

**Phaeographis Müll. Arg.**  
(GRAPHIDALES: GRAPHIDACEAE)

After Fink (1935), Wirth & Hale (1978), and Harris (1990, 1995)

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Thallus crustose, uniform, epi- or endo-phloic, ecorticate or with a cortex of interwoven hyphae; attached by medullary or prothallial hyphae; hyphae I+ blue in some species. Apothecia generally elongate (rarely only oblong), simple or often branched, immersed to somewhat emergent or sessile; disk narrow but often  $\pm$  expanded, black, matt, sometimes  $\pm$  white-pruinose; thalline exciple usually inconspicuous; proper exciple colorless to pale brown or yellowish, or opaque, often black and brittle, continuing below the hymenium or developed only laterally, lateral walls vertical to divergent; hypothecium pale to black; hymenium colorless, I-, with numerous crystal-like inclusions; paraphyses unbranched, apical cells clavate and brownish; asci clavate, Graphis-type, unitunicate, I-, K/I-, 8-spored; spores transversely 3-15 septate, colorless, soon becoming pale to deep red-brown withing the ascus; walls unequally thickened resulting in lenticular locules; I+ violet. Pycnidia rare, immersed; fulcrum exobasidial; pycnosporos elongate, bacilliform to ellipsoid, straight or slightly curved. Norstictic. Photobiont Trentepohlia. On smooth bark (or smooth plateaux of fissured bark) of deciduous trees, rarely conifer branches in woodlands, or sometimes on wood; primarily tropical.

Morphs of Graphis scripta with old, shrivelled, brown-walled ascospores can be distinguished by the thicker, more conspicuous true exciple and persistently slit-like disc.

1. **Lirellae red;** exciple not carbonized; spores 6-10-celled, 21-35 x 9-11  $\mu$ m. Thallus greenish gray to olive-brown. Ascocarps 2-5 x 0.3-0.5 mm; disc soon open, red varying toward blackish; exciple reddish brown to brown, open below. Spores 5-9-septate, 20-35 x 8-10  $\mu$ m. Florida. .... P. haematites (Fée) Müll. Arg.
1. **Lirellae white, brown or blackish.** ..... 2
  2. **Spores 4-celled.** ..... 3
  2. **Spores 6-10-celled.** ..... 10
3. **Ascomata erumpent with more or less erect bark flaps.** ..... 4
3. **Ascomata not erumpent.** ..... 5
  4. **Norstictic acid. Hymenium not inspersed; spores 19021 x 7-8  $\mu$ m.** Florida. .... P. sp. (Harris, 1990)
  4. **No substances. Hymenium inspersed; spores 16-20(-22) x (6-)7-8  $\mu$ m.** Apothecia rarely branched, 0.5-1.5 x 0.15-0.25 mm; disc entirely covered by thallus or becoming narrowly open and light colored; exciple brown, open below. Florida. .... P. subfulgurata (Nyl.) Zahlbr.
5. **Hymenium inspersed.** ..... 6
5. **Hymenium not inspersed.** ..... 8
  6. **Exciple carbonized only at apex.** No substances. Thallus greenish gray to whitish or pale olivaceous, thick, rugose, K- or K+ yellow then brown, P-, C-, KC-, UV-. Ascocarps 1-5 x (0.1-)0.12-0.25(-0.45) mm;  $\pm$  immersed; disc open, flat, brownish black to black,

sometimes pruinose; proper exciple dark brown to black, prominent, open below, lateral walls 12-15  $\mu\text{m}$  wide, broadening to 25  $\mu\text{m}$  above; thalline margin thin to lacking. Hymenium 45-70  $\mu\text{m}$ . Spores 6-8 per ascus, thick-walled, brown, (3-)5(-7)-septate, 16-25(-36)  $\times$  (6-)7(-10)  $\mu\text{m}$ . On bark of broad-leaved trees, Massachusetts to Florida, Louisiana, and California. .... P. inusta (Ach.) Müll. Arg.

**6. Exciple entire, carbonized below. .... 7**

**7. Lirellae simple to loosely asteriform, not surrounded by whitish "stroma"; spores 15-16(-21)  $\times$  5-6(-8)  $\mu\text{m}$ .** No substances or rarely norstictic acid. Ascocarps dendritically branched. Exciple entirely black, closed and thickened below; disc black or gray. Thallus smooth, K+ yellow or K-, P-. Florida. .... P. sericea (Eschw. in Martius) Müll. Arg.

**7. Lirellae densely branched, surrounded by a weakly raised whitish "stroma". ....7a**

**7a. Ascospores 17-21  $\times$  7-8.5  $\mu\text{m}$ . No substances.** Florida. .... (Sarcographa tricola)

**7a. Ascospores 16-21  $\times$  5.5-6  $\mu\text{m}$ . Stictic acid agg.** Florida. .... (Sarcographa labyrinthica)

**8. Lirellae simple to loosely branched, not surrounded by whitish area; spores 15-18  $\times$  5-6  $\mu\text{m}$ .** Norstictic, + or - stictic acid, or rarely acid deficient. Florida. .... P. subtigrida (Vainio) Zahlbr.

**8. Lirellae densely branched or crowded and irregular, surrounded by distinct whitish area. .... 9**

**9. Norstictic acid. Spores 15-20(-26)  $\times$  5-6(-9)  $\mu\text{m}$ .** Whitish area weakly raised, not mealy. Apothecia much branched, 0.5-2  $\times$  0.2-0.5 mm; disc soon open, grayish pruinose to finally black; exciple brown, open below. Spores 5-7-septate. Florida. .... (Sarcographa intricans sensu Harris 1990 non (Nyl.) Müll. Arg.)

**9. No substances. Spores 13-16  $\times$  5-6  $\mu\text{m}$ .** Lirellae in mealy decorticate patches, brown, irregular, crowded. Florida. .... P. sp. (Harris, 1990)

**10. Ascomata round to slightly elongated, not branched. .... 11**

**10. Ascomata elongated, often branched. .... 12**

**11. Thallus UV+ yellow (lichexanthone); margin not raised; spores 6(-8)-celled, 18-24(-28)  $\times$  6-7(-8)  $\mu\text{m}$ , 18-24  $\times$  6-7  $\mu\text{m}$ .** Exciple open below. Ascocarps  $\pm$  elongated, 0.3-0.7 mm across; disc open, black; exciple brownish black. Louisiana and Florida. .... P. punctiformis (Eschw. in Martius) Müll. Arg.

**11. Thallus UV- (no substances); margin often erect, jagged; spores (6-)8-10-celled, 25-40  $\times$  7-10  $\mu\text{m}$ .** Ascocarps unbranched, straight, 0.5-1.3  $\times$  0.4-0.8 mm; disc open, brownish black to black or obscurely grayish pruinose; exciple blackish, open below. On wood. Florida and Louisiana. .... P. lobata (Eschw. in Martius) Müll. Arg.

**12. Exciple not carbonized; hymenium not inspersed. .... 13**

**12. Exciple carbonized, at least at apex. .... 15**

**13. Margin striate; lirellae long, flexuose, branched; disk becoming exposed, brown; spores 6-celled, 25-27  $\times$  9-10  $\mu\text{m}$ .** Florida. .... P. sp. (Harris, 1990)

**13. Margin not striate. .... 14**

**14. Lirellae simple or sparingly branched; disk weakly white pruinose; spores (4-)6-celled, 20-25  $\times$  7-9  $\mu\text{m}$ .** Norstictic acid. Florida. .... P. sp. (Harris, 1990)

**14. Lirellae much branched, angular, crowded, surrounded by poorly developed whitish area; discs bluish white pruinose; spores (4-)6-celled, 22-24  $\times$  6-7  $\mu\text{m}$ .** Stictic

**acid.** Florida. .... (*Sarcographa medusulina*)

**15. Ascomata erumpent with distinct erect bark flaps;** exciple entire; hymenium inspersed; thallus often with a reddish tinge; spores 6-7(-8)-celled, (22-)27-32 x (6-)8-9  $\mu$ m. No substances. Apothecia infrequently branched, 0.5-2 x 0.2-0.3 mm; disc finally open, whitish pruinose to dull black; exciple black, closed below. North Carolina to Florida, and Louisiana. .... *P. erumpens* (Nyl. in Hue) Müll. Arg.

**15. Ascomata not erumpent.** ..... 16

**16. Hymenium inspersed with orange pigment, K+ dull purple;** lirellae black, short, little branched; exciple carbonized only at apex, black, shiny; not striate; disk exposed, white pruinose; epihymenium brown; spores 2-6(-8?)/ascus, 8-celled, 30-40 x 8-11  $\mu$ m. Norstictic acid. Thallus white, ecorticate. Florida. .... *P. multicolor* R. C. Harris

**16. Hymenium not inspersed, hyaline, K-.** ..... 17

**17. True exciple entire, continuous (closed) below hymenium; spores (6-)8-10(-11)-celled.** Ascospores (18-)26-42(-50) x (6-)8-11(-13)  $\mu$ m. Norstictic acid. Ascocarps somewhat emergent, never sessile, to 0.4 mm wide; exciple black, not greatly thickened below; thalloid margin never prominent or stromatoid. New England to Florida, west to Texas and Nebraska. .... *P. dendritica* (Ach.) Müll. Arg.

**17. True exciple open and colorless towards the base; spores 6-8-celled. Thallus smoother, often continuous or only sparingly rimose-cracked. Ascocarps often shorter, less branched, rarely radiating-dendroid; thalloid exciple indistinct to weakly distinct.** Hymenium 80-100  $\mu$ m tall. Ascospores 26-40 x 7-9.5  $\mu$ m. Thallus P+ orange, K+ red (crystals), KC+ red, C0, UV- (norstictic acid). On bark, Washington state. .... *P. smithii* (Leighton) de Lesd.

## Detailed Descriptions

### **P. dendritica**

Thallus thin to rather thick, wide-spreading or in patches, smooth, even, to coarsely and deeply cracked-areolate, areoles less than 2.5 mm diam., irregular, surface whitish to pale gray, occasionally with a yellowish tinge, matt or slightly glossy, often white-powdery.

Apothecia  $\pm$  deeply immersed, very variable, without or  $\pm$  with a distinct,  $\pm$  raised, entire or notched thalline exciple, usually  $\pm$  elongate, scattered, straight, curved or serpentine, commonly stellate, dendritically branched and radiating; disc to 0.16-0.30 mm wide, ends commonly acute, not or  $\pm$  thinly white-pruinose; true exciple entire, continuous below the hymenium, opaque, lateral walls 10-15  $\mu$ m wide; hymenium 90-120  $\mu$ m tall. Ascospores 30-50 x 7-9.5  $\mu$ m, (5-)7-9(-10)-septate. Thallus P+ yellow to orange, K+ red (crystals), KC+ red, C-, UV- (norstictic acid). On broad-leaved trees, especially in smooth bark plateaux of older trees, in moderate shade

EXCLUDED? (HARRIS, 1990):

Similar to S. medusulina in containing stictic acid, but exciple carbonized, hymenium inspersed and spores 4-celled. No N. American material seen by Harris, 1990. .... Sarcographa labyrinthica (Ach.) Müll. Arg.

Thallus somewhat rough and minutely warty. Ascocarps 0.5-2 x 0.1-0.2 mm, often clustered; disc open, black; exciple black, open below. Spores 15-18 x 6-7  $\mu$ m. Florida. [Not seen; sensu Fink = P. subtigrina, but that description incorrect according to Harris, 1990] ..... P. tortuosa (Ach.) Müll. Arg.

Ascocarps often radially branched, 1-2.5 x 0.12-0.27 mm; disc soon open and brownish black. Exciple brownish-black, closed but thin below. Spores 15-20 x 4.5-7.5  $\mu$ m. Reported from Florida; no N. American material seen by Harris 1990. .... P. dendriticella

Thallus thick, pale, dull white. Exciple closed below. Ascocarps 1 x 1 to 6 x 1 mm, prominent, irregular, branched and flexuous, sometimes stellate; thalline margin distinct, very prominent, often raised, often interrupting and breaking one fruit into several; disc wide, black to faintly gray pruinose; exciple black, open, base carbonized; labia usually divergent. Spores 8, brown, darkening and wrinkling with age, (5-)7-9-septate, 20-30 x 7-11  $\mu$ m. Thallus containing "quintaria" unknowns or no substances. No N. American material seen by Harris, 1990 ..... P. exaltata

Spores 25-38 x 6-9  $\mu$ m, 5-13-septate, finally brown. Ascocarps 0.6-4(-5) x 0.2-0.5 mm; disc closed to narrowly open and black; exciple black or whitish pruinose, open below. Vermont and Illinois. Probably a Graphis, close to G. scripta but probably distinct, according to Harris, 1990. .... "P. eulectra"

Spores 7-9-septate, 19-26 x 7-10  $\mu$ m. Ascocarps slender, elongate, unbranched, straight, somewhat emergent, never sessile; exciple black, dimidiate, not greatly thickened below; thalloid margin never prominent or stromatoid. Hymenium not inspersed. No N. American material seen by Harris, 1990. .... P. arthonioides

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