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A CONTRIBUTION TO CYTOTAXONOMICAL KNOWLEDGE OF ALLIUM EBUSITANUM FONT QUER (*)

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Resumen. Se compara morfológica, cariológica y anatómicamente *Allium ebusitanum* Font Quer (2n=16) de las islas Baleares, con *A. vineale* y *A. sphaerocephalon* con los que ha sido relacionado con anterioridad. En opinión de los autores, *A. ebusitanum* no puede incluirse en el complejo de *A. vineale*, sino en el de *A. sphaerocephalon*. Esto permite definir el tipo de endemismo (esquizoendemismo intrabaleares) que representa *A. ebusitanum*.

Summary. The Balearic species *Allium ebusitanum* Font Quer (2n=16) is compared morphologically, karyologically and anatomically with *A. vineale* and with *A. sphaerocephalon*, to which it has been previously correlated. In the authors' opinion, *A. ebusitanum* cannot be assigned to the *A. vineale* complex but to that of the *A. sphaerocephalon*. This allows us to define the type of endemism (intrabaleares schizoendemism) that *A. ebusitanum* represents.

INTRODUCCION

Allium ebusitanum Font Quer (Sect. *Allium*) is a diploid entity (2n=16; CARDONA and CONTANDRIOPOULOS, 1983), considered as being a patroendemism of the isle of Ibiza (CONTANDRIOPOULOS and CARDONA, 1984). STEARN (1980) considers that it might be an afferent to *Allium vineale*, which is a generally polyploid complex (PASTOR, 1982), with considerable intraspecific

(*) Locus classicus of *Allium eivissanum* (Miceli and Garbari, 1987).

variability and bulbils in the inflorescence. CONTANDRIOPOULOS and CARDONA (1984) are of a similar opinion. PASTOR and VALDÉS (1983), on the other hand, consider *Allium ebusitanum* to be very close to *Allium sphaerocephalon* because of undeniable morphological analogies.

After some specimens of *Allium ebusitanum* were gathered on Ibiza (at Cala Aubarca, 7/4/1984, leg. Torres, Garbari et Del Prete) and cultivated in the Pisa Botanical Gardens, it became possible to compare this species with specimens of *Allium sphaerocephalon* gathered on Ibiza (at Jesus, Can Gómez (*), 7/4/1984, leg. Torres, Garbari et Del Prete) and in Italy (at Imperia, Vasia, 300 m, 15/7/1972, Terzo) and with specimens of *Allium vineale* gathered in several places in Italy (Trieste, Pisa, Isernia) and Sicily (Palermo):

A comparison of living material evidenced in the present authors' opinion, the improbability of *Allium ebusitanum* being assignable to the *Allium vineale* «complex» since it is distinguished from the latter by a considerable number of characters, one of which is the general absence of bulbils and bulblets, the type of the bulb tunics, (PASTOR & VALDÉS, 1987) the size of the scape, the type of inflorescence and the colour of the anthers. By contrast the affinities between *Allium ebusitanum* and *Allium sphaerocephalon* which are practically indistinguishable in the vegetative state in leaf form and colour, and in colour, form and size of the leaf sheath are numerous.

There are however differences during anthesis already remarked on by PASTOR and VALDÉS (1983). These are, i. e., the form of the inflorescence and of the perigonium. This note has the aim of further clarifying the relationship between *Allium ebusitanum* and *Allium sphaerocephalon* by karyological and histo-anatomical analysis and to give some indication as to the type of endemism represented by the Balearic entity.

OBSERVATIONS AND RESULTS

Karyological, anatomical and histological analyses were carried out following the usual technique of squashing and dyeing (GARBARI et al., 1979; MICELI and GARBARI, 1987).

Karyology

In agreement with what had been previously observed (CARDONA and

CONTANDRIOPOULOS, 1983), all the plants of *Allium ebusitanum* examined (6 individuals) showed $2n=16$. The karyotype -described for the first time here- is represented by the following formula (LEVAN & al., 1964):
 $2n=16=12m+4sm^s$ (Fig. 1). Two «*scorodoprasum*» type chromosome pairs with satellites (sm^s) are always present in VII and VIII position. The remaining six pairs are always metacentric (m). No accessory chromosomes were observed. Specimens of *Allium sphaerocephalon* examined showed a karyotype of the same chromosomal typology which could be represented by the same formula as *Allium ebusitanum*. It is widely known that the literature



Fig. 1. *Allium ebusitanum*: caryography of metaphase ($2n=16$) and karyotype.

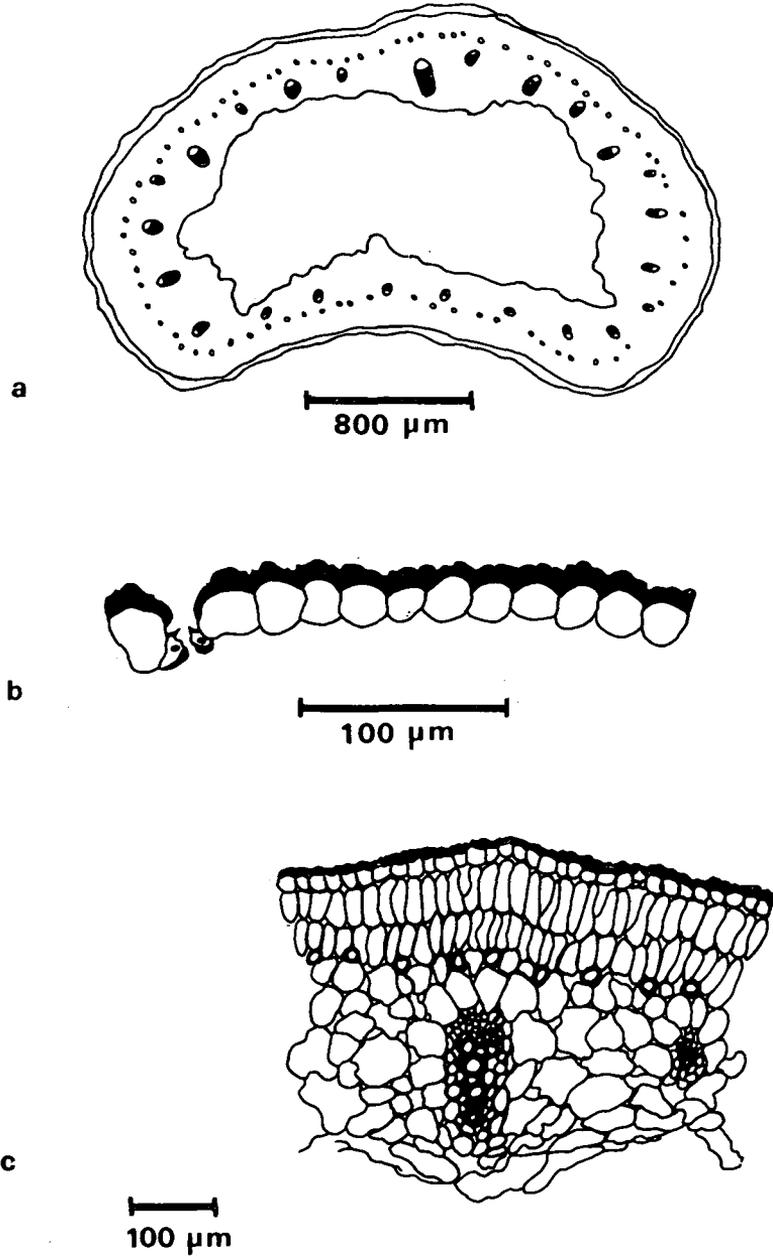


Fig. 2. *Allium ebusitanum*: a) cross section of the leaf: b) epidermis (detail): c) mesophyll in detail.

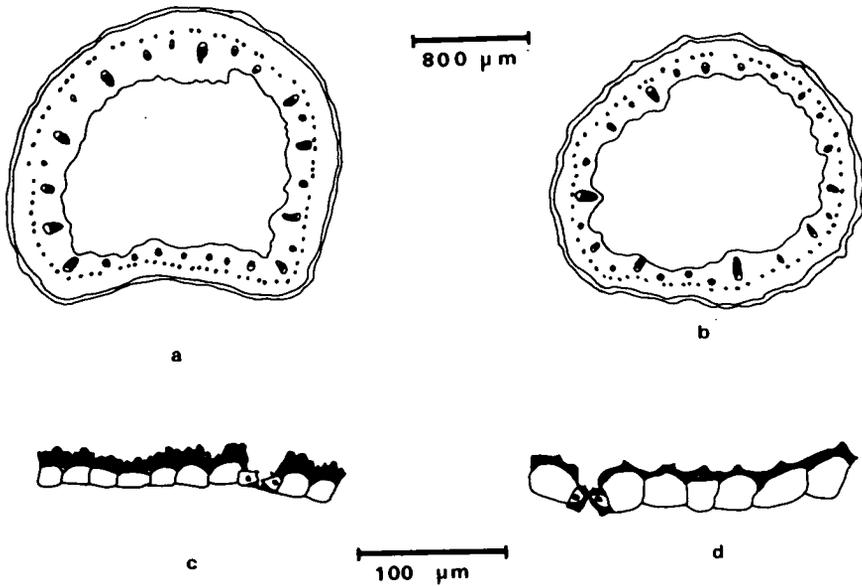


Fig. 3. *Allium sphaerocephalon*: comparison of Balearic (right) and Italian (left) specimens: a-b, cross sections of the leaf; c-d, details of epidermis.

on the karyology of *Allium sphaerocephalon* is substantial (cfr. PASTOR, 1982 and reported references; TZANOUDAKIS, 1985; TORNADORE, 1986). This species is always diploid ($2n=16$) with a highly variable karyotype, presence or absence of accessory chromosomes (GUILLÉN and RUIZ-REJÓN, 1984; WITTMANN, 1984). *Allium ebusitanum* is therefore clearly connected to *Allium sphaerocephalon* as far as its chromosomes are concerned.

Leaf Anatomy

Leaf sections from *Allium ebusitanum* (from Ibiza, Spain) were compared with those of *Allium sphaerocephalon* (from Ibiza and from Imperia, Italy). The leaves are always fistulose. In its widest part, that is the lower half, the leaf of *Allium ebusitanum* has a flattish adaxial surface, while in the upper half the section becomes circular (Fig. 2a). The epidermal cells have a thick cuticle, about 1/3 the height of the cell. The stomata are distributed around the periphery of the leaf and their internal tangential walls are much

thicker than the others (Fig. 2b). The palisade is highly regular, two-layered with numerous laticiferous canals placed between the inner layer of the palisade and the parenchyma.

There are 24 vascular bundles, some of which are larger than the others and interspersed with them. The xylem is «V»-shaped (Fig. 2c).

Leaf sections from *Allium sphaerocephalon* from Imperia (Italy) and Ibiza (Spain) show a similar morphology to *Allium ebusitanum*, particularly to those from Italy (Figs. 3a-3b).

The anatomical investigation revealed the same internal distribution of tissues in *Allium sphaerocephalon* and *Allium ebusitanum*, with some histological differences. The cuticle in the Italian *Allium sphaerocephalon* (Fig. 3c) is roughly the same thickness as that in *Allium ebusitanum*, but its surface is quite different, with prominent protruberances; the Balearic *Allium sphaerocephalon* (Fig. 3d) differs from *Allium ebusitanum* (Fig. 2b) not only in the different «ornamentation» of the cuticle but also in the thickness of the cuticle.

CONCLUSIONS

The morphological and histo-anatomical examinations conducted on both *Allium ebusitanum* and *Allium sphaerocephalon* support PASTOR and VALDÉS' hypothesis (1983) of the affinity of these two taxa, excluding the referral of *Allium ebusitanum* to *Allium vineale* because of organographic reasons.

From the karyological aspect, *Allium ebusitanum* presents two «scorodoprasum» type pairs of chromosomes. *Allium sphaerocephalon* has both «scorodoprasum» type and «sativum» type pairs (SCRUGLI and BOCCHIERI, 1977; VIEGI and CELA RENZONI, 1981; WITTMANN, 1984; TZANOUDAKIS, 1985; TORNADORE, 1986). It should be noted that *Allium vineale*-to which *Allium ebusitanum* is quite different, as we have already remarked, in its structural and morphological characteristics- possess prevalently «sativum» type chromosomes (SCRUGLI, 1972; MARCHI et al., 1974; WITTMANN, 1984; TZANOUDAKIS, 1985), but at times also «scorodoprasum» type. From the chromosomal point of view then, *Allium vineale* cannot possibly be connected with *Allium ebusitanum*, in which «sativum» type chromosomes are never present. On the other hand TORNADORE (1986) indentified a cytotype with two pairs of «scorodoprasum» type chromosomes in *Allium sphaerocephalon* from

Aranjuez (Spain), which testifies a certain genomic affinity with *Allium ebusitanum*.

It is therefore the present author's opinion that it is reasonable to suppose that *Allium ebusitanum* differentiated in the sphere of *Allium sphaerocephalon*, and not in that of *Allium vineale*.

This re-proposes the problem of the type of endemism represented by *Allium ebusitanum* in the Balearic Islands. It is not so much a question of patroendemism -a qualification which was justified in the sphere of *Allium vineale* and in the relationship between the degrees of ploidy in the two taxa (CONTANDRIOPOULOS and CARDONA, 1984)- but of «intra-Balearic schizoendemism», given the objective morphological affinities with *Allium sphaerocephalon*, with which it shares the diploid level and the sympatric distribution on Ibiza. Once again this island proves to be a centre of speciation for the genus *Allium* (MICELI and GARBARI, 1987). It is the present authors' opinion that the differences between *Allium ebusitanum* and *Allium sphaerocephalon*, although only slight, are now stably consolidated and that the rank of species of the Balearic endemic entity is therefore fully justified.

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