

Table S1. The references of complete organelle genome used in this study.

Species	Genbank number	Organelle	Study
<i>Psilotum nudum</i>	KX171638	mitochondrion	Guo <i>et al.</i> , 2017
<i>Psilotum nudum</i>	KX171639	mitochondrion	Guo <i>et al.</i> , 2017
<i>Ophioglossum californicum</i>	NC030900	mitochondrion	Guo <i>et al.</i> , 2017
<i>Angiopteris evecta</i>	DQ821119	chloroplast	Roper <i>et al.</i> , 2007
<i>Christensenia aesculifolia</i>	NC044756	chloroplast	Liu <i>et al.</i> , 2019
<i>Danaea sellowiana</i>	NC051976	chloroplast	Lehtonen <i>et al.</i> , 2020
<i>Equisetum arvense</i>	NC014699	chloroplast	Karol <i>et al.</i> , 2010
<i>Hymenophyllum holochilum</i>	NC039753	chloroplast	Kuo <i>et al.</i> , 2018
<i>Marattia laxa</i>	NC051979	chloroplast	Lehtonen <i>et al.</i> , 2020
<i>Ophioglossum californicum</i>	NC020147	chloroplast	Grewe <i>et al.</i> , 2013
<i>Osmunda mildei</i>	MZ292715	chloroplast	Zuo <i>et al.</i> , 2021
<i>Osmundastrum cinnamomeum</i>	NC024157	chloroplast	Kim <i>et al.</i> , 2014
<i>Psilotum nudum</i>	KC117179	chloroplast	Grewe <i>et al.</i> , 2013
<i>Ptisana novoguineensis</i>	NC051980	chloroplast	Lehtonen <i>et al.</i> , 2020
<i>Vandenboschia speciosa</i>	NC041000	chloroplast	Ruiz-Ruano <i>et al.</i> , 2018

Table S2. Sample composition of different datasets.

Species	SRA number	26-O-aa	26-O-cds	26-S-aa	26-S-cds	16-O-aa	16-O-cds	16-S-aa	16-S-cds	Family-O-aa	Family-O-cds
<i>Angiopteris caudatiformis</i> ✓	This study	✓	✓	✓	✓	✓	✓	✓	✓		
<i>Angiopteris fokiensis</i>	This study	✓	✓	✓	✓	✓	✓	✓	✓		
<i>Angiopteris hokouensis</i>	This study	✓	✓	✓	✓	✓	✓	✓	✓		
<i>Angiopteris sparsisora</i>	This study	✓	✓	✓	✓	✓	✓	✓	✓		
<i>Angiopteris wangii</i>	This study	✓	✓	✓	✓	✓	✓	✓	✓		
<i>Angiopteris yunnanensis</i>	This study	✓	✓	✓	✓	✓	✓	✓	✓		
<i>Angiopteris bipinnate</i>	This study	✓	✓	✓	✓	✓	✓	✓	✓		
<i>Angiopteris latipinna</i>	This study	✓	✓	✓	✓	✓	✓	✓	✓		
<i>Angiopteris chingii</i>	This study	✓	✓	✓	✓	✓	✓	✓	✓		
<i>Angiopteris subrotundata</i>	This study	✓	✓	✓	✓	✓	✓	✓	✓		
<i>Christensenia aesculifolia</i>	This study	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
<i>Christensenia aesculifolia</i>	SRR6920618	✓	✓	✓	✓	✓	✓	✓	✓		
<i>Danaea nodosa</i>	ERR2041196	✓	✓	✓	✓	✓	✓	✓	✓		
<i>Danaea nodosa</i>	SRR6920621	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
<i>Marattia</i> sp.	ERR3487391	✓	✓	✓	✓	✓	✓	✓	✓		
<i>Ptisana pellucida</i>	SRR6920616	✓	✓	✓	✓	✓	✓	✓	✓		
<i>Equisetum arvense</i>	SRR6920624	✓	✓	✓	✓					✓	✓
<i>Equisetum diffusum</i>	SRR2103706	✓	✓	✓	✓					✓	✓
<i>Psilotum nudum</i>	SRR6920623	✓	✓	✓	✓					✓	✓
<i>Ophioglossum thermale</i>	SRR6920622	✓	✓	✓	✓					✓	✓
<i>Ophioglossum vulgatum</i>	SRR2103720	✓	✓	✓	✓					✓	✓
<i>Osmundastrum cinnamomeum</i>	ERR2041191	✓	✓	✓	✓					✓	✓
<i>Osmunda japonica</i>	SRR2103721	✓	✓	✓	✓					✓	✓

<i>Hymenophyllum holochilum</i>	SRR6920702	√	√	√	√					√	√
<i>Vandenboschia speciosa</i>	ERR2020652	√	√	√	√						
<i>Amborella trichopoda</i>	SRR15206987	√	√	√	√					√	√
Species	SRA number	Family- S-aa	Family- S-cds	Genus- O-aa	Genus- O-cds	Genus-S- aa	Genus-S- cds	Species- O-aa	Species- O-cds	Species- S-aa	Species- S-cds
<i>Angiopteris caudatiformis</i> √	This study							√	√	√	√
<i>Angiopteris fokiensis</i>	This study			√	√	√	√	√	√	√	√
<i>Angiopteris hokouensis</i>	This study							√	√	√	√
<i>Angiopteris sparsisora</i>	This study			√	√	√	√	√	√	√	√
<i>Angiopteris wangii</i>	This study							√	√	√	√
<i>Angiopteris yunnanensis</i>	This study							√	√	√	√
<i>Angiopteris bipinnate</i>	This study							√	√	√	√
<i>Angiopteris latipinna</i>	This study							√	√	√	√
<i>Angiopteris chingii</i>	This study							√	√	√	√
<i>Angiopteris subrotundata</i>	This study			√	√	√	√	√	√	√	√
<i>Christensenia aesculifolia</i>	This study	√	√	√	√	√	√				
<i>Christensenia aesculifolia</i>	SRR6920618			√	√	√	√				
<i>Danaea nodosa</i>	ERR2041196			√	√	√	√				
<i>Danaea nodosa</i>	SRR6920621	√	√	√	√	√	√				
<i>Marattia</i> sp.	ERR3487391			√	√	√	√	√	√	√	√
<i>Ptisana pellucida</i>	SRR6920616										
<i>Equisetum arvense</i>	SRR6920624	√	√								
<i>Equisetum diffusum</i>	SRR2103706	√	√								
<i>Psilotum nudum</i>	SRR6920623	√	√								
<i>Ophioglossum thermale</i>	SRR6920622	√	√								
<i>Ophioglossum vulgatum</i>	SRR2103720	√	√								

<i>Osmundastrum cinnamomeum</i>	ERR2041191	√	√
<i>Osmunda japonica</i>	SRR2103721	√	√
<i>Hymenophyllum holochilum</i>	SRR6920702	√	√
<i>Vandenboschia speciosa</i>	ERR2020652		
<i>Amborella trichopoda</i>	SRR15206987	√	√

Note. “O” and “S” means performed by Orophinder and SonicParanoid. “aa” and “cds” means amino acid sequence and nucleotide sequence.

Table S3. Information of transcriptomes included in this study

Species	Raw reads	Raw bases	Percent GC of raw data	Filtered reads	Filtered bases	Percent GC of filtered data
<i>Angiopteris caudatiformis</i>	50,727,232	7,659,812,032	46.40%	47,027,154	7,071,635,285	46.78%
<i>Angiopteris fokiensis</i>	49,708,970	7,506,054,470	46.85%	46,061,868	6,916,894,226	47.21%
<i>Angiopteris hokouensis</i>	49,909,892	7,536,393,692	46.38%	46,182,844	6,939,795,547	46.76%
<i>Angiopteris sparsisora</i>	52,742,160	7,964,066,160	46.60%	48,767,488	7,325,393,780	46.96%
<i>Angiopteris wangii</i>	51,232,230	7,736,066,730	47.02%	47,540,386	7,144,092,364	47.42%
<i>Angiopteris yunnanensis</i>	47,412,096	7,159,226,496	47.07%	43,937,712	6,599,561,095	47.47%
* <i>Angiopteris bipinnate</i>	47,475,778	7,168,842,478	46.84%	44,062,764	6,620,698,777	47.24%
* <i>Angiopteris latipinna</i>	46,204,608	6,976,895,808	46.78%	42,900,906	6,443,400,757	47.17%
* <i>Angiopteris chingii</i>	45,021,794	6,798,290,894	46.59%	41,613,264	6,256,095,110	46.92%
* <i>Angiopteris subrotundata</i>	56,347,342	8,508,448,642	46.82%	52,013,624	7,796,020,285	47.08%
<i>Christensenia aesculifolia</i>	48,211,488	7,279,934,688	47.30%	44,635,604	6,705,581,279	47.70%
<i>Christensenia aesculifolia</i>	23,400,326	2,363,432,926	46.29%	21,892,288	2,209,225,642	46.04%
<i>Danaea nodosa</i>	31,192,790	2,807,351,100	48.95%	31,192,352	2,805,994,132	48.95%
<i>Danaea nodosa</i>	48,290,300	7,243,545,000	47.62%	46,770,954	6,278,417,128	47.19%
<i>Marattia</i> sp.	22,432,808	2,018,952,720	44.87%	22,432,080	2,017,698,528	44.87%
<i>Ptisana pellucida</i>	31,785,910	3,210,376,910	47.68%	29,564,784	2,982,169,052	47.37%
<i>Equisetum arvense</i>	19,888,142	2,008,702,342	46.83%	18,801,736	1,895,566,522	46.75%
<i>Equisetum diffusum</i>	37,143,940	4,680,136,440	48.28%	33,109,634	4,078,250,170	48.26%
<i>Psilotum nudum</i>	17,437,634	1,761,201,034	45.94%	16,595,954	1,673,419,188	45.88%
<i>Ophioglossum thermale</i>	30,567,136	3,087,280,736	45.23%	28,574,566	2,881,902,694	45.17%
<i>Ophioglossum vulgatum</i>	36,397,236	4,586,051,736	51.29%	33,873,546	4,200,456,856	51.43%

<i>Osmundastrum cinnamomeum</i>	19,656,280	1,769,065,200	48.23%	19,656,160	1,767,620,120	48.23%
<i>Osmunda japonica</i>	34,138,716	4,301,478,216	48.68%	31,748,310	3,937,276,206	48.71%
<i>Hymenophyllum holochilum</i>	20,644,362	3,096,654,300	48.49%	20,077,500	2,825,831,220	48.15%
<i>Vandenboschia speciosa</i>	66,346,550	6,701,001,550	47.46%	62,756,378	6,319,062,682	47.30%
<i>Amborella trichopoda</i>	79,878,588	7,941,924,719	44.68%	78,938,126	7,848,172,731	44.69%

*Show these species have been recognized as the members of *Archangiopteris* historically.