**Table S1**. Coefficients of Variation of each phenotypic trait (in percentages).

| Species | Pop | n | H | Hw | LL | LW | ShL | NL | IL | BRL | EBR | NR | VL | SL | SW | VP | FP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *P. intermedium* | PIN2 | 14 | 9.1 | 9.1 | 12.4 | 4.7 | 11.2 | 12.3 | 5.8 | 11.0 | 8.8 | 6.3 | 6.7 | 6.8 | 6.2 | 11.3 | 4.9 |
| | PIN4 | 18 | 7.5 | 7.4 | 12.0 | 4.2 | 14.0 | 10.0 | 6.1 | 10.0 | 24.9 | 12.7 | 5.7 | 2.0 | 0.0 | 10.8 | 4.5 |
| | PIN7 | 18 | 19.2 | 19.7 | 12.5 | 10.9 | 8.2 | **37.4** | 10.7 | 9.7 | 8.0 | 15.3 | 18.3 | 2.2 | 0.0 | 11.1 | 5.9 |
| | PIN8 | 18 | 18.0 | 11.6 | 20.9 | 21.8 | 18.6 | 15.3 | 13.1 | 18.7 | 20.3 | 10.4 | 17.9 | 5.1 | 5.9 | 13.7 | 12.8 |
| | PIN9 | 18 | 11.4 | 13.8 | 26.5 | 23.9 | 11.1 | 18.3 | 13.6 | 14.2 | 13.6 | 6.6 | 9.1 | 2.9 | 5.3 | 9.1 | 5.1 |
| *P. durifolium* | PD3 | 16 | 14.8 | 11.9 | 26.3 | 14.5 | 24.7 | 22.8 | 12.1 | 11.8 | 13.2 | 17.2 | 14.6 | 1.7 | 4.4 | 9.9 | 8.3 |
| | PD4 | 16 | 19.1 | 10.6 | 15.1 | 14.3 | 22.2 | **32.1** | 12.6 | 15.0 | 17.4 | 20.8 | 21.6 | 4.2 | 4.1 | 14.1 | 8.9 |
| | PD5 | 19 | 14.7 | 10.7 | 20.2 | 14.5 | 22.2 | 23.8 | 12.3 | 14.4 | 17.7 | 15.3 | 15.0 | 3.2 | 4.8 | 6.9 | 6.4 |
| | PD1 | 19 | 18.3 | 16.5 | 19.1 | 12.5 | 25.1 | **34.4** | 11.0 | 17.8 | 20.3 | 22.9 | 18.9 | 4.4 | 8.6 | 9.4 | 6.8 |
| | PD2 | 16 | 12.0 | 19.9 | 19.3 | 11.5 | 14.7 | 20.2 | 12.7 | 17.3 | 15.8 | 16.5 | 12.1 | 3.5 | 4.5 | 8.2 | 5.6 |
| *P. ionanthum* | PI3 | 19 | 19.3 | 10.9 | 17.1 | 11.3 | 16.3 | 20.5 | 16.6 | 15.0 | 17.6 | 9.1 | 22.3 | 6.8 | 1.7 | 13.7 | 7.6 |
| | PI4 | 20 | 15.5 | 10.3 | 16.5 | 8.2 | 18.2 | 18.2 | 12.0 | 14.5 | 20.4 | 18.1 | 15.6 | 8.0 | 0.0 | 16.6 | 9.7 |
| | PI5 | 19 | 16.6 | 14.7 | 11.5 | 13.3 | 23.4 | 18.5 | 13.5 | 14.3 | 15.5 | 12.3 | 18.0 | 6.3 | 2.5 | 11.3 | 9.6 |
| | PI1 | 19 | 6.9 | 11.4 | 11.3 | 10.0 | 17.6 | 9.8 | 11.9 | 11.0 | 15.4 | 3.4 | 3.8 | 4.9 | 1.6 | 20.9 | 12.5 |
| | PI2 | 19 | 20.4 | 10.6 | 17.7 | 12.3 | 20.5 | 29.3 | 15.1 | 16.4 | 14.5 | 3.4 | 19.8 | 5.5 | 7.00 | 11.9 | 9.1 |
| *P. regnellii* | PR2 | 18 | 7.0 | 8.2 | 15.3 | 9.5 | 21.2 | 13.7 | 14.7 | 11.7 | 16.1 | 13.4 | 9.9 | 0.0 | 0.0 | 12.0 | 1.5 |
| | PR1 | 20 | 6.3 | 2.9 | 10.4 | 10.6 | 14.3 | 11.1 | 15.4 | 10.7 | 16.2 | 20.9 | 10.3 | 0.0 | 0.0 | 7.6 | 1.1 |
| | PR3 | 20 | 5.9 | 9.9 | 15.7 | 11.6 | 11.8 | 10.6 | 16.6 | 15.1 | 20.8 | 20.7 | 9.4 | 0.0 | 0.0 | 12.4 | 3.4 |
| | PR4 | 20 | 6.6 | 7.1 | 15.2 | 10.6 | 15.7 | 15.8 | 15.9 | 13.6 | 15.3 | 19.5 | 8.2 | 0.0 | 0.0 | 8.8 | 2.6 |
| | PR5 | 19 | 4.3 | 21.6 | 14.5 | 6.7 | 10.8 | 12.0 | 15.8 | 10.7 | 14.4 | 24.6 | 6.9 | 0.0 | 0.0 | 12.2 | 3.0 |
| *P. urvillei* | PU1 | 16 | 4.2 | 7.7 | 11.8 | 5.8 | 9.9 | 10.5 | 17.3 | 17.2 | 17.2 | 24.8 | 10.3 | 3.1 | 0.0 | 23.5 | 5.1 |
| | PU3 | 18 | 5.2 | 8.1 | 7.5 | 12.1 | 11.9 | 15.3 | 11.3 | 16.7 | 15.9 | 18.9 | 7.1 | 5.0 | 0.0 | **30.2** | 18.0 |
| | PU4 | 17 | 7.3 | 8.2 | 15.7 | 11.1 | 11.2 | 10.3 | 10.1 | 10.3 | 10.3 | 10.2 | 8.9 | 3.7 | 0.0 | **41.0** | 21.0 |
| | PU5 | 17 | 5.9 | 9.1 | 14.2 | 13.9 | 11.6 | 14.2 | 13.5 | 18.6 | 14.7 | 13.3 | 10.0 | 5.0 | 0.0 | **34.7** | 27.2 |
| | PU2 | 20 | 6.8 | 10.5 | 12.2 | 14.4 | 10.3 | 13.6 | 20.4 | 18.7 | 11.7 | 18.9 | 9.2 | 6.9 | 0.0 | **36.2** | 21.9 |

*References:* n, sample size; *H*, plant height with flowering culms; *Hw*, plant height without flowering culms; *LL*, 2nd leaf blade length; *LW*, 2nd leaf blade width, *ShL*, 2nd leaf sheath length; *NL*, 2nd internode length; *IL*, inflorescence length; *BRL*, basal raceme length; *EBR*, number of spikelets in the basal raceme; *NR*, raceme number; *VL*, flowering culms length with inflorescences; *SL*, spikelet length; *SW*, spikelet width; V*P*, extension of the vegetative period; *FP*, extension of the flowering period. Numbers in red indicate a %CV >30.

**Table S2.** Kruskal-Wallis Test.

| Species | variable | n | statistic | d.f. | p-value |
|---|---|---|---|---|---|
| *P. intermedium* | | | | | |
| | BRL | 86 | 39.4 | 4 | <0.001 |
| | EBR | 86 | 33.5 | 4 | <0.001 |
| | FP | 86 | 75.4 | 4 | <0.001 |
| | H | 86 | 65.3 | 4 | <0.001 |
| | Hw | 86 | 65.4 | 4 | <0.001 |
| | IL | 86 | 62.0 | 4 | <0.001 |
| | LL | 86 | 49.1 | 4 | <0.001 |
| | LW | 86 | 44.6 | 4 | <0.001 |
| | NL | 86 | 66.1 | 4 | <0.001 |
| | NR | 86 | 73.5 | 4 | <0.001 |
| | SL | 86 | 65.9 | 4 | <0.001 |
| | ShL | 86 | 46.0 | 4 | <0.001 |
| | SW | 86 | 79.1 | 4 | <0.001 |
| *P. durifolium* | | | | | |
| | FP | 86 | 19.0 | 4 | 0.001 |
| | LL | 86 | 17.5 | 4 | 0.002 |
| *P. ionanthum* | | | | | |
| | FP | 96 | 39.0 | 4 | <0.001 |
| | H | 96 | 26.5 | 4 | <0.001 |
| | LL | 96 | 23.4 | 4 | <0.001 |
| | NL | 96 | 17.0 | 4 | 0.002 |
| | SL | 96 | 20.0 | 4 | <0.001 |
| | ShL | 96 | 59.7 | 4 | <0.001 |
| | SW | 96 | 47.0 | 4 | <0.001 |
| *P. regnellii* | | | | | |
| | EBR | 97 | 15.7 | 4 | 0.003 |
| | FP | 97 | 32.9 | 4 | <0.001 |
| | H | 97 | 20.6 | 4 | <0.001 |
| | Hw | 97 | 37.3 | 4 | <0.001 |
| | ShL | 97 | 22.7 | 4 | <0.001 |
| | VL | 97 | 16.9 | 4 | 0.002 |
| | VP | 97 | 33.5 | 4 | <0.001 |
| *P. urvillei* | | | | | |
| | FP | 88 | 14.1 | 4 | 0.007 |
| | H | 88 | 25.1 | 4 | <0.001 |
| | Hw | 88 | 26.6 | 4 | <0.001 |
| | LL | 88 | 28.6 | 4 | <0.001 |
| | LW | 88 | 41.7 | 4 | <0.001 |

| | | | | | |
|---|---|---|---|---|---|
| | SL | 88 | 22.8 | 4 | <0.001 |

*References:* n, sample size; d.f., degree of freedom; *H*, plant height with flowering culms; *Hw*, plant height without flowering culms; *LL*, 2nd leaf blade length; *LW*, 2nd leaf blade width, *ShL*, 2nd leaf sheath length; *NL*, 2nd internode length; *IL*, inflorescence length; *BRL*, basal raceme length; *EBR*, number of spikelets in the basal raceme; *NR*, raceme number; *VL*, flowering culms length with inflorescences; *SL*, spikelet length; *SW*, spikelet width; V*P*, extension of the vegetative period; *FP*, extension of the flowering period.

**Table S3.** Games-Howell post hoc test. Only traits that showed differentiation among populations are presented.

| *P. intermedium* | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| group1 | group2 | **BRL** | **EBR** | **FP** | **H** | **Hw** | **IL** | **LL** | **LW** | **NL** | **NR** | **SL** | **ShL** | **SW** | **VL** | **VP** |
| PIN2 | PIN4 | ns | ** | **** | **** | **** | **** | **** | **** | **** | **** | *** | **** | - | - | - |
| PIN2 | PIN7 | ** | **** | **** | **** | **** | ** | **** | ns | **** | *** | ns | * | - | - | - |
| PIN2 | PIN8 | ns | ns | ns | ns | *** | ns | ns | ns | ns | *** | * | ns | - | - | - |
| PIN2 | PIN9 | * | ns | **** | *** | ns | **** | ns | ns | ns | **** | *** | **** | - | - | - |
| PIN4 | PIN7 | **** | ns | **** | **** | **** | **** | **** | **** | **** | **** | **** | **** | - | - | - |
| PIN4 | PIN8 | ns | ** | **** | **** | **** | **** | *** | **** | **** | **** | **** | **** | - | - | - |
| PIN4 | PIN9 | ns | ** | * | ns | **** | ns | ns | **** | **** | ns | **** | ** | - | - | - |
| PIN7 | PIN8 | **** | *** | *** | **** | * | *** | **** | ns | **** | **** | *** | ns | - | - | - |
| PIN7 | PIN9 | **** | **** | **** | **** | **** | **** | **** | ns | **** | **** | **** | *** | - | - | - |
| PIN8 | PIN9 | ns | ns | **** | **** | *** | **** | ns | ns | * | **** | ns | * | - | - | - |
| *P. durifolium* | | | | | | | | | | | | | | | | |
| group1 | group2 | **BRL** | **EBR** | **FP** | **H** | **Hw** | **IL** | **LL** | **LW** | **NL** | **NR** | **SL** | **ShL** | **SW** | **VL** | **VP** |
| PD3 | PD4 | - | - | ns | - | - | - | ns | - | - | - | - | - | - | - | - |
| PD3 | PD5 | - | - | ns | - | - | - | ns | - | - | - | - | - | - | - | - |
| PD3 | PD1 | - | - | ns | - | - | - | ns | - | - | - | - | - | - | - | - |
| PD3 | PD2 | - | - | ns | - | - | - | ns | - | - | - | - | - | - | - | - |
| PD4 | PD5 | - | - | ns | - | - | - | ** | - | - | - | - | - | - | - | - |
| PD4 | PD1 | - | - | * | - | - | - | ** | - | - | - | - | - | - | - | - |
| PD4 | PD2 | - | - | ns | - | - | - | ** | - | - | - | - | - | - | - | - |
| PD5 | PD1 | - | - | *** | - | - | - | ns | - | - | - | - | - | - | - | - |
| PD5 | PD2 | - | - | ns | - | - | - | ns | - | - | - | - | - | - | - | - |
| PD1 | PD2 | - | - | * | - | - | - | ns | - | - | - | - | - | - | - | - |
| *P. ionanthum* | | | | | | | | | | | | | | | | |
| group1 | group2 | **BRL** | **EBR** | **FP** | **H** | **Hw** | **IL** | **LL** | **LW** | **NL** | **NR** | **SL** | **ShL** | **SW** | **VL** | **VP** |
| PI3 | PI4 | - | - | * | ns | - | - | ns | - | ns | - | ns | **** | ns | - | - |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PI3 | PI5 | - | - | ** | ns | - | - | ns | - | ns | - | ns | *** | ns | - | - |
| PI3 | PI1 | - | - | * | ns | - | - | ns | - | ns | - | ns | ns | ns | - | - |
| PI3 | PI2 | - | - | ns | ns | - | - | ns | - | ns | - | ** | ** | *** | - | - |
| PI4 | PI5 | - | - | **** | ns | - | - | ns | - | ns | - | ns | ns | ns | - | - |
| PI4 | PI1 | - | - | ns | *** | - | - | ** | - | ns | - | ns | **** | ns | - | - |
| PI4 | PI2 | - | - | * | * | - | - | ns | - | ns | - | ns | **** | *** | - | - |
| PI5 | PI1 | - | - | **** | **** | - | - | *** | - | ** | - | ns | **** | ns | - | - |
| PI5 | PI2 | - | - | ** | ** | - | - | ns | - | * | - | ns | **** | *** | - | - |
| PI1 | PI2 | - | - | * | ns | - | - | ** | - | ns | - | **** | ns | *** | - | - |
| *P. regnellii* | | | | | | | | | | | | | | | | |
| group1 | group2 | **BRL** | **EBR** | **FP** | **H** | **Hw** | **IL** | **LL** | **LW** | **NL** | **NR** | **SL** | **ShL** | **SW** | **VL** | **VP** |
| PR2 | PR1 | - | ** | **** | ns | ns | - | - | - | - | - | - | * | - | ns | ** |
| PR2 | PR3 | - | ns | * | ns | ns | - | - | - | - | - | - | ns | - | ns | ns |
| PR2 | PR4 | - | ns | ns | ns | * | - | - | - | - | - | - | ns | - | ns | ns |
| PR2 | PR5 | - | * | ns | ** | * | - | - | - | - | - | - | ns | - | ns | ns |
| PR1 | PR3 | - | ns | **** | ns | ns | - | - | - | - | - | - | * | - | ns | **** |
| PR1 | PR4 | - | ns | **** | ns | * | - | - | - | - | - | - | *** | - | ns | **** |
| PR1 | PR5 | - | ns | * | ** | ns | - | - | - | - | - | - | ns | - | ns | ** |
| PR3 | PR4 | - | ns | ns | ns | ns | - | - | - | - | - | - | ns | - | ns | ns |
| PR3 | PR5 | - | ns | ns | ** | ns | - | - | - | - | - | - | ns | - | ** | ns |
| PR4 | PR5 | - | ns | ns | ** | ns | - | - | - | - | - | - | ns | - | ** | ns |
| *P. urvillei* | | | | | | | | | | | | | | | | |
| group1 | group2 | **BRL** | **EBR** | **FP** | **H** | **Hw** | **IL** | **LL** | **LW** | **NL** | **NR** | **SL** | **ShL** | **SW** | **VL** | **VP** |
| PU1 | PU3 | - | - | * | *** | *** | - | *** | **** | - | - | ns | - | - | - | - |
| PU1 | PU4 | - | - | * | * | **** | - | *** | **** | - | - | ns | - | - | - | - |
| PU1 | PU5 | - | - | ** | ns | ns | - | ns | ** | - | - | ns | - | - | - | - |
| PU1 | PU2 | - | - | ns | ns | *** | - | *** | *** | - | - | *** | - | - | - | - |
| PU3 | PU4 | - | - | ns | ns | ns | - | ns | ns | - | - | ns | - | - | - | - |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PU3 | PU5 | - | - | ns | ns | ns | - | ns | ** | - | - | ns | - | - | - | - |
| PU3 | PU2 | - | - | ns | **** | ns | - | ns | * | - | - | *** | - | - | - | - |
| PU4 | PU5 | - | - | ns | ns | ns | - | ns | * | - | - | ns | - | - | - | - |
| PU4 | PU2 | - | - | ns | ** | ns | - | ns | ns | - | - | * | - | - | - | - |
| PU5 | PU2 | - | - | ns | ns | ns | - | ns | ns | - | - | * | - | - | - | - |

*References: H*, plant height with flowering culms; *Hw*, plant height without flowering culms; *LL*, 2nd leaf blade length; *LW*, 2nd leaf blade width, *ShL*, 2nd leaf sheath length; *NL*, 2nd internode length; *IL*, inflorescence length; *BRL*, basal raceme length; *EBR*, number of spikelets in the basal raceme; *NR*, raceme number; *VL*, flowering culms length with inflorescences; *SL*, spikelet length; *SW*, spikelet width; V*P*, extension of the vegetative period; *FP*, extension of the flowering period; -, traits that showed no significant differences among populations; ns, not significant; *$p$<0.05. **$p$<0.01. ***$p$<0.001. ****$p$<0.0001

**Table S4.** Annealing temperature of ISSR primers.

| Primer | Annealing temperature | Primer | Annealing temperature |
|---|---|---|---|
| $(AC)_8T$ | 55ºC | $CAG(CA)_7$ | 55ºC |
| $(AC)_8G$ | 49ºC | $(CT)_8G$ | 50ºC |
| $(AG)_8T$ | 46ºC | $(CTC)_6AC$ | 60ºC |
| $(AG)_8C$ | 49ºC | $(GA)_8C$ | 49ºC |
| $(AG)_8GC$ | 50ºC | $(GA)_8T$ | 48ºC |
| $(AGAC)_4GC$ | 55ºC | $(GA)_8TC$ | 46ºC |
| $(ATG)_5GA$ | 46ºC | $(GAG)_7AC$ | 52ºC |
| $(CA)_8G$ | 49ºC | $(TC)_8A$ | 50ºC |

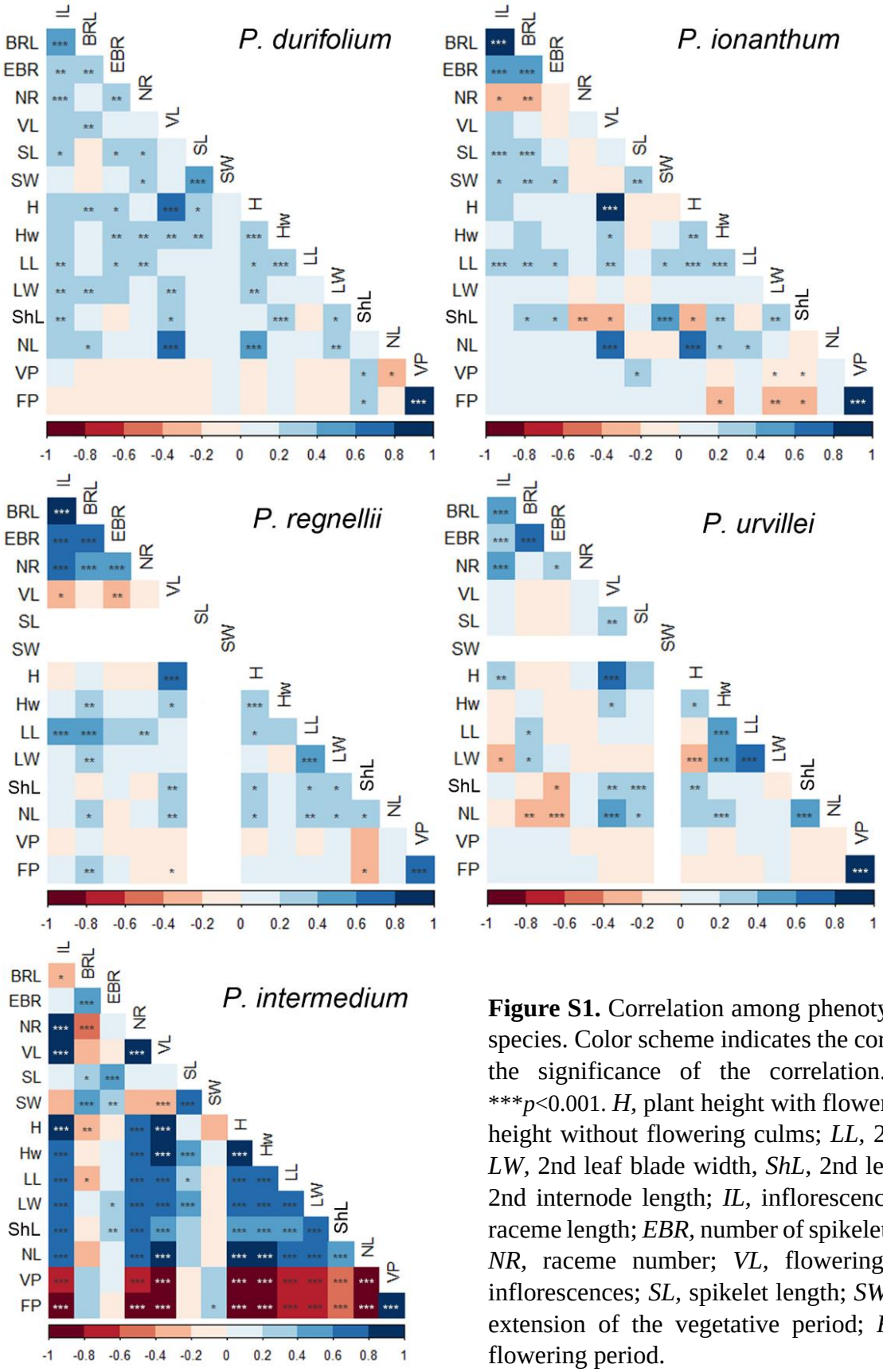



**Figure S1.** Correlation among phenotypic variables in each species. Color scheme indicates the correlation and asterisks the significance of the correlation. *$p$<0.05, **$p$<0.01, ***$p$<0.001. *H*, plant height with flowering culms; *Hw*, plant height without flowering culms; *LL*, 2nd leaf blade length; *LW*, 2nd leaf blade width, *ShL*, 2nd leaf sheath length; *NL*, 2nd internode length; *IL*, inflorescence length; *BRL*, basal raceme length; *EBR*, number of spikelets in the basal raceme; *NR*, raceme number; *VL*, flowering culms length with inflorescences; *SL*, spikelet length; *SW*, spikelet width; V*P*, extension of the vegetative period; *FP*, extension of the flowering period.

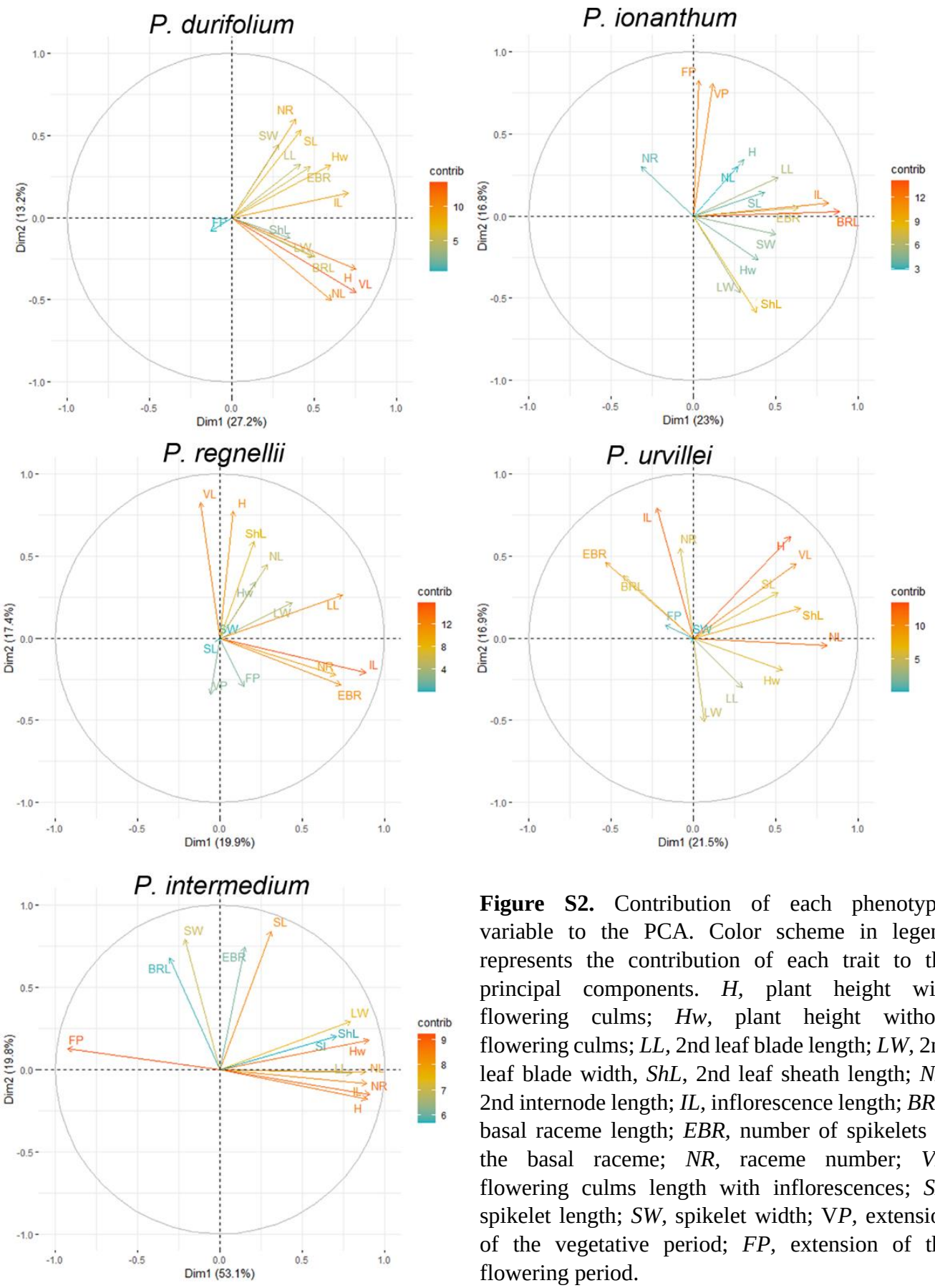



**Figure S2.** Contribution of each phenotypic variable to the PCA. Color scheme in legend represents the contribution of each trait to the principal components. *H*, plant height with flowering culms; *Hw*, plant height without flowering culms; *LL*, 2nd leaf blade length; *LW*, 2nd leaf blade width, *ShL*, 2nd leaf sheath length; *NL*, 2nd internode length; *IL*, inflorescence length; *BRL*, basal raceme length; *EBR*, number of spikelets in the basal raceme; *NR*, raceme number; *VL*, flowering culms length with inflorescences; *SL*, spikelet length; *SW*, spikelet width; V*P*, extension of the vegetative period; *FP*, extension of the flowering period.

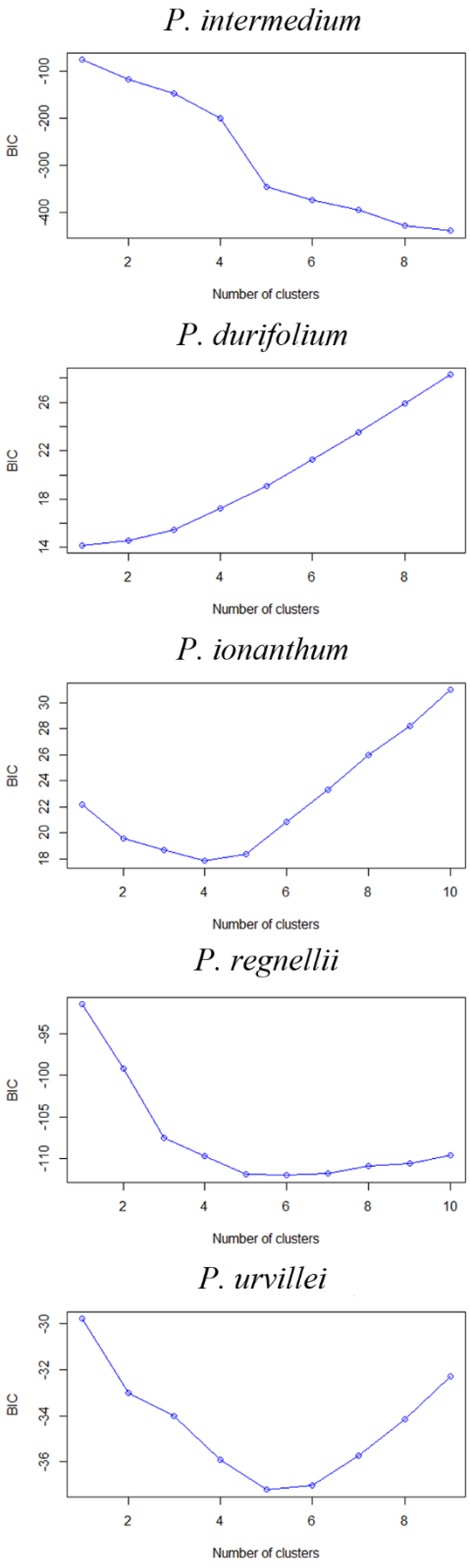



**Figure S3.** The effective number of clusters obtained using a k-means approach with the package *adegenet* in R.

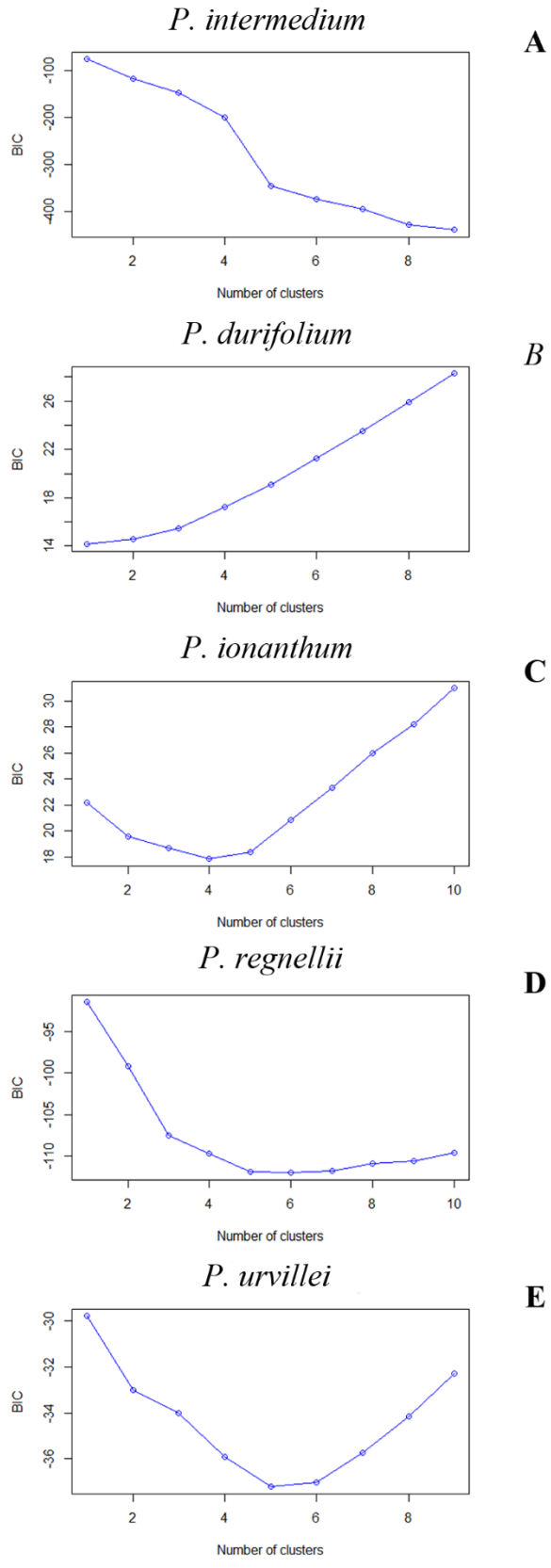



**Figure S4.** The effective number of clusters obtained for our dataset using a STRUCTURE-like approach with the package *LEA* in R**.**

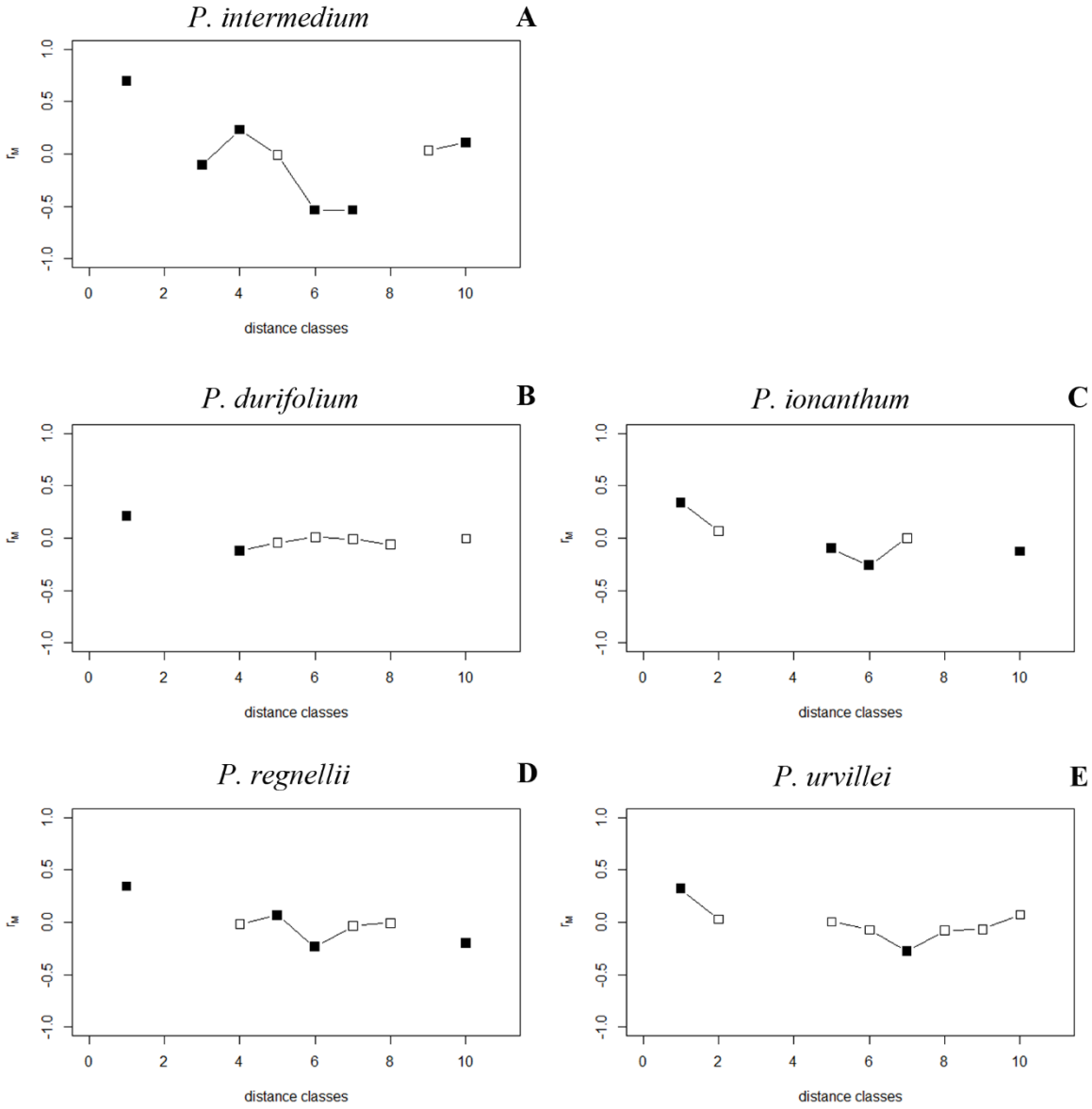



**Figure S5.** Identification of clusters isolated by distance using the *mpmcorrelogram* package in R. Those significantly isolated ($p$<0.05) are shown in black.