















PERSPECTIVE ARTICLE

Towards a collaborative approach to the systematics of *Ipomoea*: A response to the “Rebuttal to (2786) Proposal to change the conserved type of *Ipomoea*, nom. cons. (Convolvulaceae)”

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DOI <https://doi.org/10.1002/tax.13081>

Abstract A proposal to change the conserved type of *Ipomoea* was published in December 2020, and recommended by the Nomenclature Committee in 2023. This was done in the light of the possible negative consequences for a name change in the crop sweetpotato, which risk our proposal would significantly minimize. Recently, Muñoz-Rodríguez & al. have published a rebuttal to this proposal, which we respond to here. The objections raised by these authors focus as much on the expertise and credibility of our group of authors as on the merits of our arguments. In this “rebuttal to the rebuttal”, we respond to the scientific questions raised, highlight demonstrated misinterpretation of the specialised literature relevant to this discussion and counter the assertion that a reclassification of Ipomoeae is impossible given existing evidence. While the currently recognised genera of Ipomoeae are not all monophyletic, the proposal to change the conserved type of *Ipomoea* is a necessary step that will allow exploring an improved classification for the tribe Ipomoeae, either in the form of a better recircumscription of the genera or an efficient infrageneric classification for *Ipomoea*. Previously published literature has not advocated for the integration of all genera into a single genus, as Muñoz-Rodríguez and co-authors have incorrectly suggested, and instead have recommended a reanalysis of the high morphological diversity of the group

in the context of expanded phylogenetic studies, with the possible maintenance of some of the existing genera. We believe that, in a concerted collaborative approach and with the contribution of experts from different regions and scientific backgrounds, an improved classification of Ipomoeae that integrates the principles of monophyly and diagnosability may soon be achieved, and until when some uncertainty may need to be accommodated, with the added reassurance that, regardless of the direction of future systematic rearrangements, the stability of the scientific name of sweetpotato would be preserved.

Keywords Convolvulaceae; *Ipomoea*; Ipomoeae; rebuttal

■ INTRODUCTION

On 29 May 2023, a “Rebuttal to ‘(2786) Proposal to change the conserved type of *Ipomoea*, nom. cons. (Convolvulaceae)’”, by Pablo Muñoz-Rodríguez, John R.I. Wood, Tom Wells, Tom Carruthers, Alex Sumadijaya and Robert W. Scotland was published in *Taxon* (Muñoz-Rodríguez & al., 2023).

This publication presents an expression of disagreement with our previously published proposal to change the type of *Ipomoea* L. from *I. pes-tigridis* L. to *I. triloba* L. (Eserman & al., 2020), which was published in December 2020, and recommended by the Nomenclature Committee in February 2023, with the acknowledgement that “Regardless of the geographic distribution of the species that would lose the familiar generic name—for those who choose to adopt this division—the enormous economic, cultural, and scientific importance of *I. batatas* militates in favor of keeping the name *Ipomoea* for its half of the group. Therefore, conservation is recommended” (Applequist, 2023).

While we appreciate the opportunity for scientific discourse and welcome differing opinions on our proposal to change the type of *Ipomoea* (Eserman & al., 2020), we are compelled to address both the derogatory tone towards our group of authors as well as the rebuttal’s scientific inconsistencies resulting from misinterpretation of existing literature.

■ REPLY AND DISCUSSION

Muñoz-Rodríguez & al. (2023: 644) state that “the majority [of the authors] have little to no experience of taxonomic or systematic research on *Ipomoea*”. This condescending assertion dismisses the sizeable contribution to *Ipomoea* and Convolvulaceae systematics and taxonomy the authors have collectively produced over decades, especially on sweetpotato (*I. batatas* (L.) Lam.) and wild relatives. The many authors of our proposal (Eserman & al., 2020) are established nationally and internationally as experts in this field, and this is reflected in both their credentials and their publication records: in total, the authors (not “signatories”, as incorrectly asserted) of our proposal have produced more than 100 publications on taxonomy and systematics of *Ipomoea*, sweetpotato, and wild relatives across the global distribution of the Ipomoeae, and at a range of taxonomic scales: species, genus and family level.

Furthermore, taxonomy is integral to studies of evolution, agriculture, ecology, and many more fields, and considering the impact of the change in conserved type of *Ipomoea* for a range of fields, we strategically included contributions from

experts in a variety of disciplines, all of whom have a strong stake in *Ipomoea* taxonomy. As such, our proposal integrates contributions from experts on taxonomy and systematics of the tribe Ipomoeae, from different career stages and regions of the world where the group is most biodiverse, combined with viewpoints from experts in other fields of *Ipomoea* research, such as genetics, breeding, and ecology. Additionally, we incorporated the view of experts on the taxonomy of other plant groups who have faced similar problems (Eserman & al., 2020). These experts added diverse perspectives to the proposal and demonstrated its importance beyond taxonomy and systematics alone.

With this point addressed, we now discuss the scientific arguments raised by Muñoz-Rodríguez and co-authors. First, the authors of the rebuttal raise the inaccurate claim that the consequences of changing the type of *Ipomoea*, both in favour and against, have not been thoroughly discussed. Their claim is incorrect because specific “for” and “against” points were made in the original proposal (Eserman & al., 2020). We specifically outline the consequences of splitting *Ipomoea* into smaller genera were the type of *Ipomoea* to remain as *I. pes-tigridis* (in the Argyreinae clade), specifically the number of potential name changes of economically and scientifically important species, e.g., *I. batatas*, and the destabilizing effect these name changes would have on the broader scientific and agricultural community for those who choose to adopt this division. Further, we present consequences of accepting the proposal to change the type to *I. triloba* (in the Astripomoeinae clade), specifically, the possibility to develop a new classification of the tribe Ipomoeae while protecting the name of cultivated sweetpotato.

Second, Muñoz-Rodríguez & al. (2023: 644) assert that the proposal “is unnecessary because all previous attempts to recognise segregate genera within *Ipomoea* have been unsuccessful” and that “the proposal implies the continued acceptance and extension of a system of non-monophyletic and non-diagnosable genera nested within several hundreds of species of *Ipomoea*”. We wholeheartedly disagree with these assertions and contend that the failures of previous attempts to segregate diagnosable, monophyletic genera within *Ipomoea* should not limit potential future scientific progress. To be clear, we do not support a system of non-monophyletic and non-diagnosable genera; suggesting that we do is a gross mischaracterization and misinterpretation of our proposal. Rather, our proposal is meant to support future taxonomic and systematic studies in the tribe Ipomoeae, with the acknowledgement that skilled taxonomists will continue to grapple with this tangled clade. Additionally, diagnosable infra-generic groups have been proposed within *Ipomoea*, which have

later proved to be monophyletic in studies of molecular phylogenetics and have the potential to be resurrected as separate genera (e.g., the *Arborescens* group, McPherson, 1979, 1981; *Calonyction*, Gunn, 1972; McDonald, 1993; *Stictocardia*, Austin & Demissew, 1997). Arguing for the “impossibility” of reconciling monophyly and diagnosability in Ipomoeae is, in our view, a simplistic view that dismisses key available literature in this taxonomic group and falls short of further exploring effective solutions, e.g., a more adequate generic circumscription, or a comprehensive infrageneric classification.

Third, multiple factual errors are presented in the rebuttal by Muñoz-Rodríguez & al. (2023). The authors incorrectly assert that the clade names “Astripomoeinae” and “Argyreinae” were based on a phylogenetic analysis of Ipomoeae with reduced sampling by Eserman & al. (2014). However, the clade names were first presented by Stefanović & al. (2003) in a study to classify the family Convolvulaceae based on clades resolved in previous molecular phylogenetic studies (i.e., McDonald & Mabry, 1992; Wilkin, 1999; Miller & al., 1999, 2002; Manos & al., 2001; Stefanović & al., 2002). Furthermore, they state (p. 645) that “Only by using a poorly sampled and cherry-picked phylogeny of *Ipomoea* in the broad sense, not including any ‘Argyreinae’ *Ipomoea* species (as by Simões & al., 2022), can an artificial split between *Ipomoea* and the current non-monophyletic segregate genera be misleadingly portrayed.” Simões & al. (2022) not only included four species of the *Argyreinae* clade, but also the study was not designed to assess relationships within the tribe Ipomoeae but to provide a backbone phylogeny of the entire Convolvulaceae family. Considering that the tribe Ipomoeae has been shown to be monophyletic for over 20 years (Manos & al., 2001; Stefanović & al., 2002), the sampling within this tribe was not relevant to the overall relationships at family level that this study was attempting to grasp. The split between these two major clades is not a recent conclusion but is a topology that has been repeatedly recovered in previous studies. In both of these two major clades, a large number of *Ipomoea* species is present, rendering the genus in its current circumscription polyphyletic. However, this does not obscure the fact that these two large clades, sister to each other, could be morphologically characterized in the future, with the possible generic reassignment of the *Ipomoea* species present in the *Argyreinae* clade to another genus or multiple genera, if that is proved to be a suitable solution. Additionally, Muñoz-Rodríguez & al. (2023) cite Manos & al. (2001) as support for prior literature arguing for a single large *Ipomoea* and dismissal of recognizing the existing smaller genera. However, Manos & al. (2001) have never advocated for a single, large *Ipomoea*. Instead, they demonstrated that *Ipomoea* was not monophyletic and described the vast morphological variation within the group using the most updated phylogenetic hypothesis at the time. They also questioned whether several of the traditionally recognized genera were, in fact, monophyletic, and whether they share a suite of character states that would make them unique; they further suggested that future studies which would analyse morphological characters in an evolutionary context could result in the recognition of additional clades

or subclades, not yet formally recognized, with unique combinations of morphological characteristics. Therefore, these authors did not, at any point, advocate for a reclassification of the tribe Ipomoeae in which all species would be combined into *Ipomoea*, but instead left open the possibility for exploration of the morphological diversity of the group towards a better characterization of the resolved clades (Manos & al., 2001).

Finally, Muñoz-Rodríguez & al. (2023) assert that we do not provide a proposed new classification of Ipomoeae. However, that is not a requirement of the proposal for change of the conserved type of *Ipomoea* and should not be an impediment to it. What we are proposing is a simple modification which will provide a solid foundation for future studies, allowing for reclassifications without undesirable nomenclatural effects such as a name change for sweetpotato. Taxonomic and systematic progress can be achieved through small adjustments as well as large-scale restructurings and may happen in a single move or a series of taxonomic moves over a long period of time. It is good practice to start the (re-)classification with a broad-scale phylogenetic hypothesis, after which clades can subsequently be characterized through reciprocal illumination between molecular phylogenetic hypotheses and pre-existing or newly observed morphological characters. For the tribe Ipomoeae, such a broad-scale phylogenetic hypothesis has been published only recently (Muñoz-Rodríguez & al., 2019), and this work can be a valuable foundation for the classification of the tribe Ipomoeae into manageable genera that are both monophyletic and recognizable by means of morphology. Precedents of such a prudent approach abound in the literature. For example, the reclassification of the large and polyphyletic genus *Polyalthia* Blume (Annonaceae), started with a broad-scale phylogeny (Mols & al., 2004), and it was only 16 years later that it was possible to fully reclassify the species of this genus into several other genera, some of which were newly described (e.g., Mols & al., 2008), while others were reinstated (Xue & al., 2012). Further examples exist in the literature of taxonomic revisions of large genera that required the submission of nomenclatural proposals to maximize the stability of classification (e.g., Van Welzen & al., 2009). Within Convolvulaceae, there is the example of the polyphyletic and morphologically highly variable genus *Merremia* Hallier f. (Simões & al., 2015; Simões & Staples, 2017). While a nomenclatural proposal was not necessary to advance with systematic studies of this group, it is a clear example where a large-scale generic reclassification was possible with an integrative approach that combined molecular phylogenetics and morphological evidence. This is also a possible outcome for Ipomoeae, given the available evidence and the examples of success in other genera with similar systematic challenges.

■ CONCLUSIONS

Muñoz-Rodríguez & al. (2023: 644) discredit our proposal by claiming that “the majority [of the authors] have little

to no experience of taxonomic or systematic research on *Ipomoea*”, which has no factual basis, considering the demonstrated collective expertise of our group of authors, and projects a discriminating tone that we consider unhealthy to the scientific debate. We counter that our proposal is strengthened by diverse perspectives from Ipomoeae researchers from around the world, from different career stages and with expertise in multiple disciplines, as well as experts from other taxonomic groups who have grappled with complex taxonomic issues in their own study systems. We believe the future of the systematics of this intricate taxonomic group will be collaborative and inclusive.

From a scientific standpoint, our proposal to change the type of *Ipomoea* has been contested by Muñoz-Rodríguez & al. (2023) on the basis that (1) it is unnecessary, (2) it will bring no more nomenclatural stability to the group than their proposal to merge all the existing genera into *Ipomoea*; (3) a reclassification of the tribe Ipomoeae that respects monophyly and morphological diagnosability of clades or genera has not yet been proposed and/or is not possible. We argue that changing the conserved type of *Ipomoea* is the necessary step that will open avenues for a reassessment of the current non-monophyletic genera in Ipomoeae, some of which seem to have a unique suite of morphological characters, as discussed in previous literature, and be broadly reclassified based on an integrative approach, as has been successfully done in other groups.

We are enthusiastic with the prospect that a much-needed new classification of Ipomoeae will soon be possible by integrating several sources of evidence (molecular phylogenetics, morphological, palynological, and others) and incorporating contributions of a diverse group of authors with good knowledge of the species and genera involved, worldwide. While Muñoz-Rodríguez & al. (2023) are entitled to disagree with the need to reclassify Ipomoeae, or may not be confident that this is achievable, our efforts are now focused on making positive progress on the systematics of tribe Ipomoeae, which is the greater challenge.

■ AUTHOR CONTRIBUTIONS

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■ ACKNOWLEDGEMENTS

We are grateful to Bob Jarret for thoughtful comments on this manuscript.

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