblast, Respublika Kareliya), Sweden, Ukraine.

PHYSIOLOGICAL SPECIALIZATION: None reported.

TRANSMISSION: Infection is by ascospores wind-dispersed during humid weather.

NOTES: Infrequently collected on wild plants in north Asia, Europe and North America, probably mainly because of the inconspicuous nature and boggy habitat of the plant on which it grows, but likely to be not uncommon and widely distributed with its associated plant. Also causing a disease, sometimes serious, in cultivated cranberries in North America, particularly in the Pacific Northwest region of the USA. The conidial state, described by HILITZER (1929), has only rarely been observed. Being associated with boreal and often montane cold-temperature plants (records are known up to nearly 67° N) may make it vulnerable to climate change, otherwise it is of least concern at European, North American and global levels. For other areas its status remains data-deficient. In addition to literature and internet sources, the information in this description sheet derives from specimens in **IMI** and 31 records in the author's database.

LITERATURE: BRISTOW, P.R. & WINDOM, G.E., Controlling twig blight and fruit rots of cranberry with fungicides. *Fungicide and Nematicide Tests* **44**: 81 (1989). ERIKSSON, B., On *Ascomycetes* on *Diapensiales* and *Ericales* in Fennoscandia 1. Discomycetes. *Symbolae Botanicae Upsalienses* **19**(4): 71 pp. (1970). HILITZER, A., Monographická Studie o Českých Druzích Řádu *Hysteriales* a o Sypavkách Jimi Působených. *Vědecké Spisy Vydávané Československou Akademií Zemědělskou* **3**: 162 pp. (1929). SHEAR, C.L., STEVENS, N.E. & BAIN, H.F., Fungous Diseases of the Cultivated Cranberry. *USDA Technical Bulletin* **258**: 58 pp. (1931). TEHON, L.R., A Monographic Rearrangement of *Lophodermium*. *Illinois Biological Monographs* **13**(4): 151 pp. (1935).

See also the following internet pages:

www.apsnet.org/online/feature/cranberry/ [as causal organism of cranberry twig blight in North America, with illustrations of symptoms and information about symptoms and control]

http://plant-disease.ippc.orst.edu/factsheet.cfm?RecordID=374.00000&rec_type=disease [as causal organism of cranberry twig blight in Oregon, with illustrations of symptoms and information about symptoms and control]

www.apsnet.org/meetings/div/pc03abs.asp [control]

www.bccranberrygrowers.com/diseases.htm#twig [occurrence in British Columbia]

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