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Morphometric and flow cytometric evaluations of a putative natural hybrid of *Centaurium* (Gentianaceae) from Turkey

MEHMET ÇİÇEK[1*], AHMET EMRE YAPRAK[2] & ALİ RAMAZAN ALAN[1]
[1]*Pamukkale University, Faculty of Arts & Science, Department of Biology, 20070 Denizli, Turkey*
[2]*Ankara University, Faculty of Science, Department of Biology, 06100 Ankara, Turkey*
**Corresponding author; E-mail: mcicek@pau.edu.tr*

Abstract

A putative natural hybrid of *Centaurium* was discovered in a population composed of *C. serpentinicola* and *C. tenuiflorum* subsp. *tenuiflorum* in the vicinity of Köyceğiz (Muğla province, SW Turkey). Morphometric analysis performed using 14 diagnostic characters supported that the putative natural hybrid as an interspecific hybrid between *C. serpentinicola* and *C. tenuiflorum* subsp. *tenuiflorum*. Flow cytometric measurements revealed that *C. serpentinicola* and *C. tenuiflorum* subsp. *tenuiflorum* have similar nuclear DNA amounts (2.61 and 2.53 pg DNA/2C), whereas the putative hybrid have a significantly higher nuclear DNA amount (2.77 pg DNA/2C), and they have the same ploidy level.

Key words: Köyceğiz, natural hybridization, nuclear DNA amount, numerical taxonomy

Introduction

The genus *Centaurium* Hill (1756: 62; subtribe Chironiinae, tribe Chironieae, Gentianaceae), includes about 20 species distributed mainly in the Mediterranean Basin (Mansion 2004). It is native to Europe and Western Asia and naturalized in America and Australia. These plants commonly known as "centaury", are annual or biennial herbs with opposite and sessile leaves, cymose inflorescences, and salverform and pink to pinkish-reddish or purplish, rarely yellow or white corollas. Its anthers are spirally twisted after dehiscence.

In Turkey, *Centaurium* is represented by 8 species, two of which are recorded as doubtful or imperfectly known (Jakobsen 1978, Carlström 1986, Davis *et al.* 1988, Çiçek 2012). Two of them, *C. erythraea* Rafn (1800: 75) and *C. tenuiflorum* (Hoffmannsegg & Link 1813–1820: 354) Fritsch (1907: 97) are variable species widely distributed throughout Eurasia. *C. erythraea* includes 6 subspecies (4 of which occur in Turkey) and *C. tenuiflorum* includes 3 subspecies (2 of which occur in Turkey) (Melderis 1972).

Natural hybridization within *Centaurium* is a common occurrence both in nature and *in vitro*. According to literature (Ubsdell 1979; Mansion *et al*. 2005; Guggisberg *et al*. 2006; Banjanac *et al*. 2014), and records from IPNI (2014) and The Plant List (2014), several hybrids or putative hybrid species of *Centaurium* are recognized. The hybridizations are mostly among European *Centaurium* species, and are the following: *C. erythraea* × *C. tenuiflorum*, *C. bianoris* Sennen (1936: 175) (*C. maritimum* × *C. tenuiflorum*), *C. malzacianum* Maire (1939: 25) (*C. maritimum* × *C. pulchellum*), *C. centaurioides* (Roxburgh 1824: 283) Rao & Hemadri (1970: 357) (*C. tenuiflorum* × *C. pulchellum*), *C.* ×*aschersonianum* (Seemen 1897: 45) Fournier (1938: 856) (*C. littorale* subsp. *littorale* × *C. pulchellum*), *C.* ×*intermedium* (Pollini 1816: 16) Druce (1905: 48) (*C. erythraea* × *C. littorale*), *C.* ×*jolivetinum* (Fournier 1931: 26) Fournier (1938: 856) (*C. erythraea* × *C. pulchellum*), *C.* ×*litardierei* Ronniger ex Litardière (1948: 213) (*C. littorale* × *C. tenuiflorum*), and C. ×*klattii* Fournier (1938: 856) (*C. erythraea* × *C. littorale* subsp. *littorale*). These hybridizations generally involved *C. maritimum* (Linnaeus 1767: 55) Fritsch (1907: 97), *C. tenuiflorum* (Hoffmannsegg & Link 1813–1820: 354) Fritsch (1907: 97), *C. erythraea* Rafn (1800: 75), *C. littorale* (Turner 1805: 469) Gilmour (1937: 498) and *C. pulchellum* (Swartz 1783:85) Druce (1907: 242).

During fieldwork undertaken for the taxonomic revision of Turkish *Centaurium*, we collected *Centaurium* specimens from a locality at 10 km NW of the town Köyceğiz (Muğla province, SW Turkey). This locality is the same

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TABLE 6. Nuclear DNA contents of *Centaurium* specimens as determined by flow cytometry and estimated genome size.

Analyzed specimen	Nuclear DNA content (pg/2C)	Estimated 1C genome size (Mbp)
C. serpentinicola	2.61[a]	1276
C. tenuiflorum subsp. *tenuiflorum*	2.53[a]	1237
Putative natural hybrid *Centaurium*	2.77[b]	1355

Means with the same letter are not statistically different at α=0.05 as per LSD.

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