

GRAPHIS

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Graphis Adans., *Fam. Pl.* 2: 11 (1763); from the Greek *graphos* (a letter), in reference to the resemblance of the black lirellae to hand-written script.

Type: *G. scripta* (L.) Ach.

Thallus crustose, usually corticolous, occasionally saxicolous, rarely sorediate. Ascomata lirellae, immersed to sessile, simple, branched or stellate, with or without a thalline margin. Proper exciple apically, laterally or completely carbonised; surface smooth or sulcate. Hymenium 60–200 µm thick, interspersed with granules or not, I–; paraphyses unbranched. Asci clavate to subcylindrical, unitunicate, I–. Ascospores 1–8 per ascus, narrowly ellipsoidal to ellipsoidal, ±cylindrical or fusiform, transversely septate with lenticular locules, or submuriform to partly or completely muriform, hyaline, I+ blue or blue-violet at maturity.

Chemistry. Depsidones present, rarely with lichexanthone, or lacking lichen compounds.

Graphis is a cosmopolitan genus of c. 400 species. It is predominantly tropical to subtropical, and most species are corticolous. Seventy-six taxa are known from Australia, and 17 are endemic. The genus is most diverse along the east coast, especially in Queensland.

Following the recently revised circumscription of the genus, species with carbonised exciples and hyaline, muriform ascospores, formerly placed in *Graphina* Müll.Arg., are now included in *Graphis*.

A.W.Archer, The lichen genera *Graphis* and *Graphina* (Graphidaceae) in Australia 1. Species based on Australian type specimens, *Telopea* 8: 273–295 (1999); A.W.Archer, The lichen genus *Graphina* (Graphidaceae) in Australia; new reports and new species, *Mycotaxon* 77: 153–180 (2001); A.W.Archer, The lichen genus *Graphis* in Australia, *Austral. Syst. Bot.* 14: 245–271 (2001); A.W.Archer & J.A.Elix, New species and new reports in the Australian Graphidaceae, *Telopea* 11: 451–462 (2007); R.Lücking, J.L.Chaves, H.J.M.Sipman, L.Umaña & A.Aptroot, First assessment of the Ticolichen diversity inventory in Costa Rica: the genus *Graphis*, *Fieldiana (Bot.)* 46: 1–126 (2008).

KEY TO SPECIES GROUPS

- 1 Ascospores transversely septate (*Graphis*-type).....2
- 1: Ascospores submuriform, muriform or partly muriform (*Graphina*-type).....4
 - 2 Exciple completely carbonised (1) **GROUP 1**
 - 2: Exciple apically or laterally carbonised.....3
- 3 Exciple apically carbonised (2:)..... **GROUP 2**
- 3: Exciple laterally carbonised **GROUP 3**
 - 4 Exciple completely carbonised (1:)..... **GROUP 4**
 - 4: Exciple apically or laterally carbonised..... **GROUP 5**

GROUP 1: Ascospores transversely septate; exciple completely carbonised

- 1 Exciple sulcate; hymenium not interspersed.....2
- 1: Exciple not sulcate; hymenium interspersed or not.....6
 - 2 Ascospores > 60 µm long; lirellae with a conspicuous thalline margin (1)3
 - 2: Ascospores < 60 µm long; lirellae lacking a conspicuous thalline margin4
- 3 Ascospores 60–80 µm long, 12–16-locular; lirellae immersed to semi-immersed (2) **39. G. longula**
- 3: Ascospores 72–100 µm long, 16–20-locular; lirellae sessile **46. G. noumeana**

4	Ascospores 28–55 µm long, 8–13-locular; lirellae 0.2–0.4 (–0.5) mm wide (2:)	51. <i>G. rimulosa</i>
4:	Ascospores 20–38 µm long, 6–10-locular; lirellae 0.1–0.2 mm wide	5
5	Norstictic acid present; ascospores 20–30 µm long, 6–9-locular (4:)	55. <i>G. schiffneri</i>
5:	Lichen compounds absent; ascospores 26–38 µm long, 6–10-locular	6. <i>G. aurita</i>
6	Hymenium not interspersed (1:)	7
6:	Hymenium interspersed	18
7	Lirellae immersed; lichen compounds absent (6:)	8
7:	Lirellae sessile; lichen compounds present or absent	9
8	Ascospores 20–31 µm long, 6–8-locular; lips closed or slightly open (7)	22. <i>G. dracaenae</i>
8:	Ascospores 43–65 µm long, 13–16-locular; lips closed	64. <i>G. subimmersa</i>
9	Ascospores mostly more than 50 µm long (7:)	10
9:	Ascospores < 50 µm long	13
10	Lichen compounds absent; ascospores (45–) 50–65 (–70) µm long (9)	56. <i>G. seminuda</i>
10:	Lichen compounds present	11
11	Lips of lirellae covered by a thalline layer (10:)	63. <i>G. subcelata</i>
11:	Lips of lirellae exposed, not covered by a thalline layer	12
12	Stictic acid present; ascospores 66–84 × 9–10 µm (11:)	52. <i>G. rustica</i>
12:	Norstictic acid present; ascospores (55–) 65–80 (–120) × 10–12 µm	44. <i>G. marginata</i>
13	Lichen compounds absent (9:)	14
13:	Lichen compounds present	15
14	Ascospores 30–40 µm long, 8–10-locular; lirellae 1–5 mm long, 0.15–0.25 mm wide, with a thalline margin (13)	29. <i>G. geraensis</i>
14:	Ascospores 30–50 µm long, (8–) 10–12-locular; lirellae 0.7–3.5 mm long, 0.2–0.3 mm wide, lacking a thalline margin	74. <i>G. virescens</i>
15	Stictic acid present; ascospores 28–40 µm long, 8–11-locular (13:)	18. <i>G. descissa</i>
15:	Norstictic acid present	16
16	Ascospores 25–30 µm long, 6–8-locular (15:)	35. <i>G. intricata</i>
16:	Ascospores 30–44 µm long, 8–12-locular	17
17	Lirellae lacking a thalline margin, unbranched, sessile (16:)	27. <i>G. emersa</i>
17:	Lirellae with a thalline margin, often branched, semi-immersed to sessile	4. <i>G. assimilis</i>
18	Lichen compounds absent; ascospores 100–120 µm long, 18–20-locular (6:)	68. <i>G. superans</i>
18:	Lichen compounds present; ascospores mostly less than 80 µm long	19
19	Stictic acid present (18:)	20
19:	Norstictic acid present; stictic acid absent	21
20	Ascospores 25–32 µm long, 6–8-locular (19)	40. <i>G. luluensis</i>
20:	Ascospores 50–90 µm long, 9–16-locular	31. <i>G. gloriosensis</i>
21	Ascospores 54–70 µm long, 14–16-locular (19:)	32. <i>G. gonimica</i>
21:	Ascospores to 35 µm long	22
22	Lirellae open at maturity; ascospores 20–34 µm long (21:)	2. <i>G. aperiens</i>
22:	Lirellae remaining closed	23
23	Lirellae richly branched; ascospores 15–26 µm long (22:)	9. <i>G. centrifuga</i>
23:	Lirellae sparingly branched; ascospores 25–35 µm long	19. <i>G. desquamescens</i>

GROUP 2: Ascospores transversely septate; exciple apically carbonised

1	Lirellae sulcate	2
1:	Lirellae not sulcate	4
2	Lichen compounds absent; ascospores 20–35 µm long, (6–) 8–10-locular (1)	10. <i>G. chlorotica</i>
2:	Stictic acid present	3
3	Ascospores 25–40 µm long, 7–10-locular (2:)	58. <i>G. stenotera</i>
3:	Ascospores 35–55 µm long, 10–16-locular	75. <i>G. vittata</i>
4	Norstictic acid present; ascospores 32–42 µm long, 10–12-locular (1:)	24. <i>G. eburnea</i>
4:	Lichen compounds absent	5
5	Thallus farinose-sorediate; ascospores 32–48 µm long, 8–12-locular (4:)	30. <i>G. glaucescens</i>
5:	Thallus not sorediate	6

- 6 Lirellae semi-immersed; ascospores 30–40 µm long, 8–10-locular (5:) **76. G. xanthospora**
 6: Lirellae immersed; ascospores 30–55 µm long, 9–12-locular **54. G. sayeri**

GROUP 3: Ascospores transversely septate; exciple laterally carbonised

- 1 Exciple sulcate 2
 1: Exciple not sulcate 7
 2 Hymenium interspersed; ascospores 20–30 µm long (1) **23. G. duplicatoinpersa**
 2: Hymenium not interspersed 3
 3 Lichen compounds absent (2:) 4
 3: Lichen compounds present 6
 4 Sulcae inconspicuous; ascospores 20–35 µm long, 6–8-locular (3) **70. G. tenella**
 4: Sulcae conspicuous; ascospores 30–60 µm long, 9–16-locular 5
 5 Lirellae with a lateral thalline margin; ascospores 30–50 µm long, 9–14-locular (4:) ... **36. G. leptoclada**
 5: Lirellae with, at most, an inconspicuous thalline margin; ascospores 40–60 µm long, 10–16-locular **62. G. striatula**
 6 Stictic acid present; ascospores 25–40 µm long, 7–10-locular (3:) **58. G. stenotera**
 6: Norstictic acid present; ascospores 35–70 µm long, 10–14-locular **25. G. elegans**
 7 Hymenium interspersed (1:) 8
 7: Hymenium not interspersed 12
 8 Lichen compounds absent (7) 9
 8: Norstictic acid present 10
 9 Ascospores 24–36 µm long, 8–10-locular (8) **38. G. lineola**
 9: Ascospores 50–60 µm long, 12–14-locular **65. G. subregularis**
 10 Exciple lips closed, conspicuously open at the base; ascospores 30–40 µm long, 8–12-locular (8:) **11. G. cincta**
 10: Exciple lips open, sometimes almost closed at the base 11
 11 Ascospores 28–40 µm long, 8–11-locular (10:) **15. G. crebra**
 11: Ascospores 35–70 µm long, 10–16-locular **61. G. streimannii**
 12 Lichen compounds absent (7:) 13
 12: Lichen compounds present 14
 13 Ascospores 20–40 µm long, 8–12-locular (12) **28. G. furcata**
 13: Ascospores 50–74 µm long, 12–16-locular **57. G. stenospora var. deficiens**
 14 Stictic acid present (12:) 15
 14: Norstictic acid or protocetraric acid present 16
 15 Ascospores 30–42 µm long (14) **33. G. immersella**
 15: Ascospores 45–65 µm long **14. G. crassilabra**
 16 Protocetraric acid present; ascospores 25–32 µm long, 8–10-locular (14:) **69. G. supracola**
 16: Norstictic acid present 17
 17 Norstictic acid and lichexanthone present; ascospores 15–20 µm long, 5–6-locular (16:) **59. G. stiptata**
 17: Norstictic acid present; lichexanthone absent 18
 18 Ascospores < 35 µm long (17:) 19
 18: Ascospores mostly 35–55 µm long 20
 19 Lirellae to 2 mm long, with a thin thalline margin; ascospores 15–30 µm long, 5–8-locular (18) **37. G. librata**
 19: Lirellae to 6 mm long, with a conspicuous thalline margin or white pruina; ascospores 25–35 µm long, 8–11-locular **8. G. caesiella**
 20 Ascospores 40–50 µm long, 10–14-locular, not terminally mucronate (18:) **73. G. vinosa**
 20: Ascospores 30–55 µm long, 7–11-locular, terminally mucronate **45. G. mucronata**

GROUP 4: Ascospores muriform or partly muriform; exciple completely carbonised

1	Lirellae sulcate; hymenium not interspersed	2
1:	Lirellae not sulcate; hymenium interspersed or not	3
2	Norstictic acid present; ascospores 72–105 µm long (1).....	3. <i>G. aquilonia</i>
2:	Lichen compounds absent; ascospores 90–145 µm long	72. <i>G. vestitoides</i>
3	Hymenium interspersed (1:).....	4
3:	Hymenium not interspersed.....	5
4	Corticolous; ascospores 1 per ascus, 90–130 µm long; hirtifructic acid present (3).....	26. <i>G. elixiana</i>
4:	Saxicolous; ascospores 4 per ascus, 40–55 µm long; norstictic acid present.....	53. <i>G. saxicola</i>
5	Lichen compounds absent (3:).....	6
5:	Lichen compounds present.....	8
6	Lirellae 0.5–0.8 mm long; ascospores 95–120 µm long (5)	49. <i>G. plagiocarpa</i>
6:	Lirellae 1–5 mm long; ascospores < 80 µm long	7
7	Lirellae 1–3 mm long; ascospores 28–38 µm long, 8 per ascus (6:)	43. <i>G. maritima</i>
7:	Lirellae 1–5 mm long; ascospores 50–72 µm long, 2 per ascus	22. <i>G. dolichographa</i>
8	Lirellae 1–5 mm long; norstictic acid present; ascospores 110–125 µm long (5:).....	16. <i>G. cycasicola</i>
8:	Lirellae 0.5–2.0 mm long	9
9	Norstictic acid and protocetraric acid present; ascospores 115–150 µm long (8:).....	41. <i>G. lumbschii</i>
9:	Norstictic acid present, protocetraric acid absent; ascospores 90–110 µm long	12. <i>G. cleistoblephara</i>

GROUP 5: Ascospores muriform or partly muriform; exciple apically or laterally carbonised

1	Exciple apically carbonised; norstictic acid present; ascospores 20–35 µm long	47. <i>G. perstriatula</i>
1:	Exciple laterally carbonised; norstictic acid present or absent.....	2
2	Hymenium interspersed (1:).....	3
2:	Hymenium not interspersed.....	6
3	Lichen compounds absent; ascospores 35–45 µm long (2)	67. <i>G. subvelata</i>
3:	Lichen compounds present.....	4
4	Stictic acid present; ascospores 37–50 µm long (3:).....	50. <i>G. polyclades</i>
4:	Norstictic acid present.....	5
5	Ascospores 28–36 µm long (4:)	48. <i>G. pertriosa</i>
5:	Ascospores 75–120 µm long	34. <i>G. insulana</i>
6	Lichen compounds present (2:)	7
6:	Lichen compounds absent	10
7	Stictic acid present; ascospores 60–100 µm long (6).....	60. <i>G. streblocarpa</i>
7:	Norstictic acid present	8
8	Ascospores 80–145 µm long; lirellae semi-immersed (7:).....	66. <i>G. subserpentina</i>
8:	Ascospores < 60 µm long.....	9
9	Ascospores 22–40 µm long; lirellae semi-immersed (8:).....	1. <i>G. analoga</i>
9:	Ascospores 37–51 µm long; lirellae immersed	7. <i>G. borealis</i>
10	Thallus saxicolous; ascospores 69–90 µm long (6:)	13. <i>G. coenensis</i>
10:	Thallus corticolous.....	11
11	Ascospores 125–175 µm long (10:)	5. <i>G. atrocelata</i>
11:	Ascospores to 130 µm long.....	12
12	Lirellae sulcate; ascospores 94–130 µm long (11:).....	42. <i>G. macella</i>
12:	Lirellae not sulcate; ascospores < 94 µm long	13
13	Ascospores 55–92 µm long (12:)	17. <i>G. daintriensis</i>
13:	Ascospores 19–28 µm long	14
14	Lirellae sessile, 0.5–1.5 mm long; ascospores completely muriform (13:).....	20. <i>G. dimidiata</i>
14:	Lirellae immersed, 1–4 mm long; ascospores may be only partly muriform	71. <i>G. tenuirima</i>