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Research Article

New Genus *Lobidiscus* and New Combinations of Genera of *Moutan*, *Liquidambar* and *Hamamelis* (Hamamelidales)

Da-Li Fu[1, 2, *]

[1]Research Institute of Non-Timber Forestry, Chinese Academy of Forestry, Zhengzhou, China

[2]Key Laboratory of Non-Timber Forest Germplasm Enhancement & Utilization of National Forestry and Grassland Administration, Zhengzhou, China

Abstract

Hamamelidales Griseb. (1854) order serves as a foundational group and plays a significant role in the research of evolutionary systematics of the class Rosopsida Batsch (1802) of Fructophyta D. L. Fu & H. Fu (2018). To address the ambiguities surrounding the circumscription of certain genera within this order, such as *Paeonia* L. (1753), *Liquidambar* L. (1753), and *Hamamelis* L. (1753), relevant chloroplast complete genome sequences from the NCBI database were retrieved, and evolutionary analyses were conducted on these sequences in this study. Notably, *Lobidiscus* D. L. Fu, gen. nov., a new genus endemic to America characterized by its distinctly lobed floral discs, has been separated from *Paeonia* L. belonging to Paeoniaceae (Bercht. & J. Presl) Rudolphi, nom. cons. (1830), and *Lobidiscus californicus* (Nutt.) D. L. Fu is designated as its type species. This new genus derives from *Moutan* Rchb. (1827), rather than *Paeonia* L., given that a maximum PHS value of 0.837 were observed between *Lobidiscus brownii* (Hook.) D. L. Fu and *Moutan delavayi* (Franch.) D. L. Fu based on CPCG evolutionary analyses. Meanwhile, the application of the minimum criterion PHS ≤ 0.928 (intergeneric, CPCG) for genus classification of Fructophyta D. L. Fu & H. Fu, has led to confirmation of two synonyms for *Liquidambar* L.: *Altingia* Noronha and *Semiliquidambar* H. T. Chang; additionally, three current synonyms for *Hamamelis* L., including *Distylium* Siebold & Zucc., *Parrotia* C. A. Mey., and *Sycopsis* Oliv., have been scientifically identified. In total, 13 novel family names like Liquidambaraceae D. L. Fu, Dianthaceae D. L. Fu, Diospyraceae D. L. Fu and Ilecaceae D. L. Fu have been established, along with two new specific epithets, *Hamamelis hubeiensis* D. L. Fu and *Hamamelis grandifolia* D. L. Fu, and 39 newly valid combinations involving *Hamamelis* L., *Liquidambar* L., *Lobidiscus* D. L. Fu, and *Moutan* Rchb. also been published, such as *Hamamelis annamica* (Gagnep.) D. L. Fu, *Liquidambar cambodiana* (Lecomte) D. L. Fu, *Lobidiscus brownii* (Hook.) D. L. Fu, and *Moutan suffruticosus* (Andrews) D. L. Fu. These contributions will effectively clarify taxonomic nomenclature confusions in a scientific manner while establishing a robust foundation for further research into the evolutionary systems within the order Hamamelidales Griseb.

Keywords

Lobidiscus, *Moutan*, *Liquidambar*, *Hamamelis*, New Genus, New Combination, CPCG (Chloroplast Complete Genome), Genus Minimum Criterion, Typical Algorithm

[*]Corresponding author: fu_dali@163.com (Da-Li Fu)

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1. Introduction

The order Hamamelidales Griseb. (1854) is foundational and plays a significant role in the research of evolutionary systematics of the class Rosopsida Batsch (1802) of Fructophyta D. L. Fu & H. Fu (2018). This order encompasses families such as Hamamelidaceae R. Br., nom. cons. (1818), Vitaceae Juss., nom. cons. (1789), Penthoraceae Rydb. ex Britt., nom. cons. (1901) and Paeoniaceae (Bercht. & J. Presl) Rudolphi, nom. cons. (1830) [1, 2]. However, traditional taxonomy and modern phylogenetic approaches reveal persistent taxonomic challenges [3-9], particularly regarding ambiguities in the circumscription of certain genera including *Paeonia* L. (1753), *Liquidambar* L. (1753), and *Hamamelis* L. (1753) within this order.

In 1804, the species of Mudan, renowned as the "King of Flowers" in China, was officially published and named *Paeonia suffruticosa* Andrews (Woody Peony). This was also the first species of *Moutan* taxa to be released, in accordance with the relevant articles of the International Code of Botanical Nomenclature, the name holds absolute precedence in the names of *Moutan* taxa. Consequently, the assertion that "many scholars have confirmed that *P. suffruticosa* is a hybrid formed by repeated hybridization of several species of subsect. *Vaginatae*, based on morphological and molecular biological evidence" [10] is wholly incorrect. In other words, as long as the type of *P. suffruticosa* is authentic, regardless of whether it is collected from cultivated or wild plants, the species must be acknowledged. It implies that all other subsequent species of *Moutan* taxa can be regarded as the hybrids (alternative forms of varieties) of *P. suffruticosa*, yet *P. suffruticosa* cannot be considered as a hybrid of these later species. In 1824, the *Paeonia* sect. *Moutan* DC. was published [11], and in 1827, the genus *Moutan* Rchb. was established. This was a typical course of development in plant taxonomy; however, it failed to draw the attention of taxonomists, despite the *Moutan* taxa having very distinct characteristics, such as the woody stems and the envelope discs [11-19]. Subsequently, species within the *Moutan* taxa such as *Paeonia delavayi* Franch (1887), *Paeonia potaninii* Komarov (1921), and *Paeonia decomposita* Hand-Mazz. (1939), have continued to utilize the genus name *Paeonia* L. Over the past three decades, Chinese *Moutan* taxonomist Hong T. [12-14] and world-renowned *Paeonia* taxonomist Hong D. Y. [15-19] have also maintained the use of the genus name in their publications concerning *Moutan* taxa. However, contemporary phylogenic studies [20-21] have demonstrated that the genus *Paeonia* L. can be clearly divided into three distinct taxa, now recognized as 3 subgenera or 3 sections. Further investigations are requisite to ascertain whether these two additional taxa may warrant classification as separate genera based on their unique taxonomic characteristics [12-19, 22].

In another instance, phylogenic analyses have revealed that *Altingia* Noronha and *Semiliquidambar* H. T. Chang are nested within *Liquidambar* L., leading to the formal transfer of all *Altingia* and *Semiliquidambar* species to *Liquidambar* L. [23-25]. The reasons for this nesting typically involve the synonymy of *Altingia* and *Semiliquidambar* with *Liquidambar* L., or the characterization of *Liquidambar* L. as a diverse genus, with exceptions arising from sampling and analysis errors. Consequently, further analyses are warranted to ascertain whether the other two genera should be considered synonyms of *Liquidambar* L.

Similarly, phylogenetic analyses have indicated a close relationship between the genus *Hamamelis* L. and *Distylium* Siebold & Zucc., *Parrotia* C. A. Mey., and *Sycopsis* Oliv. [26, 27], some of which are nested. Therefore, further analyses are required to determine whether the other three genera should be considered synonyms of *Hamamelis* L. or if *Distylium* Sieb. & Zucc. represents a diverse genus.

Both traditional taxonomy and modern phylogeny encounter limitations in their objectivity and impartiality when it comes to determine whether a genus is the synonym or a diverse genus. The new science evolutionomy has been developed with the publications of the evolutionary continuity principle, the evolutionary particularity principle, the theoretical monograph as *the Theory and Practice of Evolutionomy*, and so on [1-9]. The establishment, publication, and implementation of the minimum criterion PHS $\leq$ 0.928 (intergeneric, CPCG) for the classification of genus of Fructophyta D. L. Fu & H. Fu has scientifically identified 107 current genus synonyms within the class Scutellopsida D. L. Fu, and the taxonomic confusions of the class has also been scientifically resolved to a certain extent. [4-9].

To scientifically identify the circumscription of certain genera and resolve the synonyms or diverse genera leading to the taxonomic confusions within the three genera of Hamamelidales Griseb., some relevant CPCG sequences from the NCBI (National Center for Biotechnology Information, USA) database have been downloaded and the evolutionary analyses on these sequences have been conducted, and the results are as follows.

2. Materials and Methods

2.1. CPCG of Hamamelidales

Total 28 CPCG of representative species of three families of Hamamelidales Griseb. were selected from the NCBI database. Their current names, scientific names and CPCG numbers of NCBI are listed in Table 1 to Table 6.

2.2. Evolutionary Analyses of CPCG

The evolutionary analyses of CPCG mainly use the typical algorithm [3-9] to determine the relative evolutionary relationships between different taxa by comparing the phyloge-

netic similarity (PHS) between the designated type and target taxa. The formula is as follows:

$$PHS = \frac{\text{SPHL}}{\text{APHL}}$$

PHS = phylogenetic similarity between the type and objective taxon; SPHL = the number of same phylogenetic loci between the type and objective taxon; APHL = the number of all phylogenetic loci of the type; statistics of phylogenetic loci using Nucleotide Barcodes (17bp).

3. Results

3.1. Evolutionary System of Paeoniaceae

Using the types of *Moutan suffruticosus* (Andrews) D. L. Fu, *Paeonia lactiflora* Pall., *Lobidiscus brownii* (Hook.) D. L. Fu, and *Cercidiphyllum japonicum* Siebold & Zucc. respectively, the PHS of CPCG of total 17 species, 16 species of Paeoniaceae and *Cercidiphyllum japonicum* Siebold & Zucc. are analyzed, and the results are shown in Table 1 to Table 4.

Table 1. *PHS of CPCG between Moutan suffruticosus and some representative species of Paeoniaceae.*

No.	Scientific Names and Numbers of CPCG in NCBI	Current Names	PHL/17bp	PHS
1	*Moutan suffruticosus*_JQ952559.1	*Paeonia suffruticosa*	127105	1
2	*Moutan ostii*_MK701990.1	*Paeonia ostii*	122827	0.966
3	*Moutan qiui*_MT210544.1	*Paeonia qiui*	122471	0.964
4	*Moutan decompositus*_NC039425.1	*Paeonia decomposita*	122355	0.963
5	*Moutan rockii*_NC037772.1	*Paeonia rockii*	122242	0.962
6	*Moutan jishanensis*_MT210545.1	*Paeonia jishanensis*	121976	0.960
7	*Moutan delavayi*_MT210546.1	*Paeonia delavayi*	116440	0.916
8	*Moutan ludlowii*_NC035623.1	*Paeonia ludlowii*	115813	0.911
9	*Paeonia anomala*_MT210549.1	*Paeonia anomala*	110249	0.867
10	*Paeonia lactiflora*_MN868412.1	*Paeonia lactiflora*	110210	0.867
11	*Paeonia mairei*_MZ617462.1	*Paeonia mairei*	110175	0.867
12	*Paeonia intermedia*_MT210547.1	*Paeonia intermedia*	110084	0.866
13	*Paeonia veitchii*_NC032401.1	*Paeonia veitchii*	109600	0.862
14	*Paeonia emodi*_MT210548.1	*Paeonia emodi*	109542	0.862
15	*Paeonia obovata*_NC026076.1	*Paeonia obovata*	109465	0.861
16	*Lobidiscus brownii*_JQ952560.1	*Paeonia brownii*	104203	0.820
17	*Cercidiphyllum japonicum*_NC037940.1	*Cercidiphyllum japonicum*	44192	0.348

Table 2. *PHS of CPCG between Paeonia lactiflora and some representative species of Paeoniaceae.*

No.	Scientific Names and Numbers of CPCG in NCBI	Current Names	PHL/17bp	PHS
1	*Paeonia lactiflora*_MN868412.1	*Paeonia lactiflora*	126772	1
2	*Paeonia mairei*_MZ617462.1	*Paeonia mairei*	126698	0.999
3	*Paeonia anomala*_MT210549.1	*Paeonia anomala*	123509	0.974
4	*Paeonia veitchii*_NC032401.1	*Paeonia veitchii*	121653	0.960
5	*Paeonia intermedia*_MT210547.1	*Paeonia intermedia*	121049	0.955
6	*Paeonia obovata*_NC026076.1	*Paeonia obovata*	120315	0.949
7	*Paeonia emodi*_MT210548.1	*Paeonia emodi*	115807	0.914

No.	Scientific Names and Numbers of CPCG in NCBI	Current Names	PHL/17bp	PHS
8	*Moutan delavayi*_MT210546.1	*Paeonia delavayi*	111923	0.883
9	*Moutan ludlowii*_NC035623.1	*Paeonia ludlowii*	111508	0.880
10	*Moutan decompositus*_NC039425.1	*Paeonia decomposita*	111051	0.876
11	*Moutan ostii*_MK701990.1	*Paeonia ostii*	110968	0.875
12	*Moutan jishanensis*_MT210545.1	*Paeonia jishanensis*	110693	0.873
13	*Moutan qiui*_MT210544.1	*Paeonia qiui*	110631	0.873
14	*Moutan rockii*_NC037772.1	*Paeonia rockii*	110547	0.872
15	*Moutan suffruticosus*_JQ952559.1	*Paeonia suffruticosa*	110217	0.869
16	*Lobidiscus brownii*_JQ952560.1	*Paeonia brownii*	103350	0.815
17	*Cercidiphyllum japonicum*_NC037940.1	*Cercidiphyllum japonicum*	44551	0.351

Table 3. *PHS of CPCG between Lobidiscus brownii and some representative species of Paeoniaceae.*

No.	Scientific Names and Numbers of CPCG in NCBI	Current Names	PHL/17bp	PHS
1	*Lobidiscus brownii*_JQ952560.1	*Paeonia brownii*	126326	1
2	*Moutan delavayi*_MT210546.1	*Paeonia delavayi*	105782	0.837
3	*Moutan ludlowii*_NC035623.1	*Paeonia ludlowii*	105265	0.833
4	*Moutan ostii*_MK701990.1	*Paeonia ostii*	105032	0.831
5	*Moutan decompositus*_NC039425.1	*Paeonia decomposita*	104898	0.830
6	*Moutan jishanensis*_MT210545.1	*Paeonia jishanensis*	104580	0.828
7	*Moutan qiui*_MT210544.1	*Paeonia qiui*	104507	0.827
8	*Moutan rockii*_NC037772.1	*Paeonia rockii*	104388	0.826
9	*Moutan suffruticosus*_JQ952559.1	*Paeonia suffruticosa*	104209	0.825
10	*Paeonia anomala*_MT210549.1	*Paeonia anomala*	103392	0.819
11	*Paeonia lactiflora*_MN868412.1	*Paeonia lactiflora*	103353	0.818
12	*Paeonia mairei*_MZ617462.1	*Paeonia mairei*	103345	0.818
13	*Paeonia intermedia*_MT210547.1	*Paeonia intermedia*	103179	0.817
14	*Paeonia emodi*_MT210548.1	*Paeonia emodi*	102903	0.815
15	*Paeonia obovata*_NC026076.1	*Paeonia obovata*	102722	0.813
16	*Paeonia veitchii*_NC032401.1	*Paeonia veitchii*	102721	0.813
17	*Cercidiphyllum japonicum*_NC037940.1	*Cercidiphyllum japonicum*	43220	0.342

Table 4. *PHS of CPCG between Cercidiphyllum japonicum and some representative species of Paeoniaceae.*

No.	Scientific Names and Numbers of CPCG in NCBI	Current Names	PHL/17bp	PHS
1	*Cercidiphyllum japonicum*_NC037940.1	*Cercidiphyllum japonicum*	133181	1
2	*Moutan delavayi*_MT210546.1	*Paeonia delavayi*	44789	0.336
3	*Moutan decompositus*_NC039425.1	*Paeonia decomposita*	44777	0.336

No.	Scientific Names and Numbers of CPCG in NCBI	Current Names	PHL/17bp	PHS
4	*Moutan jishanensis*_MT210545.1	*Paeonia jishanensis*	44754	0.336
5	*Moutan qiui*_MT210544.1	*Paeonia qiui*	44731	0.336
6	*Moutan ostii*_MK701990.1	*Paeonia ostii*	44719	0.336
7	*Moutan rockii*_NC037772.1	*Paeonia rockii*	44677	0.336
8	*Moutan ludlowii*_NC035623.1	*Paeonia ludlowii*	44627	0.335
9	*Paeonia lactiflora*_MN868412.1	*Paeonia lactiflora*	44554	0.335
10	*Paeonia anomala*_MT210549.1	*Paeonia anomala*	44539	0.334
11	*Paeonia mairei*_MZ617462.1	*Paeonia mairei*	44536	0.334
12	*Paeonia emodi*_MT210548.1	*Paeonia emodi*	44467	0.334
13	*Paeonia obovata*_NC026076.1	*Paeonia obovata*	44415	0.334
14	*Paeonia intermedia*_MT210547.1	*Paeonia intermedia*	44381	0.333
15	*Paeonia veitchii*_NC032401.1	*Paeonia veitchii*	44340	0.333
16	*Moutan suffruticosus*_JQ952559.1	*Paeonia suffruticosa*	44197	0.332
17	*Lobidiscus brownii*_JQ952560.1	*Paeonia brownii*	43221	0.325

From Table 1 to Table 3, it can be concluded that using the types of *Moutan suffruticosus* (Andrews) D. L. Fu, *Paeonia lactiflora* Pall. and *Lobidiscus brownii* (Hook.) D. L. Fu respectively, Paeoniaceae (Bercht. & J. Presl) Rudolphi obviously include 3 genera: *Moutan* Rchb., *Paeonia* L., and *Lobidiscus* D. L. Fu, which all have the same evolutionary boundary: PHS (17bp) ≥ 0.90 (intrageneric) or PHS (17bp) ≤ 0.89 (intergeneric). Therefore, the 3 genera system of Paeoniaceae is natural by the chloroplast complete genomic evolutionomy.

From Table 4, it is evident that the PHL between *Cercidiphyllum japonicum* Siebold & Zucc. and *Moutan delavayi* (Franch.) D. L. Fu is 44789 more than other species. It means the genus *Moutan* Rchb. is the most primitive genus of Paeoniaceae.

Based on Table 1 to Table 4, the evolutionary system of genera of Paeoniaceae is presented as Figure 1. The figure provides a clearly evolutionary context within the family Paeoniaceae (Bercht. & J. Presl) Rudolphi, indicating that the newly established genus *Lobidiscus* D. L. Fu is derived from the most primitive genus *Moutan* Rchb., rather than from *Paeonia* L.. This conclusion is supported by the maximum PHS value of 0.837 between *Lobidiscus brownii* (Hook.) D. L. Fu and *Moutan delavayi* (Franch.) D. L. Fu (Table 3), as determined through CPCG evolutionary analyses.

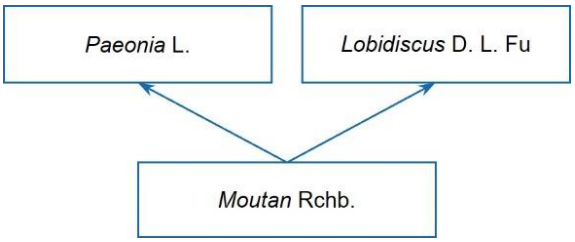

Figure 1. *Evolutionary system of genera of Paeoniaceae.*

3.2. Synonyms of *Liquidambar* Genus

Using the type of *Liquidambar formosana* Hance, the PHS of CPCG of 6 species of Liquidambaraceae D. L. Fu are analyzed, and the results are presented in Table 5.

Table 5. *PHS of CPCG between Liquidambar formosana and some representative species of Liquidambaraceae.*

No.	Scientific Names and Numbers of CPCG in NCBI	Current Names	PHL/17bp	PHS
1	*Liquidambar formosana*_KC588388.1	*Liquidambar formosana*	133703	1
2	*Liquidambar chinensis*_NC047288.1	*Altingia chinensis*	133531	0.999

No.	Scientific Names and Numbers of CPCG in NCBI	Current Names	PHL/17bp	PHS
3	*Liquidambar cathayensis*_MN410884.1	*Semiliquidambar cathayensis*	132359	0.990
4	*Cercidiphyllum japonicum*_NC037940.1	*Cercidiphyllum japonicum*	83212	0.622
5	*Exbucklandia populnea*_NC065400.1	*Exbucklandia populnea*	78802	0.589
6	*Hamamelis mollis*_NC037881.1	*Hamamelis mollis*	77977	0.583

From Table 5, it is evident that using the type of *Liquidambar formosana* Hance, the genera of *Altingia* Noronha and *Semiliquidambar* H. T. Chang are the synonyms of the genus *Liquidambar* L., owing to their evolutionary relationships with the type far from reaching the minimum criterion PHS (17bp) ≤ 0.928 (intergeneric) for genus classification. Therefore, it can be confirmed that the combination of the genus *Liquidambar* L. by Ickert-Bond & Wen [24] is scientific. However, the nine specific combinations of the genus are not validly published according to the relevant articles of International Code of Botanical Nomenclature.

3.3. Synonyms of *Hamamelis* Genus

Using the type of *Hamamelis mollis* Oliv., the PHS of CPCG of 7 species of Hamamelidaceae R. Br. are analyzed, and the results are presented in Table 6.

Table 6. *PHS of CPCG between Hamamelis mollis and some representative species of Hamamelidaceae.*

No.	Scientific Names and Numbers of CPCG in NCBI	Current Names	PHL/17bp	PHS
1	*Hamamelis mollis*_NC037881.1	*Hamamelis mollis*	133081	1
2	*Hamamelis sinensis*_MT323104.1	*Sycopsis sinensis*	124249	0.934
3	*Hamamelis racemosum*_MZ571522.1	*Distylium racemosum*	124146	0.933
4	*Hamamelis subaequalis*_NC037243.1	*Parrotia subaequalis*	123821	0.930
5	*Eustigma oblongifolium*_NC071207.1	*Eustigma oblongifolium*	114012	0.857
6	*Sinowilsonia henryi*_NC036069.1	*Sinowilsonia henryi*	112888	0.848
7	*Fortunearia sinensis*_NC041487.1	*Fortunearia sinensis*	112522	0.846

Table 6 indicates that using the type of *Hamamelis mollis* Oliv., the genera of *Sycopsis* Oliv., *Distylium* Sieb. & Zucc., and *Parrotia* C. A. Mey. are the synonyms of the genus *Hamamelis* L., because of their evolutionary relationships with the type not meeting the minimum criterion PHS (17bp) ≤ 0.928 (intergeneric) for genus classification. Therefore, it is scientific to combine *Hamamelis* L. genus as follows.

Hamamelis L., Sp. Pl. 1: 124 (1753). Type: *Hamamelis virginiana* L. ─ *Distylium* Sieb. & Zucc., Fl. Jap. (Sieb.) 1: 178, t. 94. 1841. Type: *Hamamelis racemosa* (Sieb. & Zucc.) D. L. Fu. ─ *Parrotia* C. A. Mey., Verz. Pfl. Casp. Meer. 46. 1831. Type: *Hamamelis persica* DC. ─ *Sycopsis* Oliv., Trans. Linn. Soc. London 23(1): 83, t. 8. 1860. Type: *Hamamelis sinensis* (Oliv). D. L. Fu.

About 25 species, in Asia and America, including 18 new specific combinations.

4. New Genus *Lobidiscus* D. L. Fu

Lobidiscus D. L. Fu, gen. nov. *Moutan* Rchb. et *Paeonia* L. similis, sed herbis perennus, cespitosis et semi-decumbentus, foliolis profunde dissectis, discis carnosis, lobatis cum nectarifluis, basis carpellis circumdatis.

Perennial herbs, cespitose and semi-decumbent. Roots fleshy and large. Multi-stems semi-decumbent. Leaves 5-7, alternate, biternate; leaflets deeply dissected. Flowers large, nodding, solitary and termina on a stem, more than 4 cm in diam. Sepals 5–6, purplish green, ovate to sub-orbicular, overlapping, and cupped. Petals 5–10, orbicular, varying in color from crimson, brownish maroon to yellow on the margins. Stamens numerous, yellow. Disc fleshy, with about 12 nectariferous lobes, encircled the bases of carpels. Carpels 3-6, free; ovules numerous, borne in two rows along ventral

suture. Styles short; stigmas laterally flattened, recurved. Fruit a follicle. Seeds yellowish tan to black, globose, or ovoid-globose, 6-11 mm in diam. diploid (2N = 10).

Type: *Lobidiscus californicus* (Nutt.) D. L. Fu.

2 species, in America. *Lobidiscus californicus* (Nutt.) D. L. Fu and *Lobidiscus brownii* (Hook.) D. L. Fu.

5. New Names of Some Families

The family name, Altingiaceae Lindl. (1846) nom. cons., fails to comply with the fundamental principles of the International Code of Botanical Nomenclature due to the inappropriate type, namely *Altingia* Noronha, being a synonym of *Liquidambar* L.. Replacing the family name with a scientific and standardized one will be an inevitable tendency in the advancement of plant taxonomy. This circumstance is not an isolated instance. Some conserved family names that employ synonyms or illegal types have been compiled, and their scientific names have been determined as follows.

Aesculaceae D. L. Fu, fam. nom. nov. Hippocastanaceae A. Rich., Bot. Méd.: 680. Jun 1823, nom. cons. Typus: *Aesculus* L. (*Hippocastanum* Mill., nom. syn.).

Amphipterygiaceae D. L. Fu, fam. nom. nov. Julianiaceae Hemsl. in J. Bot. 44: 379. Oct 1906, nom. cons. Typus: *Amphipterygium* Standl. (*Juliania* Schltdl., nom. illeg.)

Dianthaceae D. L. Fu, fam. nom. nov. Caryophyllaceae Juss., Gen. Pl.: 299. 4 Aug 1789, nom. cons. Typus: *Dianthus* L. (*Caryophyllus* Mill., nom. illeg.).

Diospyraceae D. L. Fu, fam. nom. nov. Ebenaceae Gürke in Engler & Prantl, Nat. Pflanzenfam. 4(1): 153. Dec 1891, nom. cons. Typus: *Diospyros* L. (*Ebenus* Kuntze, nom. illeg.).

Drimydaceae D. L. Fu, fam. nom. nov. Winteraceae R. Br. ex Lindl., Intr. Nat. Syst. Bot.: 26. Sep 1830, nom. cons. Typus: *Drimys* J. R. Forst. & G. Forst., nom. cons. (*Wintera* Murray, nom. illeg.).

Ilecaceae D. L. Fu, fam. nom. nov. Aquifoliaceae DC. ex A. Rich., Nouv. Elém. Bot., ed. 4: 555. 1828, nom. cons. Typus: *Ilex* L. (*Aquifolium* Mill., nom. illeg.).

Liquidambaraceae D. L. Fu, fam. nom. nov. Altingiaceae Lindl., Veg. Kingd.: 253. Jan-Mai 1846, nom. cons. Typus: *Liquidambar* L. (*Altingia* Noronha, nom. syn.)

Loniceraceae D. L. Fu, fam. nom. nov. Caprifoliaceae Adans., Fam. Pl. 2: 153. Jul-Aug 1763, nom. cons. Typus: *Lonicera* L. (*Caprifolium* Mill., nom. syn.).

Mammillariaceae D. L. Fu, fam. nom. nov. Cactaceae Juss., Gen. Pl.: 310. 4 Aug 1789, nom. cons. Typus: *Mammillaria* Haw., nom. cons. (*Cactus* L., nom. rej.).

Mirabilidaceae D. L. Fu, fam. nom. nov. Nyctaginaceae Juss., Gen. Pl.: 90. 4 Aug 1789, nom. cons. Typus: *Mirabilis* L. (*Nyctago* Juss., nom. syn.).

Oenotheraceae D. L. Fu, fam. nom. nov. Onagraceae Adans., Fam. Pl. 2: 81. Jul-Aug 1763, nom. cons. Typus: *Oenothera* L. (*Onagra* Mill., nom. syn.).

Triglochinaceae D. L. Fu, fam. nom. nov. Juncaginaceae Rich., Démonstr. Bot.: ix. Mai 1808, nom. cons. Typus: *Triglochin* L. (*Juncago* Ség., nom. syn.).

Utricylariaceae D. L. Fu, fam. nom. nov. Lentibulariaceae Rich., Fl. Paris. (Poiteau & Turpin) 1: 23 (ed. fol.), 26 (ed. qto.) 1808, nom. cons. Typus: *Utricularia* L. (*Lentibularia* Ség., nom. syn.).

6. New Specific Combinations

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Moutan rotundilobus (D. Y. Hong) D. L. Fu, sp. comb. nov. *Paeonia decomposita* subsp. *rotundiloba* D. Y. Hong, Kew Bull. 52(4): 961. 1997; *Paeonia rotundiloba* (D. Y. Hong) D. Y. Hong, J. Syst. Evol. 49(5): 465. 2011.

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7. Conclusion

The evolutionary system of the genera within Paeoniaceae (Bercht. & J. Presl) Rudolphi has been initially established, encompassing three natural genera: *Moutan* Rchb., *Paeonia* L., and *Lobidiscus* D. L. Fu, all sharing a common evolutionary boundary defined by PHS (17bp) ≥ 0.90 (intrageneric) or PHS (17bp) ≤ 0.89 (intergeneric). The most primitive genus in this family is *Moutan* Rchb. Notably, the new genus *Lobidiscus* D. L. Fu, gen. nov., characterized by its distinctly lobed floral discs, is described herein with *Lobidiscus californicus* (Nutt.) D. L. Fu designated as the type species; this new genus originates from *Moutan* Rchb. (1827), rather than *Paeonia* L., as evidenced by a maximum PHS value of 0.837 between *Lobidiscus brownii* (Hook.) D. L. Fu and *Moutan delavayi* (Franch.) D. L. Fu based on CPCG evolutionary analyses. Two synonyms of the genus *Liquidambar* L. (1753), *Altingia* Noronha and *Semiliquidambar* H. T. Chang, have been confirmed, while three current synonyms of the genus *Hamamelis* L. (1753), including *Distylium* Siebold & Zucc., *Parrotia* C. A. Mey. and *Sycopsis* Oliv., have also been scientifically identified. Additionally, 13 novel family names, two new specific epithets, and 39 newly valid specific combinations have been published in accordance with the scientific criterion. These contributions will provide a robust foundation for future research into the evolutionary systems within the order Hamamelidales Griseb. and serve an indicative function in subsequent investigations regarding the scientific definition of genus and scientifically resolving confusions of certain genera within the phylum Fructophyta D. L. Fu & H. Fu.

Abbreviations

CPCG	Chloroplast Complete Genomes
PHL	Phylogenetic Loci
PHS	Phylogenetic Similarity

Author Contributions

Da-Li Fu is the sole author. The author read and approved the final manuscript.

Conflicts of Interest

The author declares no conflicts of interest.

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