

# Molina's species of *Lucuma*: neotypifications and nomenclatural implications

## Las especies de *Lucuma* de Molina: neotipificación e implicancias nomenclaturales

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### ABSTRACT

The story of the life and botanical contributions of Juan Ignacio Molina (1740-1829), “the first Chilean scientist”, are briefly outlined. The generic name *Lucuma* is considered to be validly published by Molina in 1782, and the identities of the five species of the genus, *L. bifera*, *L. turbinata*, *L. valparadisaea*, *L. keule*, and *L. spinosa*, are discussed. Four species names are neotypified with material from Chile and the nomenclatural implications are discussed. *Lucuma bifera*, with *L. turbinata* in synonymy, becomes the name for the commonly cultivated Andean fruit tree in Sapotaceae currently called *Pouteria lucuma*. *Gayella valparadisaea*, with *Lucuma valparadisaea* in synonymy, becomes the name for the endemic Chilean tree in Sapotaceae currently called *Pouteria splendens*. *Gomortega keule*, with *Lucuma keule* in synonymy, remains the name for this endemic Chilean fruit tree in the monotypic family Gomortegaceae. *Geoffroea decorticans*, with *Lucuma spinosa* in synonymy, remains the name for this South American tree or shrub with edible fruits in Fabaceae.

**Keywords:** *Gayella valparadisaea*, *Geoffroea decorticans*, *Gomortega keule*, *Lucuma bifera*, *Pouteria lucuma*, *Pouteria splendens*

### RESUMEN

Se describe brevemente la historia de la vida y las contribuciones botánicas de Juan Ignacio Molina (1740-1829), “el primer científico chileno”. Se considera que el nombre genérico *Lucuma* fue válidamente publicado por Molina en 1782, y se examinan las identidades de las cinco especies del género, *L. bifera*, *L. turbinata*, *L. valparadisaea*, *L. keule* y *L. spinosa*. Los nombres de cuatro especies se neotipifican con material de Chile y se describen las implicaciones nomenclaturales. *Lucuma bifera*, con *L. turbinata* como sinónimo, se convierten en el nombre del árbol frutal andino comúnmente cultivado en las Sapotaceae que actualmente se llama *Pouteria lucuma*. *Gayella valparadisaea*, con *Lucuma valparadisaea* como sinónimo, pasa a ser el nombre del árbol chileno endémico de Sapotaceae actualmente llamado *Pouteria splendens*. *Gomortega keule*, con *Lucuma keule* como sinónimo, sigue siendo el nombre de este árbol frutal chileno endémico de la familia monotípica Gomortegaceae. *Geoffroea decorticans*, con *Lucuma spinosa* como sinónimo, sigue siendo el nombre de este árbol o arbusto sudamericano de frutos comestibles de la familia Fabaceae.

**Palabras clave:** *Gayella valparadisaea*, *Geoffroea decorticans*, *Gomortega keule*, *Lucuma bifera*, *Pouteria lucuma*, *Pouteria splendens*

## INTRODUCTION

Juan Ignacio Molina (1740-1829) is regarded as the first Chilean scientist (Charrier & Hervé 2011) and has been characterized, for his time, as “the world’s window on Chile” (Ronan 2002). Molina was born June 24, 1740 (Ronan 2002; Menichetti 2011), near the present day city of Villa Alegre during the time when Chile was part of the Spanish empire. The statement by Stafleu & Cowan (1981) that he was born in 1737 is erroneous.

Molina was educated within Jesuit establishments in central Chile, including colleges in Talca and Concepción. His interests were very broad and early in life he made detailed observations and took careful and systematic notes on all aspects of Chile, including its history, geography, geology, flora and fauna. In 1761 he contracted smallpox, leaving his face pock-marked for the rest of his life (Ronan 2002).

After the completion of his studies, he spent a few years in Talca as a teacher at the Jesuit school, with the opportunity to continue his studies of the natural history of the area. In 1766 he returned to Santiago to finalize his preparations for ordination to the priesthood (Ronan 2002; Menichetti 2011).

Then, in February 1767, by decree of Charles III of Spain, all Jesuits were expelled from Chile and other Spanish territories. Molina, then 27 years old, left Chile in February 1768 for Lima in Peru, and a few months later he boarded a ship in Callao (Lima’s sea port) heading for Europe. In February 1769, after a journey of four months rounding Cape Horn and a stop in Cádiz in Spain, he finally arrived in La Spezia, an Italian harbour east of Genoa, together with more than two hundred other Jesuits. In May 1769, the exiles settled in Imola after a journey of approximately 17 months since their departure from Santiago (Ronan 2002).

In 1774, Molina decided to move to Bologna, a city more intellectually stimulating than Imola, and this is where he produced his scientific works, and where he died in 1829 after more than 60 years in exile. However, in 1966 his remains were repatriated to Chile and finally reposed in the parish church of Villa Alegre, close to his place of birth (Ronan 2002; Charrier & Hervé 2011).

All the notes and other materials Molina had assembled during the years in Chile were confiscated when he left Callao in 1768. Therefore, his first work “Compendio della storia geografica, naturale, e civile del regno del Chile” (Molina 1776) was written with few other sources to draw on than his memories. The “Compendio” was published anonymously as Molina was concerned about its lack of scholarship (Ronan 2002). All his scientific works were written in Italian and as an author Molina called himself Giovanni Ignazio Molina.

Molina’s most celebrated work “Saggio sulla storia naturale

del Chili” (Molina 1782) appeared a few years later as a much more complete version of the “Compendio”. By that time, most of Molina’s confiscated notes and papers from Chile had luckily been returned to him (Ronan 2002). This is the work where Molina made his most important contributions to the natural history of Chile (Ronan 2002; Charrier & Hervé 2011; Menichetti 2011). The “Saggio” received much attention and was subsequently translated into German, French, Spanish and English. It was the western world’s principal source of information on Chile for many decades (Ronan 2002).

In the botanical part of the “Saggio”, 16 new genera of flowering plants are proposed, most of which are still recognized, such as the well-known *Maytenus* Molina (Celastraceae), *Peumus* Molina (Monimiaceae), *Puya* Molina (Bromeliaceae) and *Quillaja* Molina (Quillajaceae). About 70 new species of plants are also published and detailed information on vernacular names and uses is generally provided.

A second edition of “Saggio sulla storia naturale del Chili” was published in 1810 (Molina 1810). The botanical part now incorporated much information from other authors on the Latin American flora, such as Antonio José Cavanilles, José Antonio Pavon and Hipólito Ruiz López. A detailed commentary on the two editions of the “Saggio” was published by Rudolph Amandus Philippi in Spanish (Philippi 1863) and German (Philippi 1864).

Molina’s descriptions are very brief and often inaccurate, which is understandable due to the circumstances relating to his work. When writing the “Saggio” no material was available for him to study, and he depended on his memory and on the notes he had made many years earlier. Stafleu & Cowan (1981) state that Molina’s personal herbarium is “unknown, some material in BOLO”, but no Molina material from Chile has been located at BOLO (U. Mossetti, pers. comm.). If Molina ever had a herbarium of Chilean plants, this must have been lost in Chile. That then means that there is no original material available for typification of any of Molina’s names.

Hauman (1923) considered that all plant names published by Molina in the “Saggio” should be rejected as *nomina nuda*, due to the poor descriptions. However, this view was refuted by Johnston (1924), who pointed to the fact that the brief descriptions are accompanied by discussions of habit, vernacular names and uses of the plants that generally make them easily identifiable. For example, most of Molina’s species were identified by Philippi (1863), and many names were cited in synonymy in Flora de Chile (Reiche 1896-1911). Johnston also pointed out that most botanical works from this period, including *Systema naturae* by Linnaeus, had similarly poor descriptive matter. Since then, the validity of Molina’s names has mostly not been disputed and, in our opinion, they should

be typified and used. Molina's generic names generally have species names as types and one of them, *Peumus*, has been conserved with *P. boldus* Molina as the type, but hardly any of Molina's species have been typified. The only exception seems to be *Maytenus boaria* Molina, the type of *Maytenus*, which has been neotypified with a recent specimen from central Chile (Biral & Lombardi 2013).

One of the new genera proposed by Molina (1782) is *Lucuma* Molina, and this is the subject of the present paper. *Lucuma sensu* Molina comprised five species, *L. bifera* Molina, *L. turbinata* Molina, *L. valparadisaea* Molina, *L. keule* Molina, and *L. spinosa* Molina, all trees or shrubs with edible fruits. Our aim is to briefly describe how each of these names has been used and treated by previous authors, to neotypify them primarily with material in the herbarium in Concepción (CONC), and to present the nomenclatural implications of these typifications.

### THE GENERIC NAME LUCUMA

The word "Lucuma" appeared already in Molina's "Compendio" (Molina 1776), as the vernacular name for a fruit tree originating from the northern part of Chile, especially the Coquimbo region and therefore called "Lucuma di Coquimbo". The tree was said to be similar to a laurel and to have fruits with the size of a peach.

In the "Saggio" (Molina 1782), *Lucuma* was formally described as a genus within *Icosandria Digynia* according to the Linnean sexual system, implying that it has 20 or more stamens and two pistils. The confused diagnosis and description said "*Drupa 1- seu 2- sperma*" and "*Stamina plurima*", among other things. In any case, there is no doubt that the name is validly published.

*Lucuma* has been taken up by numerous authors over the years as the name for a genus of Sapotaceae, not only in the Neotropics but also in Asia, Australia and Africa. Well over 200 combinations exist within *Lucuma*, and the name has been typified with *L. bifera* (Britton & Millspaugh 1920). Currently, *Lucuma* is mostly treated as a synonym of *Pouteria* Aubl. (Pennington 1990, 1991). As in most Sapotaceae, the fruits of *Pouteria/Lucuma* are one- to several-seeded berries (Pennington 1990). However, growing evidence from molecular phylogenetic analyses indicate that the family in the Neotropics contains a strongly supported clade that includes *L. bifera*, separate from a re-circumscribed *Pouteria* (Faria *et al.* 2017; Swenson *et al.* in prep.). The generic name *Lucuma* therefore needs to be restored for this clade.

### LUCUMA BIFERA

*Lucuma bifera* was published by Molina (1782) as one of two kinds of "Lucuma" that are cultivated in Chile. It was said to have a round fruit and the epithet *bifera* was given as the tree bears fruit twice a year, early in summer and in autumn. The formal description reads "*Lucuma fol. alternis petiolatis ovato-oblongis*". In the second edition of the "Saggio" (Molina 1810), the cultivated "Lucuma" was briefly referred to, but the species name *L. bifera* was not mentioned.

Molina's *Lucuma bifera* was included in the edition of *Systema naturae* published by Gmelin (1791), although the epithet was misspelt as "*bifara*" in the text and "*biflora*" in the index. However, it was forgotten by most subsequent authors, and Ruiz & Pavon (1802) published *Achras lucuma* Ruiz & Pav. from Peru and Kunth (1819) published *Lucuma obovata* Kunth from Ecuador for the same species, without any mention of Molina's earlier name, whereas Philippi (1863, 1864), as well as Reiche (1910) treated *L. bifera* as a synonym of *L. obovata*. In the treatment of Sapotaceae for *Flora Neotropica* (Pennington 1990), *Lucuma bifera* was cited as a synonym of *Pouteria lucuma* (Ruiz & Pav.) Kuntze. It was noted that the name had not been typified (Pennington 1990), but there was no comment on the fact that *L. bifera* is the oldest name.

### LUCUMA TURBINATA

*Lucuma turbinata* was published by Molina (1782) as a second kind of cultivated "Lucuma" in Chile. It was said to differ by having a conical fruit and the formal description reads "*Lucuma fol. alternis petiolatis lanceolatis*".

There was no mention of *Lucuma turbinata* in the second edition of the "Saggio" (Molina 1810), but it was included in the edition of *Systema naturae* published by Gmelin (1791). Philippi (1863, 1864), as well as Reiche (1910) treated *L. turbinata* as a synonym of *L. obovata*, along with *L. bifera*. Pennington (1990) cited *L. turbinata* as a synonym of *Pouteria lucuma* with a query, and noted that no type had been designated for the name.

### LUCUMA VALPARADISAEA

*Lucuma valparadisaea* is one of three native species of *Lucuma* published by Molina (1782). It was said to have the vernacular name "Bellota", to grow in large quantities in the surroundings of Valparaíso, and to differ from the other species by its

opposite leaves and round or oval, usually bitter fruit. The formal description reads "*Lucuma fol. oppositis, petiolatis, ovato-oblongis*".

In the second edition of the "Saggio" (Molina 1810) the name *Lucuma valparadisaea* did not appear, but the vernacular name "Bellota" was mentioned. Gmelin (1791) recognized *L. valparadisaea*, as did Philippi (1863, 1864), who also noted that the vernacular name "Bellota" had been erroneously used by Molina; it instead refers to a member of Lauraceae, *Beilschmiedia miersii* (Gay) Kosterm. (= *Bellota miersii* Gay). Reiche (1910) recognized *L. valparadisaea* as a native Chilean species occurring in the coastal parts of the Aconcagua and Valparaiso provinces. *Lucuma splendens* A.DC., described in 1844, was cited in synonymy, and the vernacular names "palo colorado" and "lúcumo" were provided.

Pierre (1890) established the genus *Gayella* Pierre, with the single species *Gayella valparadisaea* (Molina) Pierre, citing *Lucuma splendens* in synonymy.

Pennington (1990) cited *Lucuma valparadisaea* with a query as a synonym of *Pouteria splendens* (A.DC.) Kuntze (= *Lucuma splendens* A.DC.), noting that a type had not been designated for the name. He argued that "Molina's species are so confused and imperfectly described that it is impossible to typify them with any certainty". Therefore, he favoured the use of the epithet "*splendens*" rather than the earlier "*valparadisaea*". However, there is nothing to confuse this species with, since it is the only native species of Sapotaceae in Chile, where it occurs along the coast particularly in the vicinity of Valparaiso.

### LUCUMA KEULE

*Lucuma keule* was described by Molina (1782) as a tree often up to 100 feet high with the vernacular name "Keule". The leaves were said to be oval, about six inches long, and of a brilliant green, and the fruits were said to be perfectly round and shining yellow. The formal description reads "*Lucuma fol. alternis, petiolatis, ovalibus, subserratis*".

Gmelin (1791) recognized *L. keule*, but in the second edition of the "Saggio" (Molina 1810), it was placed in a genus of its own, *Keulia* Molina, as *K. chilensis* Molina, and had now been moved to *Decandria Monogynia*. As "*Gomortega* Fl. per." was cited in synonymy, Molina's name is an illegitimate renaming of *Gomortega*.

The genus *Gomortega* Ruiz & Pav. was proposed by Ruiz & Pavon (1794) for a tree with the vernacular name "queule", and was named after D. Casimiro Gomez Ortega, professor at Real Jardín Botánico de Madrid. Ruiz & Pavon (1798) subsequently published the species as *Gomortega nitida* Ruiz

& Pav., citing *Lucuma keule* in synonymy and the vernacular names "Queule" and "Keule", and giving the distribution as "*in Regni Chilensis nemoribus per Conceptionis et alias Provincias*". Ruiz & Pavon (1798) also pointed to the fragrant leaves, savoury fruits and valuable wood of this tree.

Persoon (1805) published *Adenostemum* Pers., another illegitimate renaming of *Gomortega*, with the single species *A. nitidum* (Ruiz & Pav.) Pers., citing *Lucuma keule* in synonymy. The tree was subsequently generally treated under the name *A. nitidum* and as a member of Lauraceae (e.g., Meissner 1864), until Baillon (1868) made the combination *Gomortega keule* (Molina) Baill. and referred it to Monimiaceae.

On the basis of a detailed study, Reiche (1896) placed *Gomortega* in its own family, Gomortegaceae Reiche, but for the species he used the name *G. nitida*. The family Gomortegaceae has since then been generally accepted as a monotypic member of Laurales. Its phylogenetic position has also been studied repeatedly by molecular methods, first by Ueda *et al.* (1997). However, there are inconsistencies in the nomenclature of this taxon, with the name *G. nitida* sometimes still used, and the combination *G. keule*, when used, is mostly ascribed to Baillon (1869) or Johnston (1924). Furthermore, the basionym *Lucuma keule* has not been typified. A review paper on *Gomortega keule* was published by Muños-Concha & Davey (2011), treating many diverse aspects of the tree and providing numerous references. The fruit of *Gomortega* is a drupe (Reiche 1896).

### LUCUMA SPINOSA

*Lucuma spinosa*, with the vernacular name "Chagnar", was described by Molina (1782) as about 30 feet high, with spiny branches, ovate, sessile leaves, and rounded fruits similar to those of "Keule". The wood was said to be hard, yellow, and much valued by cabinet makers. The formal description reads "*Lucuma fol. alternis sessilibus, ramis spinosis*".

In the second edition of the "Saggio" (Molina 1810) the name *Lucuma spinosa* did not appear, but the vernacular name "Chagnar" was mentioned. Gmelin (1791) recognized *L. spinosa*, but Philippi (1863, 1864) cited it as a synonym of the legume *Gourliea chilensis* Clos.

The legume genus *Gourliea* Gillies (1833) was published for a single species in Argentina, *G. decorticans*, for which the vernacular name "Chañar" was published, but without any mention of Molina's "Chagnar". However, when Clos (1847) published a second species of *Gourliea*, *G. chilensis* from Chile, with the vernacular name "Chañar", he cited "*Lucuma spinosa* Mol." in synonymy. Reiche (1898) in *Flora de Chile* treated the Chilean and the Argentinian plants of "Chañar" together

as *Gourliea decorticans*, citing *G. chilensis* and *Lucuma spinosa* as synonyms.

Burkart (1949) transferred *Gourliea decorticans* to the genus *Geoffroea* Jacq. (Jacquin 1760), making the combination *Geoffroea decorticans* (Gillies) Burkart, citing *Lucuma spinosa* in synonymy. *Geoffroea decorticans* has since then been the name for this species that is, besides Argentina and Chile, now also known from Uruguay, Paraguay and southern Bolivia (Ireland & Pennington 1999). Ireland & Pennington (1999) cited *Lucuma spinosa* in synonymy of *G. decorticans*, noting that the type for it is not known. The edible fruits of *Geoffroea* are unusual among members of Fabaceae in being fleshy and drupe-like (Ireland & Pennington 1999).

## TYPIFICATIONS AND NOMENCLATURAL IMPLICATIONS

*Lucuma* Molina, Sag. Stor. Nat. Chili: 186, 352 (1782). Type: *L. bifera* Molina (designated by Britton & Millspaugh 1920: 322, corroborated by Pennington 1990: 247).

Notes: The genus *Lucuma* will be resurrected for a group of species of Sapotaceae in the Neotropics based on molecular phylogenetic data (Swenson *et al.* in prep.).

*Lucuma bifera* Molina, Sag. Stor. Nat. Chili: 187, 352 (1782). Type: Chile, Región de Coquimbo, Prov. Elqui, Gabriela Mistral, Escuela Familiar Agrícola, huerto, 29°58'47"S, 71°04'43"W, alt. 204 m, 26.V.2021, *M. Rosas* 9449 (CONC No. 191032 neotype, **designated here**; S isoneotype). Fig. 1.

*Lucuma turbinata* Molina, Sag. Stor. Nat. Chili: 187, 352 (1782). Type: not designated.

*Achras lucuma* Ruiz & Pav., Fl. Peruv. 3: 17 (1802); *Pouteria lucuma* (Ruiz & Pav.) Kuntze, Revis. Gen. Pl. 3(2): 195 (1898); *Richardella lucuma* (Ruiz & Pav.) Aubrév., Adansonia, n.s. 1: 175 (1962).

*Lucuma obovata* Kunth in Humboldt, Bonpland & Kunth, Nov. Gen. Sp. 3: 241 (1819).

Notes: The fruits of the widely cultivated *Lucuma bifera* vary in shape and the synonym *L. turbinata* represents a variant with more or less conical fruits in contrast to the more common rounded fruits of the neotype of *L. bifera* (Fig. 1).

*Gayella valparadisaea* (Molina) Pierre, Not. Bot. Sapot.: 27 (1890); *Lucuma valparadisaea* Molina, Sag. Stor. Nat. Chili: 187, 352 (1782). Type: Chile, V Región, Prov. Valparaíso, Laguna Verde, 33°05'19.64"S, 71°39'33.33"W, alt. 75 m, 10.XI.2004, *O. Fernandez C. s.n.* (CONC No. 162240 neotype, **designated**

**here**; JBN No. 1058 isoneotype). Fig. 2.

*Lucuma splendens* A.DC., Prodr. 8: 171 (1844); *Pouteria splendens* (A.DC.) Kuntze, Revis. Gen. Pl. 3(2): 195 (1898); *Gayella splendens* (A.DC.) Aubrév., Adansonia 1: 180 (1962).

Notes: The genus *Gayella* will be resurrected for this Chilean species of Sapotaceae based on molecular phylogenetic data and morphology (Swenson *et al.* in prep.). Results indicate that the closest relatives are from Australia, not from South America. The Chilean endemic *Gayella valparadisaea* is red-listed as Endangered (EN) by the Chilean authorities under the name *Pouteria splendens* (especies.mma.gob.cl).

*Gomortega keule* (Molina) Baill., Adansonia 9: 118 (1868); *Lucuma keule* Molina, Sag. Stor. Nat. Chili: 187, 352 (1782); *Gomortega nitida* Ruiz & Pav., Syst. Veg. Fl. Peruv. Chil. 1: 108 (1798), *nom. illeg.*; *Adenostemum nitidum* (Ruiz & Pav.) Pers., Synopsis Pl. 1: 467 (1805), *nom. illeg.*; *Keulia chilensis* Molina, Sag. Stor. Nat. Chili, ed. 2: 288 (1810), *nom. illeg.* Type: Chile, VIII Región, Prov. Concepción, Fundo Guaiguay, 6 km al interior de Purema, 36°27'S, 72°49'W, alt. 350 m, 30.X.2000, *C. Le Quesne s.n.* (CONC No. 149806 neotype, **designated here**). Fig. 3.

Notes: The place of publication of the combination *Gomortega keule* has previously been cited as Baill., Hist. Pl. 1: 325 (1869). However, as stated by Baillon in a footnote on p. 325, the combination had then already been made in Adansonia 9: 118, in a part of vol. 9 published in 1868. The Chilean endemic *Gomortega keule* in the monotypic family Gomortegaceae is red-listed as Endangered (EN) by the Chilean authorities (especies.mma.gob.cl).

*Geoffroea decorticans* (Gillies) Burkart, Darwiniana 9: 19 (1949); *Gourliea decorticans* Gillies in Hooker, Bot. Misc. 3: 208 (1833).

*Lucuma spinosa* Molina, Sag. Stor. Nat. Chili: 188, 352 (1782); *Gourliea chilensis* Clos in Gay, Fl. Chil. 2: 218 (1846), *nom. illeg.*; *Gourliea spinosa* (Molina) Skeels, Bull. U.S.D.A. Bur. Pl. Industr. 162: 31 (1909). Type: Chile, II Región, Prov. El Loa, Catarpe, curso superior del río San Pedro, 22°49'S, 68°11'W, alt. 2640 m, 24.XI.1996, *R. Rodríguez* 3233 (CONC No. 136753 neotype, **designated here**). Fig. 4.

Notes: Molina's *Lucuma spinosa* cannot be transferred to *Geoffroea* because of the existence of *G. spinosa* Jacq. (Jacquin 1760). *Geoffroea* is a genus of Fabaceae with two currently recognized species (Ireland & Pennington 1999).



FIGURE 1. Neotype of *Lucuma bifera*, M. Rosas 9449 (CONC no. 191032). / Neotipo de *Lucuma bifera*, M. Rosas 9449 (CONC no. 191032).



FIGURE 2. Neotype of *Lucuma valparadisaea* (≡ *Gayella valparadisaea*), O. Fernandez C. s.n. (CONC No. 162240). / Neotipo de *Lucuma valparadisaea* (≡ *Gayella valparadisaea*), O. Fernandez C. s.n. (CONC No. 162240).



FIGURE 3. Neotype of *Lucuma keule* ( $\equiv$  *Gomortega keule*), C. Le Quesne s.n. (CONC No. 149806). / Neotipo de *Lucuma keule* ( $\equiv$  *Gomortega keule*), C. Le Quesne s.n. (CONC No. 149806).



FIGURE 4. Neotype of *Lucuma spinosa* (= *Geoffroea decorticans*), R. Rodríguez 3233 (CONC no. 136753). / Neotipo de *Lucuma spinosa* (= *Geoffroea decorticans*), R. Rodríguez 3233 (CONC no. 136753).

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