**Introduction**

The menace of misinformation (fake news) affecting society shows little signs of abatement. Even the American horticultural trade has fallen prey due to its embrace of the African ornamental, *Leonotis menthifolia*, which is known elsewhere in the world as *L. ocymifolia*.1 Understanding its nomenclature should be more than a pedantic exercise since *Leonotis* is valued by traditional African herbalists as a medicinal with putative antimicrobial activity. Therefore, the horticultural trade could represent one avenue for preservation of important germplasm.

*Leonotis* is a charismatic, bird-pollinated plant with long, scentless, tubular orange flowers distinguished intraspecifically by the number of annular rings in the corolla base (fig. 1A). Floral morphology is so uniform that a revision of *Leonotis* reduced dozens of species to synonymy. Molecular work suggests the genus is polyphyletic resolving variably within the morphologically-distinct *Leucas* and *Acrotome*, both with small, sweet-scented, white flowers (fig. 1B). This raises the question of whether *Leonotis* itself is a valid construct. Goldblatt and Manning2 attempted to address polyphly by sinking several southern African *Leucas* into *Leonotis*, thereby expanding its morphological definition. We ask, why not sink *Leucas* into *Leonotis*? Should *Leonotis menthifolia* even be considered a *Leonotis*?

**Materials and Methods**

Molecular work involved extraction of gDNA from *L. menthifolia* grown in the Daveyhousehouse using a DNeasy Plant Mini Kit® with the standard protocol modified for an extended incubation period to 30 min. Sequencing was outsourced to Macrogen® for three plastid markers based on Scheen and Albert; trnL-F intron, trnL-F intergenic spacer, and RPS16 intron. An additional 40 lamioid accessions (n = 5 *Acrotome*, 8 *Leucas*, 16 *Leucas*, 9 *Ostegtea*, 2 *Philesia*) were downloaded from NCBI3. CLC Sequence Viewer ver. 8.0.8 was used to piece together a *L. menthifolia* contig and force-join individual reads, and for editing, trimming, alignment, and the construction of a clustering cladogram (Neighbor-joining, Euclidean, boot N = 10,000X). No gaps were coded.

**Morphological work** was conducted by producing an *n x n* matrix scored as presence/absence data (1/0) for 29 characters gathered from literature3–15 for 30 core taxa (*n = 6 *Acrotome*, 12 *Leucas*, 12 *Leucas*), of which some do not have NCBI records such as the validly published *Leucas menthifolia*. This was imported into PAST ver. 3.191 and analyzed using clustering analysis (Neighbor-joining, Euclidean, boot N = 10,000X) and for ordination analysis (NMS, Euclidean, 2-D).

**Results**

Since morphological and molecular data sets did not contain identical taxa, data analyses were kept separate instead of opting for a global approach. Morphology results using NMS ordination clearly separated *Leonotis* from *Leucas and Acrotome* with the exception of *Acrotome inflata* (fig. 2A). The same data imported into a neighbor-joining cladogram places *L. menthifolia* as sister to a sister pair of *ocymifolia* (L. o. var. schinzii sister to L. o. var. *ocymifolia*) with 71% bootstrap support (fig. 2B detail). A third variant of *L. ocymifolia*, var. *rainieriana*, resolves in a different clade with weak support.

**Discussion**

Although proper taxonomic identity may appear arcane in ornamental horticulture, misidentification can have repercussions in other sectors such as conservation science, which is problematic during a time of habitat fragmentation and global weather change. Many plants also provide nutraceuticals that can enhance our pharmacopeia since antibiotic-resistance is considered a world-wide threat15. Aesthetics aside, *Leonotis* is potentially important since literature suggests they have antimicrobial properties.2 Based on the International Code for Nomenclature, it is reasonable to expect the horticulture industry to maintain integrity of their products, which would also provide a ready mechanism for *ex situ conservation* (fig. 4).

**References**

5. Qiagen.
6. Codd.
8. Harvey.
10. Aims.
11. Qiagen.
12. Conte.
14. Harvey.
15. Fitch.

---

**Figure 1.** A. *Leonotis menthifolia* with a single ring of hairs in the corolla base, a trait otherwise distinct to *L. ocymifolia*. B. *Leonotis* (R) versus *Leucas* (L).

**Figure 2.** A. Morphology ordination separating *Leonotis* from *Leucas* and *Acrotome*. B. Morphology shows *Leonotis menthifolia* as sister to a sister pair of *L. ocymifolia*.

**Figure 3.** cpDNA placement of *L. menthifolia* in mixed *L. ocymifolia*/*Leucas* clade.

**Figure 4.** Eroneous ‘menthifolia’ listings at nurseries and botanic gardens.

*Leonotis menthifolia* appeared in American horticulture from a West Coast introduction where the genus is hardy. Based on morphology, Henning (unpublished data) stated the taxon keyed out to *L. ocymifolia* in 2001. Our research revisited this assertion in the light of new data that shows *Leonotis* is polyphyletic, embedding the morphologically distinct *Leucas* and *Acrotome*. Not surprisingly, our morphological evidence clearly separates the florally-distinct taxa placing *L. menthifolia* as sister to a clade of *L. ocymifolia*-types, far-removed from *Leucas menthifolia*. Our molecular work places *L. menthifolia* as sister to an *L. ocymifolia* variety while reconfirming polyphly with *Leucas*. Both approaches suggest *ocymifolia* is the correct epithet if *Leonotis* is considered a valid entity. However, more work is required since the *Leonotis*-type flower would have had to arise multiple times within *Leucas*, which suggests simple gene networks might control floral development. In addition, cytology counts and breeding trials would support the case.

In conclusion, *Leucas menthifolia* and *Leucas menthifolia* are separate taxa with ‘menthifolia’ a nomen invalidum for what should be *L. ocymifolia*. Deciding if molecular trees are synonymous with species-trees, however, is an argument requiring further investigation.