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Karyological observations on *Isoëtes duriei* Bory (*Lycophyta, Isoëtaceae*) in Sicily

Abstract

Troìa, A. & Bellini, E.: Karyological observations on *Isoëtes duriei* Bory (*Lycophyta, Isoëtaceae*) in Sicily. – Bocconea 13: 397-400. 2001. – ISSN 1120-4060.

The paper reports the results of karyological investigations made on somatic cells of the Mediterranean *Isoëtes duriei* Bory. Counts, made on plants from Sicilian populations, vary between ca. 104 and ca. 132, showing a high ploidal level. Results are discussed in the framework of the karyological data available for the genus.

Introduction

Isoëtes L. is a cosmopolitan genus of heterosporous lycopsids (*Lycophyta*, according to Gifford & Foster 1988) comprising approximately 150 species (Taylor & Hickey 1992), including aquatic, amphibious and terrestrial taxa (Jermy & Akeroyd 1993). *I. duriei* Bory is one of the two Mediterranean "terrestrial" species occurring in seasonally wet habitats, and losing their leaves in the dry Summer season: these species retain several peculiar anatomical and biological features, including "phyllopodia" (persisting sclerotic structures derived from the basal portion of leaves), and a seasonal cycle. It was suggested that these features are derived as an adaptation to resist desiccation (Taylor & Hickey 1992). *I. duriei* is a small silicicolous species. The sporophyte has a three-lobed perennial corm; the leaves are 2-15 cm long; megaspores are 600-800 μm, reticulate with prominent ridges (Jermy & Akeroyd 1993). The species has a Mediterranean distribution (mainly in the Western region, see Greuter & al. 1984), where it is sparingly met with in isolated small colonies. In Sicily it is a rather rare species, usually occurring in meso-mediterranean bioclimates *sensu* Rivas-Martinez (1981).

In spite of the fact that chromosomal evolution has been considered a main character of the genus, cytological data regarding this Mediterranean species are lacking and its chromosome number is unknown (Prada 1983; Ferrarini & al. 1986). The count 2n=20 reported by Hickey (1984) and Cox & Hickey (1984) is probably a mistake since that number is known only for the other Mediterranean terrestrial species, *I. histrix* Bory (cfr. Manton 1950).

Materials & Methods

The plants used in this study were collected in Sicily from three localities: "Dingoli" (Piana degli Albanesi), "Monte Cuccio" (Palermo), a new locality, and "Monte Gibele", Pantelleria Island. Plants were collected in the wild and cultivated in the Botanical Garden of the University of Palermo. Identification of the material was made on the basis of Ferrarini & al. (1986), which maintain the correctness of the name "I. duriei" (p. 36). Root tips were pre-treated with a saturated solution of paradichlorobenzene and fixed with "Carnoy" (three parts absolute ethyl alcohol to one part glacial acetic acid), then stained according to several techniques: aceto-carmine (according to Jensen 1962), Wittman haematoxylin (according to Brunton & Taylor 1990, modified), leucobasic fuchsin (Feulgen) (according to Manton 1950). Best results were obtained with the last one. Chromosome counts were made from several metaphase plates of nine individuals (six from "Dingoli", two from "Monte Cuccio", one from Pantelleria).

Results and Discussion

Our counts vary between ca. 104 and ca. 134 chromosomes. In detail, counts were as follows: ca. 104, ca. 114, ca. 120, ca. 121, ca. 123 (Fig. 1) (Dingoli), ca. 115, ca. 134 (M. Cuccio), ca. 118 (Pantelleria).

Accurate counting was difficult, and we were not able to assign a single precise number for our populations. This variability could be the result of chromosome fragmentation, commonly occurring in neotropical species (Hickey 1984); but several previous works in the genus *Isoetes* showed variable counts within the same species: for example, in *I. pantii* Goswamy & Arya ten different numbers between 2n = 22+2 and 2n = 44+3 were reported (Goswami 1975), and *I. novo-granadensis* H.P. Fuchs have yielded counts of 2n = 126, 128, 129, 132 (Hickey 1984).

The basic chromosome number of the genus *Isoetes* has been known as x=11 in almost all species (cfr. Löve & al. *1*977). Chromosome counts based on that number have been reported mostly at the diploid and tetraploid level, with few records of higher ploidal levels (Löve & al. *1*977). In this framework, our counts suggest a high ploidal level, between 10x (2n=110) and 12x (2n=132).

Two different ways of recent evolution have been identified for aquatic and terrestrial *Isoetes* species, corresponding to two different reproductive strategies. In contrast to terrestrial species, which occur mainly as isolated populations, two or more aquatic species frequently grow together. Because gametes of different species can readily mingle in these aquatic habitats, the potential exists for interspecific hybridization: evidence supporting an allopolyploid mode of evolution (interspecific hybridization and chromosome doubling) has been shown for the European *I. brochonii* Motelay (Taylor & Hickey 1992) and other aquatic species. The reproductive biology of terrestrial *Isoëtes* is not well known but it is supposed to be very different (Oddo & Bellini 1994): dispersion is probably achieved through animals (cattle, earthworms, etc.), anyhow the range of dispersal is presumed to be very limited. These species, usually diploids (Taylor & Hickey 1992), appear to represent examples of gradual speciation due to spatial isolation of ancestral populations followed by genetic divergence (Taylor & Hickey 1992).

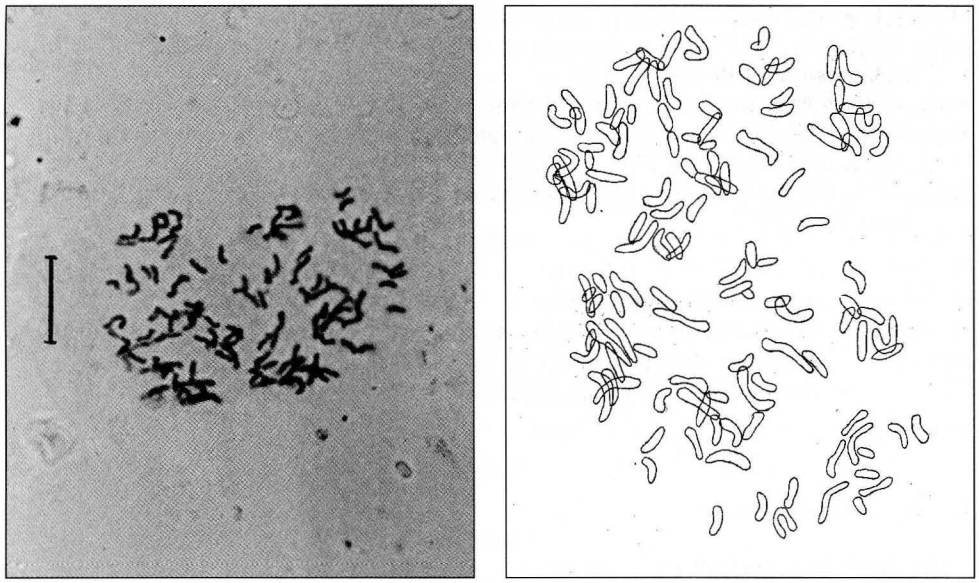

Fig. 1. Photomicrograph (a) and interpretive drawing (b) of mitotic root tip plate of *I. duriei* Bory [Dingoli, #20: PDB (3h), "Carnoy" (60'), HCl 1N 60°C (8'), Feulgen (2h)]. 2n = ca. 123. Scale bar = 10 μm.

In this framework, the present count for *I. duriei* seems rather "anomalous"; further cytological and bio-systematic investigations are needed to explain the reproductive biology and the origin of the species, and its relationships with other living ones.

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