Atti Soc. Tosc. Sci. Nat., Mem., Serie B, **96** (1989)
pagg. 53-62, figg. 2, tabb. 4

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POPULATION VARIABILITY IN *ALLIUM SPHAEROCEPHALON* L.(**)

Riassunto — *Variabilità in* Allium sphaerocephalon *L.* Sono stati studiati cariologicamente 15 popolamenti di *Allium sphaerocephalon* L. ssp. *sphaerocephalon* provenienti da varie località del bacino mediterraneo. Tutti i popolamenti mostrano numero cromosomico diploide $2n=16+0—1B$. I cariotipi esaminati invece sono molto variabili oltre che per la presenza o meno di cromosomi accessori, per il numero e la posizione di costrizioni secondarie e presenza di dimorfismo a carico degli omologhi. Vi è una certa correlazione tra la presenza di costrizioni secondarie, il periodo fenantesico e il colore del perigonio e dei pedicelli anche se la variabilità è continua. I differenti citotipi non sono correlati invece con la distribuzione geografica. È stato studiato anche un popolamento pugliese di *Allium sphaerocephalon* L. ssp. *arvense* (Guss.) Arcangeli che ha mostrato un numero cromosomico $2n=16$ e un cariotipo che rientra nella variabilità della subspecie tipica.

Abstract — Chromosome counts were determined for 15 populations of *Allium sphaerocephalon* L. ssp. *sphaerocephalon*, using the fuchsin squash technique. This species was found to have a somatic chromosome number of $2n=16+0—1B$. The idiograms of all populations are illustrated; the karyotypes are variable for the different populations. The variation is correlated with the one of the phenological period and with the colours of the perianth and pedicels. The different cytotypes is not related to the geographic distribution. A chromosome count for *A. sphaerocephalon* L. ssp. *arvense* (Guss.) Arcangeli, that presents the same chromosome number and different karyotype, was made too.

Key words — *Allium sphaerocephalon* - Population variation.

INTRODUCTION

It's well-known that largely diffused species produced different biotypes as genotypical reply to different ecological conditions (TURESSON, 1922; LANDOLT, 1984). *Allium sphaerocephalon* L. makes no ex-

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(**) This paper was presented as a poster at the Vth Meeting of OPTIMA, Istanbul (8th-15th September, 1986).

ception. The species contains subspecific *taxa* as ssp. *sphaerocephalon*, distributed all throughout the range of the species; ssp. *durandoi* (Battandier et Trabut) Duyfjes confined to Algeria and Tunisia; ssp. *curtum* (Boissier et Gaillardot) Duyfjes wich occurs in Egypt and Near Est (WILDE-DUYFJES, 1976); ssp. *arvense* (Guss.) Arcangeli in Sicily, Malta, Southern Greece and Albania according to STEARN (1978) but also near Lecce (Apulia-Southern Italy) where our plants come from; ssp. *trachypus* (Boiss. et Spruner) Stearn, endemic of Greece (STEARN, 1980). In this work the intrasubspecific variation of *A. sphaerocephalon* L. ssp. *sphaerocephalon* and the caryology of ssp. *arvense* were studied.

MATERIALS AND METHODS

Actively growing root tips were collected and transfered into a 0,3% aqueous colchicine solution where they remained for 3 hours. Upon removal from the colchicine solution, the root tips were fixed in Carnoy's fluid. For microscopic examination, root tips were macerated in 1N HCl (60°) for 8 minutes and then soaked in basic fuchsin for 2 hours. The apical 2-3 mm tips of each rootwere cut off and squashed in a drop of 45% acetic acid. The karyotypes were constructed from the best micrographies and the chromosomes measured and classified according to LEVAN *et Al.* (1964) nomenclature. To determine the karyotypes of the different populations (Tab. 1) numerous plants were investigated.

PHENOLOGY

A two days check of phenological processes during flowering was carried out. Flowering begins the first week of June and ends late July - early August (Tab. 2).

MORPHOLOGY OF THE POPULATIONS EXAMINED

Bulbs 0,8-1,7 x 0,3-1,5 cm; *bulblets* yellowish or brown (9-6 mm) enclosed within the sheaths. *Stem* 35-80 cm. *Leaves* up to 25-52 cm x 1,5-4 mm, fistular semicylindrical, canaliculate, sheating the lower 1/4-1/2 of the stem. *Sphate* up to 2 cm, persistent, shorter than the

TAB. 1 - *Living populations investigated.*

	roll	source		date	collector
ssp. *arvense*	50/79	Serrano - Lecce	(I)	29.04.79	N. Tornadore
ssp. *sphaerocephalon*	3/77	Karst - Trieste	(I)	7.05.77	»
»	39/80	Iseo - Brescia	(I)	3.05.80	»
»	53/80	Elba - Leghorn	(I)	8.05.80	S. Marchiori
»	123/80	Roccamurata - Parma	(I)	23.08.80	N. Tornadore
»	143/80	Aranjuez - Madrid	(Hs)	12.09.80	»
»	146/80	Lourdes - Tolouse	(F)	15.09.80	»
»	52/81	Roccamurata - Parma	(I)	8.05.81	G. Sburlino
»	78/81	Broves - Marseilles	(F)	10.06.81	N. Tornadore
»	92/81	M.S. Bäume - Marseille	(F)	8.06.81	»
»	128/81	Prati di Tivo - Teramo	(I)	13.08.81	G. Caniglia
»	40/82	M. Catria - Pesaro	(I)	13.06.82	Tornadore
»	7/83	Lesina - Foggia	(I)	23.04.83	»
»	8/83	Portocesareo - Lecce	(I)	29.04.83	»
»	35/83	Lokrum - Dubrovnik	(Ju)	17.06.83	»
»	49/83	Dubrovnik	(Ju)	15.06.83	»

TAB. 2

Phenology 1984	+00	++0	0++	00+
Broves	06.VI	14.VI	24.VI	12.VII
Aranjuez	06.VI	14.VI	24.VI	12.VII
M.te Catria	12.VI	18.VI	26.VI	14.VII
Prati di Tivo	06.VI	10.VI	18.VI	14.VII
Lourdes	06.VI	14.VI	24.VI	12.VII
M.te S. Bäume	18.VI	24.VI	02.VII	22.VII
Elba	20.VI	28.VI	06.VII	28.VII
Porto Cesareo	20.VI	26.VI	04.VII	30.VII
Roccamurata (1)	24.VI	08.VII	14.VII	03.VIII
Dubrovnik	24.VI	02.VII	12.VII	26.VII
Lokrum	26.VI	10.VII	12.VII	03.VIII
Lesina	26.VI	08.VII	12.VII	05.VIII
Iseo	26.VI	06.VII	14.VII	03.VIII
Karst - Trieste	26.VI	08.VII	14.VII	05.VIII
Roccamurata (2)	28.VI	06.VII	14.VII	30.VII

umbel. *Umbel* 2,2-3,5 cm in diameter, pedicels 6-11 mm, unequal. *Perianth* cylindrical to narrowly ovoid; *segments* 3,6-6 x 1,5-2 mm, pink to dark reddish-purple or white with green kell (ssp. *arvense*); *stames* exerted, 4-8 x 0,7-2 mm, *anthers* reddish before dehiscence; *capsula* 3-5 x 2-3 mm; *style* 3-7 mm.

CARYOLOGY

Literature data report for the species a somatic chromosome number (2n) of 16 with 0-2 B-chromosomes, by now well-known for several genera of Liliaceae (BARLOW & VOSA, 1970; CORSI & GARBARI, 1971; TORNADORE & GARBARI, 1979; DYER, 1979; JONES & REES, 1982; TORNADORE, 1985, 1986; TORNADORE & ORZA, 1987). In *A. sphaerocephalon* 1 B-chromosome in Italy (VIEGI & CELA RENZONI, 1981); and in Greece (BOTHMER, 1970); 2 B's in Spain (RUIZ REJON & SANUDO, 1976) (Tab. 3). As for as regards the plants examined, these have a karyotype consisting of four pairs of median or sub-median chromosomes

TAB. 3

Allium sphaerocephalon	$2n=16$:	DIANELLIDES in LÖVE & LÖVE, 1961; LINDER & BRUN in LÖVE & LÖVE, 1961; BOTHMER, 1970; CELA RENZONI & GARBARI, 1971; SOPOVA, 1972; NEVES, 1973; LEVAN in NEVES, 1973; LOON & OUDEMANS, 1976; MAGULAEV, 1976; SCRUGLI & BOCCHIERI, 1977; VOSA, 1977; AREND & LAAN, 1979; COUDERC, 1979; LOON & SNELDERS, 1979; FERNANDEZ CASAS & Coll., 1980; VIEGI & CELA RENZONI, 1981; STRID, 1981; LOON & SETTEN, 1982; PASTOR, 1982; DIETRICH in PASTOR, 1982; FERNANDEZ in PASTOR, 1982; TSCHERMAK-WOESS in PASTOR, 1982; GUILLEN & RUIZ REJON, 1984.
»	$2n=16+1B$:	BOTHMER, 1970; VIEGI & CELA RENZONI, 1981; PASTOR, 1982; GUILLEN &RUIZ REJON, 1984.
»	$2n=16+2B$:	KURITA, 1956; RUIZ REJON, 1976; RUIZ REJON & SANUDO, 1976.

(m-sm) and one, two, three or four secondary costrictions close to the centromere (Fig. 1). There are manifest cytological differences between the populations in the number of secondary costrictions and also in some case of heteromorphism in the homologous pairs and presence or absence of B's (Tab. 4).

RESULTS AND DISCUSSION

There is a correlation between flowering period, caryology and the colour of both perianth and pedicels. Indeed a first group of populations flowers from 6 June to 14 July, an intermediary group from 18 June to 3 August and a last group from 26 June to 5 August (Tab. 2). The first group of five populations has no intercalary satellites on 7th pair; a second group has intercalary satellites on 5th and 7th and while a third group has no satellites on 5th and has them on 6th pair (Tab. 4). The above caryological differences are paralleled by colour differences. Flowers of the first group have either pink or reddish purple perianth and green pedicels, those of the second group have reddish purple (white in ssp. *arvense*) perianth and greenish pedicels while in the third group the flowers have both, perianth and pedicels, dark reddish purple. In our opinion these differences are not to be identified with intraspecific *taxa* (TORNA-

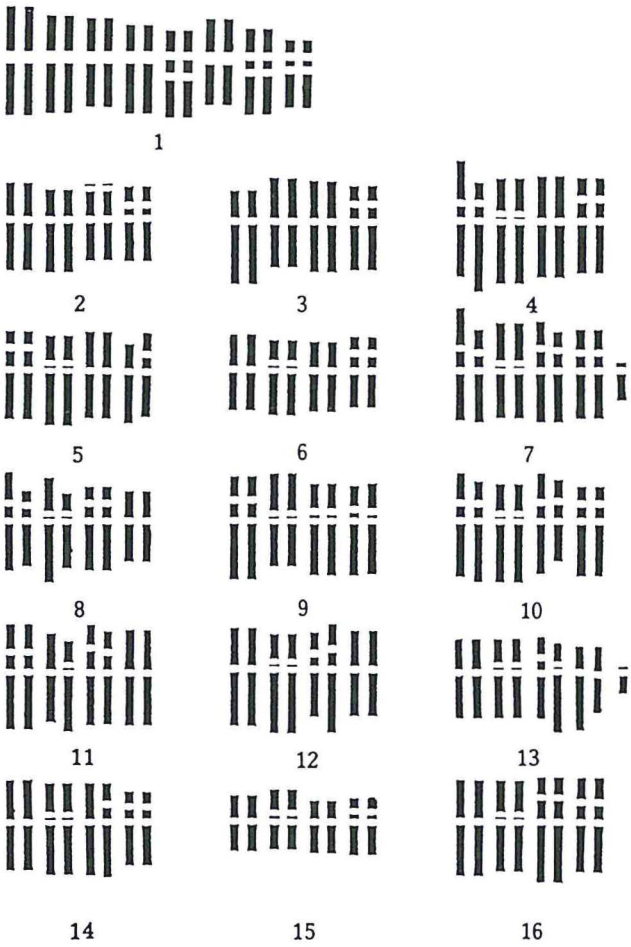

Fig. 1 - The first chromosome pairs are similar (m-ms type) in all populations. The last four chromosome pairs show a great variableness. The idiogram: 1) belongs to *A. sphaerocephalon* ssp. *arvense* - Serrano, the others to *A. sphaerocephalon* ssp. *sphaerocephalon* - 2) Broves; 3) Aranjuez; 4) M. Catria; 5) Prati di Tivo; 6) Lourdes; 7) M.S. Bäume; 8) Elba; 9) Porto Cesareo; 10) Roccamurata I°; 11) Dubrovnik; 12) Lokrum; 13) Lesina; 14)Iseo; 15) Karst-Trieste; 16) Roccamurata II°.

DORE, 1982). The subspecies considered has a large distribution, all central and southern Europe and northern Africa. The environmental conditions in which the species lives are extremely variable for pedology, altitude, latitude, etc. (Fig. 2). All these are the reasons of the existence of many cytotypes and probably ecotypes, throughout the range of the *A. sphaerocephalon* ssp. *sphaerocephalon*. It's difficult to recognize well-marked groups of genetic variants for the presence of a more or less continuous series of mediate populations.

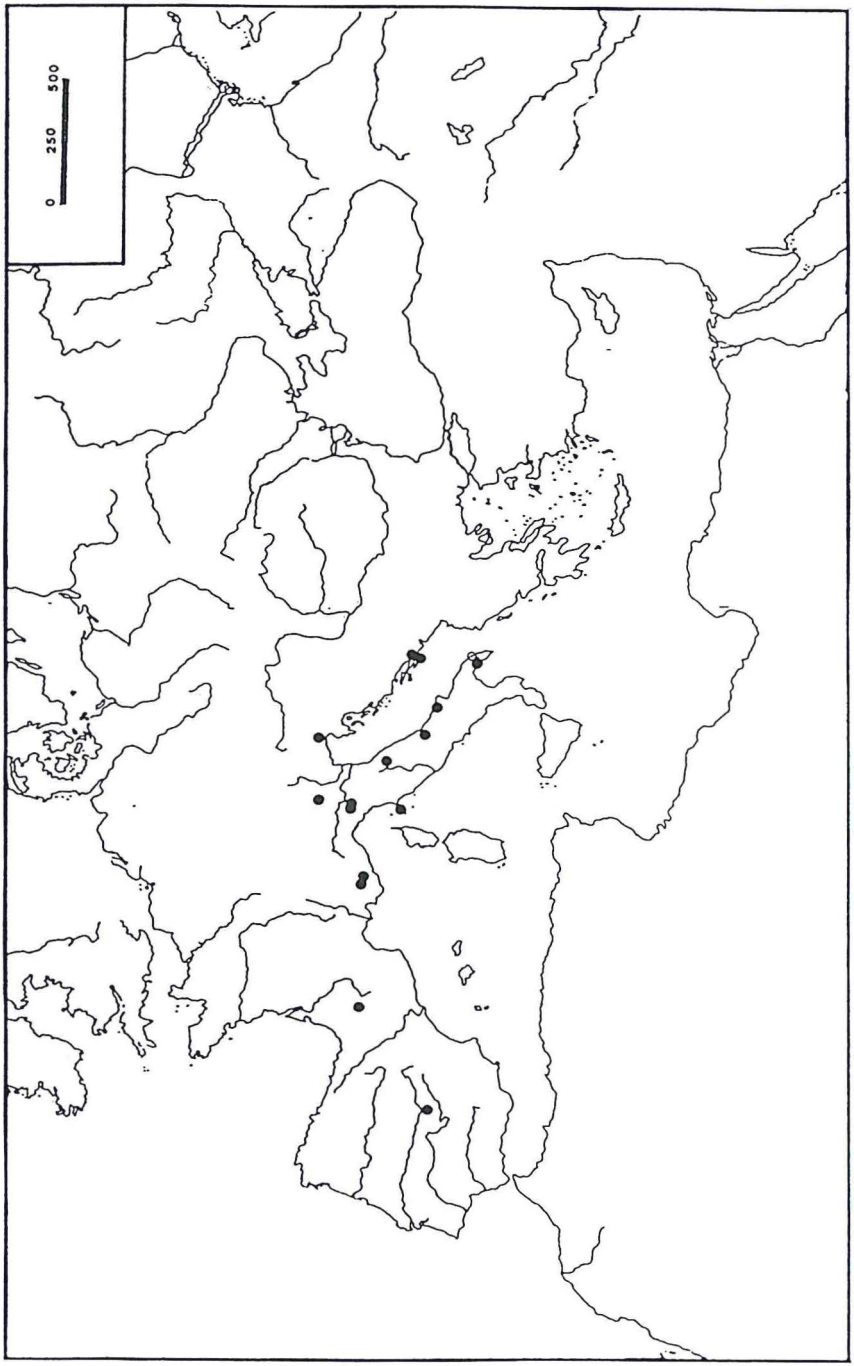

Fig. 2 - Map of the investigated populations, ○ ssp. *arvense*, ● ssp. *sphaerocephalon*.

TAB. 4

PAIR	V°	VI°	VII°	VIII°	B'S
Broves	2m	2sm	2m*	2sm^s	
Aranjuez	2sm	2m	2m	2sm^s	
Mt. Catria	1m^s+1st^s	2sm^s	2m	2sm^s	
Prati di Tivo	2sm^s	2sm^s	2m	1sm+1sm^s	
Lourdes	2m	2m^s	2m	2sm^s	
Mt. S. Bäume	1m^s+1sm^s	2m^s	1sm^s+1sm^s	2sm^s	1st
Elba	1m^s+1st^s	1m^s+1sm^s	2st^s	2m	
Porto Cesareo	2sm^s	2m^s	2sm^s	1sm^s+1sm^s	
Roccamurata (1)	1sm^s+1sm^s	2sm^s	1sm^s+1sm^s	2st^s	
Bubrovnik	2sm^s	1m+1sm^s	1sm^s+1sm^s	2m	
Lokrum	2m	2sm^s	1sm^s+1sm^s	2m	
Lesina	2m	2sm^s	1sm^s+1sm^s	1sm+1sm	1st
Iseo	2m	2sm^s	1m+1sm^s	2sm^s	
Karst - Trieste	2m	2m^s	2sm	2st^s	
Roccamurata (2)	2m	2sm^s	2sm^s	2sm^s	

* The satellites are terminal (see fig. 1)

The interpretation of these differences is one of the most difficult problems because the karyotype is a phenotipic character and it is only a little part of the genetic system. We may therefore think that these biotypes may be looked as the initial stage in the divergence of evolutionary lines inside the ssp. *sphaerocephalon*, ecological races that are not easily distinguishable. In our opinion these populations are not recognizable as distinct *taxa*, exist under particular *habitat* and site conditions have different karyotypes ascribable to physiologic and environmental reactions.

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(*ms. pres. il 7 febbraio 1989; ult. bozze il 24 agosto 1989*)