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Notes about *Phaseolus pallar* Molina (Leguminosae-Papilionoideae-Phaseoleae): alas but at best a synonym!

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Abstract. A name given by Molina in 1782 and again in 1810 to a new *Phaseolus* species after a food legume crop grown for millennia mostly in the western part of the Quechua realm in South America refers to that crop (in the text of his essay) as well as to a weed (in his short Latin description), thus raising taxonomical uncertainty. Obviously, a taxonomical epithet cannot refer to two different botanical entities within the same genus. An example of that uncertainty was the naming of a specimen likely of *Macroptilium lathyroides* collected in northern Colombia and kept in the negative series of Berlin-Dahlem at the Field Museum. That crop spread so widely and fast that it received several names that Molina and *a fortiori* Philippi should have considered.

Keywords: Chile, crop migration, folk taxonomy, Lima bean, nomenclature.

INTRODUCTION

The Linnean taxonomy of New World crops turned complicated by their wide and rapid adoption within the century after 1492. For instance, chili pepper was registered in Indonesia in 1540 (Andrews 1999). The success of introduction of chili peppers in warm regions of Asia was such that Nikolaus von Jacquin described a *Capsicum chinense* after its putative home, although he acknowledged having seen it cultivated in the island of Martinica, West Indies (Jacquin 1776, p. 38). Here follows one more example: the Lima bean that according to Carl Ortwin Sauer (1950, p. 501) "predominates over the common bean in the majority of the American tropics". The purpose of this note is a clarification about *Phaseolus pallar* Molina, for which the consultation of Tropicos (2022) and the International Plant Names Index database (2022) yielded the abbreviated reference to Molina's essay referred to hereafter. There might be an additional justification for this clarification as, and because of the presence of a specific archive kept at the Field Museum of Natural History of Chicago (see below), the consultation about the type (https://collections-botany.fieldmuseum.org/taxonomy/58121) indicated: "status unknown".

RESULTS

Molina and the Phaseolus beans of Chile

The abbot Giovanni Ignazio Molina (Villa Alegre, Chile 1740 – Bologna, Italy 1829) was among the first scholars to report about the natural history of Chile. No wonder that his work raised interest – thus the various translations - among the European botanists during most of the 19th century (Charrier and Hervé 2011; Thulin et al. 2021). Molina (1782) in his essay 'Saggio sulla Storia naturale del Chili' indicated that the inhabitants were growing a bean (reported as "degul"; a somewhat similar name "dengüll" was reported by Ernst Wilhem de Mösbach 1992) before the arrival of the Spaniards. In addition, among the climbing varieties he mentioned the *pallari*, with seeds of about one inch in size, and then wrote the description of two new species *Phaseolus pallar* and *P. asellus* (p. 130 and p. 353). The descriptions were (and repeated as such in the second edition of 1810, p. 293):

- *Phaseolus asellus*: Phaseolus caule volubili, foliis sagittatis, seminibus globosis, and
- *Phaseolus pallar*: Phaseolus caule volubili, legum[inibus] pendulis cylindricis, torulosis.

In both publications by Molina there were no illustrations nor indications about reference specimens; these shortcomings resulted in many botanical confusions (see discussions by Lucien Hauman 1923 and Ivan Murray Johnston 1924). Efforts to track specimens of these two species at BOLO (acronyms of Herbaria according to Thiers 2023) – the likely place where Molina could have deposited specimens (Stafleu and Cowan 1981; Thulin et al. 2021) - were unsuccessful.

Several botanists mentioned these two species afterwards:

1813: Jean Louis Marie Poiret (p. 6) copied the descriptions of *P. asellus* and *P. pallar* by Molina under a subtitle "Espèces moins connues".

1825: Augustin Pyrame de Candolle (p. 396) under a headline "species non satis notae" merely reported the two species with the same brief descriptions by Molina.

1832: George Don (p. 356) in his treatment also had a group of "Species not sufficiently known". If his description of *P. asellus* is the translation of Molina's Latin description into English, he added a few words about leaflets ("obliquely-oblong, villous"), peduncles ("racemose, very long") and flowers ("small, remote") for *P. pallar*. For both species he added "native of Chili".

1837: George Bentham (p. 78) expressed doubts about both species mentioned at the very end of his treatment of *Phaseolus* and did not include them in any of his sections.

1841: Ernst Steudel (p. 316 and 317) mentioned the two species named by Molina. Without explanation, he related *P. pallar* with *P. pilosus* H.B.K. [= *Vigna lasiocarpa* (Mart. ex Benth.) Verdc.].

1846: Claudio Gay considered both *P. asellus* and *P. pallar* as belonging to *P. multiflorus* Willd. (= *P. coccineus* L., Piper 1926: 685). His brief descriptions of seeds (p. 207) would indicate a reference to cultivated materials. It is noteworthy that for *P. pallar* he also used the additional data given by Don but in Spanish. When he dealt with pulses and other food plants (1865, p. 103), Gay used the vernacular name 'pallar' for a bean grown in the northern provinces of Chile by the Amerindians before the conquest.

1847: David Dietrich (p. 1196) under "Species quoad sectiones dubiae" merely reproduced in Latin the descriptions given by Don.

1863: Rudolph Philippi (p. 703) considered *P. asellus* as a variety of common bean and *P. pallar* as a distinct species (see below). His reference to *Anales de la Universidad de Chile* 1860 page 654 for additional information is a noninformative dead-end (matters internal to the University of Chile).

1898: Karl Reiche briefly mentioned (p. 208) that *P. pallar* is from Peru (referring to Philippi, 1859) and that *P. vulgaris* coming from South America is known as a cultivated plant ('poroto').

1919: Edward Lewis Sturtevant indicated that both species defined by Molina were "cultivated by the natives before the Conquest". For *P. pallar*, he added that "the beans are half an inch long" (p. 422) (Hedrick 1972).

1923: Emile Hassler (p. 470) just mentioned the two species at the end of his revision of the genus *Phaseolus* for South America.

1926: Charles Vancouver Piper did not include specimens from Chile in his revision of *Phaseolus* and did not mention the two species defined by Molina.

In taxonomic treatments of *Phaseolus lunatus*, Liberty Hyde Bailey (1923, 1940) and Glen van Eseltine (1931) did not include *P. pallar* Molina, nor did Wil-

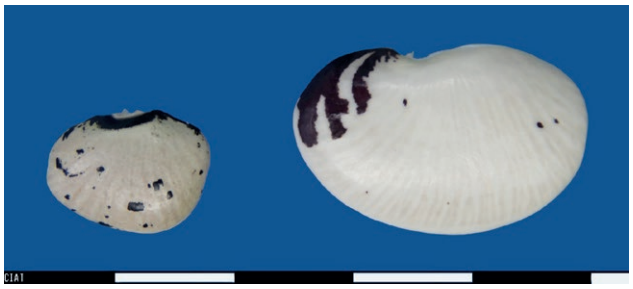

Figure 1. Seeds of two cultivated forms of Lima bean: the small-seeded types frequent in Mesoamerica (left) and the large-seeded types frequent in Pacific Central South America (right; scale bar in cm). The seed to the left belongs to a landrace named 'comba' and grown in 'Tierra caliente' of Guerrero, Mexico (G26291 in CIAT genebank, with 100-seed weight of 50g). The seed to the right belongs to a 'pallar' grown on the coast of Peru in Ica (G25496, also in CIAT genebank, with 100-seed weight of 159g).

liam Wylie Mackie (1943) and Egbert Westphal (1974). Recently, in his list about Molina´s new taxa, Hugo Gunckel-Luer (2020, p. 88) indicated *Phaseolus lunaris* L. (a typographical error?) for *Phaseolus pallar* Molina; the former is considered as introduced into Chile.

It seems that the vernacular name 'pallar' was widely used for a large-seeded cultivated food legume or pulse (Figure 1) in agricultural areas of the Pacific side of South America, from today central Ecuador down to central Chile (Figure 2). That crop seems to have been grown in the coastal area of Peru for five millennia (Kaplan and Lynch 1999). This name of Quechua origin (Academia 1995) and the range where constantly used seem almost matching with the expansion of the Quechua people and extension of Tawantisuyu (Inca empire) by the early 1500s (Lumbreras 1974). The vernacular name seems not known north of Quito (CIAT 2022), where various other names are used (Figure 2), nor south of the Coquimbo region in Chile (Philippi 1859). The name *pallar* appeared early in historic documents about Peru (Navarrete 1560); it is also reported by Hipólito Ruiz for the area around Lima in May 1778, while the name Lima bean was used by English-speaking seed merchants in the second half of the 18th century. In this regard, Thomas Jefferson, the third president of the United States, reported the planting of Lima beans on his property in Virginia over many years, for example on April 19, 1777 (Jefferson 1766-1824).

Molina used twice (1782, 1810) the name *pallar* thinking of that cultivated plant ("per i loro semi di un pollice incirca di grandezza", p. 130), without understanding that his scanty Latin description would better

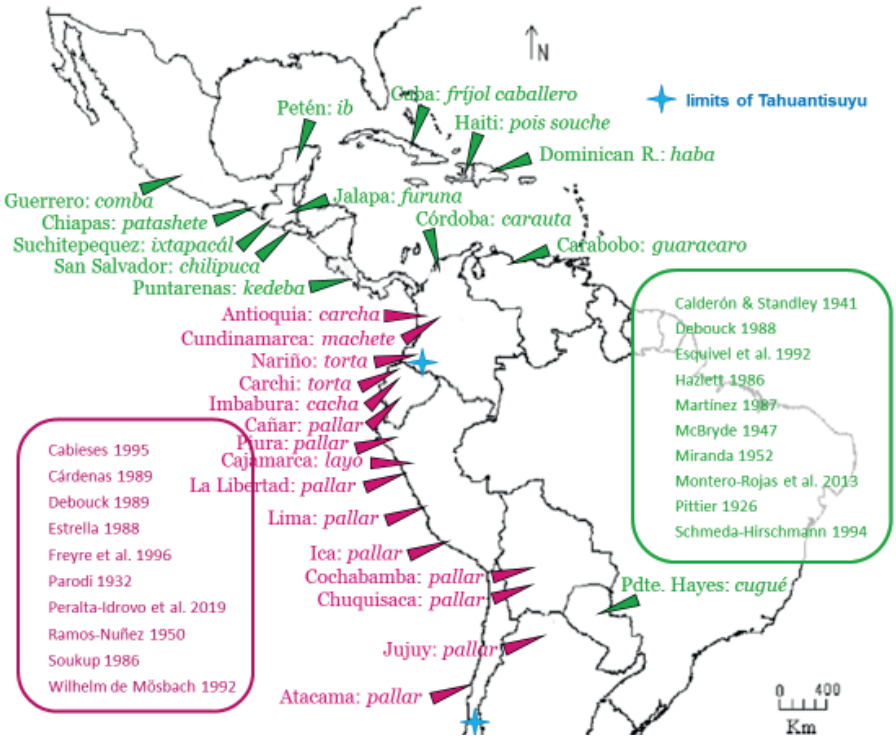

Figure 2. Some folk names given by native peoples to *P. lunatus* in the Neotropics. The names reported in purple refer to the large-seeded Lima beans, while those reported in green refer to the small-seeded Lima beans.

apply to that of a common weed of the legume family. Philippi (1859) realized that the pods of the *pallar* plant described by Molina were completely different from the ones of the plant grown by the native Chilean farmers and named by them '*pallar*'. Accordingly, he remade a description of the species (without indicating a reference specimen nor providing an illustration).

The case of 'specimen 2598'

In 1821, Carlo Giuseppe Bertero collected a legume plant (Figure 3 left) in the surroundings of Soledad, on the left bank (downstream) of the Magdalena River in Colombia. This hamlet, whose approximate coordinates would be 10º 54' lat. N, 74º 46' long. W, elev. 20 masl, is now part of the city of Barranquilla (dep. Atlántico). Shortly after, the specimen was received by Giovanni Battista Balbis, who passed it to Kurt Polycarp Sprengel, then working at Halle (Laura Guglielmone, personal communication, April 2022). Balbis had the opportunity to affix a label to the specimen, that reads: "Phaseolus pallar, Soledad, 2598". While the specimen was kept in Halle in the late 1820s, it seems that at least one botanist had the opportunity to see it: George Don and maybe also David Dietrich, because both added data to the original description by Molina.

The Herbarium of K. Sprengel was received at the Museum botanicum Berolinense (B) in 1890, and included in the collections of B. In 1929-1933, the types kept at Berlin-Dahlem were photographed by J.F. Macbride (then Staff member of the Field Museum of Natural History of Chicago), thanks to the support of the Rockefeller Foundation (Grimé and Plowman 1987). Fortunately,

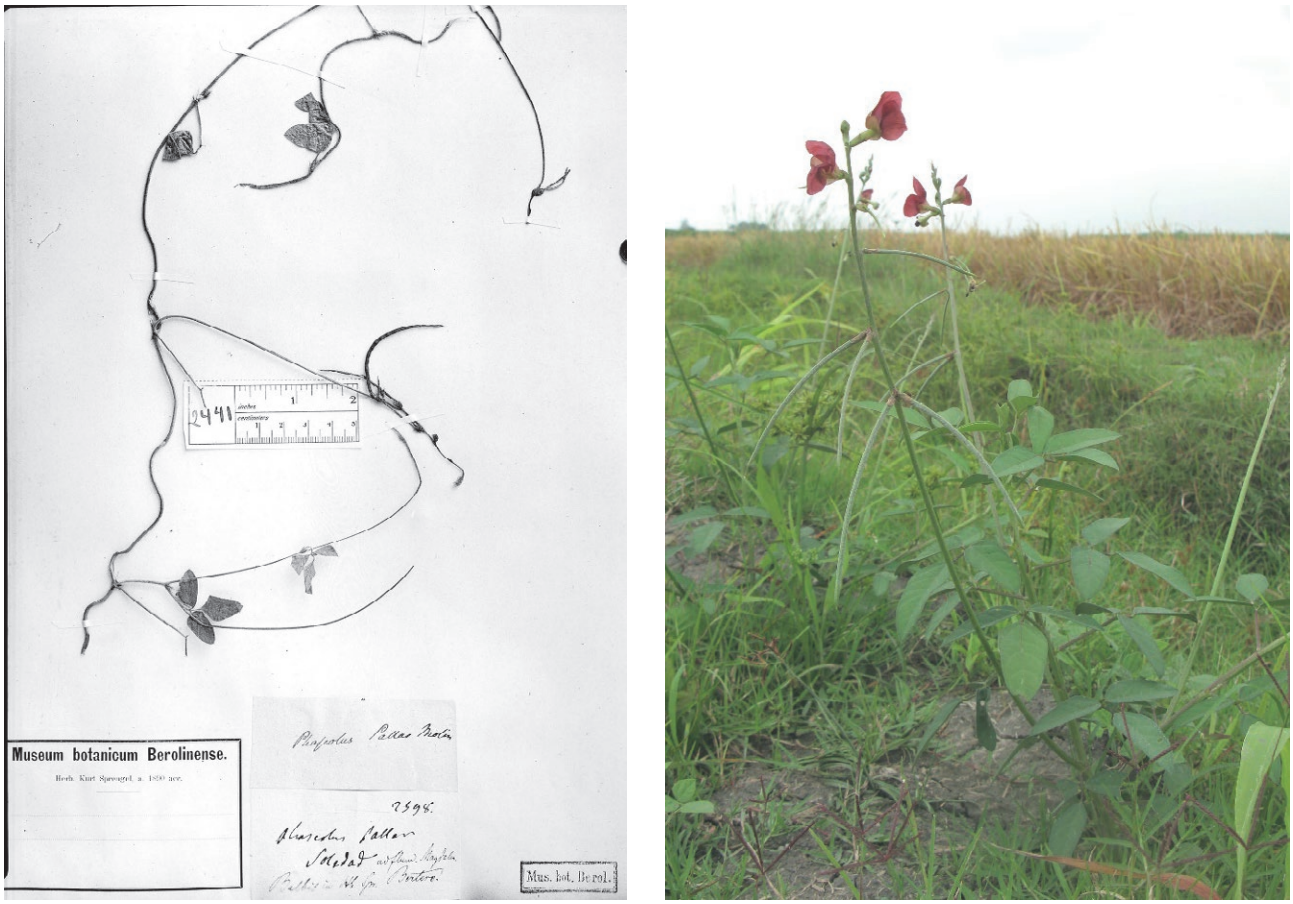

Figure 3. Left: photograph of the specimen 2598 collected by Bertero; that B/N photograph was likely taken by James Francis Macbride in 1929-1933. The lower central label is considered by the authors as the oldest label with the identification in bold face by G.B. Balbis. The upper central label has the identification possibly given by K. Sprengel. The third label in the lower left corner would have been affixed upon receipt at the Herbarium of Berlin (confirmed by the stamp in the lower right corner). Right: a young plant of *Macroptilium lathyroides* growing on a dyke at flowering (wings brick red) and early pod setting stages, a paddy field in the back (photograph taken in Palmira, Colombia, on September 24, 2022).

someone at B considering the specimen '2598' as a possible lectotype of *Phaseolus pallar* Molina (although dates do not match with the protologue) included it in the set of specimens to be photographed. By the way, the types of *Phaseolus augusti* Harms and of *Phaseolus pachyrrhizoides* Harms were included too, and these B/N photographs (numbered as 2434 and 2440, respectively) were key to solve another puzzle (Debouck 2021). The specimen '2598' was numbered '2441' in that series of B/N photographs and is currently available in the project 'Berlin negatives' at the Field website (https://collections-botany.fieldmuseum.org/list?search_fulltext=Phaseolus+pallar&family=&genus=&species=&country=&collector=&ss_ObjEcode=&type_status=&scientific_name=&ss_DarCollectorNumber=&catalog_number=&state_province=&ss_ColCollectionEventRefColSiteRef_PolPD1=&ss_ColCollectionEventRefColSiteRef_PolPD3=&collection_date=&project=&ss_EcoHabitatMicrohabitat=&ss_EcoSubstrate=&photo_neg_number=&ss_EcbUse=&sm_DesObjectName=&sort_by=solr_document&sort_order=ASC&items_per_page=25&f%5B0%5D=ss_CatCatalogSubset%3A%22Seed+Plants%22) and kindly reproduced here with permission. The specimen '2598' can be identified as *Macroptilium lathyroides* (L.) Urban (Figure 3 right). This taxon has been reported for the flora of Paraguay (Hassler 1923), many states of Brazil (Barbosa-Fevereiro 1986-1987) and the northern provinces of Argentina (Drewes 1999); according to the later author, it is also present in Bolivia and Chile. This plant seems to have benefited directly or indirectly from humans because it has also been reported from Australia, Hawaii, Java, Thailand, Vietnam, the Philippines (Maréchal et al. 1978). and the southeastern USA (Isely 1990). Perhaps this current huge distribution may indicate that this plant was present in the area of central Chile visited by Molina (about 30-40o latitude south: Figure 4 in Charrier and Hervé 2011, p. 452) in the 1780s, thus explaining his Latin description.

DISCUSSION

From the afore-mentioned compilation and elements available in the two editions of "Saggio" (1782 p. 130 and 1810 p. 293), two points seem worth discussing, perhaps along the intention by Molina and next the consequences of his scanty description. The first point relates to a legume cultivated for its seeds ("i loro semi di un pollice incirca di grandezza", 1782 p. 130), and grown from Santiago northwards into Chile and Peru (Philippi 1859; Gay 1865). Molina usefully fixed the prevailing vernacular name 'pallar' with a date and a location on the Pacific side of South America (Figure 2). Incidentally, by doing so, Molina anticipated the linguistic argument developed by Alphonse de Candolle (1883, p. 15 and following) when searching about the origin of cultivated plants. In this part of "Saggio" Molina clearly referred to the crop, likely native, but did not realize that this crop was already widely distributed into the tropics, possibly since and thanks to the crossing of the Strait of Magellan since 1520 (twelve years before the fall of the Inca empire; Moseley 1993). Charles de l'Ecluse (1601) reported one variety from Ethiopia, while Johannes Bauhin and John Henry Cherlero (1651) also mentioned large-seeded types from Africa. Linnaeus (1737, p. 359) did the description of *P. inamoenus* (the epithet could be translated as 'continuously beautiful', namely because of its seeds? To note, better described in 1737 than in *Species Plantarum* of 1753 and its second edition of 1763!) on a plant grown in the Clifford Garden at Hartekamp, Holland, from seeds obtained from Africa. In this regard, Henri Perrier de la Bathie (1923) reported two groups of Lima beans present in Madagascar: one with small and toxic seeds, and one with large white seeds known as *kabaro* or Pois du Cap and present as early as 1620. This bean went at least as far as the Tonkin where it was described as *Phaseolus tunkinensis* Lour. (de Loureiro 1790). By 1810, Molina had recovered all his notes (Charrier and Hervé 2011) and could have anticipated that it was not a minor crop, and thus already named in the scientific literature.

The second point relates to the Latin description provided by Molina (the same in the two versions of "Saggio"), namely in relation to the pod that clearly cannot contain seeds of one inch each (and with 2-3 seeds per pod). It seems that Rudolph Philippi was the first in noting this impossibility and thus changed and completed the description of *P. pallar* (1859, p. 363) as a crop. But there was no need to redefine *P. pallar*. The evidence about its spread and adoption in warm regions had further increased since the "Saggio": at that time this pulse was grown in India (as *Phaseolus maximus* Roxb.; Roxburgh 1832), Jamaica (as *Phaseolus limensis* Macfad.; Macfadyen 1837), the Philippines (as *Phaseolus vexillatus* Blanco; Blanco 1837), and in warm parts of the United States: a cultivar named Large Lima was reported there in 1822 (Jarvis 1908). Again in 1859 the previous records of names and places were poorly surveyed. As aptly explained by van Eseltine (1931) and Mackie (1943), these species names – and others – traced back to *Phaseolus inamoenus* L., the large-seeded form of *P. lunatus* L.

That said, coming back to the original Latin description by Molina and on that basis, Balbis did in the 1820s

an identification not in contradiction with the elements provided by the abbot when he identified the specimen 2598 of Bertero as *P. pallar*, although he could have referred to *P. lathyroides* L. instead. The later taxon was described in 1763 and reported from Jamaica (Sloane 1696, p. 71; Linnaeus 1763, p. 1018).

The two parallel botanical stories, complicated by poor descriptions, lack of types or illustrations, absence of reference to specimens and incomplete studies of previous works, apparently ended up on the one hand in 1910 when Julien Costantin and Désiré Bois considered *P. pallar* as belonging to *P. lunatus*. Their conclusion is based on morphological characters of flowers and seeds, using Peruvian materials (reported to them as *pallares*, plural of *pallar*), including archaeological seeds, but with no reference to 'specimen 2598'. On the other hand, when reassessing the reports by archaeologists such as Alphonse-Trémeau de Rochebrune (1879) and Ludwig Wittmack (1879), Hermann Harms (1922), again without referring to 'specimen 2598', wisely concluded: "But it is not sure at all of which species spoke Molina. It is doubtful that he really understood *Ph. Pallar* as *lunatus* because the description of the legumes does not fit. The name *Ph. Pallar* Molina has to be let away because it cannot be totally identified".

From a nomenclatural perspective, the epithet 'pallar' based on the Quechuan vernacular name for the cultivated pulse was effectively published as evidenced by the numerous works afore mentioned referring to it (article 29.1 of the Shenzhen Code; Turland et al. 2018). Apparently, Molina meant the crop but made a scanty Latin description incompatible with the pods of that crop, thus raising confusion (and with no illustration nor any reference specimen to help with the taxonomic delimitation). Specimen 2598 exemplified that confusion as two botanists, G.B. Balbis and K. Sprengel, considered it as *P. pallar*, while it was more accurately attributed to *P. lathyroides* (now within *Macroptilium* after the work of Ignatz Urban of 1928). The situation of having a single name referring to two different botanical entities within the same genus (a situation that must be avoided: Article 34, de Candolle 1867, p. 22) casts doubts whether *P. pallar* was validly published. The designation '*pallar*' has thus no status under the Code (article 12.1 of the Shenzhen Code), and cannot have a type (Turland 2013, p. 47). While one can regret the missed recognition to the Amerindians for that long and wide impacting domestication, the taxonomic use of *P. pallar* was in addition untenable because of the overlooking of so many previous records (Principle 4 of the Code).

Botanists were of different opinion about the small and the large-seeded Lima beans (as cultivated; Figure 1), some arguing about two different species (e.g. Bailey 1923, 1940), while others considered them as one species (Piper 1926; van Eseltine 1931; Mackie 1943; Maréchal et al. 1978; Freytag and Debouck 2002). The finding of wild populations in the Andes of southwestern Ecuador and northwestern Peru (Debouck et al. 1987) opened another perspective on the independent domestication of two gene pools (Motta-Aldana et al. 2010). While there are some differences between the wild forms in existence for one million years (Delgado-Salinas et al. 2006) in contrast to the cultivated forms in existence possibly for several thousands of years (Kaplan and Lynch 1999), these differences do not exceed those found between gene pools of wild forms within the common bean (Caicedo et al. 1999; Serrano-Serrano et al. 2010). Further, in spite of significant progress over the last two decades, it might be premature to inflate the naming of Lima bean variants, since another gene pool A2 has been found in wild forms in the Colombian Andes (Toro-Chica et al. 1993; Garcia et al. 2021). Given this, the best solution for nomenclatural stability at this time might still be in using *P. lunatus*.

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REFERENCES

Academia Mayor de la Lengua Quechua. 1995. Diccionario Quechua- Español. Cuzco, Perú. 928p.

Andrews, J. 1999. The pepper trail: history and recipes from around the world. The University of North Texas Press. Denton, Texas, USA. 261p.

Bailey LH. 1923. Cultigens, and transfers in nomenclature. Phaseolus. Gentes Herbarum. 1(3): 121-125.

Bailey LH. 1940. Article 28. *Phaseolus lunatus* and relatives. Gentes Herbarum. 4(9): 336-341.

Barbosa-Fevereiro VP. 1986-1987. *Macroptilium* (Bentham) Urban do Brasil (Leguminosae- Faboideae- Phaseoleae- Phaseolinae). Arquivos do Jardim Botânico do Rio de Janeiro. 28: 109-180.

Bauhin J, Cherlero J-H. 1651. Historia plantarum universalis nova et absolutissima cum consensu et dissensu circa eas. Tome 2, part 17. F.L. Graffenried. Yverdon, Switzerland. 1108p.

Bentham G. 1837. Commentationes de leguminosarum generibus. J.P. Sollingeri. Vienna, Austria. Pp. 72-78.

Blanco FM. 1837. Flora de Filipinas, según el Sistema sexual de Linneo. Candido López, Imprenta de Santo Tomás. Manila, The Philippines. 887p.

Cabieses F. 1995. Cien siglos de pan: 10,000 años de alimentación en el Perú. Consejo Nacional de Ciencia y Tecnología. Lima, Perú. 273p.

Caicedo AL, Gaitán E, Duque MC, Toro-Chica O, Debouck DG, Tohme J. 1999. AFLP fingerprinting of *Phaseolus lunatus* L. and related wild species from South America. Crop Science. 39 (5): 1497-1507.

Calderón S., Standley PC. 1941. Flora salvadoreña – Lista preliminar de plantas de El Salvador. 2da edición. Imprenta Nacional. San Salvador, El Salvador, C.A. Pp. 149-151.

Cárdenas M. 1989. Manual de plantas económicas de Bolivia. 2da edición. Editorial Los Amigos del Libro. Cochabamba, Bolivia. 291p.

Charrier R, Hervé F. 2011. El abate Juan Ignacio Molina: una vida dedicada a la historia natural y civil del reino de Chile. Revista de la Asociación Geológica Argentina. 68(3): 445-463.

CIAT. 2022. *Phaseolus* genebank at the International Center for Tropical Agriculture, Cali, Colombia : passport data of *Phaseolus* accessions. Available from: https://ciat.cgiar.org/what-we-do/crop-conservation-and-use/; accessed on: 27 August 2022.

Costantin J, Bois D. 1910. Sur les graines et tubercules des tombeaux péruviens de la période incasique. Revue Générale de Botanique. 22(258): 242-265.

Debouck DG. 1988. *Phaseolus* germplasm collection in central and eastern Guatemala. The World Conservation Union (IUCN). Gland, Switzerland. Mimeographed, 36 p. (in Spanish).

Debouck DG. 1989. Recolección de germoplasma de *Phaseolus* en el norte del Perú. Centro Internacional de Agricultura Tropical, Cali, Colombia. Mimeographed, 29 Pp. (in Spanish).

Debouck DG. 2021. *Phaseolus* beans (Leguminosae, Phaseoleae): a checklist and notes on their taxonomy and ecology. Journal of the Botanical Research Institute of Texas. 15(1): 73-111.

Debouck DG., Liñan-Jara JH, Campana-Sierra A, De la Cruz-Rojas JH. 1987. Observations on the domestication of *Phaseolus lunatus* L. FAO/IBPGR Plant Genetic Resources Newsletter. 70: 26-32.

de Candolle AP. 1825. Prodromus Systematis Naturalis Regni Vegetabilis. Pars II. Treuttel & Würtz. Paris, France. 644p.

de Candolle A. 1867. Lois de la nomenclature botanique. V. Masson et Fils, libraires. Paris, France. 60p.

de Candolle A. 1883. Origine des plantes cultivées. Librairie Germer Baillière et Cie. Paris, France. 378p.

de l'Ecluse Ch. 1601. Aulae quondam familiaris, rariorum plantarum historia. Johannes Moretus, Plantijn. Antwerp, Belgium. 736p.

Delgado-Salinas A, Bibler R, Lavin M. 2006. Phylogeny of the genus *Phaseolus* (Leguminosae): a recent diversification in an ancient landscape. Systematic Botany. 31(4): 779-791.

de Loureiro J. 1790. Flora cochinchinensis: sistens plantas in regno Cochinchina nascentes. Tomus II. Ulyssipone. Lisboa, Portugal. Pp. 357-744.

de Rochebrune A-T. 1879. Recherches d'ethnographie botanique sur la flore des sépultures péruviennes d'Ancon. Actes de la Société Linnéenne de Bordeaux. 33: 343-358.

Dietrich D. 1847. Synopsis plantarum seu enumeratio systematica plantarum plerumque adhuc cognitarum cum differentiis specificis et synonymis selectis ad modum Persoonii elaborata. Sectio Quarta. Bernhard Friedrich Voigth. Weimar, Germany. Pp. 731-1692.

Don G. 1832. A general system of gardening and botany containing a complete enumeration and description of all plants hitherto known. JG & F Rivington. London, England. Vol. 2. Pp. 349-356.

Drewes S. 1999. *Macroptilium*. *in*: "Catálogo de las plantas vasculares de la República Argentina II. Fabaceae-Zygophyllaceae" In: Zuloaga FO, Morrone O. (eds.). Missouri Botanical Garden Press. St. Louis, Missouri, U.S.A. Pp. 693-694.

Esquivel M, Knüpffer H, Hammer K. 1992. Inventory of the cultivated plants. In: "… y tienen faxones y fabas muy diversos de los nuestros … Origin, evolution and diversity of Cuban plant genetic resources". In: Hammer K, Esquivel M, Knüpffer H. (eds.). Volume 2. Chapter 14. Institut für Pflanzengenetik und kulturpflanzenforschung. Gatersleben, Germany. Pp. 213-454.

Estrella E. 1988. El pan de América. Ediciones Abya-Yala. Quito, Ecuador. 390p.

Field Museum of Natural History. 2022. Botanical collections: taxonomy. Accessed on 13 April 2022 at https://collections-botany.fieldmuseum.org/taxonomy/58121 and re-checked on 2 October 2022.

Freyre R, Ríos R, Guzmán L, Debouck DG, Gepts P. 1996. Ecogeographic distribution of *Phaseolus* spp. (Fabaceae) in Bolivia. Economic Botany. 50(2): 195-215.

Freytag GF, Debouck DG. 2002. Taxonomy, distribution, and ecology of the genus *Phaseolus* (Leguminosae-Papilionoideae) in North America, Mexico and Central America. SIDA Botanical Miscellany. 23: 1-300.

Garcia T, Duitama J, Smolenski-Zullo S, Gil J, Ariani A, Dohle S, Palkovic A, Skeen P, Bermudez-Santana CI, Debouck DG, Martínez-Castillo J, Gepts P, Chacón-Sánchez MI. 2021. Comprehensive genomic resources related to domestication and crop improvement traits in Lima bean. Nature Communications. 12(702): 1-17.

Gay C. 1846. Historia física y política de Chile. Botánica. Tomo segundo. Museo de Historia Natural de Santiago. Santiago, Chile. 534p.

Gay C. 1865. Historia física y política de Chile. Agricultura. Tomo segundo. Museo de Historia Natural de Santiago. Santiago, Chile. 450p.

Grimé WE, Plowman T. 1987. Type photographs at the Field Museum of Natural History. Taxon 36(2): 425-426.

Gunckel-Luer H. 2020. Plantas chilenas descritas como nuevas por Juan Ignacio Molina y sus concordancias con la nomenclatura actual. Chloris Chilensis. 23(2): 80-93.

Harms H. 1922. List of the plant rests found in tumbs of ancient Peru. In: "Dissertation Eduard Seler", Lehmann W. (ed.). Strecker und Schröder. Stuttgart, Germany. Pp. 1-25.

Hassler E. 1923. Revisio specierum austro-americanarum generis *Phaseoli* L. Candollea. 1: 417-472.

Hauman L. 1923. Notes sur le saule sud-américain et sur la valeur des espèces botaniques décrites par Molina. Physis (Buenos Aires). 7(24): 67-81.

Hazlett DL. 1986. Ethnobotanical observations from Cabecar and Guaymi settlements in Central America. Economic Botany. 40(3): 339-352.

Hedrick UP. (ed.). 1972. Sturtevants's edible plants of the world [of 1919]. Dover Publications Inc. New York, New York, USA. 686p.

International Plant Names Index. 2022. Accessed on 5 January 2022 at http://www.ipni.org/ and re-checked on 15 September 2022.

Isely D. 1990. Vascular flora of the southeastern United States. Volume 3, part 2. Leguminosae (Fabaceae). The University of North Carolina Press. Chapel Hill, North Carolina, USA. 258p.

Jacquin NJ. 1776. Hortus botanicus vindobonensis, seu plantarum rariorum, quae in horto botanico vindobonensi. Volume 3. Joseph Michael Gerold. Wien, Austria. 154p.

Jarvis CD. 1908. American varieties of beans. Cornell University Agricultural Experiment Station Bulletin. 260: 143-255.

Jefferson Th. 1766-1824. Garden Book. Page 20. Thomas Jefferson Papers: An Electronic Archive. Massachusetts Historical Society, Boston, Massachusetts, USA. 2003. http://www.thomasjeffersonpapers.org/. Accessed 13 August 2022 and re-checked on 15 September 2022.

Johnston IM. 1924. Taxonomic records concerning American spermatophytes. 4. On the validity of Molina's scientific names. Contributions from the Gray Herbarium of Harvard University. New series. 70: 90-92.

Kaplan L, Lynch T. 1999. *Phaseolus* (Fabaceae) in archaeology: AMS radiocarbon dates and their significance for pre-Colombian agriculture. Economic Botany. 53 (3): 261-272.

Lamarck M, Poiret JLM. 1813. Encyclopédie méthodique. Botanique. Supplément, tome 3. H. Agasse. Paris, France. 780p.

Linnaeus C. 1737. Hortus Cliffortianus. Plantas exhibens quas in hortistam vivis quam siccis, Hartecampi in Hollandia. J. Wandelaar. Amsterdam, The Netherlands. 530p.

Linnaeus C. 1753. Species Plantarum. Tomus II. A facsimile (1957-1959) of the first edition. Ray Society. London, England. Pp. 723-725.

Linnaeus C. 1763. Species plantarum, exhibentes plantas rite cognitas, ad genera relatas. Editio secunda. Tomus II. Impensis direct. Laurentii Salvii. Stockholm, Sweden. Pp. 1016-1018.

Lumbreras LG. 1974. The peoples and cultures of ancient Peru. Smithsonian Institution Press. Washington, D.C., USA. 248p.

Macfadyen J. 1837. The Flora of Jamaica: a description of the plants of that island, arranged according to the natural orders. Longman, Orme, Brown, Green & Longmans. London, United Kingdom. 351p.

Mackie WW. 1943. Origin, dispersal, and variability of the Lima bean, *Phaseolus lunatus*. Hilgardia. 15(1): 1-24.

Maréchal R, Mascherpa J, Stainier F. 1978. Etude taxonomique d'un groupe complexe d'espèces des genres *Phaseolus* et *Vigna* (Papilionaceae) sur la base de données morphologiques et polliniques, traitées par l'analyse informatique. Boissiera. 28: 1-273.

Martínez M. 1987. Catálogo de nombres vulgares y científicos de plantas mexicanas. Fondo de Cultura Económica. Ciudad de México, D.F., México. 1247p.

McBryde FW. 1947. Cultural and historical geography of southwest Guatemala. Smithsonian Institution Publications. 4: 1-184.

Miranda F. 1952. La vegetación de Chiapas. Primera parte. Ediciones del Gobierno del Estado. Tuxtla Gutiérrez, Chiapas, México. 426p.

Molina GI. 1782. Saggio sulla Storia naturale del Chili. Stamperia de San Tommaso d'Aquino. Bologna, Italia. 367p.

Molina GI. 1810. Saggio sulla Storia naturale del Chili. 2da edizione. Fratelli Masi & Co. Bologna, Italia. 306p.

Montero-Rojas M., Ortiz M, Beaver JS, Siritunga D. 2013. Genetic, morphological and cyanogen content evaluation of a new collection of Caribbean Lima bean (*Phaseolus lunatus* L.) landraces. Genetic Resources & Crop Evolution. 60(8): 2241-2252.

Moseley ME. 1993. The Incas and their ancestors. Thames and Hudson Ltd. London, England. 272p.

Motta-Aldana JR., Serrano-Serrano ML, Hernández-Torres J, Castillo-Villamizar G, Debouck DG, Chacón-Sánchez MI. 2010. Multiple origins of Lima bean landraces in the Americas: evidence from chloroplast and nuclear DNA polymorphisms. Crop Science. 50(5): 1773-1787.

Navarrete DST. 1560. Lexicon o vocabulario de la lengua general del Perú. Francisco Fernández de Córdoba. Valladolid, Spain. 179p.

Parodi LR. 1932. Notas preliminares sobre plantas sudamericanas cultivadas en la Provincia de Jujuy. Anales de la Sociedad Argentina de Estudios Geográficos. 4(1): 19-28.

Peralta-Idrovo E, Peralta-Idrovo F., Peralta-Idrovo H. 2019. Lúdica y juegos con el fréjol en Ecuador, Perú y Bolivia. Letra Sabia. Quito, Ecuador. 213p.

Perrier de la Bathie H. 1923. Sur le Pois du Cap (*Phaseolus lunatus*). 1. Les *Phaseolus* de Madagascar. Revue de Botanique Appliquée et d'Agriculture Coloniale. 27: 751-753.

Philippi RA. 1859. Ueber die Chilenische Palme und den Pallar Molina's. Botanische Zeitung. 43: 361-364.

Philippi RA. 1863. Comentario sobre las plantas chilenas descritas por el abate D. Juan Ignacio Molina, por el Doctor R. A. Philippi. Anales de la Universidad de Chile 22(6): 699-741.

Piper CV. 1926. Studies in American Phaseolinae. Contributions from the U.S. National Herbarium. 22(9): 663-701.

Pittier H. 1926 (1978). Manual de las plantas usuales de Venezuela y su suplemento. Fundación Eugenio Mendoza. Caracas, Venezuela. 478p.

Ramos-Nuñez G. 1950. Apuntes sobre el fríjol en Colombia (*Phaseolus vulgaris* L.). Agricultura Tropical (Bogotá). 8: 1-29.

Reiche K. 1898. Flora de Chile. Tomo Segundo. Imprenta Cervantes. Santiago, Chile. 397p.

Roxburgh W. 1832. Flora Indica or description of Indian plants. 2nd edition. Carey. Serampore, India. Vol. 3: 287-317.

Ruiz H. 1777-1788. Relación del viaje hecho a los reynos del Perú y Chile. Transcribed by J. Jaramillo-Arango. [Translated by R.E. Schultes and M.J. Nemry von Thenen de Jaramillo-Arango]. 1998. Timber Press. Portland, Oregon, USA. 357p.

Sauer CO. 1950. Cultivated plants of South and Central America. In: "Handbook of South American Indians, Vol. 6. Physical anthropology, linguistics and cultural geography of South American Indians", J.H. Steward (ed.). Smithsonian Institution. Washington, D.C., USA. Pp. 487-543.

Schmeda-Hirschmann G. 1994. Plant resources used by the Ayoreo of the Paraguayan Chaco. Economic Botany. 48 (3): 252-258.

Serrano-Serrano ML., Hernández-Torres J, Castillo-Villamizar G, Debouck DG, Chacón-Sánchez MI. 2010. Gene pools in wild Lima beans (*Phaseolus lunatus* L.) from the Americas: evidences for an Andean origin and past migrations. Molecular Phylogenenetics and Evolution. 54(1): 76-87.

Sloane H. 1696. Catalogus plantarum quae in insula Jamaica sponte proveniunt, vel vulgò coluntur, cum earundem synonymis & locis natalibus. Pars prima. Impensis D. Brown, Cygni & Bibliorum. London, England. 232p.

Soukup J. 1986. Vocabulario de los nombres vulgares de la flora peruana y catálogo de los géneros. Editorial Salesiana. Lima, Perú. 436p.

Stafleu FA, Cowan RS. 1981. Taxonomic literature: a selective guide to botanical publications and collections with dates, commentaries and types. Volume 3: Lh-O. Second edition. Bohn, Scheltema and Holkema. dr W. Junk b.v. Publishers. The Hague, The Netherlands. Pp. 548-550.

Steudel E. 1841. Nomenclator botanicus seu synonymia plantarum universalis. Editio secunda. J.G. Cotta. Stuttgart, Germany. 810p.

Thiers BM. 2023 (continuously updated). Index Herbariorum: a global directory of public herbaria and associated staff. New York Botanical Garden's Virtual Herbarium. New York, USA. Accessed on 14 January 2023 at http://sweetgum.nybg.org/science/ih/ and re-checked on 22 January 2023.

Thulin M., Marticorena A., Swenson U. 2021. Molina's species of *Lucuma*: neotypifications and nomenclatural implications. Gayana Botanica. 78 (2): 162-171.

Toro-Chica O, Lareo L, & Debouck DG. 1993. Observations on a noteworthy wild Lima bean, *Phaseolus lunatus* L., from Colombia. Annual Report of the Bean Improvement Cooperative. USA. 36: 53-54.

Tropicos. 2022. Vascular plants of the Americas. Missouri Botanical Garden, St. Louis, USA. Accessed on 5 January 2022 at http://www.tropicos.org/ and re-checked on 15 September 2022.

Turland NJ. 2013. The Code decoded - A user's guide to the International Code of Nomenclature for algae, fungi and plants. Regnum Vegetabile 155. Koeltz Scientific Books. Königstein, Germany. 169p.

Turland NJ, Wiersema JH, Barrie FR, Greuter W, Hawksworth DL, Herendeen PS, Knapp S, Kusber W-H, Li D-Z, Marhold K, May TW, McNeill J, Monro AM, Prado J, Price MJ, Smith GF. 2018. International code of nomenclature for algae, fungi, and plants (Shenzhen Code) adopted by the Nineteenth International Botanical Congress Shenzhen, China, July 2017. Regnum Vegetabile. 159. Koeltz Botanical Books. Glashütten, Germany. 228p.

Urban I. 1928. Plantae cubenses novae vel rariores a clo. Er. L. Ekman lectae. IV. Symbolae Antillanae. 9 (4): 433-568.

van Eseltine GP. 1931. Variation in the Lima bean, *Phaseolus lunatus* L., as illustrated by its synonymy. New York State Agricultural Experiment Station Technical Bulletin. 182: 3-24.

Westphal E. 1974. Pulses in Ethiopia, their taxonomy and agricultural significance. Agricultural Research Reports Wageningen. The Netherlands, 815: 129-176.

Wilhelm de Mösbach E. 1992. Botánica indígena de Chile. Editorial Andrés Bello. Santiago de Chile, Chile. 140p.

Wittmack L. 1879. [no title]. Sitzung vom 19 December 1879. Verhandlungen des Botanischen Vereins für der Provinz Brandenburg. 62: 176-184.