

C. Salmeri, R. Perrone, P. Colombo, S. Brullo, O. De Castro

Comparative leaf micromorphology, anatomy and architecture in some Mediterranean species of *Pancratium* (*Amaryllidaceae*)

Pancratium L. is the most widespread genus of the Eurasian clade of *Amaryllidaceae*. It includes about 20 species of bulbous herbaceous geophytes, naturally occurring only in Macaronesia, Mediterranean basin, and throughout Africa to tropical Asia, but also introduced and cultivated in many countries (De Castro & al.2012).

Pancratium species generally occur in specialized habitats, such as dry rocky slopes, cliffs, sandy seashores, coastal dunes, desert sandy soils. Leaf features are the main adaptive strategies of these plants in response to the numerous environmental constraints.

Leaves in *Pancratium* show a gross morphological identity being usually glaucous, ensiform, parallel-veined, plane-convex to slightly V-shaped, straight to curly or spirally twisted. Difference at macroscopic level also regards leaf tip (acute to obtuse) and lamina width, ranging among different species from 0.2 up to 5 cm. Despite such uniformity of the leaf visible traits, micro-morphological and anatomical characteristics reveal significant variation both at intra-specific and inter-specific levels, which have proven to strongly depend on adaptation to microclimatic and ecological local conditions, such as temperature, water availability, insolation (Morton 1965; Sultan & al.2010; Perrone & al. 2013, 2015).

Here we present preliminary results of a comparative morpho-anatomical study carried out on leaves of some species of *Pancratium* from different localities of Mediterranean area in order to assess the range of inter-specific variation to be used as additional evidence for taxonomic delimitation, as well as population similarity or dissimilarity related to ecological adaptation. Selected species were *P. sickenbergeri* Boiss., *P. foetidum* Pomel, *P. illyricum* L., and *P. maritimum* L., including plants from Linosa (Pelagie Islands) previously referred to *P. linosae* Soldano & F. Conti, a taxonomic distinction not supported by molecular data (De Castro & al.2012; Giovino & al. 2015).

Morphometric analysis and statistics were made on 37 micro-morphological and anatomical characters calculated from 10 samples for each population. The significance of variation for each trait was tested by one-way ANOVA. Data comparison was made by three multivariate approaches: stepwise DFA, PCA, and UPGMA cluster analysis based on squared Euclidean distance.

The comparative analysis of leaf traits of the investigated taxa of *Pancratium* confirmed a rather stable and uniform leaf morpho-anatomical structure (Rudall 1995). Notwithstanding, significant differences in the size, number and/or type of several micro-morphological and anatomical leaf traits were detected as clearly linked to specific environmental conditions.

As expected, leaves of *P. sickenbergeri* from Israeli desert showed the major mix of xeromorphic characteristics, such as very undulate leaf surface, the thickest epidermis and

palisade tissue, the lowest number of veins which are very narrow, high stomata index, wide mesophyll with large spongy tissue.

Samples clustered according to taxa in all multivariate analyses. Cross-validation results of the discriminant analysis provided sample percentages correctly classified to each group ranging from 90% to 100% with respect to *P. sickenbergeri*, *P. illyricum*, and *P. maritimum* from Is. of Linosa, while the overall percentage was 63.33%, due to some overlapping of different populations of *P. maritimum* and *P. foetidum* from Algeria.

In summary, there is a strong relationships between leaf morpho-anatomical traits and ecological adaptation to different microclimatic conditions. In addition, our study also revealed marked diversity between the examined populations of *P. foetidum* coming from different habitats, with leaves of long-term cultivated samples at Catania Botanical Garden highly diverging from those ones of wild N African specimens.

References

- De Castro, O., Brullo, S., Colombo, P., Jury, S., De Luca, P., Di Maio, A. 2012: Phylogenetic and biogeographical inferences for *Pancreatium* (*Amaryllidaceae*), with an emphasis on the Mediterranean species based on plastid sequence data. – *Bot. J. Linn. Soc.* **170**: 12-28.
- Giovino, A., Domina, G., Bazan, G., Campisi, P., Scibetta, S. 2015: Taxonomy and conservation of *Pancreatium maritimum* (*Amaryllidaceae*) and relatives in the Central Mediterranean. – *Acta Bot. Gallica*, doi: 10.1080/12538078.2015.1089416.
- Morton, J. K. 1965: The experimental taxonomy of the West African species of *Pancreatium* L. (*Amaryllidaceae*). – *Kew Bull.* **19**(2): 337-347
- Perrone, R., De Rosa, P., De Castro, O., & Colombo, P. 2013: A further analysis of secretory structures of some taxa belonging to the genus *Hypericum* (*Clusiaceae*) in relation to the leaf vascular pattern. – *Turk. J. Bot.* **37**: 847-858.
- , Salmeri, C., Brullo, S., Colombo, P., De Castro, O. 2015: What do leaf anatomy and micromorphology tell us about the psammophilous *Pancreatium maritimum* L. (*Amaryllidaceae*) in response to sand dune conditions? – *Flora* **213**: 20-31.
- Rudall, P. J. 1995: *Iridaceae*. – Pp. 1-126 in: Cutler, D. F., Gregory, M. (Eds.), *Anatomy of the monocotyledons*, **8**. – Oxford.
- Sultan, H. A. S., Abu Elreish, B. I., Yagi, S. M. 2010: Anatomical and Phytochemical studies of the leaves and roots of *Urginea grandiflora* Bak. and *Pancreatium tortuosum* Herbert. – *Ethnobot. Leaflets* **14**: 826-835.

Indirizzi degli autori:

Cristina Salmeri¹, Rosaria Perrone², Paolo Colombo², Salvatore Brullo³, Olga De Castro⁴,
¹Dept. of Biological, Chemical and Pharmaceutical Sciences and Technologies,
 University of Palermo, via Archirafi 38, Palermo I-90123, Italy

²Dept. of Earth and Marine Sciences, Division of Ecology, University of Palermo,
 Viale delle Scienze, Ed. 16, Palermo I-90128, Italy

³Dept. Biological, Geological and Environmental Science, University of Catania, Via
 A. Longo 19, Catania I-95125, Italy

⁴Dept. of Biology, University of Naples Federico II, Via Foria 223 - Botanical
 Garden, Naples I-80139, Italy

Società Botanica Italiana, Gruppo per la Floristica, Sistematica ed Evoluzione
“Approfondimenti floristici e sistematici sulla flora d'Italia”

Orto botanico di Roma, La Sapienza Università di Roma, 20-21 novembre 2015

Editori: Lorenzo Peruzzi, Gianniantonio Domina

Technical editing: Gianniantonio Domina

Design: Gianniantonio Domina, Giuseppe Bazan

Gruppo per la Floristica, Sistematica ed Evoluzione

Lorenzo Peruzzi (Coordinatore),

Dipartimento di Biologia, Università di Pisa, via Derna, 1 – 56126 Pisa; e-mail: lorenzo.peruzzi@unipi.it

Gianniantonio Domina (Segretario),

Dipartimento di Scienze Agrarie e Forestali, Università di Palermo, via Archirafi, 38 – 90123 Palermo;
e-mail: gianniantonio.domina@unipa.it

Fabrizio Bartolucci,

Scuola di Bioscienze e Medicina Veterinaria, Università di Camerino – Centro Ricerche Floristiche dell'Appennino, Parco Nazionale del Gran Sasso e Monti della Laga, San Colombo, 67021 Barisciano (L'Aquila); e-mail: fabrizio.bartolucci@gmail.com

Gabriele Galasso,

Sezione di Botanica, Museo di Storia Naturale di Milano, Corso Venezia 55, 20121 Milano, Italia;
e-mail: gabriele.galasso@comune.milano.it

Cristina Salmeri,

Dipartimento STEBICEF, Università di Palermo, via Archirafi, 38 – 90123 Palermo; e-mail: cristinamaria.salmeri@unipa.it

In copertina: fronte: Edda Lattanzi in loc. Lago, Brienza (Potenza), giugno 2013. (foto di Leonardo Rosati); retro: *Pinguicula lattanziae* nom. prov. (foto di Giovanni Gestri)

Novembre 2015

Tipolitografia Euroservice Punto Grafica, via Toselli Pietro Maggiore, 8 - Palermo.

Copyright © by Società Botanica Italiana, Firenze.

Edito da Società Botanica Italiana, Firenze.

ISBN 978-88-85915-17-6