

OXALIDACEAE

REDISCOVERY AND PHYLOGENETIC POSITION OF THE RARE *OXALIS PURPURATA*

The most recent major taxonomic work on southern African *Oxalis* L. (Salter 1944) features a number of poorly known taxa collected from only one or two localities. A significant fraction of these species are described and only known from extremely poor data. Some, such as *Oxalis incerta* R.Knuth and *O. linooides* R.Knuth, are described from incomplete herbarium specimens that often lack bulbs or even flowers. Other taxa lack locality data, or appear to be merely aberrant forms of good species. Although these species were upheld by Salter (1944), he retained these taxa only in the interests of completeness, and expressed his gravest doubt about the validity of several.

Recent palynological (Dreyer 1996) and DNA sequence-based work (Oberlander *et al.* 2004, 2009) on the genus has clarified the status of a number of these taxa. In some of these cases a more definite answer to the uncertain status of these poorly known species was achieved. For example, Dreyer & Van Wyk (1996) placed *Oxalis henrici* F.Bolus in synonymy under the more widespread *O. engleriana* Schltr. on the basis of a unique pollen type shared by both species. In other instances, new species such as *O. hygrophila* Dreyer (Kumwenda *et al.* 2004) and *O. saltusbelli* Dreyer & Roets (Dreyer *et al.* 2009b), have been described that have clarified relationships between morphologically dissimilar taxa. Also, a phylogenetic scheme based on DNA data is in the process of being constructed for the entire southern African clade of *Oxalis*, of which some preliminary phylogenies have been presented in the literature (Oberlander *et al.* 2004, 2009). A number of poorly known taxa were not relocated after eight years of intensive collection, and could not be validated and/or systematically placed with any certainty on the basis of DNA data. This was not a problem for species that share

putative macro-morphological or palynological synapomorphies, which would allow at least a tentative placement. For some poorly known taxa, however, the paucity of even this knowledge meant that little could be changed with regards to their highly dubious taxonomic status.

Oxalis purpurata Jacq. represents one of these poorly known taxa. To our knowledge, this species has only been collected twice. Apart from the original description by Jacquin (1798), Salter (1940) found a population of this species growing amongst rocks in Vanrhyn's Pass, now on the border between the Northern and Western Cape Provinces, South Africa. Due to this poor record, this species is placed in the Rare category (Dreyer *et al.* 2009a).

Taxonomically, Salter (1940) placed the species in section *Cernuae* subsection *Purpuratae* based on the acaulescent habit, the lack of an apical beak to the bulb, the smooth nature of the bulb tunics, and the basal peduncles. This position was upheld in his later monograph on South African *Oxalis* (Salter 1944). The other two members of this subsection, *O. bowiei* Lindl. and *O. semiloba* Sond., are both summer rainfall species associated with the coastal regions of the Eastern Cape and KwaZulu-Natal. The resulting biogeographic link between these summer rainfall species and *O. purpurata* seems unlikely if the current distributions of the three species are compared. In addition, *O. purpurata* differs from both of the other taxa in not producing a contractile root and by bearing teeth on the filament bases, characters considered taxonomically important by Salter (1944).

Oxalis purpurata has not been rediscovered at Vanrhyn's Pass after several years of visiting the site, and its

status at this locality is uncertain, presumed extinct. A recent scrutiny of unidentified *Oxalis* specimens in the Compton Herbarium (NBG, Cape Town, South Africa) produced a specimen of *O. purpurata* from the Oorlogskloof Nature Reserve, ± 10 km south of the Pass (*W.A.J. Pretorius 707, NBG181394*). This prompted more extensive searches for this species in the Nature Reserve, and in June 2008 a flowering population was discovered in a similar habitat to that described by Salter (1940). Herbarium specimens and living material (*MO1118, Dreyer 836*) were collected, and a leaf sample was taken for later DNA extraction and sequencing.

Due to the recent date of rediscovery, this species could not be included in large-scale phylogenetic analyses of the genus (Oberlander *et al.* 2009). However, smaller-scale analyses of the nuclear Internal Transcribed Spacer region (Genbank accession number FJ426283), following the protocols and procedures of Dreyer *et al.* (2009b), yielded a confident placement within a small clade of species with umbellate inflorescences (Parsimony bootstrap support: 99%; Bayesian posterior probability: 1.00). This clade corresponds to a clade represented by *Oxalis pes-caprae* L. and *O. purpurascens* Salter in Oberlander *et al.* (2009), hereafter called the *O. pes-caprae* clade. Apart from well-known weedy species such as *O. pes-caprae*, this clade includes taxa from Namibia (e.g. *O. purpurascens* and its allies), Namaqualand (e.g. *O. haedulipes* Salter and its allies) and the western Cape Floristic Region (e.g. *O. compressa* L.f.). The only other sampled member of subsection *Purpuratae*, *Oxalis bowiei*, is not closely related to the *O. pes-caprae* clade, but instead is closely related to other summer rainfall taxa such as *O. tragopoda* Salter and *O. stellata* Eckl. & Zeyh. The extremely close morphological resemblance between *O. bowiei* and *O. semiloba*, and provisional DNA data (K.C. Oberlander pers. comm.), also makes the latter species a very unlikely relative of *O. purpurata*.

The presence of umbellate inflorescences and the almost succulent nature of *Oxalis purpurata* are in agreement with many other members of the *O. pes-caprae* clade. It does differ from all other members of the clade in bearing pale lilac (instead of yellow or white) flowers, and no contractile root. However, neither of these character states are shared by the two summer rainfall taxa either. Most other morphological (i.e. teeth present on the filaments, seven or more ovules per carpel, glabrous corolla) and palynological (finely reticulate tectum; Dreyer 1996) features are congruent with a

placement in the *O. pes-caprae* clade. Given the congruent DNA and morphological data, we consider *O. purpurata* to be unrelated to the summer rainfall species of subsection *Purpuratae*. Instead, a position within the *O. pes-caprae* clade as a close relative of *O. pes-caprae*, *O. compressa*, *O. copiosa* Bolus f. and *O. haedulipes* is therefore strongly supported.

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