Discovery of substantial Oxalis (Oxalidaceae) diversity and endemism in an arid biodiversity hotspot

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Abstract

Despite globally acknowledged diversity levels, the flora of the arid Richtersveld of South Africa remains poorly known for certain plant lineages, including the eudicot genus Oxalis. Cryptic habit, inaccessible and harsh terrain and the lack of focussed systematic attention has led to the assumption that the region is depauperate in this genus. However, recent exploration proved quite the opposite and revealed a wealth of Oxalis species, including at least ten undescribed species and many significant range extensions of known taxa. We are in the process of describing these new species, but an overarching work, placing the abundant new knowledge in the context of southern African Oxalis, is necessary. In this study we revise the state of knowledge regarding Richtersveld Oxalis and provide brief descriptions, diagnostic characters and a morphological identification key for the 20 species confirmed to occur in the region. Nine of the ten new species are currently only known from the Richtersveld, with seven having extremely limited known distributions. Surprisingly, levels of endemism in the Richtersveld are higher than the relatively well-explored central Namaqualand Oxalis flora, and suggest that, far from being depauperate in Oxalis, the Richtersveld region should be considered a centre of endemism for the genus in southern Africa.

Introduction

The Richtersveld of South Africa occupies an area of only 7325 km² yet it contains 336 known endemic plant taxa (Cowling et al. 1999). It is acknowledged as one of the richest desert floras of the planet (Cowling et al. 1998) and forms part of a ‘biodiversity hotspot’ defined to set conservation priorities (Myers et al. 2000). Two main biomes are present in the Richtersveld: true desert and the semi-arid Succulent Karoo, and both are represented by a rich diversity of vegetation units within the region (Mucina & Rutherford 2006). The area has a varied geology, which includes formations of granite, gneiss, limestone, schist, layered shale and scattered white quartz (Williamson 2000). Average annual rainfall of 150 mm falls mostly during winter (Fleminger 2008) and is supplemented by early morning fog during summer (Williamson 2000). Pressure on natural resources due to semi-nomadic pastoral land use, mining and climate change pose threats to the fragile Richtersveld habitat (Rutherford et al. 1999a, b, Mucina & Rutherford 2006). As most undescribed plant species are thought to occur in areas with high levels of endemism (Joppa et al. 2011), and the Richtersveld is particularly under-collected for cryptic plant lineages, numerous endemic taxa may currently be threatened with extinction even before their discovery.

Oxalis Linnaeus (1753: 433) is acknowledged as a major component of the geophyte floras of the Cape Floristic Region (CFR; Proches et al. 2006) and the adjacent Succulent Karoo directly to the south of the Richtersveld. These two regions are considered global biodiversity hotspots (Myers et al. 2000) and were recently combined into a single unit constituting the Greater Cape Floristic Region (GCFR) sensu Born et al. (2006). The centre of diversity (> 90% of approx. 210 species) and putative origin for African Oxalis is within the GCFR (Oberlander et al. 2011). Many GCFR Oxalis species have restricted distribution ranges, with 70 species and subspecific taxa currently included in the Red List of South African Plants (Raimondo et al. 2009).

Oxalis is underexplored in the GCFR border regions, with the Oxalis flora of the Richtersveld in particular being extremely poorly understood. This can be attributed to a variety of reasons: the area is large, remote and inhospitable,
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