APPENDIX H

Table H1. Cross-population variation of the secondary vascular system in stems of *Moquiniastrum polymorphum*.

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| --- | --- | --- | --- | --- | --- |
|  |  | Wet | Dry1 | Dry2 | Dry3 |
| Secondary xylem | Fraction (%) |  |  |  |  |
| Fibers | 45.2 ± 5.2 (32.1–55) | 48.7 ± 9 (30–69.3) | 50.3 ± 11.2 (26.4–75.5) | 46.6 ± 7.7 (14.7–59.3) |
| Vessels | 22.4 ± 3.8 (14.7–31.3) | 17.7 ± 4.5 (7.7–29.2) | 15.5 ± 6 (5.1–29.3) | 22.3 ± 5.5 (1.2–39.1) |
| Parenchyma (axial + radial) | 32.4 ± 4.2 (22.7–42.8) | 33.6 ± 6.7 (16.4–52.7) | 34. 2 ± 7.5 (18.4–53.9) | 31.1 ± 5.5 (19.5–48.7) |
| Anatomical descriptors |  |  |  |  |
| Vessel diameter (µm) | 38.5 ± 10.1 (17.3–69.2) | 51.7 ± 7.4 (37–71.6) | 53.75 ± 8.5 (37.3–76.7) | 44.65 ± 9.4 (19.7–63.4) |
| Vessel element length (µm) | 292.9 ± 37 (165.3–377.2) | 290.5 ± 30.5 (194.6–346.4) | 245.9 ± 27.1 (181.1–325.8) | 299.7 ± 41 (212.7–414.5) |
| Vessel density (*n* mm–2) | 121.7 ± 29.1 (73–228) | 84.9 ± 17.2 (48–125) | 64.1 ± 13.6 (35–94) | 114.6 ± 21.6 (28–167) |
| Vessel grouping index | 1.6 ± 0.3 (1.2–4) | 2.2 ± 0.4 (1.5–3.6) | 1.6 ± 0.2 (1.2 -2.2) | 1.8 ± 0.3 (1.2–2.8) |
| Intervessel pit diameter (µm) | 5.8 ± 0.5 (4.3–7.6) | 5.7 ± 0.6 (3.9–7.1) | 5.5 ± 0.6 (3.5–7) | 5.8 ± 0.6 (3.8–7.2) |
| Intervessel pit aperture (µm) | 2.1 ± 0.4 (1.2–3.3) | 2.2 ± 0.4 (1.3–3) | 2.4 ± 0.4 (1.5–3.5) | 2.3 ± 0.4 (1.5–3.4) |
| Vessel-ray pit diameter (µm) | 4.2 ± 0.6 (2.6–5.7) | 4.5 ± 0.6 (3.1–6.1) | 4.3 ± 0.5 (3.1–5.3) | 4.6 ± 0.5 (3.1–6.1) |
| Vessel-ray pit aperture (µm) | 2.5 ± 0.4 (1.2–3.6) | 2.8 ± 0.6 (1.7–4.9) | 2.7 ± 0.5 (1.7–4.3) | 2.8 ± 0.5 (1.7–4.7) |
| Fiber diameter (µm) | 20.5 ± 2.9 (13.5–30.5) | 20.3 ± 3.4 (10.5–29.1) | 21.3 ± 4.2 (13.1–32.6) | 22.5 ± 3.7 (12.6–34.2) |
| Fiber lumen diameter (µm) | 10.7 ± 2.7 (5.2–14.2) | 9.7 ± 2.7 (4.2–15.2) | 10.6 ± 3.5 (3.1–23.5) | 11.2 ± 3.4 (3.4–20.7) |
| Fiber wall thickness (µm) | 4.9 ± 0.8 (3.1–7.3) | 5.3 ± 1.1 (3–8.6) | 5.4 ± 1.1 (2.5–8.4) | 5.7 ± 1 (2.8–9.1) |
| Fiber length (µm) | 834.6 ± 131.2 (568.1–1161.7) | 885.3 ± 58.2 (761.5–1031.7) | 858.8 ± 68.9 (719.7–1079.1) | 877.6 ± 122.3 (563.7–1201.4) |
| Rays per millimeter | 5.4 ± 1.5 (2–9) | 5.3 ± 1.4 (2–9) | 5.5 ± 1.5 (2–11) | 5.5 ± 1.4 (2–10) |
| Ray height (µm) | 180.9 ± 28.5 (109.1–267) | 195.3 ± 37.6 (105.3–420.2) | 206.4 ± 49.5 (117.3–393.6) | 213.4 ± 48.3 (133.7–375.5) |
| Ray width (µm) | 30.7 ± 7.1 (12.4–50.1) | 33.1 ± 7.5 (15.3–58.2) | 42.5 ± 9.1 (18.5–76.6) | 35.7 ± 8.2 (17.3–64.7) |
| Secondary phloem | Fractions of cells (%) |  |  |  |  |
| With secondary lignified walls | 20.5 ± 2.65 (21.9–18.2) | 28.5 ± 8.1 (14.2–34.6) | 20.9 ± 2.8 (16.5–23.9) | 27.2 ± 3.5) (21.8–30.6) |
| With primary walls | 79.5 ± 2.65 (78–81.7) | 71.5 ± 8.1 (65.3–85.8) | 79.1 ± 2.8 (76.1–83.5) | 72.8 ± 3.5 (69.3–78.2) |
| Anatomical descriptors |  |  |  |  |
| Sieve-tube diameter (µm) | 20.1 ± (12.2–29.7) | 20.5 ± 4.4 (10.6–34.8) | 19.5 ± 4.2 (11.4–31.8) | 22.1 ± 4.7 (11.5–34.05) |
| Sieve-tube element length (µm) | 289.1 ± 44.9 (185.9–389.7) | 302.1 ± 34.9 (220.5–398.05) | 242.9 ± 29.9 (146.9–314.06) | 306.4 ± 41.7 (179.8–414.1) |
| Rays per millimeter | 5.7 ± 1.2 (3–9) | 5.6 ± 1.2 (4–9) | 5.6 ± 1.1 (2–9) | 5.7 ± 1.3 (3–9) |
| Ray height (µm) | 185.5 ± 21.6 (130.05–278.03) | 213.8 ± 29.2 (156.1–319.8) | 217.4 ± 30.7 (150.9–298.71) | 218.2 ± 35.3 (151.5–321.4) |
| Ray width (µm) | 41.8 ± 5.4 (27.6–59.7) | 50 ± 6.8 (33.8–67.4) | 63.4 ± 10.9 (41.9–89.1) | 50.8 ± 6.5 (34.7–68.4) |

Values are shown as mean ± standard deviation (minimum–maximum).

Table H2. Cross-population variation of the secondary vascular system in stems of *Zanthoxylum rhoifolium*. Values are shown as mean ± standard deviation (minimum–maximum).

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | | Wet | Dry1 | Dry2 | Dry3 |
| Secondary xylem | Fractions (%) |  |  |  |  |
| Fibers | 56.1 ± 10.64 (28.6–77.4) | 63.6 ± 6.7 (49.2–84.2) | 65.9 ± 8.8 (36.1–81.8) | 62.4 ± 10.1 (31.6–76.3) |
| Vessels | 20.1 ± 7.03 (6.5–25.5) | 13.6 ± 4.6 (5.6–27.9) | 13.4 ± 5.5 (3–28) | 16.2 ± 3.9 (8.7–25) |
| Parenchyma (axial + radial) | 23.8 ± 4.7 (12.8–35.8) | 22.8 ± 4.9 (5.4–33.8) | 20.7 ± 5.4 (10.6–37.9) | 21.4 ± 7.7 (7.7–48.7) |
| Anatomical descriptors |  |  |  |  |
| Vessel diameter (µm) | 103.8 ± 15.1 (69.4–136.8) | 81.5 ± 14 (45.9–118.9) | 71.4 ± 14 (39.3–106.2) | 76.2 ± 16.2 (39.8–126.6) |
| Vessel element length (µm) | 504.6 ± 97.3 (338.6–749.3) | 437.2 ± 86.6 (225.5–657.8) | 552.5 ± 102.3 (304.8–828.8) | 500.8 ± 92.3 (281.3–691.6) |
| Vessel density (*n* mm–2) | 22.9 ± 7.1 (11–41) | 21.6 ± 4.9 (10–38) | 25.7 ± 10.8 (11–67) | 30.7 ± 6.8 (16–54) |
| Vessel grouping index | 1.4 ± 0.1 (1.1–1.9) | 1.4 ± 0.2 (1.1–2) | 1.3 ± 0.1 (1.1–1.7) | 1.4 ± 0.2 (1.1–1.8) |
| Intervessel pit diameter (µm) | 5.9 ± 0.7 (4.5–8.2) | 5.7 ± 0.5 (4.4–6.9) | 5.7 ± 0.5 (5.1–6.2) | 5.5 ± 0.5 (3.9–6.4) |
| Intervessel pit aperture (µm) | 2.4 ± 0.4 (1.3–3.5) | 2.9 ± 0.4 (1.8–4) | 2 ± 0.4 (1.2–3) | 2.5 ± 0.4 (1.4–3.7) |
| Vessel-ray pit diameter (µm) | 5.3 ± 0.8 (3.6–7.7) | 4.8 ± 0.5 (3.6–6.3) | 4.9 ± 0.6 (3.3–7) | 4.7 ± 0.4 (3.5–6.1) |
| Vessel-ray pit aperture (µm) | 2.7 ± 0.5 (1.5–3.7) | 2.8 ± 0.6 (1.5–4.4) | 2.4 ± 0.5 (1.4–3.8) | 2.5 ± 0.4 (1.5–3.7) |
| Fiber diameter (µm) | 20.7 ± 3.2 (14–25.3) | 22.9 ± 4 (14–36.8) | 20.8 ± 3.7 (10.5–28.9) | 21.6 ± 3.6 (12.6–32.7) |
| Fiber lumen diameter (µm) | 12.3 ± 3.3 (5.8–23.2) | 13.9 ± 3.7 (6.7–31.2) | 11 ± 3 (4.1–19.5) | 12.4 ± 3.2 (5.8–23.2) |
| Fiber wall thickness (µm) | 4.2 ± 0.9 (2.2–6.7) | 4.2 ± 1.3 (1.9–8.5) | 4.8 ± 1.5 (2.1–9) | 4.6 ± 1 (2.2–7.6) |
| Fiber length (µm) | 1200.5 ± 153.5 (835.1–1581.6) | 1041.5±131.3 (770–1401.9) | 1223.6 ± 195.9 (706.4–1687.3) | 1089.3 ± 160.8 (676.1–1534.3) |
| Rays per millimeter | 7 ± 1 (4 -10) | 6 ± 1 (4–9) | 6 ± 1 (4–8) | 5 ± 1.2 (4–9) |
| Ray height (µm) | 287.1 ± 43 (165.8–382.1) | 277.7 ± 37.2 (188.9–369.9) | 299.3 ± 45.7 (200.4–419.8) | 293.3 ± 41.6 (212.9–406.9) |
| Ray width (µm) | 24.4 ± 4.2 (15.3–36.1) | 32 ± 6.1 (19.4–48.1) | 31.5 ± 5.1 (18.3–44.9) | 34.9 ± 10.5 (19.6–72.5) |
| Secondary phloem | Fraction of cells (%) |  |  |  |  |
| With secondary lignified walls | 12 ± 3.3 (6.39–14.9) | 15.9 ± 2.6 (13.4–18.8) | 16.9 ± 2.2 (13.6–19.2) | 20.8 ± 5.2 (12.3–25.7) |
| With primary walls | 88 ± 3.3 (85–93.6) | 84.1 ± 2.6 (81.1–86.6) | 83.1 ± 2.2 (80.7–86.3) | 79.2 ± 5.2 (74.3–87.7) |
| Anatomical features |  |  |  |  |
| Sieve-tube diameter (µm) | 26.6 ± 5.2 (16.2–41.9) | 22.9 ± 4.3 (12.3–32.4) | 21.7 ± 4.2 (12.2–31.7) | 23.2 ± 5.4 (11.4–37.7) |
| Sieve-tube element length (µm) | 526.4 ± 90.7 (263.3–731.3) | 406.2 ± 63.5 (255.1–543.7) | 550.9 ± 83.9 (302.8–735.8) | 498.8 ± 84.4 (322.2–681.7) |
| Fiber diameter (µm) | 23.9 ± 3.8 (16.2–34.1) | 23.4 ± 3.5 (14.8–30.9) | 21.5 ± 3.05 (13.9–28.6) | 22.5 ± 3.8 (15.08–36.4) |
| Fiber lumen diameter (µm) | 2.3 ± 0.9 (0.7–7.1) | 2.9 ± 1.4 (0.7–9.9) | 2.9 ± 1.1 (0.8–7.2) | 2.5 ± 1 (0.9–7.1) |
| Fiber wall thickness (µm) | 10.8 ± 1.7 (6.9–16.1) | 10.1 ± 1.8 (4.4–14.06) | 9.2 ± 1.3 (5.7–12.9) | 10 ± 1.8 (6.6–15.6) |
| Fiber length (µm) | 1171.9 ± 170 (710.5–1608.5) | 1000.1 ± 166.6 (686.2–1430.8) | 1215.5 ± 145.1 (851–1583.2) | 1082.9 ± 160.4 (715.8–1444.9) |
| Rays per millimeter | 6.2 ± 1.1 (3–9) | 5.7 ± 1.4 (3–9) | 4.83 ± 1.1 (2–8) | 4.6 ± 1.1 (2–8) |
| Ray height (µm) | 288.5 ± 48.3 (193.0–431.4) | 279.6 ± 41.9 (190–391.8) | 287.87 ± 39.98 (189.9–387.9) | 305.6 ± 43.7 (197.2–404.5) |
| Ray width (µm) | 28.7 ± 5.9 (16.3–46.01) | 35 ± 7.3 (22.4–59.5) | 39.47 ± 7.6 (24.5–67.4) | 39.6 ± 7.1 (23.4–60.9) |

Values are shown as mean ± standard deviation (minimum–maximum).