Supplement

Table S1. Plant materials collection location information in this study.

| Species	ID	Locality	Longitude	Latitude	Species	ID	Locality	Longitude	Latitude
A.alba	yxing2837	Diqing,YN	99.04122	28.35717	*A.delavayi*	xinglab189	Lijiang,YN	100.1798	27.00342
A.alba	yxing1591	Lijiang,YN	100.1748	27.02119	*A.delavayi*	xinglab376	Diqing,YN	100.0413	27.96407
A.alba	yxing1601	Diqing,YN	99.81677	27.45452	*A.delavayi*	Aca11	Diqing,YN	98.97095	28.42708
A.alba	yxing1614	Diqing,YN	99.61572	27.93194	*A.delavayi*	Aca7	Diqing,YN	99.63676	27.91376
A.alba	yxing1698	Xiaojin,SC	102.8794	30.96327	*A.delavayi*	Aca8-2	Diqing,YN	99.71754	27.61388
A.alba	yxing1745	Hongyuan,SC	102.6112	33.00342	*A.delavayi*	Aca9	Diqing,YN	99.78989	27.4349
A.alba	yxing1748	Hongyuan,SC	102.8098	33.0876	*A.delavayi*	Aca9-2	Diqing,YN	99.80989	27.4239
A.alba	yxing1651	Derong,SC	99.33372	29.20694	*A.delavayi*	xinglab22	Xiangcheng,SC	99.8477	28.72545
A.alba	yxing1682	Luhuo,SC	100.2366	31.62799	*A.delavayi*	xinglab3	Lijiang,YN	100.1757	26.99006
A.alba	yxing1775	Muli,SC	102.7457	27.61711	*A.delavayi*	Xinglab9	Diqing,YN	99.865	27.47022
A.alba	yxing2716	Muli,SC	101.1884	28.1253	*A.delavayi*	yxing2782	Diqing,YN	99.83007	28.5614
A.alba	yxing1736	Maerkang,SC	102.2929	32.17266	*A.nepalensis*	yxing2747	Ganzi,SC	100.2033	28.55095
A.alba	Aca15	Xiaojin,SC	102.8794	30.96329	*A.nepalensis*	yxing2896	Linzhi,XZ	95.69847	29.79356
A.alba	xinglab 89	Batang,SC	99.50935	30.28722	*A.nepalensis*	yxing2916	Linzhi,XZ	94.74307	29.7761
A.alba	xinglab 83	Baiyu,SC	98.96792	30.96792	*A.nepalensis*	yxing2974	Shannan,XZ	91.77566	27.93488
A.alba	xinglab77	Ganzi,SC	100.2694	31.93498	*A.nepalensis*	yxing2941	Linzhi,XZ	93.45661	29.0395
A.alba	xinglab 63	Seda,SC	100.3346	32.35154	*A.nepalensis*	yxing2992	Shannan,XZ	91.85243	27.921
A.alba	xinglab 60	Daofu,SC	101.3385	30.738	*A.nepalensis*	yxing3020	Rikaze,XZ	85.41341	28.38435
A.alba	xinglab58	Daofu,SC	101.5857	30.53595	*A.nepalensis*	yxing3031	Rikaze,XZ	87.59973	27.90478
A.alba	xinglab43	Litang,SC	100.3494	29.84329	*A.nepalensis*	yxing3070	Linzhi,XZ	94.01433	29.9943
A.alba	xinglab29	Xiangcheng,SC	99.59893	29.13228	*A.nepalensis*	xinglab126	Linzhi,XZ	94.68046	29.61653
A.alba	xinglab27	Xiangcheng,SC	99.74419	28.99662	*A.nepalensis*	xinglab128	Linzhi,XZ	94.65517	29.61165
A.alba	xinglab76	Dege,SC	99.26826	31.90296	*A.nepalensis*	xinglab139	Shannan,XZ	91.85162	27.92076
A.alba	yxing2219	Tagong,SC	101.5595	30.34971	*A.nepalensis*	xinglab142	Shannan,XZ	91.13137	28.09584
A.alba	yxing2873	Changdu,XZ	96.72654	29.7086	*A.nepalensis*	xinglab153	Rikaze,XZ	88.95793	27.67375
A.alba	yxing3078	Changdu,XZ	97.49649	31.37063	*A.nepalensis*	xinglab169	Rikaze,XZ	85.40463	28.35719
A.alba	xinglab154	Rikaze,XZ	88.95487	27.67169	*A.nepalensis*	xinglab113	Linzhi,XZ	97.63582	28.76607

Notions: *A. alba*, *Acanthocalyx alba*; *A. delavayi*, *Acanthocalyx delavayi*; *A. nepalensis*, *Acanthocalyx nepalensis*; YN,Yunna Province; SC, Sichuan Province; XZ, Xizang Province.

**Table S2.** Measurement results of *Acanthocalyx* samples using flow cytometry.

Species	ID	Lineage	DNA values (pg)	1C- Genome size(Gb)	Species	ID	Lineage	DNA values (pg)	1C- Genome size(Gb)
A.alba	yxing2837	white-flowered	1.30	1.27	*A.delavayi*	xinglab189	red-flowered	2.18	2.13
A.alba	yxing1591	white-flowered	1.38	1.35	*A.delavayi*	xinglab376	red-flowered	2.25	2.2
A.alba	yxing1601	white-flowered	1.27	1.24	*A.delavayi*	Aca11	red-flowered	2.27	2.22
A.alba	yxing1614	white-flowered	1.31	1.28	*A.delavayi*	Aca7	red-flowered	2.52	2.46
A.alba	yxing1698	white-flowered	1.41	1.38	*A.delavayi*	Aca8-2	red-flowered	2.24	2.19
A.alba	yxing1745	white-flowered	1.27	1.24	*A.delavayi*	Aca9	red-flowered	2.03	1.99
A.alba	yxing1748	white-flowered	1.28	1.25	*A.delavayi*	Aca9-2	red-flowered	2.16	2.11
A.alba	yxing1651	white-flowered	1.29	1.26	*A.delavayi*	xinglab22	red-flowered	2.28	2.23
A.alba	yxing1682	white-flowered	1.27	1.24	*A.delavayi*	xinglab3	red-flowered	2.30	2.25
A.alba	yxing1775	white-flowered	1.33	1.3	*A.delavayi*	Xinglab9	red-flowered	2.03	1.99
A.alba	yxing2716	white-flowered	1.34	1.31	*A.delavayi*	yxing2782	red-flowered	2.27	1.84
A.alba	yxing1736	white-flowered	1.29	1.26	*A.nepalensis*	yxing2747	red-flowered	2.03	2.22
A.alba	Aca15	white-flowered	1.30	1.27	*A.nepalensis*	yxing2896	red-flowered	1.88	1.92
A.alba	xinglab 89	white-flowered	1.31	1.28	*A.nepalensis*	yxing2916	red-flowered	1.96	1.94
A.alba	xinglab 83	white-flowered	1.27	1.24	*A.nepalensis*	yxing2974	red-flowered	1.98	2.01
A.alba	xinglab77	white-flowered	1.25	1.22	*A.nepalensis*	yxing2941	red-flowered	2.06	2.04
A.alba	xinglab 63	white-flowered	1.32	1.29	*A.nepalensis*	yxing2992	red-flowered	2.09	2.41
A.alba	xinglab 60	white-flowered	1.31	1.28	*A.nepalensis*	yxing3020	red-flowered	2.46	2.06
A.alba	xinglab58	white-flowered	1.26	1.23	*A.nepalensis*	yxing3031	red-flowered	2.11	2.31
A.alba	xinglab43	white-flowered	1.26	1.23	*A.nepalensis*	yxing3070	red-flowered	2.36	2.16
A.alba	xinglab29	white-flowered	1.25	1.22	*A.nepalensis*	xinglab126	red-flowered	2.21	2.22
A.alba	xinglab27	white-flowered	1.38	1.35	*A.nepalensis*	xinglab128	red-flowered	2.27	2.22
A.alba	xinglab76	white-flowered	1.24	1.21	*A.nepalensis*	xinglab139	red-flowered	2.27	2.3
A.alba	yxing2219	white-flowered	1.31	1.28	*A.nepalensis*	xinglab142	red-flowered	2.35	2.16
A.alba	yxing2873	white-flowered	1.27	1.24	*A.nepalensis*	xinglab153	red-flowered	2.29	2.19
A.alba	yxing3078	white-flowered	1.34	1.31	*A.nepalensis*	xinglab169	red-flowered	2.24	2.18
A.alba	xinglab154	white-flowered	1.39	1.36	*A.nepalensis*	xinglab113	red-flowered	2.23	2.09

Table S3. Climate, soil, and trait datasets used in this study.

| Dataset	Abbreviation	Explanation
climate	Bio1	Annual Mean Temperature (℃)
	Bio2	Mean Diurnal Range (mean of monthly (max temp – min temp))
	Bio3	Isothermality (Bio 2/ Bio 7) (× 100)
	Bio4	Temperature Seasonality (standard deviation × 100)
	Bio5	Max Temperature of Warmest Month
	Bio6	Min Temperature of Coldest Month
	Bio7	Temperature Annual Range (Bio 5–Bio 6)
	Bio8	Mean Temperature of Wettest Quarter
	Bio9	Mean Temperature of Driest Quarter
	Bio10	Mean Temperature of Warmest Quarter
	Bio11	Mean Temperature of Coldest Quarter
	Bio12	Annual Precipitation
	Bio13	Precipitation of Wettest Month
	Bio14	Precipitation of Driest Month
	Bio15	Precipitation Seasonality (coefficient of variation)
	Bio16	Precipitation of Wettest Quarter
	Bio17	Precipitation of Driest Quarter
	Bio18	Precipitation of Warmest Quarter
	Bio19	Precipitation of Coldest Quarter
soil	Soil PH	A general term for soil acidity and alkalinity. It is commonly used to measure the strength of soil acid-base reactions.
	Soil CEC	Cation exchange capacity. CEC is as an indication of fertility and nutrient retention capacity.
	Soil SOM	Soil organic matter.
	Soil TN	Soil total nitrogen (TN) is the main index to measure the overall nitrogen supply of soil.
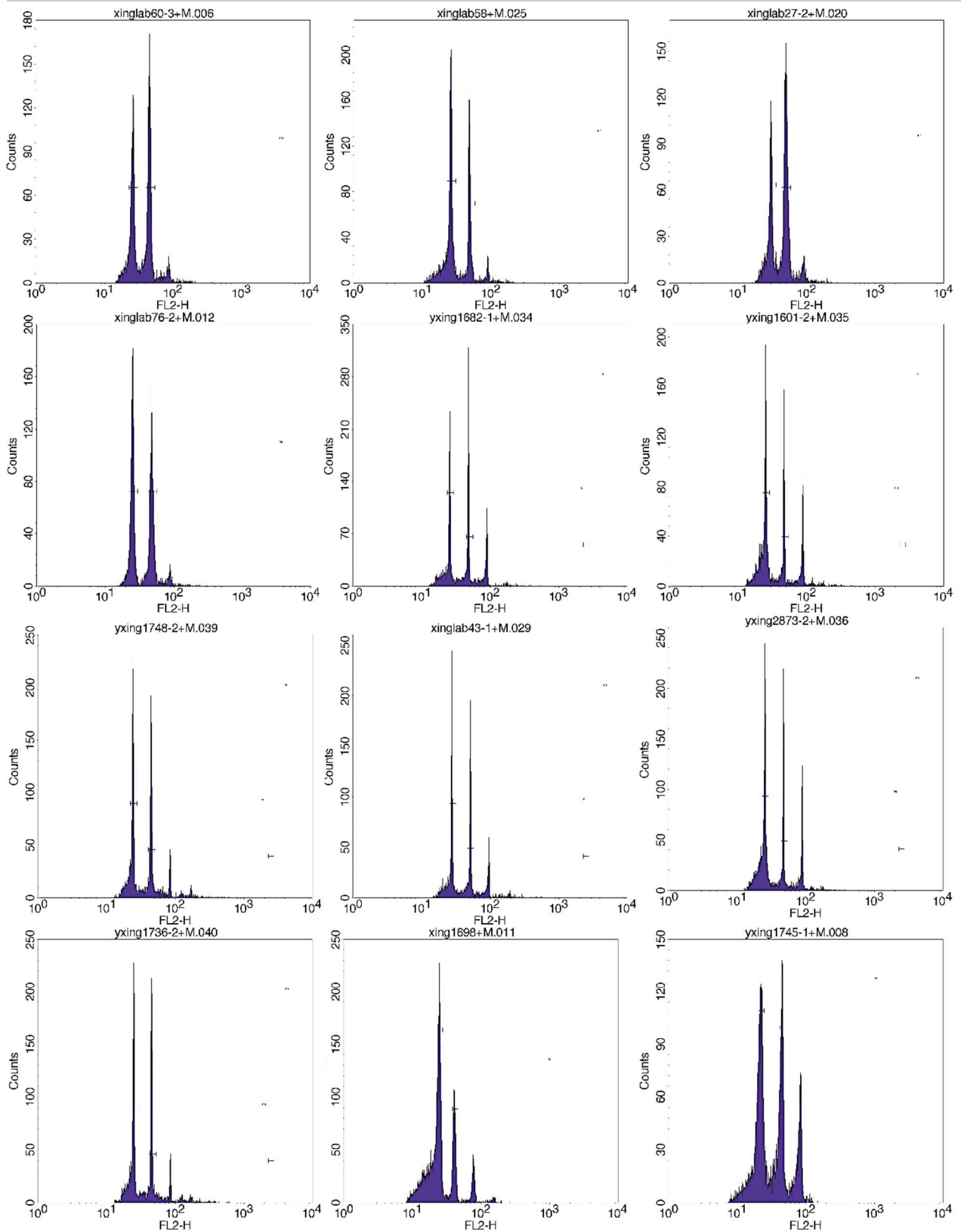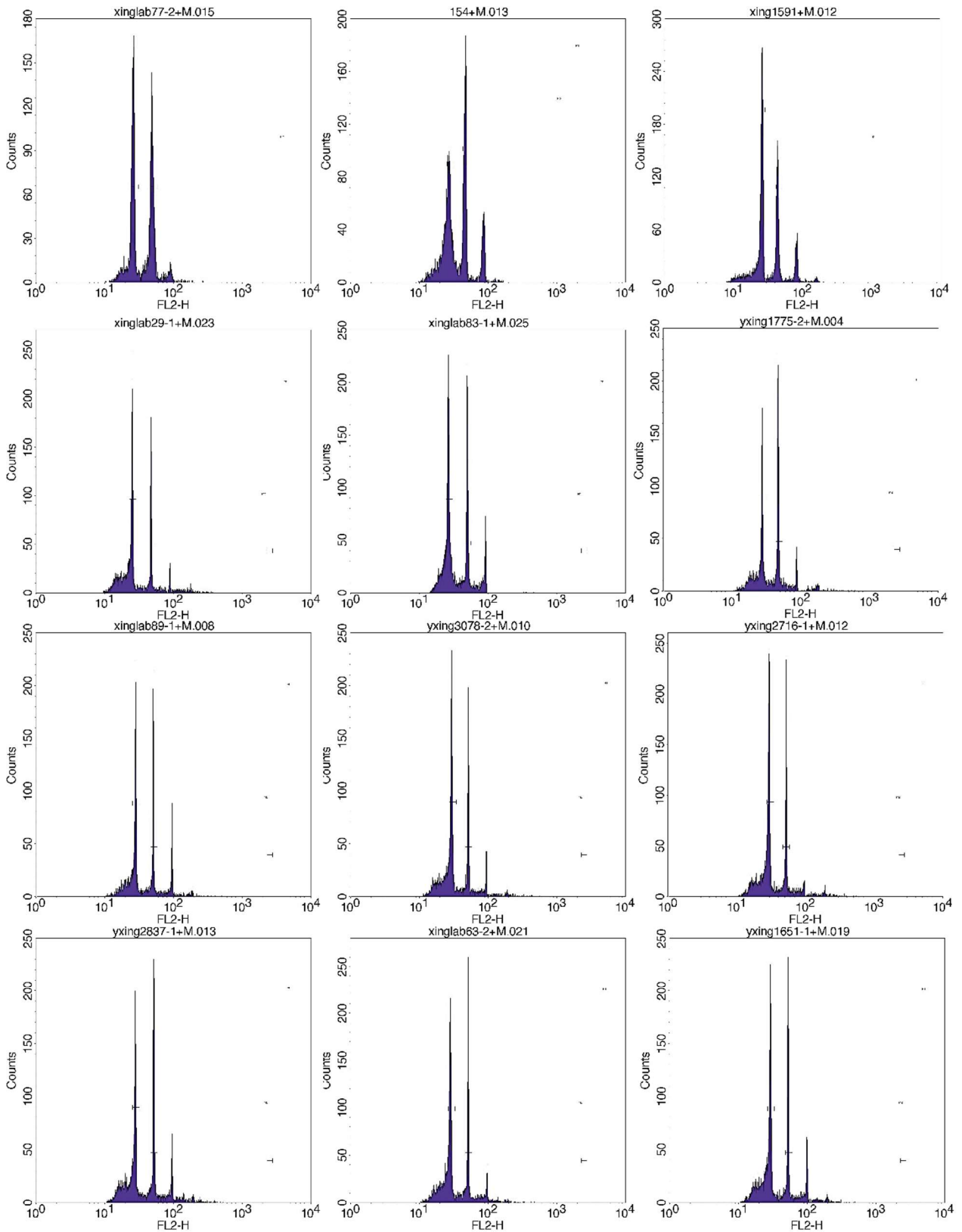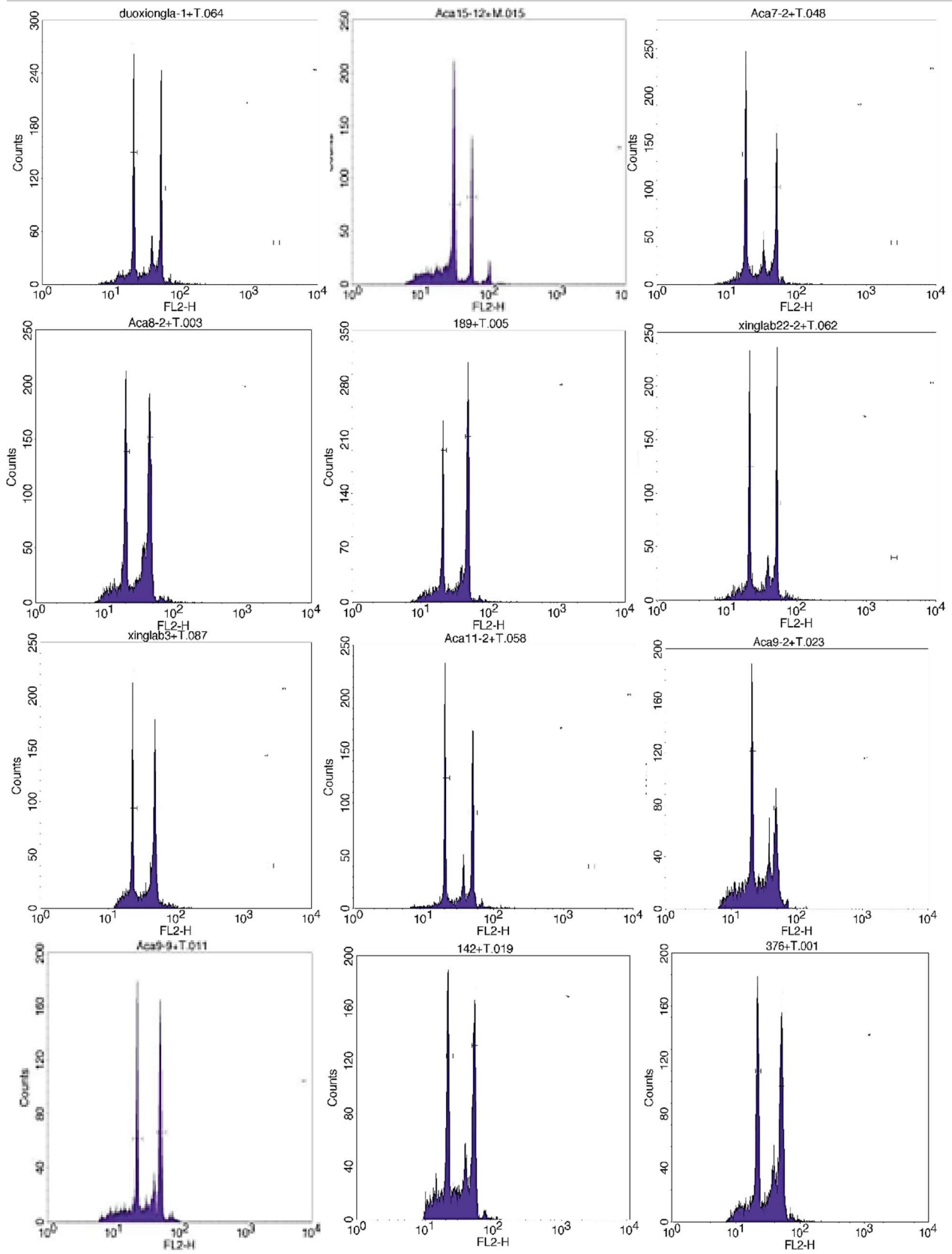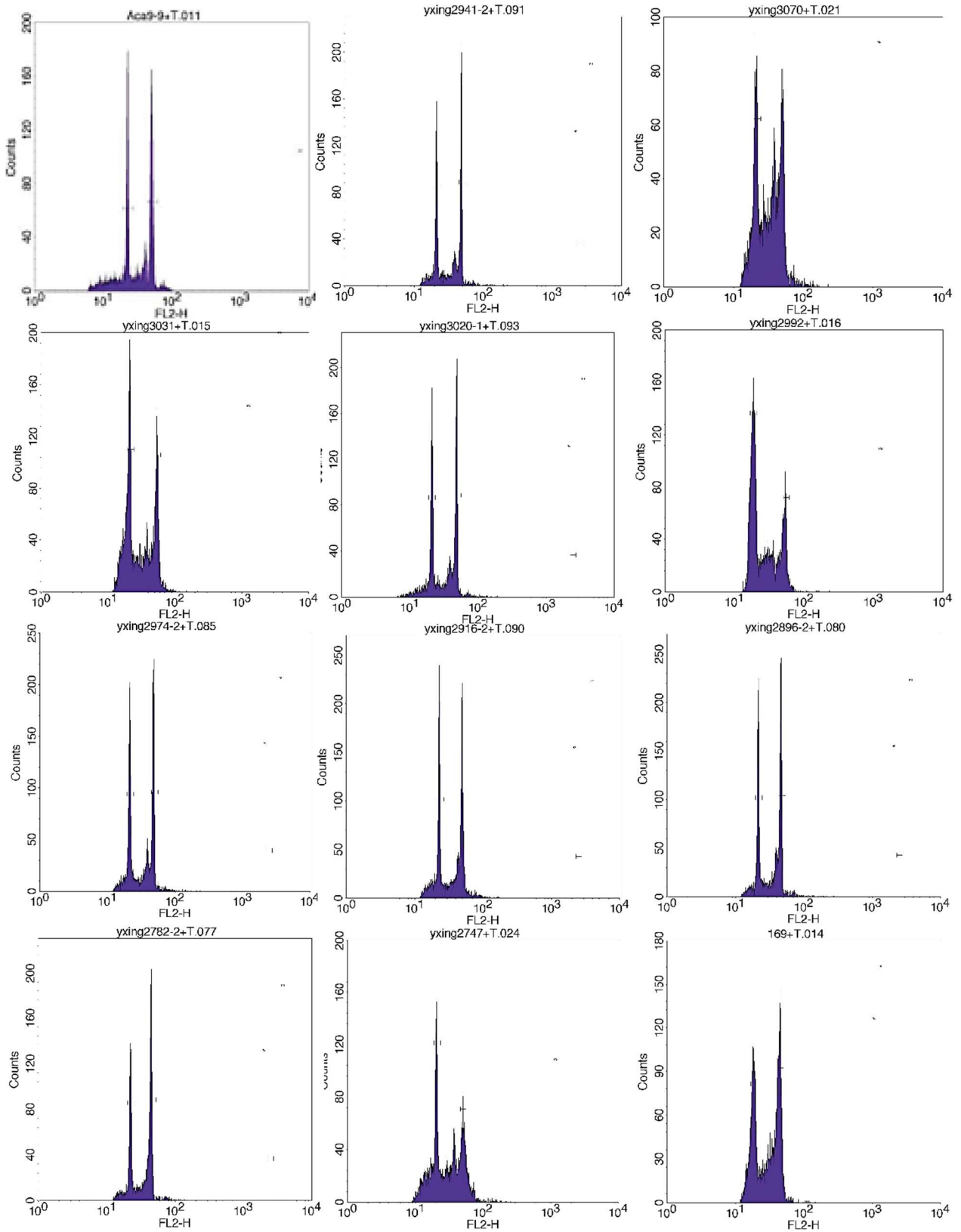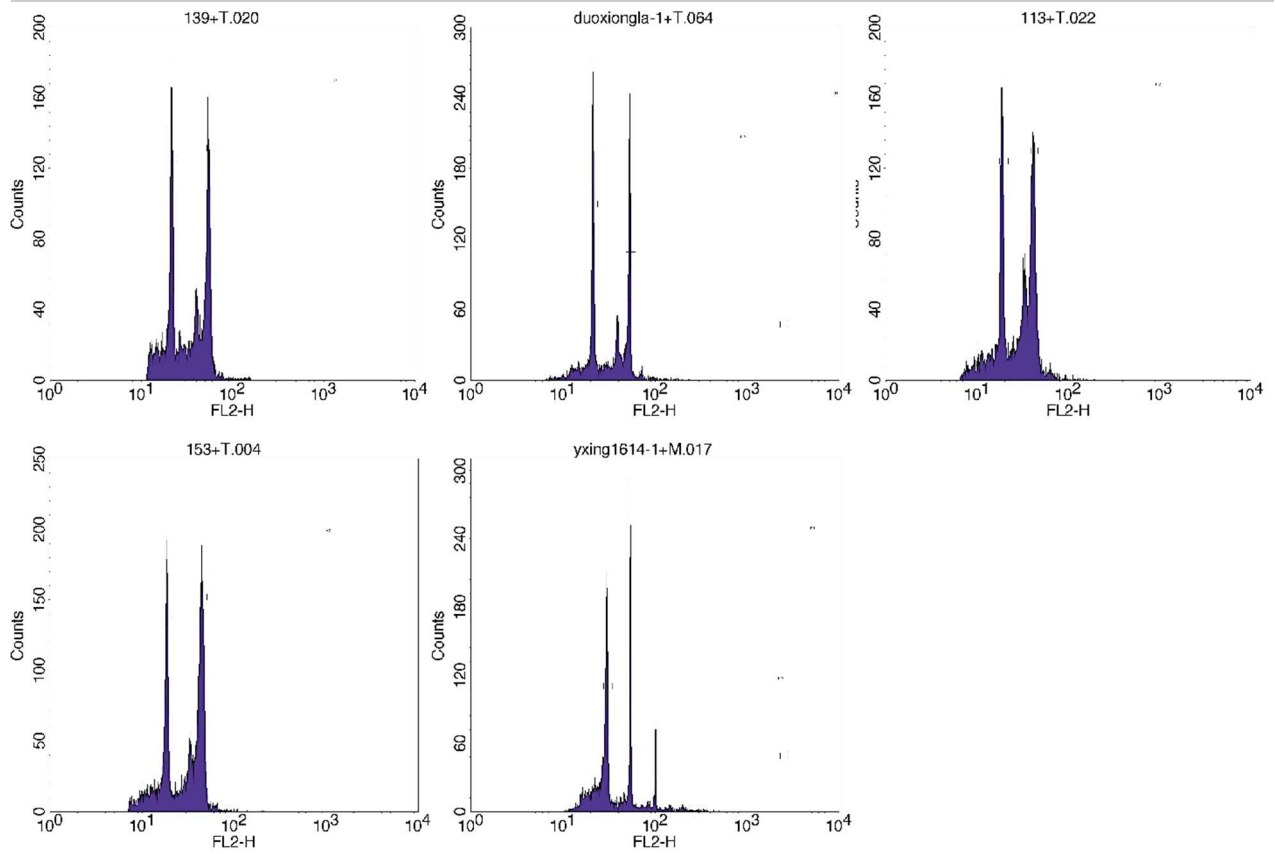
Fig. S1. Flow cytometric profiles of *Acanthocalyx*. The relative fluorescence intensity of histogram of *Acanthocalyx*.
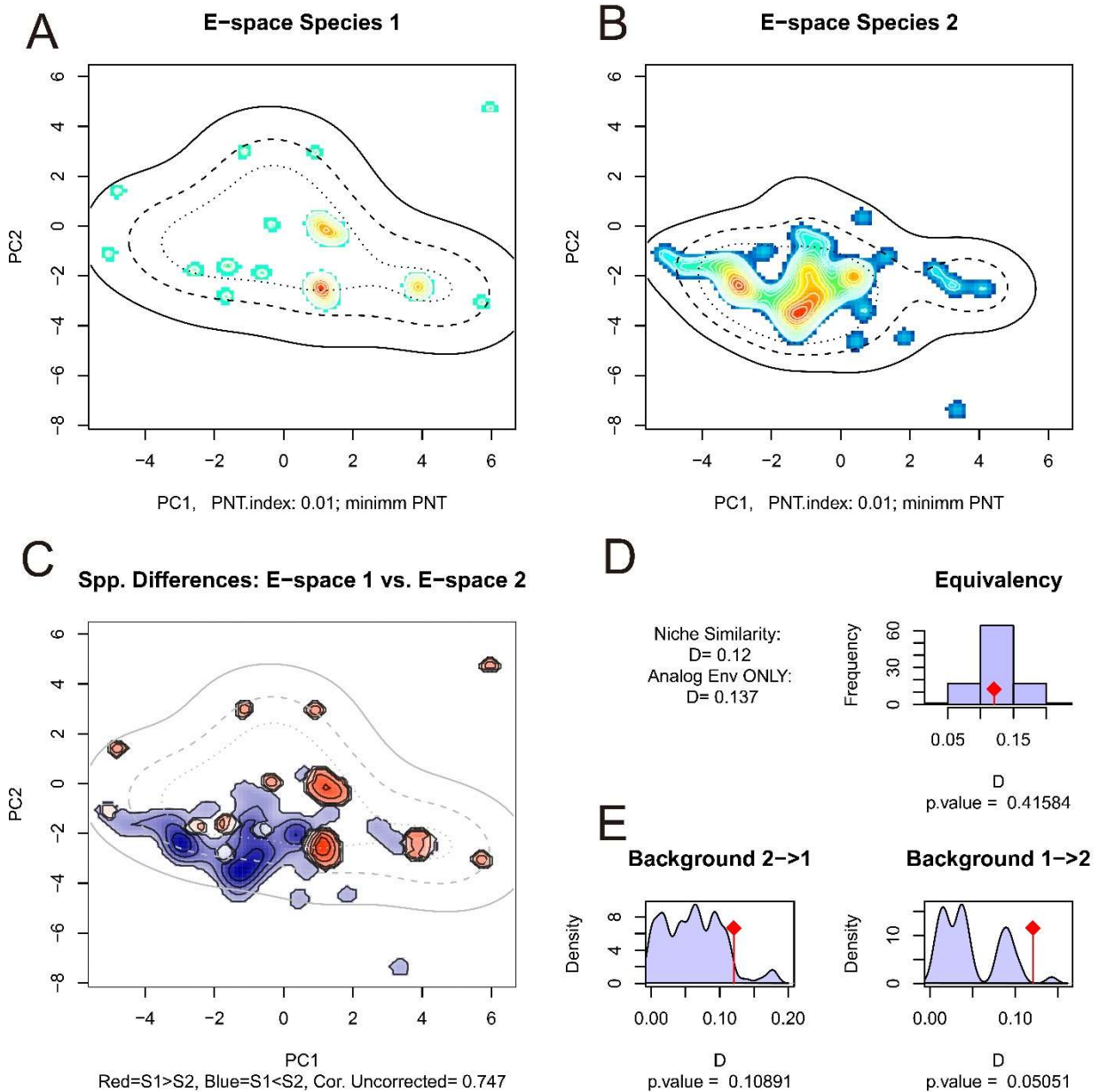
Fig.S2. Niche equivalency and niche background tests between red and white lineage. Panels (**A**) and (**B**) represent the kernel density isopleths, red color indicates high density and cooler color (blue) indicates low density. Panels (A) and (B) also represent the Potential Niche Truncation (PNT) Index describing the amount of observed E-space of the species that is truncated by the available E-space. Panel (**C**) represents the difference in the E-space of two lineages and Niche E-space Correlation Index. Panel (**D**) represents the Equivalency statistic measured as Niche similarity index and panel (E) represents niche Background statistic.
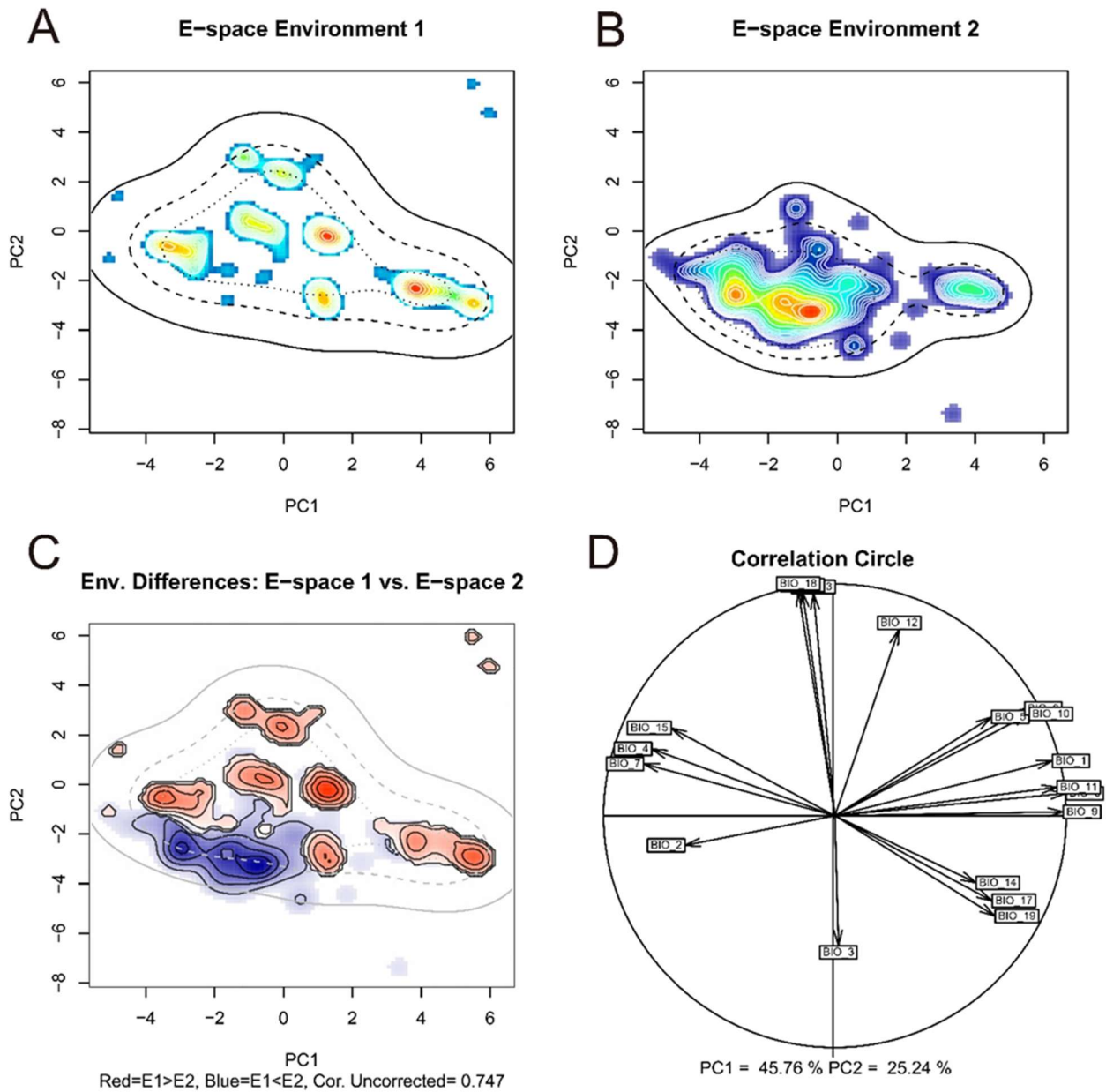
Fig. S3. Niches of red and white lineage in two dimensional E-space. Panels (**A**) and (**B**) represent the niches of species along first two axes of the PCA. The species occurrences are represented by kernel density isopleths, red color indicates high density and cooler color (blue) indicates low density. Solid and dotted contour lines illustrate 100% and 50% of the available background (environmental space). Panel (**C**) represents the difference in the E-space of two lineages and Niche E-space Correlation Index (NECI). Panel (**D**) represents the correlation circle based on the two principal components of the environmental input data.