SUPPLEMENTARY APPENDIX

This appendix has been provided by the authors to give readers additional information about their work.

Supplement to:
Genetic diversity and marker–trait association analysis for agronomic traits in *Aconitum carmichaelii* Debeaux

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**Supplemental data**

*Figure S1.* Cultivated *Aconitum carmichaelii* with (a) or without (b) removed redundant leaves and tops fresh; with (c) or without (f) removed redundant lateral roots (c); mother root (d) and lateral roots (e).
Table S1 Marker–trait association results for nine traits.

| Trait  | GLM  | Q+K  |
|--------|------|------|
|        | Marker | marker_p | markerR2 | Marker | marker_p | markerR2 |
| DWS    | P1M1-26 | 0.0024 | 0.0720 | P2M2-22 | 0.0388 | 0.0349 |
|        | P1M1-27 | 0.0015 | 0.0780 | P2M2-31 | 0.0088 | 0.0567 |
|        | P1M1-39 | 0.0010 | 0.0836 | P3M3-21 | 0.0287 | 0.0392 |
|        | P2M1-8  | 0.0211 | 0.0421 | P6M6-16 | 0.0258 | 0.0408 |
|        | P2M2-13 | 0.0449 | 0.0321 | P6M6-18 | 0.0458 | 0.0326 |
|        | P2M2-20 | 0.0091 | 0.0536 | P5M5-24 | 0.0278 | 0.0397 |
|        | P2M2-22 | 0.0120 | 0.0498 | P5M5-29 | 0.0452 | 0.0328 |
|        | P2M2-24 | 0.0015 | 0.0782 | P4M3-9  | 0.0487 | 0.0317 |
|        | P2M2-30 | 0.0326 | 0.0363 | P1M1-13 | 0.0301 | 0.0385 |
|        | P3M3-14 | 0.0172 | 0.0449 | P1M1-20 | 0.0152 | 0.0485 |
|        | P3M3-19 | 0.0106 | 0.0515 |         |         |         |
|        | P3M3-21 | 0.0027 | 0.0704 |         |         |         |
|        | P4M3-19 | 0.0308 | 0.0371 |         |         |         |
|        | P4M3-2  | 0.0061 | 0.0592 |         |         |         |
|        | P6M6-16 | 0.0250 | 0.0399 |         |         |         |
|        | P5M5-12 | 0.0352 | 0.0353 |         |         |         |
|        | P5M5-14 | 0.0317 | 0.0367 |         |         |         |
|        | P5M5-16 | 0.0034 | 0.0670 |         |         |         |
|        | P5M5-19 | 0.0075 | 0.0563 |         |         |         |
|        | P5M5-20 | 0.0234 | 0.0407 |         |         |         |
|        | P5M5-22 | 0.0124 | 0.0494 |         |         |         |
|        | P5M5-24 | 0.0105 | 0.0517 |         |         |         |
|        | P4M3-6  | 0.0042 | 0.0640 |         |         |         |
|        | P4M6-12 | 0.0212 | 0.0421 |         |         |         |

1 PH, plant height; SD, stem diameter; LRN, lateral roots number; FWS, fresh weight of stem; FWL, fresh weight of leaves for individual plant; DWS, dry weight of stem; DWL, dry weight of leaves of individual plant; FWR, The fresh weight of individual lateral root; DWR, dry weight of individual lateral root.
| Trait<sup>1</sup> | GLM | Q+K |
|-----------------|-----|-----|
|                 | Marker | marker<sub>p</sub> | marker<sub>R2</sub> | Marker | marker<sub>p</sub> | marker<sub>R2</sub> |
| DWS             | $P1M1-6$ | 0.0476 | 0.0313 | $P2M1-3$ | 0.0420 | 0.0339 |
|                 | $P4M3-9$ | 0.0018 | 0.0757 | $P2M2-22$ | 0.0450 | 0.0330 |
|                 | $P1M1-13$ | 0.0054 | 0.0607 | $P2M2-30$ | 0.0490 | 0.0318 |
|                 | $P1M1-14$ | 0.0277 | 0.0385 | $P2M2-31$ | 0.0395 | 0.0348 |
|                 | $P1M1-19$ | 0.0471 | 0.0314 | $P6M6-16$ | 0.0467 | 0.0324 |
|                 | $P1M1-20$ | 0.0005 | 0.0933 | $P5M5-16$ | 0.0366 | 0.0359 |
| FWS             | $P1M1-26$ | 0.0112 | 0.0507 | $P2M2-13$ | 0.0362 | 0.0349 |
|                 | $P1M1-27$ | 0.0049 | 0.0622 | $P2M2-20$ | 0.0115 | 0.0504 |
|                 | $P1M1-39$ | 0.0048 | 0.0622 | $P5M5-29$ | 0.0204 | 0.0443 |
|                 | $P2M1-8$ | 0.0042 | 0.0643 | $P2M2-22$ | 0.0130 | 0.0487 |
|                 | $P2M2-5$ | 0.0135 | 0.0482 | $P1M1-13$ | 0.0014 | 0.0759 |
|                 | $P2M2-13$ | 0.0362 | 0.0349 | $P1M1-19$ | 0.0389 | 0.0350 |
|                 | $P2M2-20$ | 0.0115 | 0.0504 | $P5M5-19$ | 0.0155 | 0.0463 |
|                 | $P2M2-22$ | 0.0130 | 0.0487 | $P4M5-4$ | 0.0360 | 0.0350 |
|                 | $P2M2-24$ | 0.0303 | 0.0373 | $P4M5-19$ | 0.0251 | 0.0398 |
|                 | $P2M2-30$ | 0.0347 | 0.0355 | $P4M3-9$ | 0.0095 | 0.0530 |
|                 | $P3M3-14$ | 0.0229 | 0.0411 | $P1M1-13$ | 0.0002 | 0.1079 |
|                 | $P3M3-21$ | 0.0288 | 0.0380 | $P1M1-14$ | 0.0044 | 0.0637 |
|                 | $P4M3-2$ | 0.0162 | 0.0457 | $P1M1-19$ | 0.0062 | 0.0589 |
|                 | $P6M6-16$ | 0.0412 | 0.0332 | $P1M1-20$ | 0.0019 | 0.0749 |
| Trait | GLM | Q+K |
|-------|-----|-----|
|       | Marker | marker_p | markerR2 | Marker | marker_p | markerR2 |
| SD    | P1M1-27 | 0.0051 | 0.0617 | P1M1-27 | 0.0280 | 0.0395 |
|       | P1M1-37 | 0.0342 | 0.0357 | P1M1-39 | 0.0342 | 0.0366 |
|       | P1M1-39 | 0.0079 | 0.0556 | P2M1-8  | 0.0339 | 0.0368 |
|       | P2M1-8  | 0.0135 | 0.0482 | P3M3-12 | 0.0366 | 0.0357 |
|       | P2M2-20 | 0.0484 | 0.0310 | P3M3-21 | 0.0060 | 0.0625 |
|       | P3M3-7  | 0.0309 | 0.0370 | P6M6-18 | 0.0446 | 0.0329 |
|       | P3M3-12 | 0.0202 | 0.0427 | P4M5-1  | 0.0254 | 0.0409 |
|       | P3M3-14 | 0.0052 | 0.0613 | P5M5-19 | 0.0098 | 0.0550 |
|       | P3M3-21 | 0.0014 | 0.0793 | P5M5-24 | 0.0432 | 0.0333 |
|       | P6M6-33 | 0.0375 | 0.0344 |         |        |        |
|       | P4M5-1  | 0.0171 | 0.0450 |         |        |        |
|       | P5M5-16 | 0.0100 | 0.0523 |         |        |        |
|       | P5M5-19 | 0.0015 | 0.0780 |         |        |        |
|       | P5M5-20 | 0.0041 | 0.0644 |         |        |        |
|       | P5M5-21 | 0.0330 | 0.0362 |         |        |        |
|       | P5M5-23 | 0.0231 | 0.0409 |         |        |        |
|       | P5M5-24 | 0.0313 | 0.0368 |         |        |        |
|       | P5M5-28 | 0.0325 | 0.0363 |         |        |        |
|       | P4M5-4  | 0.0177 | 0.0445 |         |        |        |
|       | P4M5-11 | 0.0445 | 0.0322 |         |        |        |
|       | P4M5-17 | 0.0226 | 0.0598 |         |        |        |
|       | P1M1-20 | 0.0224 | 0.0413 |         |        |        |

| DWL   | P1M1-27 | 0.0048 | 0.0644 | P2M2-22 | 0.0148 | 0.0506 |
|-------|---------|--------|--------|---------|--------|--------|
|       | P1M1-39 | 0.0032 | 0.0701 | P2M2-31 | 0.0361 | 0.0371 |
|       | P2M1-7  | 0.0486 | 0.0320 | P6M6-16 | 0.0147 | 0.0506 |
|       | P2M1-8  | 0.0178 | 0.0459 | P5M5-24 | 0.0242 | 0.0431 |
|       | P2M2-13 | 0.0072 | 0.0586 | P4M5-7  | 0.0491 | 0.0327 |
|       | P2M2-22 | 0.0055 | 0.0625 | P1M1-13 | 0.0261 | 0.0420 |
|       | P4M3-18 | 0.0428 | 0.0338 | P1M1-19 | 0.0131 | 0.0524 |
| Trait | GLM | Q+K |
|-------|-----|-----|
|       | Marker | marker\_p | markerR2 | Marker | marker\_p | markerR2 |
| DWL   | P6M6-16 | 0.0046 | 0.0649 | P1M1-20 | 0.0096 | 0.0572 |
|       | P4M4-18 | 0.0288 | 0.0392 |
|       | P5M5-16 | 0.0320 | 0.0378 |
|       | P5M5-19 | 0.0470 | 0.0325 |
|       | P5M5-21 | 0.0363 | 0.0360 |
|       | P5M5-24 | 0.0079 | 0.0572 |
|       | P4M5-7  | 0.0335 | 0.0371 |
|       | P4M6-13 | 0.0270 | 0.0401 |
|       | P4M6-26 | 0.0381 | 0.0353 |
|       | P1M1-13 | 0.0156 | 0.0478 |
|       | P1M1-14 | 0.0019 | 0.0775 |
|       | P1M1-19 | 0.0094 | 0.0549 |
|       | P1M1-20 | 0.0005 | 0.0953 |
| FWL   | P1M1-27 | 0.0374 | 0.0350 | P1M1-39 | 0.0480 | 0.0326 |
|       | P1M1-39 | 0.0108 | 0.0521 | P2M2-22 | 0.0014 | 0.0876 |
|       | P2M2-22 | 0.0005 | 0.0959 | P2M2-31 | 0.0464 | 0.0331 |
|       | P3M3-14 | 0.0160 | 0.0466 | P6M6-16 | 0.0033 | 0.0731 |
|       | P3M3-21 | 0.0327 | 0.0369 | P6M6-33 | 0.0450 | 0.0335 |
|       | P6M6-16 | 0.0011 | 0.0842 | P4M4-18 | 0.0424 | 0.0343 |
|       | P6M6-33 | 0.0365 | 0.0353 | P1M1-13 | 0.0286 | 0.0401 |
|       | P4M4-18 | 0.0143 | 0.0482 | P1M1-19 | 0.0095 | 0.0567 |
|       | P5M5-16 | 0.0240 | 0.0411 | P1M1-20 | 0.0398 | 0.0353 |
|       | P4M6-28 | 0.0406 | 0.0339 |
|       | P4M3-9  | 0.0432 | 0.0331 |
|       | P1M1-13 | 0.0285 | 0.0387 |
|       | P1M1-14 | 0.0119 | 0.0508 |
|       | P1M1-19 | 0.0070 | 0.0582 |
|       | P1M1-20 | 0.0081 | 0.0561 |
| PH    | P1M1-27 | 0.0011 | 0.0824 | P2M2-1 | 0.0471 | 0.0323 |
| Trait^1 | GLM | Q+K |
|---------|-----|-----|
|         | Marker | marker_p | markerR2 | Marker | marker_p | markerR2 |
| PH      | P1M1-36 | 0.0291 | 0.0378 | P2M2-28 | 0.0362 | 0.0360 |
|         | P1M1-39 | 0.0019 | 0.0751 | P6M6-4  | 0.0381 | 0.0353 |
|         | P2M1-8  | 0.0085 | 0.0545 | P6M6-6  | 0.0483 | 0.0320 |
|         | P2M2-1  | 0.0088 | 0.0541 | P6M6-11 | 0.0269 | 0.0403 |
|         | P4M3-14 | 0.0230 | 0.0410 | P6M6-16 | 0.0197 | 0.0448 |
|         | P2M2-12 | 0.0027 | 0.0704 | P4M4-13 | 0.0068 | 0.0609 |
|         | P2M2-13 | 0.0055 | 0.0604 | P5M5-6  | 0.0220 | 0.0432 |
|         | P2M2-18 | 0.0309 | 0.0370 | P5M5-24 | 0.0446 | 0.0331 |
|         | P2M2-20 | 0.0083 | 0.0548 | P4M5-12 | 0.0471 | 0.0323 |
|         | P2M2-24 | 0.0007 | 0.0892 | P4M3-6  | 0.0469 | 0.0324 |
|         | P2M2-28 | 0.0232 | 0.0409 | P1M1-11 | 0.0483 | 0.0320 |
|         | P2M2-30 | 0.0305 | 0.0372 | P1M1-13 | 0.0461 | 0.0326 |
|         | P3M3-3  | 0.0261 | 0.0393 |         |        |        |
|         | P3M3-19 | 0.0127 | 0.0491 |         |        |        |
|         | P3M3-21 | 0.0027 | 0.0702 |         |        |        |
|         | P4M3-19 | 0.0124 | 0.0493 |         |        |        |
|         | P4M3-2  | 0.0008 | 0.0874 |         |        |        |
|         | P6M6-6  | 0.0363 | 0.0349 |         |        |        |
|         | P6M6-11 | 0.0143 | 0.0474 |         |        |        |
|         | P6M6-16 | 0.0195 | 0.0432 |         |        |        |
|         | P6M6-24 | 0.0481 | 0.0311 |         |        |        |
|         | P4M4-11 | 0.0096 | 0.0529 |         |        |        |
|         | P4M4-13 | 0.0157 | 0.0462 |         |        |        |
|         | P4M4-18 | 0.0385 | 0.0341 |         |        |        |
|         | P5M5-12 | 0.0010 | 0.0844 |         |        |        |
|         | P5M5-14 | 0.0165 | 0.0455 |         |        |        |
|         | P5M5-15 | 0.0118 | 0.0500 |         |        |        |
|         | P5M5-16 | 0.0018 | 0.0762 |         |        |        |
|         | P5M5-24 | 0.0264 | 0.0391 |         |        |        |
| Trait  | GLM | Q+K |
|--------|-----|-----|
|        | marker | marker | marker | marker | marker | marker | marker | marker | marker | marker |
| PH     |       |       |       |       |       |       |       |       |       |       |
| P5M5-26 | 0.0489 | 0.0309 |       |       |       |       |       |       |       |       |
| P4M3-6  | 0.0017 | 0.0771 |       |       |       |       |       |       |       |       |
| P4M6-16 | 0.0235 | 0.0407 |       |       |       |       |       |       |       |       |
| P1M1-2  | 0.0283 | 0.0382 |       |       |       |       |       |       |       |       |
| P1M1-8  | 0.0242 | 0.0403 |       |       |       |       |       |       |       |       |
| P4M3-9  | 0.0003 | 0.1011 |       |       |       |       |       |       |       |       |
| P1M1-13 | 0.0007 | 0.0896 |       |       |       |       |       |       |       |       |
| P1M1-14 | 0.0049 | 0.0621 |       |       |       |       |       |       |       |       |
| P1M1-16 | 0.0195 | 0.0432 |       |       |       |       |       |       |       |       |
| P1M1-17 | 0.0342 | 0.0357 |       |       |       |       |       |       |       |       |
| P1M1-19 | 0.0228 | 0.0411 |       |       |       |       |       |       |       |       |
| P1M1-20 | 0.0019 | 0.0750 |       |       |       |       |       |       |       |       |
| DWR    |       |       |       |       |       |       |       |       |       |       |
| P1M1-37 | 0.0195 | 0.0436 |       |       |       |       |       |       |       |       |
| P1M1-39 | 0.0298 | 0.0378 |       |       |       |       |       |       |       |       |
| P2M1-5  | 0.0363 | 0.0352 |       |       |       |       |       |       |       |       |
| P2M2-24 | 0.0361 | 0.0352 |       |       |       |       |       |       |       |       |
| P3M3-3  | 0.0078 | 0.0561 |       |       |       |       |       |       |       |       |
| P3M3-19 | 0.0138 | 0.0483 |       |       |       |       |       |       |       |       |
| P6M6-34 | 0.0335 | 0.0362 |       |       |       |       |       |       |       |       |
| P4M4-7  | 0.0364 | 0.0351 |       |       |       |       |       |       |       |       |
| P4M5-1  | 0.0440 | 0.0326 |       |       |       |       |       |       |       |       |
| P4M5-11 | 0.0401 | 0.0338 |       |       |       |       |       |       |       |       |
| P4M6-8  | 0.0286 | 0.0384 |       |       |       |       |       |       |       |       |
| P1M1-14 | 0.0349 | 0.0357 |       |       |       |       |       |       |       |       |
| P1M1-26 | 0.0305 | 0.0372 |       |       |       |       |       |       |       |       |
| P4M1-39 | 0.0049 | 0.0620 |       |       |       |       |       |       |       |       |
| P2M2-5  | 0.0372 | 0.0345 |       |       |       |       |       |       |       |       |
| P2M2-20 | 0.0328 | 0.0362 |       |       |       |       |       |       |       |       |
| P2M2-24 | 0.0484 | 0.0310 |       |       |       |       |       |       |       |       |
| Trait | GLM | Q+K |
|-------|-----|-----|
|       | Marker | marker_p | markerR2 | Marker | marker_p | markerR2 |
| DWR   | P3M3-3 | 0.0004 | 0.0952 | P4M3-8 | 0.0336 | 0.0371 |
|       | P3M3-12 | 0.0485 | 0.0310 |       |       |       |
|       | P3M3-14 | 0.0259 | 0.0394 |       |       |       |
|       | P3M3-21 | 0.0481 | 0.0311 |       |       |       |
|       | P6M6-33 | 0.0195 | 0.0432 |       |       |       |
|       | P4M5-1 | 0.0197 | 0.0431 |       |       |       |
|       | P5M5-14 | 0.0368 | 0.0347 |       |       |       |
|       | P4M3-8 | 0.0359 | 0.0350 |       |       |       |
|       | P4M3-9 | 0.0040 | 0.0648 |       |       |       |
|       | P1M1-14 | 0.0099 | 0.0525 |       |       |       |
|       | P1M1-20 | 0.0096 | 0.0528 |       |       |       |
| LRN   | P4M3-10 | 0.0158 | 0.0461 | P3M3-3 | 0.0020 | 0.0788 |
|       | P1M1-40 | 0.0331 | 0.0361 | P3M3-25 | 0.0433 | 0.0329 |
|       | P2M1-2 | 0.0460 | 0.0317 | P6M6-9 | 0.0465 | 0.0319 |
|       | P3M3-3 | 0.0035 | 0.0666 | P6M6-24 | 0.0128 | 0.0504 |
|       | P3M3-19 | 0.0304 | 0.0372 | P5M5-24 | 0.0254 | 0.0404 |
|       | P6M6-9 | 0.0082 | 0.0551 | P4M6-26 | 0.0298 | 0.0382 |
|       | P6M6-18 | 0.0375 | 0.0344 | P1M1-6 | 0.0253 | 0.0405 |
|       | P6M6-24 | 0.0140 | 0.0477 | P1M1-14 | 0.0054 | 0.0634 |
|       | P6M6-27 | 0.0258 | 0.0395 |       |       |       |
|       | P5M5-24 | 0.0167 | 0.0453 |       |       |       |
|       | P4M5-13 | 0.0430 | 0.0326 |       |       |       |
|       | P1M1-14 | 0.0026 | 0.0710 |       |       |       |

1 PH, plant height; SD, stem diameter; LRN, lateral roots number; FWS, fresh weight of stem; FWL, fresh weight of leaves for individual plant; DWS, dry weight of stem; DWL, dry weight of leaves of individual plant; FWR, The fresh weight of individual lateral root; DWR, dry weight of individual lateral root.