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## Chemical and genetic data for a multivariate characterization of four Mexican *Lupinus* species

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**State of art and aim:** Mexico is a secondary dispersion centre of *Lupinus* with 60-100 species growing on highlands at 2000-4000 m above sea level (Bermudez Torres *et al.*, 2009). The Trans Mexican Volcanic Belt, centred around 19°05' N, crossing Mexico from East to West, is a confluence zone of two biogeographically regions, the Neotropical and the Nearctic region, in which *Lupinus* biodiversity is high, since more than 30% of the Mexican species are represented here. In this geographical area, almost 20-25 *Lupinus* species were mentioned, but their taxonomy is often chaotic, because of duplicity of names and high number of synonyms. For this reason, strict identification of wild Mexican *Lupinus* taxa is still uncertain.

The object of this investigation was to develop a multivariate reference pattern useful to help assigning any undefined species to a distinctive lineage.

**Results and discussion:** Four species, with visible morphological differences, were selected: *L. campestris*, *L. hintonii*, *L. montanus*, and *L. aschenbornii*. Our strategy was to characterize these species by a multivariate approach: morphological, chemical, and multilocus genetical analysis. Chemical data are represented by quinolizidine alkaloids content, which are important secondary metabolites of *Lupinus* usually identified and quantified by GC-MS (Boschin *et al.*, 2008).

The genetic analyses was a combination of ISSR and barcoding analysis. ISSR markers have been widely used to detect the genetic diversity of plants and has some advantages, such as high polymorphism and high reproducibility (Ferval *et al.*, 2013). Metabarcoding consists in sequencing various recognized barcode genes from nucleus and organelles, used to build species trees. We use two nuclear genes and three chloroplastic ones.

The four species are well separated considering either the chemical data or the 5 genes of the genetic analysis; *L. montanus* possesses the highest divergence between individuals of each species. Differently, ISSR data grouped the two species growing at the highest elevations, i.e. *L. montanus* and *L. aschenbornii* from the others. Whatever the data considered, all the taxa are well distinguished and when several specimens from the same species were available, they always fell in a particular specific group. In conclusion, this multivariate approach can help to clear the taxonomy of wild Mexican *Lupinus* as far as other species.

### References:

- Bermudez Torres K *et al.* (2009) *BioControl*, 54, 459  
Boschin G *et al.* (2008) *J Agric Food Chem*, 56, 3657  
Ferval M *et al.* (2013) *South Afr J Bot*, 89, 106

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