## Supporting Informations

# Röschenbleck et al., – Genus-wide screening reveals four distinct types of structural plastid genome organization in *Pelargonium* (Geraniaceae)

*Supplemental Figures*

**Fig. S1** Microstructural variation in selected plastome regions in *Pelargonium*.

**Fig. S2** Data set summary statistics.

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**Table S1** Specimens studied and results of the PCR- and sequencing results with GenBank accessions.

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**Table S5** Length range and mean (brackets) for 10 plastome regions of *Pelargonium*.

**Table S6** Substitution rate, nucleotide divergence and GC-content in unaltered and rearranged plastome regions.

**Table S7** Average length, number, and proportion [%] of repeat-rich segments of accD-like regions.

**Table S8** Summary statistics of sequence comparison for accD segments from blastN analysis.

## Supplemental Figures

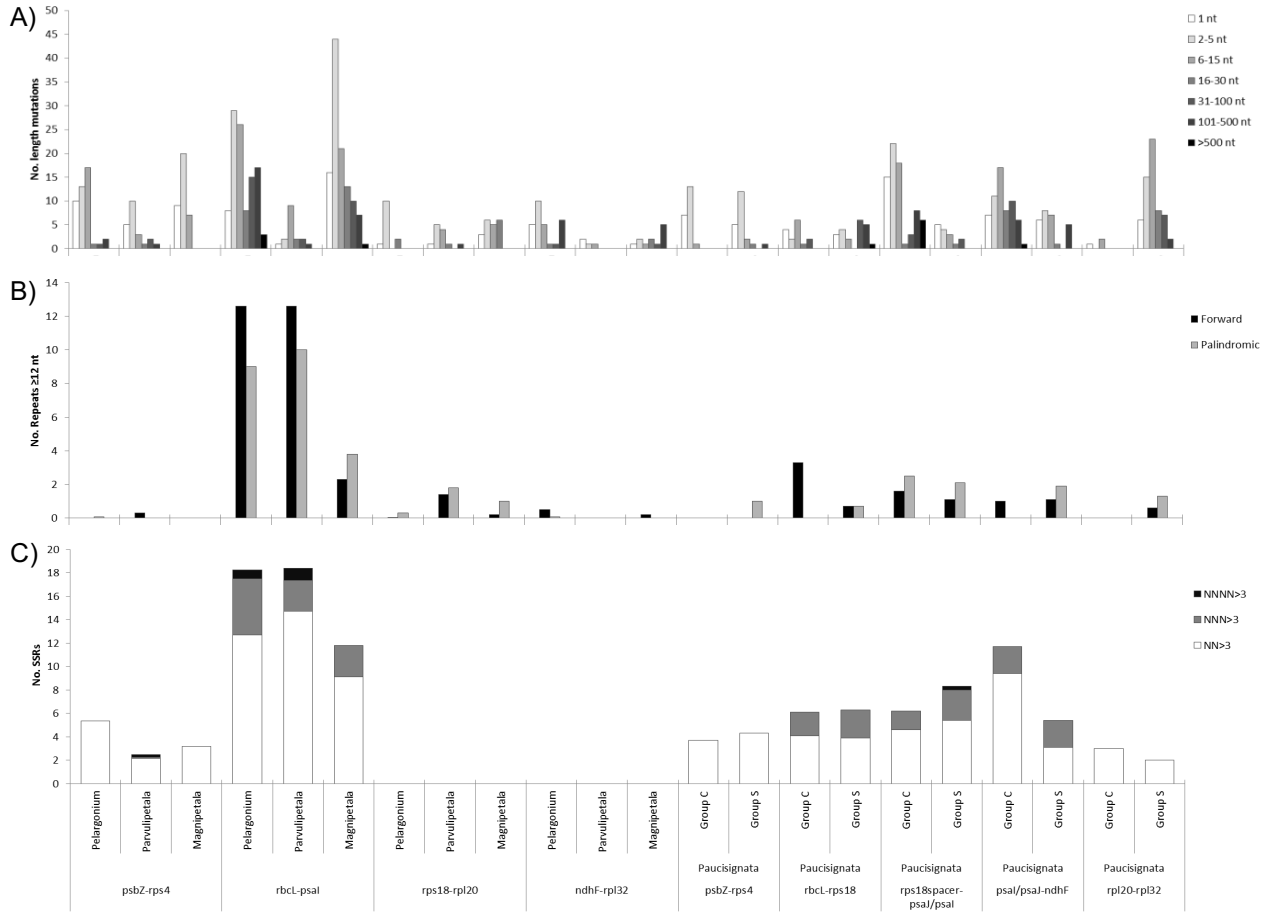


**Fig. S1 Microstructural variation in selected plastome regions in *Pelargonium***. (**A**) Number of length mutations in seven different size classes. (**B**) Average number of forward and palindromic repeats of at least 12nt length. (**C**) di-, tri- and tetramer SSRs of at least three repetitions. Note that original data including more detailed metrics (e.g. standard deviations) are deposited in datadryad.org (doi: XXXXXX).

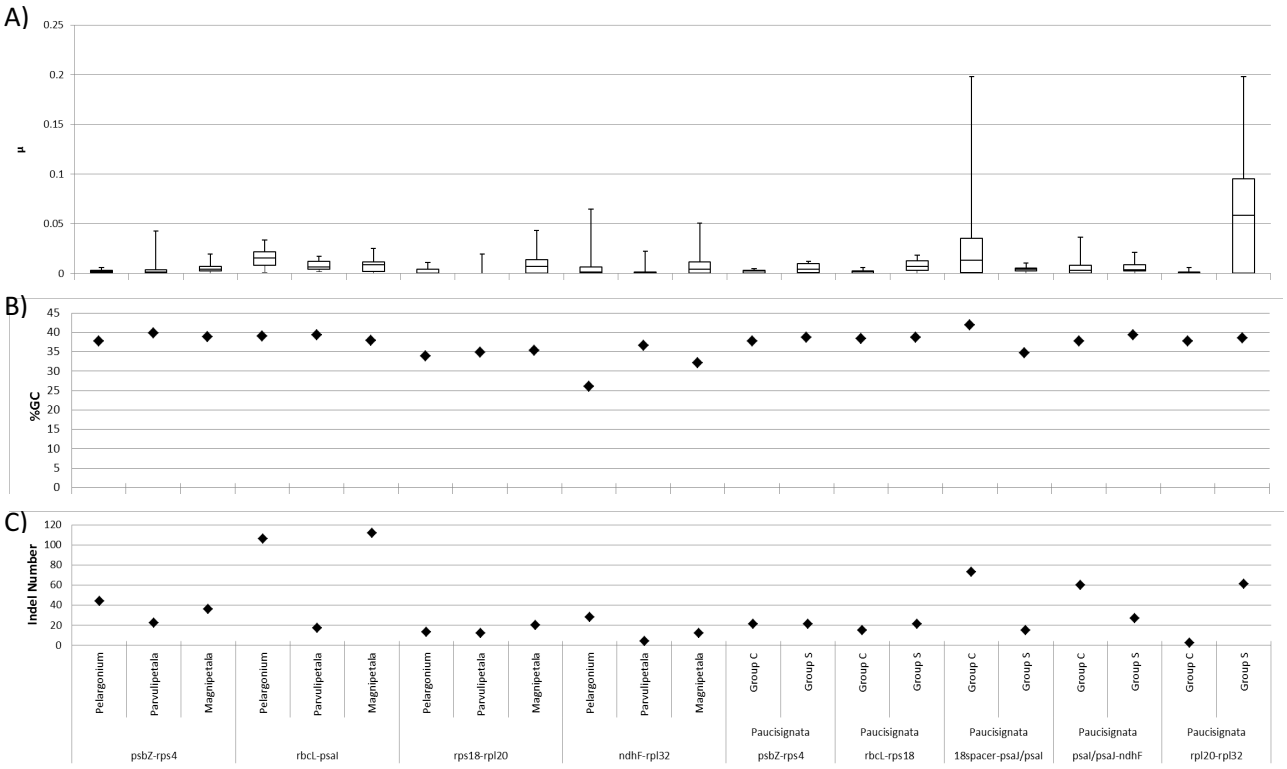


**Fig. S2 Data set summary statistics. (a)** Nucleotide substitution rates, **(b)** GC content, and **(c)** indel number are given for all regions of the subgenera *Pelargonium*, *Parvulipetala*, *Magnipetala*, and subgroups C and S of *Paucisignata*.

**Supplemental Tables**

**Table S1.** Specimens studied and results of the PCR- and sequencing results with GenBank accessions (XXXXX, also see datadryad.org: doi - XXXXXX). Note that all amplicons were sequenced as far as they could be amplified; empty cells are thus not indicative of missing data.

| Species and voucher information | rps4-psbZ | rbcL-psaI | rpl20-rps18 | ndhF rev – rpl32 | ndhF for – rpl32 | rpl20-rpl32 | rbcL-rps18 | 18S-psaJ | 18S-psaI | ndhF-psaJ | ndhF -psaI | psbA-trnI | psbA-rbcL | rpoA-petB | rpoA-ycf2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***Magnipetala*** | | | | | | | | | | | | | | | |
| *P. antidysentericum* subsp. *antidysenteri-cum* (Eckl. & Zeyh.) Kostel., MSUN 537 | GB-Nr. | GB-Nr. | GB-Nr. | GB-Nr. | - | - | - | - | - | - | - | - | - | - | - |
| *P. boranense* I.Friis & M.P. Gilbert, BG Dresden s.n. | GB-Nr. | GB-Nr. | GB-Nr. | GB-Nr. | - | - | - | - | - | - | - | - | - | - | - |
| *P. caucalifolium* subsp. *caucalifolium* Jacq., MSUN 2781 | GB-Nr. | GB-Nr. | GB-Nr. | GB-Nr. | - | - | - | - | - | - | - | - | - | - | - |
| *P. mollicomum* Fourc., MSUN 2768 | GB-Nr. | GB-Nr. | GB-Nr. | GB-Nr. | - | - | - | - | - | - | - | - | - | - | - |
| *P. myrrhifolium* var. *myrrhifolium* (L.) L'Hér., MSUN 3205 | GB-Nr. | GB-Nr. | GB-Nr. | GB-Nr. | - | - | - | - | - | - | - | - | - | - | - |
| *P. praemorsum* subsp. *praemorsum* (Andr.) Dietr., STEU 810 | GB-Nr. | GB-Nr. | GB-Nr. | GB-Nr. | - | - | - | - | - | - | - | - | - | - | - |
| *P. tetragonum* (L.f.) L'Hér., MSUN 3184 | GB-Nr. | GB-Nr. | GB-Nr. | GB-Nr. | - | - | - | - | - | - | - | - | - | - | - |
| *P. tragacanthoides* Burch., STEU 1849 | GB-Nr. | GB-Nr. | GB-Nr. | GB-Nr. | - | - | - | - | - | - | - | - | - | - | - |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *P. trifidum* Jacq., MSUN 3179 | GB-Nr. | GB-Nr. | GB-Nr. | GB-Nr. | - | - | - | - | - | - | - | - | - | - | - |
| *P. worcesterae* R. Knuth, MSUN 2746 | GB-Nr. | GB-Nr. | GB-Nr. | GB-Nr. | - | - | - | - | - | - | - | - | - | - | - |
| ***Paucisignata*, Grp C** | | | | | | | | | | | | | | | |
| *P. acetosum* (L.) L'Hér., MSUN 526 | GB-Nr. | - | - | - | - | GB-Nr. | GB-Nr. | GB-Nr. | - | - | GB-Nr. | GB-Nr. | GB-Nr. | - | - |
| *P. barklyi* Scott-Elliot, MSUN 4037 | GB-Nr. | - | - | - | - | GB-Nr. | GB-Nr. | GB-Nr. | - | - | GB-Nr. | GB-Nr. | GB-Nr. | - | - |
| *P. inquinans* (L.) L'Hér., MSUN 530 | GB-Nr. | - | - | - | - | GB-Nr. | GB-Nr. | GB-Nr. | - | - | GB-Nr. | GB-Nr. | GB-Nr. | - | - |
| *P. multibracteatum* Hochstetter ex A. Rich., MSUN 2727 | GB-Nr. | - | - | - | - | GB-Nr. | GB-Nr. | GB-Nr. | - | - | GB-Nr. | GB-Nr. | GB-Nr. | - | - |
| *P. peltatum* (L.) L'Hér., MSUN 534 | GB-Nr. | - | - | - | - | GB-Nr. | GB-Nr. | GB-Nr. | - | - | GB-Nr. | GB-Nr. | GB-Nr. | - | - |
| *P. ranunculophyllum* (Eckl. & Zeyh.) Bak., MSUN 2375 | GB-Nr. | - | - | - | - | GB-Nr. | GB-Nr. | GB-Nr. | - | - | GB-Nr. | GB-Nr. | GB-Nr. | - | - |
| *P. tongaense* Vorster, MSUN 4031 | GB-Nr. | - | - | - | - | GB-Nr. | GB-Nr. | GB-Nr. | - | - | GB-Nr. | GB-Nr. | GB-Nr. | - | - |
| ***Paucisignata*, Grp S** | | | | | | | | | | | | | | | |
| *P. caylae* Humbert, MSUN 477 | GB-Nr. | - | - | - | - | GB-Nr. | GB-Nr. | - | GB-Nr. | GB-Nr. | - | GB-Nr. | GB-Nr. | - | - |
| *P. endlicherianum* Fenzl, no voucher, s.loc., cult. BG MS | GB-Nr. | - | - | - | - | GB-Nr. | GB-Nr. | - | GB-Nr. | GB-Nr. | - | GB-Nr. | GB-Nr. | - | - |
| *P. grandicalcaratum* R. Knuth, STEU 758 | GB-Nr. | - | - | - | - | GB-Nr. | GB-Nr. | - | GB-Nr. | GB-Nr. | - | GB-Nr. | GB-Nr. | - | - |
| *P. karooicum* Compton, MSUN 4040 | GB-Nr. | - | - | - | - | GB-Nr. | GB-Nr. | - | GB-Nr. | GB-Nr. | - | GB-Nr. | GB-Nr. | - | - |
| *P. otaviense* R. Knuth, STEU 943 | GB-Nr. | - | - | - | - | GB-Nr. | GB-Nr. | - | GB-Nr. | GB-Nr. | - | GB-Nr. | GB-Nr. | - | - |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *P. spinosum* Willd., STEU 619 | GB-Nr. | - | - | - | - | GB-Nr. | GB-Nr. | - | GB-Nr. | GB-Nr. | - | GB-Nr. | GB-Nr. | - | - |
| *P. transvaalense* R.Knuth, STEU 1972 | GB-Nr. | - | - | - | - | GB-Nr. | GB-Nr. | - | GB-Nr. | GB-Nr. | - | GB-Nr. | GB-Nr. | - | - |
| ***Parvulipetala*** | | | | | | | | | | | | | | | |
| *P. anceps* subspec. nov. ined. *'geniculatum'*, MSUN 430 | GB-Nr. | GB-Nr. | GB-Nr. | - | GB-Nr. | - | - | - | - | - | - | - | - | - | - |
| *P. album* J.J.A. v.d. Walt, MSUN 669 | GB-Nr. | n.a. | GB-Nr. | - | GB-Nr. | - | - | - | - | - | - | - | - | - | - |
| *P. australe* Willd., MSUN 375 | GB-Nr. | n.a. | GB-Nr. | - | GB-Nr. | - | - | - | - | - | - | - | - | - | - |
| *P. cotyledonis* (L.) L'Hér., MSUN 4030 | GB-Nr. | n.a. | GB-Nr. | - | GB-Nr. | - | - | - | - | - | - | - | - | - | - |
| *P. exstipulatum* (Cav.) L'Hér., MSUN 656 | GB-Nr. | GB-Nr. | GB-Nr. | - | GB-Nr. | - | - | - | - | - | - | - | - | - | - |
| *P. filicaule* R. Knuth, MSUN 310 | GB-Nr. | GB-Nr. | GB-Nr. | - | GB-Nr. | - | - | - | - | - | - | - | - | - | - |
| *P. ionidiflorum* (Eckl. & Zeyh.) Steud., MSUN 673 | GB-Nr. | n.a. | GB-Nr. | - | GB-Nr. | - | - | - | - | - | - | - | - | - | - |
| *P. littorale* Hügel, MSUN 249 | GB-Nr. | n.a. | GB-Nr. | - | GB-Nr. | - | - | - | - | - | - | - | - | - | - |
| *P. minimum* (Cav.) Willd., STEU 4361 | GB-Nr. | n.a. | GB-Nr. | - | GB-Nr. | - | - | - | - | - | - | - | - | - | - |
| *P. pseudofumaroides* R.Knuth, STEU 2981 | GB-Nr. | n.a. | GB-Nr. | - | n.a. | - | - | - | - | - | - | - | - | - | - |
| *P. reniforme* subsp. *velutinum* (Eckl. & Zeyh.) Dreyer, MSUN 2721 | GB-Nr. | n.a. | GB-Nr. | - | GB-Nr. | - | - | - | - | - | - | - | - | - | - |
| *P. sidoides* DC., MSUN 2666 | GB-Nr. | n.a. | GB-Nr. | - | GB-Nr. | - | - | - | - | - | - | - | - | - | - |
| ***Pelargonium*** | | | | | | | | | | | | | | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *P. alternans* subsp. *alternans* Wendl., MSUN 720 | GB-Nr. | n.a. | GB-Nr. | GB-Nr. | - | - | - | - | - | - | - | - | - | GB-Nr. | GB-Nr. |
| *P. althaeoides* (L.) L'Hér., MSUN 4032 | GB-Nr. | n.a. | GB-Nr. | GB-Nr. | - | - | - | - | - | - | - | - | - | GB-Nr. | GB-Nr. |
| *P. caffrum* (Eckl. & Zeyh.) Harv. STEU 2738 | GB-Nr. | n.a. | GB-Nr. | GB-Nr. | - | - | - | - | - | - | - | - | - | GB-Nr. | GB-Nr. |
| *P. carnosum* subsp. *carnosum* (L.) L'Hér., MSUN 2737 | GB-Nr. | GB-Nr. | GB-Nr. | GB-Nr. | - | - | - | - | - | - | - | - | - | GB-Nr. | GB-Nr. |
| *P. coronopifolium* Jacq., STEU 1797 | GB-Nr. | GB-Nr. | GB-Nr. | GB-Nr. | - | - | - | - | - | - | - | - | - | GB-Nr. | GB-Nr. |
| *P. crassicaule* L'Hér., MSUN 601 | GB-Nr. | n.a. | GB-Nr. | GB-Nr. | - | - | - | - | - | - | - | - | - | GB-Nr. | GB-Nr. |
| *P. crispum* (Berg.) L'Hér., MSUN 2839 | GB-Nr. | GB-Nr. | GB-Nr. | GB-Nr. | - | - | - | - | - | - | - | - | - | GB-Nr. | GB-Nr. |
| *P. cucullatum* subsp. *cucullatum* (L.) L'Hér., STEU 1043 | GB-Nr. | GB-Nr. | GB-Nr. | GB-Nr. | - | - | - | - | - | - | - | - | - | GB-Nr. | GB-Nr. |
| *P. desertorum* Vorster, MSUN 538 | GB-Nr. | n.a. | GB-Nr. | GB-Nr. | - | - | - | - | - | - | - | - | - | GB-Nr. | GB-Nr. |
| *P. fulgidum* (L.) L'Hér., STEU 482 | GB-Nr. | GB-Nr. | GB-Nr. | GB-Nr. | - | - | - | - | - | - | - | - | - | GB-Nr. | GB-Nr. |
| *P. glutinosum* (Jacq.) L'Hér., STEU 1644 | GB-Nr. | n.a. | GB-Nr. | GB-Nr. | - | - | - | - | - | - | - | - | - | GB-Nr. | GB-Nr. |
| *P. hirtum* (Burm.f.) Jacq., BG Muenster, s.n. | GB-Nr. | n.a. | GB-Nr. | GB-Nr. | - | - | - | - | - | - | - | - | - | GB-Nr. | GB-Nr. |
| *P. incrassatum* (Andr.) Sims, MSUN 785 | GB-Nr. | GB-Nr. | GB-Nr. | GB-Nr. | - | - | - | - | - | - | - | - | - | GB-Nr. | GB-Nr. |
| *P. klinghardtense* R. Knuth, MSUN 709 | GB-Nr. | n.a. | GB-Nr. | GB-Nr. | - | - | - | - | - | - | - | - | - | GB-Nr. | GB-Nr. |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *P. magenteum* J.J.A. v.d. Walt, MSUN 631 | GB-Nr. | GB-Nr. | GB-Nr. | GB-Nr. | - | - | - | - | - | - | - | - | - | GB-Nr. | GB-Nr. |
| *P. nanum* L'Hér., MSUN 345 | GB-Nr. | n.a. | GB-Nr. | GB-Nr. | - | - | - | - | - | - | - | - | - | GB-Nr. | GB-Nr. |
| *P. oblongatum* E.Mey. ex. Harv., MSUN 4027 | GB-Nr. | n.a. | GB-Nr. | GB-Nr. | - | - | - | - | - | - | - | - | - | GB-Nr. | GB-Nr. |
| *P. ovale* subsp. *ovale* (Burm.f.) L'Hér., BG Muenster, s.n. | GB-Nr. | GB-Nr. | GB-Nr. | GB-Nr. | - | - | - | - | - | - | - | - | - | GB-Nr. | GB-Nr. |
| *P. radulifolium* (Eckl. & Zeyh.) Steud., MSUN 874 | GB-Nr. | n.a. | GB-Nr. | GB-Nr. | - | - | - | - | - | - | - | - | - | GB-Nr. | GB-Nr. |
| *P. schizopetalum* Sweet, STEU 1873 | GB-Nr. | n.a. | GB-Nr. | GB-Nr. | - | - | - | - | - | - | - | - | - | GB-Nr. | GB-Nr. |
| P. sericifolium J.J.A. v.d. Walt, STEU 1554 | GB-Nr. | n.a. | GB-Nr. | GB-Nr. | - | - | - | - | - | - | - | - | - | GB-Nr. | GB-Nr. |
| *P. triandrum* E.M. Marais, MSUN 751 | GB-Nr. | n.a. | GB-Nr. | GB-Nr. | - | - | - | - | - | - | - | - | - | GB-Nr. | GB-Nr. |
| *P. triste* (L.) L'Hér., STEU 1103 | GB-Nr. | GB-Nr. | GB-Nr. | GB-Nr. | - | - | - | - | - | - | - | - | - | GB-Nr. | GB-Nr. |
| *P. xerophyton* Schltr. ex R. Knuth, MSUN 636 | GB-Nr. | n.a. | GB-Nr. | GB-Nr. | - | - | - | - | - | - | - | - | - | GB-Nr. | GB-Nr. |

'-': not detected; 'n. a.': positive result in PCR screening, but not sequenced; MSUN – Herbarium of the University of Muenster; STEU – Herbarium of the University of Stellenbosch; BG – Botanical Garden

**Table S2.** PCR screening and sequencing details for clades and regions.

| Amplicon | No. species | Additional amplicons of flanking genes | Negative control (amplification region) |
|---|---|---|---|
| ***Pelargonium*** | | | |
| *rpoA*-*pet*B | 24 (24) | - | *rbc*L (IRa) rev -*psb*A for, *rbc*L(IRa) rev-*trn*$I_{CAU}$ rev |
| *ycf*2-*rpo*A | 24 (24) | - | *rbc*L (IRa) rev -*psb*A for, *rbc*L(IRa) rev-*trn*$I_{CAU}$ rev |
| *ycf*3 rev-*trn*$E_{UUC}$ rev | 10 (5) | *ycf*3 rev-*trn*$G_{GCC}$ rev, *trn*$G_{GCC}$ for-*trn*$E_{UUC}$ rev | - |
| *psb*Z for-*rps*4 for | 31 (24) | - | *rps*4 for-*ycf*3 rev |
| *rbc*L for-*psa*I rev | 31 (9) | - | *rbc*L for -*psa*J rev |
| *rps*18 for-*rpl*20 for | 28 (24) | *psa*J for-*rpl*20 for, *psa*J for-*rps*18 rev | - |
| *ndh*F rev-*rpl*32 rev | 29 (24) | - | *ndh*F for-*rpl*32 rev |
| ***Parvulipetala*** - | | | |
| - | - | - | *rbc*L (IRa) rev -*psb*A for, *rbc*L(IRa) rev-*trn*$I_{CAU}$ rev |
| *psb*Z for-*rps*4 for | 12 (12) | - | *rps*4 for-*ycf*3 rev |
| *rbc*L for-*psa*I rev | 15 (3) | - | *rbc*L for-*rps*18 rev, *rbc*L for-*psa*J for |
| *rps*18 for-*rpl*20 for | 16 (12) | *psa*J for-*rpl*20 for, *psa*J for-*rps*18 rev | *rpl*20 for-*rpl*32 for |
| *ndh*F for-*rpl*32 rev | 13 (11) | | *ndh*F rev-*rpl*32 rev |
| ***Magnipetala*** | | | |
| *ycf*3 rev-*trn*$E_{UUC}$ rev | 9 (2) | *ycf*3 rev-*trn*$G_{GCC}$ rev, ycf3 rev-trn$Y_{GUA}$ rev | - |
| *psb*Z for-*rps*4 for | 15 (10) | | *rps*4 for-*ycf*3 rev |
| *rbc*L for-*psa*I rev | 15 (10) | | *rbc*L for-*rps*18 rev, trn$N_{GUU}$ for-psaI rev |
| *rps*18 for-*rpl*20 for | 16 (10) | *psa*J for-*rpl*20 for, *psa*J for-*rps*18 rev | *rpl*20 for-*rpl*32 for |
| *ndh*F rev-*rpl*32 rev | 16 (10) | *ndh*F for-*trn*$N_{GUU}$ rev | *ndh*F for-*trn*$N_{GUU}$ for, *ndh*F rev-*rpl*32 rev |
| ***Paucisignata*** | | | |
| *rbc*L (IRa) rev-*psb*A for | 14 (0) | *rbc*L(IRa) rev-*trn*$I_{CAU}$ rev | - |
| *ycf*3 rev-*trn*$E_{UUC}$ rev | 11 (8) | *ycf*3 rev-*trn*$G_{GCC}$ rev, *trn*$G_{GCC}$ for-*trn*$E_{UUC}$ rev | - |
| *psb*Z for-*rps*4 for | 14 (14) | - | *rps*4 for-*ycf*3 rev |
| *rbc*L for (IRb)-*rps*18 rev | 17 (14) | - | - |
| *rpl*20 rev-*rpl*32 rev | 15 (14) | - | *ndh*F rev-*rpl*32 rev |
| ***Paucisignata – Grp.* C** | | | |
| *rps*18 for-*psa*J for | 9 (7) | *rbc*L for -*psa*J for | *rps*18 for-*psa*I rev |
| *ndh*F for-*psa*I rev | 7 (7) | *ndh*F for-*trn*$N_{GUU}$ rev, *trn*$N_{GUU}$ for-*psa*I rev | *ndh*F for-*psa*J for, *ndh*F for-*rps*18 for , *rps*18 rev-*psa*J for |
| ***Paucisignata – Grp.* S** | | | |
| *rps18* for -*psa*I rev | 7 (7) | *rbc*L for-*psa*I rev | *rps*18 for-*psa*J for |
| *ndh*F for-*psa*J for | 7 (7) | *ndh*F for-*trn*$N_{GUU}$ rev, *trn*$N_{GUU}$ for-*psa*J for, *trn*$N_{GUU}$ for-*rps*18 for, *rps*18 rev-*psa*J for | *ndh*F for-*psa*I rev, *trn*$N_{GUU}$ for-*psa*I rev |

Numbers in brackets in column 2 are the number of species sequences.for – forward primer, rev – reverse primer;

**Table S3.** PCR settings including primer primers used in PCR screening and sequencing.

| Region | Primer[1] | Primer sequence 5'→3' | Orientation | Cycles, Annealing, Elongation conditions |
|---|---|---|---|---|
| *rbc*L-*psb*A | rbcL-A | GTATCCTTGGTTTCATAATCAGG | Rev | 43 x, A 60°C 30sec,E 72°C 1m |
| | psbA | CCTTGGTATGGAAGTTATGCATG | Rev | |
| | rbcL-A | GTATCCTTGGTTTCATAATCAGG | Rev | 43 x, A 60°C 30sec,E 72°C 1m |
| | trnI | GTTGGGTGCTTTAACCATTCAGC | Rev | |
| *psb*Z-*rps*4 | rps4 | CATAGAATATTATTCTCGTCAGATTTCACCC | For | 40x, A 54°C 0,45m, E 72°C 1,5m |
| | psbZ | GTACCCGTTGTATTTGCTTCTC | For | 45x, A 54°C 0,45m, E 72°C 1,5m |
| | rps4 | CATAGAATATTATTCTCGTCAGATTTCACCC | For | 40x, A 54°C 0,45m, E 72°C 1,5m |
| | ycf3 | GGTCTTATCAATAAAATTTCCATT | Rev | |
| *trn*E-*ycf*3 | ycf3 | GGTCTTATCAATAAAATTTCCATT | Rev | 45x, A 54°C 1m, E 72°C 2m |
| | trnE | GAGAGATGTCCTGAACCACTAGACGATG | Rev | 45x, A 56°C 1m, E 72°C 2,15m |
| | ycf3-2 | GCCTCCCTTTCTCCTGAAGTTGTAGG | Rev | 45x, A 54°C 1m, E 72°C 2,15m |
| | trnG | TCTCTTTGCCAAGGAGAAGACG | For | 40x, A 54°C 0.45m, E 72°C 2,15m |
| | ycf3 | GGTCTTATCAATAAAATTTCCATT | Rev | 38x, A54°C 0,45m, E 72°C 1,15m |
| | trnG | CGTCTTCTCCTTGGCAAAGAGA | Rev | |
| *rbc*L-*psa*I | rbcL-B | GAAGCATGTGTACAAGCTCGTAATG | For | 38 x, A 54°C 1,5m, E 72°C 3,5m; 4m; 4,5m |
| | psaI | TGAAGAAATAAAGAAGCCATTGC | Rev | 45 x, A 54°C 1,5m, E 72°C 3,5m; 4m; 4,5m |
| | rbcL-B2 | GTGCCGTAGCTAATCGAGTAGC | For | 45x, A 54°C 1m, E 72°C 2m |
| | IR-1 | TCAATTACTCTTTTACCTGCAAATGCAAT | Rev | 45x, A 56°C 1m, E 72°C 2m |
| | IR-2.1 | GATTGAAATCGGGATCACCGCTTAC | Rev | |
| | IR-2.2 | CTCTGAAGAGTCTTCAGATTTGT | Rev | |
| | psaI2 | GCAAATGCCGGAAATACTAGGC | Rev | |
| | RI-1.1 | ACGTCCTTTTCGTTTCGTGTTGC | For | 45x, A 58°C 1m, E 72°C 2m |
| | RI-2 | CATAATCCTAGTGATTGGATTTATATAC | For | 45x, A 58°C 1m, E 72°C 1,5m |
| | RI-1.2 | TGTTTCCCCTTTGATTTTCAAGTTGA | For | |
| | RI-3 | GTTGACAAAGGTCTCTATATTCACTATAC | For | |
| | RI-4 | GACTTCTACTTATGAAGAACTCAATTGTG | For | |
| | IR-2.2 | CTCTGAAGAGTCTTCAGATTTGT | Rev | |
| | RI-8 | ACAAATCTGAAGACTCTTCAGAG | For | 45x, A 58°C 1m, E 72°C 2m |
| | RI-4 | GACTTCTACTTATGAAGAACTCAATTGTG | For | |
| | psaI | TGAAGAAATAAAGAAGCCATTGC | Rev | |
| | RI-1.1 | ACGTCCTTTTCGTTTCGTGTTGC | For | 45x, A58°C 0,45m, E 72°C 1,5m |
| | RI-1.2 | TGTTTCCCCTTTGATTTTCAAGTTGA | For | |
| | RI-3 | GTTGACAAAGGTCTCTATATTCACTATAC | For | |
| | RI-4 | GACTTCTACTTATGAAGAACTCAATTGTG | For | |

| | | | | |
|---|---|---|---|---|
| | RI-5 | GATCCCATTGAGTGGGATTCAGA | For | |
| | IR-3 | GAATAGCTTCAGGCAATCCCGTG | Rev | |
| | RI-9 | ATTGCATTTGCAGGTAAAAGAGTAATTGA | For | 45x, A58°C 0,45m, E 72°C 1,5m |
| | RI-7 | GATTGCCTGAAGCTATTCAAACAGG | For | |
| | psaI | TGAAGAAATAAAGAAGCCATTGC | Rev | |
| | rbcL-B | GAAGCATGTGTACAAGCTCGTAATG | For | 45x, A58°C 0,45m, E 72°C 1,5m |
| | RI-1 | ACGTCCTTTTCGTTTCGTGTTGC | For | |
| | IR-5 | GATGTCATCAACGAAAAGAGGCAATTC | Rev | |
| | RI-6 | CTCTACTTAGCACTCCTTGCATCTC | For | 45x, A58°C 0,45m, E 72°C 1,5m |
| | psaI | TGAAGAAATAAAGAAGCCATTGC | Rev | |
| | RI-5 | GATCCCATTGAGTGGGATTCAGA | For | 45x, A58°C 1m, E 72°C 2m |
| | IR-4 | CTATCCAGATACGCAAGACAAAGAGC | Rev | |
| *rbc*L-*rps*18 | rbcL-B, | GAAGCATGTGTACAAGCTCGTAATG | For | 45x, A 56°C 0,45m, E 72°C 1,5m |
| | rps18 | GTTTTAAAGTCACTCTATTCACCCGTCTAG | Rev | 45x, A 54°C 0,45m, E 72°C 1,5m |
| | rbcL-B2 | GTGCCGTAGCTAATCGAGTAGC | For | 40x, A 54°C 0,45m, E 72°C 1,5m |
| | RI-1.1 | ACGTCCTTTTCGTTTCGTGTTGC | For | 40x, A 54°C 1m, E 72°C 1,45m |
| | R18-1 | GAGTTCATAATCCTAGTGATTAGTCCT | For | 40x, A 54°C 1m, E 72°C 1,5m |
| | 18R-1 | GTTGAATGAATATCTGCTGCCGCGTC | Rev | 38x, A 54°C 1m, E 72°C 1,5m |
| *rpo*A-*ycf*2 | rpoA-f | ATAGATGCCGTCTTCACACCC | Rev | 40x, A 54°C 1,5m, E 72°C 3,5m |
| | ycf2-f | GATGGATTTTCCCGGATGAAATGAAA | For | |
| *rpo*A-*pet*B | petB_f | CTTAGCGCTGTATTTATGTTAATCC | For | 40x, A 54°C 1,5m, E 72°C 3,5m |
| | rpoA-f | ATAGATGCCGTCTTCACACCC | Rev | |
| *rps*18-*psa*J | rbcL-B | GAAGCATGTGTACAAGCTCGTAATG | For | 38x, A 54°C 1,5m, E 72°C 4m |
| | psaJ | GCAGGTCTATTGATAGAGATTAA | For | |
| | rps18 | CTAGACGGGTGAATAGAGTGACTTTAAAAC | For | 45x, A 56°C 1,5, E 72°C 4m |
| | psaJ | GCAGGTCTATTGATAGAGATTAA | For | 40x, A 54°C 1,5m, E 72°C 3,5m |
| | | | | 38x, A 54°C 1,5m, E 72°C 3,5m |
| | RJ-1 | CTACCTACTATCCACACGAGGATAATC | For | 45x, A 56°C 1m, E 72°C 2m |
| | psaJ | GCAGGTCTATTGATAGAGATTAA | For | 45x, A 54°C 1m, E 72°C 2m |
| | J18-1 | CGTTGTATATCTTCCCCAATTGTCTAC | For | 45x, A 54°C 1m, E 72°C 2,5m |
| | J18-2.1 | TGTATTCATTGGTTGTACAGATAGAGG | For | 45x, A 54°C 1m, E 72°C 2,5m |
| | J18-2.2 | CGGCTGTGCTATCATTTTCTTCTACC | For | 45x, A 54°C 0,45m, E 72°C 1,5m |
| | | | | 43x, A 54°C 0,45m, E 72°C 2,5m |
| | | | | 40x, A 54°C 0,45m, E 72°C 2,5m |
| | R18-1 | GAGTTCATAATCCTAGTGATTAGTCCT | For | 45x, A 54°C 1m, E 72°C 2,5m |
| | psaJ | GCAGGTCTATTGATAGAGATTAA | For | |
| | rps18V | CGCACTGAATTTATCGCAACCAAG | For | 40x, A 54°C 0,45m, E 72°C 2,5m |

| | | | | |
|---|---|---|---|---|
| | rps18H | CGAGCTAGCAATTATCCGACACGCC | Rev | |
| | rps18V2 | GGCTACGCACTGAATTTATCGC | For | |
| *rps*18-*psa*I | rps18 | GTTTTAAAGTCACTCTATTCACCCGTCTAG | For | 45x, A 54°C 0,45m, E 72°C 1,5m |
| | psaI-2 | GCAAATGCCGGAAATACTAGGC | Rev | 40x, A54°C 0,45m, E 72°C 2,5m |
| | rps18V | CGCACTGAATTTATCGCAACCAAG | For | |
| | R18-1 | GAGTTCATAATCCTAGTGATTAGTCCT | For | 45x, A 54°C 1m, E 72°C 2,5m |
| | psaI, | TGAAGAAATAAAGAAGCCATTGC | Rev | 40x, A 54°C 0,45m, E 72°C 1,5m |
| | psaI-2 | GCAAATGCCGGAAATACTAGGC | Rev | |
| | rps18-1.1 | CGCACTGAATTTATCGCAACCAAG | For | 40x, A 54°C 0,45m, E 72°C 2,5m |
| | R0 | CGAGCTAGCAATTATCCGACACGCC | Rev | |
| | rps18-1.2 | GGCTACGCACTGAATTTATCGC | For | |
| | rps18 | GTTTTAAAGTCACTCTATTCACCCGTCTAG | For | 45x, A 58°C 1m, E 72°C 2,5m |
| | psaI | TGAAGAAATAAAGAAGCCATTGC | Rev | 45x, A 56°C 0,45m, E 72°C 2m |
| | rps18-1.1 | CGCACTGAATTTATCGCAACCAAG | For | 45x, A 56°C 0,45m, E 72°C 1,5m |
| | rps18-1.2 | GGCTACGCACTGAATTTATCGC | For | 45x, A 54°C 0,45m, E 72°C 2,5m |
| | rps18-1.3 | CTAGACGGGTGAATAGAGTGAC | For | 45x, A 54°C 1m, E 72°C 2,5m |
| | 18I-1 | CCG GTAGAAAGSGATTTCCCTAATG | For | 45x, A 54°C 1m, E 72°C 2,5m |
| | 18I-2 | GTAGAAAGSGATTTCCCTAATG | For | 45x, A 54°C 0,45m, E 72°C 1,5m |
| | 18I-3 | GTTCAAGGTACGCGATCCA | For | 45x, A 54°C 0,45m, E 72°C 2m |
| | psaI-2 | GCAAATGCCGGAAATACTAGGC | Rev | 43x, A 54°C 0,45m, E 72°C 2,5m |
| | I18-1 | CATTTCTCCGAAGGTCGCTTTCTC | Rev | 40x, A 54°C 0,45m, E 72°C 2m |
| | I18-2 | AGATACGCAAGACAAAGAGCAT | Rev | |
| | I18-3 | CTTCCAGTCTTCTGCCATTATACCCAG | Rev | |
| | I18-4 | GAAATTGAAATTCACAAGACTGTCCG | Rev | |
| | I18-5 | GACTTGCCAATCCAATTCTTTG | Rev | |
| | I18-6 | TGGTAAGGGTATTGAGGCTAA | Rev | |
| *rps*18-*rpl*20 | rps18 | CTAGACGGGTGAATAGAGTGACTTTAAAAC | For | 38x, A 54°C 0,45m, E 72°C 3m |
| | rpl20 | CTTGCACAAATAGCTATCTCAAATAGG | For | 38x, A 54°C 0,45m, E 72°C 2m |
| | | | | 45x, A 56°C 0,45m, E 72°C 1,5m |
| | | | | 45x, A 58°C 0,45m, E 72°C 1,5m |
| | rps18 | GTTTTAAAGTCACTCTATTCACCCGTCTAG | Rev | 38x, A 54°C 0,45m, E 72°C 3m |
| | psaJ | GCAGGTCTATTGATAGAGATTAA | For | 45x, A56°C 1m, E 72°C 1,5m |
| | | | | 40x, A 54°C 0,45m, E 72°C 1m |
| | psaJ | GCAGGTCTATTGATAGAGATTAA | For | 38x, A 54°C 0,45m, E 72°C 3m |
| | rpl20 | CTTGCACAAATAGCTATCTCAAATAGG | For | 38x, A 54°C 0,45m, E 72°C 2m |
| | | | | 45x, A 56°C 0,45m, E 72°C 1,5m |
| *psa*I-*ndh*F | ndhF | GATGCGCGAGTTATTGATGGAATTAC | For | 38x, A54°C 1,5m, E 72°C 3,5m |

| | | | | |
|---|---|---|---|---|
| | psaI | TGAAGAAATAAAGAAGCCATTGC | Rev | |
| | ndhF-2 | GAGTTACGAAGGAAACTTCGAGC | For | 45x, A 56°C 0,45m, E 72°C 2m |
| | psaI | TGAAGAAATAAAGAAGCCATTGC | Rev | 45x, A 56°C 1m, E 72°C 1,5m |
| | trnN | GACTGGTCGTAGGTTCGAATC | For | 45x, A 54°C 1m, E 72°C 1,5m |
| | trnN-2 | CCTCAGTAGCTCAGTGGTAGAGC | For | 45x, A 54°C 0,45m, E 72°C 1,5m |
| | trnN-3 | TTCGGCTGTTAACCGACTG | For | 40x, A 54°C 0,40m, E 72°C 1m |
| | psaI-2 | GCAAATGCCGGAAATACTAGGC | Rev | 40x, A 54°C 0,45m, E 72°C 1m |
| | IN-1 | GTTGAATTCGAAAGGCTCTCATCACTG | Rev | 40x, A 54°C 0,45m, E 72°C 1,2m |
| *psa*J-*ndh*F | ndhF | GATGCGCGAGTTATTGATGGAATTAC | For | 45x, A 56°C 1m, E 72°C 1,5m |
| | psaJ | GCAGGTCTATTGATAGAGATTAA | For | 45x, A 54°C 1m, E 72°C 1,5m |
| | ndhF-22 | GAGTTACGAAGGAAACTTCGAGC | For | |
| | ndhF | GATGCGCGAGTTATTGATGGAATTAC | For | 45x, A 54°C 0,45m, E 72°C 1,5m |
| | psaJ | GCAGGTCTATTGATAGAGATTAA | For | 45x, A 56°C 0,45m, E 72°C 1,5m |
| | ndhF-2 | GAGTTACGAAGGAAACTTCGAGC | For | 40x, A 54°C 0,45m, E 72°C 1,5m |
| | trnN | GACTGGTCGTAGGTTCGAATC | For | 40x, A 54°C 0,45m, E 72°C 1,2m |
| | trnN-2 | CCTCAGTAGCTCAGTGGTAGAGC | For | 40x, A 54°C 1m, E 72°C 2,5m |
| | trnN-3 | TTCGGCTGTTAACCGACTG | For | 40x, A 54°C 0,45m, E 72°C 2,5m |
| | rps18 | CTAGACGGGTGAATAGAGTGACTTTAAAAC | For | |
| | JN-1 | CATGTCAGACTATATCTTCGATCTTTAAGTG | | |
| | JN-2 | CGTCACCTATGGCGTTCTTCCGAACG | | |
| *trn*N-*ndh*F | ndhF | GATGCGCGAGTTATTGATGGAATTAC | For | 38x, A 54°C 0,45m, E 72°C 1,5m |
| | trnN | GCTCTACCACTGAGCTACTGAGG | Rev | 45x, A 56°C 0,45m, E 72°C 1,5m |
| *rpl*20-*rpl*32 | rpl20 | CTTGCACAAATAGCTATCTCAAATAGG | For | 40x, A 54°C 0,45m, E 72°C 1,5m |
| | rpl32 | CAAAGCTTTCAACGCCGCCCAATG | Rev | 45x, A 56°C 0,45m, E 72°C 1,5m |
| | rpl20-2 | GATTTTCGTCGTTTGTGGATCACTC | For | 45x, A 60°C 0,45m, E 72°C 1,5m |
| | rpl32 | CAAAGCTTTCAACGCCGCCCAATG | Rev | 45x, A 54°C 0,45m, E 72°C 1,5m |
| *ndh*F-*rpl*32 | ndhF | GCATAATCCATGAATATTGATATATATGTTCCAT | Rev | 40x, A 54°C 0,45m, E 72°C 1,5m |
| | rpl32 | CAAAGCTTTCAACGCCGCCCAATG | Rev | 45x, A 56°C 0,45m, E 72°C 1,5m |
| | | | | 45x, A 54°C 0,45m, E 72°C 1,5m |
| | ndhF | GATGCGCGAGTTATTGATGGAATTAC | For | 40x, A 54°C 0,45m, E 72°C 1,5m |
| | rpl32 | CAAAGCTTTCAACGCCGCCCAATG | Rev | 45x, A 56°C 0,45m, E 72°C 1,5m |
| | | | | 45x, A 54°C 0,45m, E 72°C 1,5m |
| | ndhF | GATGCGCGAGTTATTGATGGAATTAC | Rev | 38x, A 54°C 0,45m, E 72°C 1,5m |
| | trnN-2 | CCTCAGTAGCTCAGTGGTAGAGC | For | |

Primers under the primary primer pair are internal primers used additionally for sequencing.

**Table S4.** Reconstructed gene order of 111 unique plastid genes in *Pelargonium*.

| Subgroup | Genome arrangement |
|---|---|
| Subg. *Magnipetala* and *Pelargonium* | **86 -85 84** -1 -2 -3 -4 -5 -6 7 8 -9 10 11 -12 -13 -14 -15 -16 -17 -18 -19 20 21 -22 -23 -24 -25 **-30 35 34 33 32 31 26 27 -28 29** 36 -37 -38 39 40 -41 -42 -43 -44 45 -46 -47 48 49 50 51 52 -53 -54 -55 -56 57 58 -59 -60 61 62 63 -64 -65 -66 67 68 -69 70 71 72 -73 -74 -75 -76 -77 -78 -79 -80 -81 -82 **-83 -87** -88 -89 90 91 92 93 94 95 96 97 -98 -99 100 **111 110 109 108 107 106 105 104 103 -102 -101** |
| Subg. *Paucisignata* | **84** -1 -2 -3 -4 -5 -6 7 8 -9 10 11 -12 -13 -14 -15 -16 -17 -18 -19 20 21 -22 -23 -24 -25 **-30 35 34 33 32 62 31 26 27 -28 29** 36 -37 -38 39 40 -41 -42 -43 -44 45 -46 -47 48 **63 -61 60 59 -58 -57 56 55 54 53 -52 -51 -50 -49 -98 -99 -97 -96 -95 -94 -93 -92 -91 -90 89 88 87 83 82 81 80 79 78 77 76 75 74 73 86 85 -72 -71 -70 69 -68 -67 66 65 64** 100 **111 110 109** 101 102 -103 -104 -105 -106 -107 -108 |
| Group C | **84** -1 -2 -3 -4 -5 -6 7 8 -9 10 11 -12 -13 -14 -15 -16 -17 -18 -19 20 21 -22 -23 -24 -25 **-30 35 34 33 32 62 31 26 27 -28 29** 36 -37 -38 39 40 -41 -42 -43 -44 45 -46 -47 48 **63 -61 60 59 -58 -57 55 56 54 53 -52 -51 -50 -49 -98 -99 -97 -96 -95 -94 -93 -92 -91 -90 89 88 87 83 82 81 80 79 78 77 76 75 74 73 86 85 -72 -71 -70 69 -68 -67 66 65 64** 100 **111 110 109** 101 102 -103 -104 -105 -106 -107 -108 |
| Group S | **84** -1 -2 -3 -4 -5 -6 7 8 -9 10 11 -12 -13 -14 -15 -16 -17 -18 -19 20 21 -22 -23 -24 -25 **-30 35 34 33 32 62 31 26 27 -28 29** 36 -37 -38 39 40 -41 -42 -43 -44 45 -46 -47 48 **63** 49 50 51 52 -53 -54 -55 -56 57 58 -59 -60 61 **-98 -99 -97 -96 -95 -94 -93 -92 -91 -90 89 88 87 83 82 81 80 79 78 77 76 75 74 73 86 85 -72 -71 -70 69 -68 -67 66 65 64** 100 **111 110 109** 101 102 -103 -104 -105 -106 -107 -108 |
| Subg. *Parvulipetala* | **86 -85 84** -1 -2 -3 -4 -5 -6 7 8 -9 10 11 -12 -13 -14 -15 -16 -17 -18 -19 20 21 -22 -23 -24 -25 **-30 35 34 33 32 31 26 27 -28 29** 36 -37 -38 39 40 -41 -42 -43 -44 45 -46 -47 48 49 50 51 52 -53 -54 -55 -56 57 58 -59 -60 61 62 63 -64 -65 -66 67 68 -69 70 71 72 -73 -74 -75 -76 -77 -78 -79 -80 -81 -82 **-83 -87** -88 -89 90 91 92 93 94 95 96 97 **99 98** 100 **111 110 109 108 107 106 105 104 103 -102 -101** |

Bold numbers – genes with an altered position compared to *Melianthus*; +/- – strand orientation; underlined numbers – regions covered in PCR-screening; Gene codes: 1=*trn*$H_{GUG}$; 2=*psb*A; 3=*mat*K; 4=*trn*$K_{UUU}$;5=*rps*16;6=*trn*$Q_{UUG}$;7=*psb*K; 8=*psb*I; 9=*trn*$S_{GCU}$; 10=*trn*$G_{UCC}$; 11=*trn*$R_{UCU}$; 12=*atp*A; 13=*atp*F; 14=*atp*H; 15=*atp*I; 16=*rps*2; 17=*rpo*C2; 18=*rpo*C1; 19=*rpo*B; 20=*trn*$C_{GCA}$; 21=*pet*N; 22=*psb*M; 23=*trn*$D_{GUC}$; 24=*trn*$Y_{GUA}$; 25=*trn*$E_{UUC}$; 26=*psb*D; 27=*psb*C; 28=*trn*$S_{UGA}$; 29=*psbZ*; 30=*trn*$G_{GCC}$; 31=*trnf*$M_{CAU}$; 32=*rps*14; 33=*psa*B; 34=*psa*A; 35=*ycf*3; 36=*trn*$S_{GGA}$; 37=*rps*4; 38=*trn*$T_{UGU}$; 39=*trn*$L_{UAA}$; 40=*trn*$F_{GAA}$; 41=*ndh*J; 42=*ndh*K; 43=*ndh*C; 44=*trn*$V_{UAC}$; 45=*trn*$M_{CAU}$; 46=*atp*E; 47=*atp*B; 48=*rbc*L; 49=*psa*I; 50=*ycf*4; 51=*cem*A; 52=*pet*A; 53=*psb*J; 54=*psb*L; 55=*psb*F; 56=*psb*E; 57=*pet*L; 58=*pet*G; 59=*trn*$W_{CCA}$; 60=*trn*$P_{UGG}$; 61=*psa*J; 62=*rpl*33; 63=*rps*18; 64=*rpl*20; 65=*rps*12 '5; 66=*clp*P; 67=*psb*B; 68=*psb*T; 69=*psb*N; 70=*psb*H; 71=*pet*B; 72=*pet*D; 73=*rpo*A; 74=*rps*11; 75=*rpl*36; 76=*rps*8; 77=*rpl*14; 78=*rpl*16; 79=*rps*3; 80=*rpl*22; 81=*rps*19; 82=*rpl*2; 83=*rpl*23; 84=*trn*$I_{CAU}$; 85=*ycf*2; 86=*trn*$L_{CAA}$; 87=*ndh*B; 88=*rps*7; 89=*rps*12 '3; 90=*trn*$V_{GAC}$; 91=*rrn*16; 92=*trn*$I_{GAU}$; 93=*trn*$A_{UGC}$; 94=*rrn*23; 95=*rrn*4.5; 96=*rrn*5; 97=*trn*$R_{ACG}$; 98=*trn*$N_{GUU}$; 99=*ndh*F; 100=*rpl*32; 101=*trn*$L_{UAG}$; 102=*ccs*A; 103=*ndh*D; 104=*psa*C; 105=*ndh*E; 106=*ndh*G; 107=*ndh*I; 108=*ndh*A; 109=*ndh*H; 110=*rps*15; 111=*ycf*1.

**Table S5.** Length range and mean (brackets) for 10 plastome regions of *Pelargonium*.

| Subgenus | *psbZ-rps4* | *rbc*L-*psa*I | *rbc*L-*rps*18 | 18S *spacer-psa*J | 18s spacer-*psa*I | *rps*18-*rpl*20 | *psa*I-*ndh*F | *psa*J-*ndh*F | *ndh*F-*rpl*32 | *rpl*20-*rpl*32 |
|---|---|---|---|---|---|---|---|---|---|---|
| ***Pelargonium*** | 1037-1262 (1222) | 4382-5258 (4780) | - | - | - | 456-475 (459) | - | - | 520-897 (602) | - |
| ***Parvulipetala*** | 870-1029 (915) | 3770-4013 (3922) | - | - | - | 475-653 (505) | - | - | 869-881 (876) | - |
| ***Magnipetala*** | 1106-1139 (1119) | 1219-3849 (3129) | - | - | - | 420-475 (453) | - | - | 408-869 (508) | - |
| ***Paucisignata*,** **Group C** | 1256-1271 (1261) | - | 2261-2425 (2236) | 1329-3222 (2345) | - | - | 2684-3477 (2911) | - | - | 701-713 (703) |
| ***Paucisignata*,** **Group S** | 668-1271 (1005) | - | 1674-2163 (1937) | - | 1786-2460 (2142) | - | - | 1836-5111 (2441) | - | 702-1312 (929) |

**Table S6.** Substitution rate, nucleotide divergence, and GC-content in unaltered and rearranged plastome regions.

| | **Conserved regions** | **Rearranged regions** | ***Pelargonium*** | ***Parvulipetala*** | ***Magnipetala*** | ***Paucisignata*, Group C** | ***Paucisignata*, Group S** |
|---|---|---|---|---|---|---|---|
| **GC content [%]** | 34.8 | 38.3 | 34.2 | 37.6 | 36.1 | 38.7 | 38.0 |
| **Divergence [%]** | 2.9 | 3.3 | 2.2 | 1.4 | 4.1 | 2.5 | 5.2 |
| **Substitution rate [μ]** | 0.0078 | 0.0098 | 0.0064 | 0.0041 | 0.0086 | 0.0082 | 0.016 |

**Table S7.** Average length, number, and proportion [%] of repeat-rich segments of accD-like regions.

| | **Total Length** | **Sum *acc*D** | ***acc*D1 (range)** | ***acc*D2 (range)** | ***acc*D3 (range)** | **Interspersed region 1 (%length repeats)** | **Interspersed region 2 (% length repeats)** |
|---|---|---|---|---|---|---|---|
| ***Pelargonium*** | 3285 | 1167 | 322 (318-324) | 211 (211-211) | 634 (634-634) | 728 (34) | 1390 (53) |
| ***Parvulipetala*** | 2827 | 887 | 42 (42-42) | 211 (211-211) | 634 (634-634) | 806 (37) | 1134 (43) |
| ***Magnipetala*** | 2304 | 1089 | 277 (88-317) | 182 (153-211) | 630 (595-654) | 314 (0) | 901 (12) |
| **Subclade of *Magnipetala*** | 234 | 234 | - | - | 234 (234-234) | - | - |

**Table S8.** Summary statistics of sequence comparison for accD segments from blastN analysis.

| **Subgenus** | ***acc*D1** | | | ***acc*D2** | | | ***acc*D3** | | |
|---|---|---|---|---|---|---|---|---|---|
| | **E value** | **Identity [%]** | **Length [nt]** | **E value** | **Identity [%]** | **Length [nt]** | **E value** | **Identity [%]** | **Length [nt]** |
| ***Pelargonium*** | 3.E-09 | 69 | 319 | 0.8 | 67 | 185 | 5.E-135 | 79 | 599 |
| ***Parvulipetala*** | - | - | - | 1.4 | 67 | 199 | 4.E-140 | 78 | 604 |
| ***Magnipetala*** | 2.E-04 | 70 | 196 | 0.1 | 68 | 154 | 8.E-119 | 76 | 587 |