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Notes on systematics and chorology of *Asparagus* L. (*Asparagaceae*) in Sardinia (Italy)

Abstract

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The occurrence in Sardinia (Italy) of *Asparagus acutifolius* L., *A. albus* L. and *A. horridus* L. is here confirmed. The three taxa were studied on material collected from natural populations and specimen from several herbaria (SS, SASSA, CAG, FI and Ancona). Notes on chorology, systematics, ecology and fenology of the mentioned species are given. The exclusion of *A. aphyllus* L. and the uncertain presence of other taxa related to the *A. officinalis* L. group, are discussed.

Introduction

The first idea of this study started few years ago from a project dealing with the cultivation of wild *Asparagus* as a possible crop for marginal areas in Sardinia (Fiori & al. 2001) in which one of us was involved. The intriguing opportunity for all of us was to find a possible way of communication between two areas usually, at least in our experience, quite distant: agriculture and systematic botany. This contribution deals with the study of some natural populations and herbarium material of the taxa of the genus *Asparagus* in Sardinia. In this note the presence of some species is not confirmed, and possible reasons for some of the most common misleading are given, using different sources of information.

The genus *Asparagus*, described by Linnaeus (1753), actually includes a quite variable number of taxa: from 160 to 290 species (Kubitzki & Rudall 1998) or about 300 species, together with the close genus *Protasparagus* (Dahlgren & al. 1985). *Asparagus* is spread in the Old Word mostly in the arid, semi-arid or Mediterranean climatic regions of Africa, Mediterranean, Eastern Asia and only one species native in Australia. Sardinia can be considered crucial in defining some of the Mediterranean taxa. For the island *Asparagus albus* L., *A. officinalis* L., *A. maritimus* Mill. (= *A. scaber* Brign.), *A. acutifolius* L., *A. aphyllus* L. and *A. horridus* L. (= *A. stipularis* Forssk.) had been reported by Barbey (1884), Fiori (1923), Bozzini (1959), Pignatti (1982) and Valdés (1980).

Material and methods

Morphological and anatomical studies were carried out on dry and fresh material collected from 15 different sites (Tab. 1). The Sardinian material conserved in the SS, SASSA, CAG, FI and Ancona herbaria was checked and reviewed. The distribution in Sardinia was reported utilizing a UTM geographic grid of 5×5 km squares (Fig. 1-3). The abbreviations of countries or specific territories names in the distribution of the taxa are as in Valdés (1980) or Greuter & al. (1989). The citotaxonomic study was carried out on germinating seeds collected from the sites in Table 1. *Specimina visa* for reference are conserved in SS. The Feulgen tecnique was carried out and material was stained with fuxine.

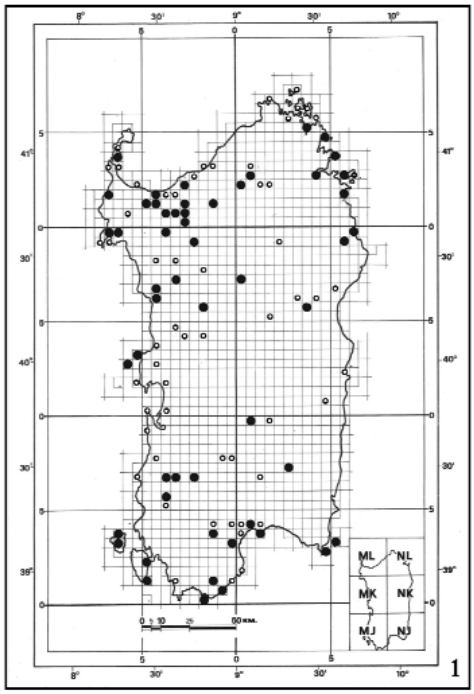
Results

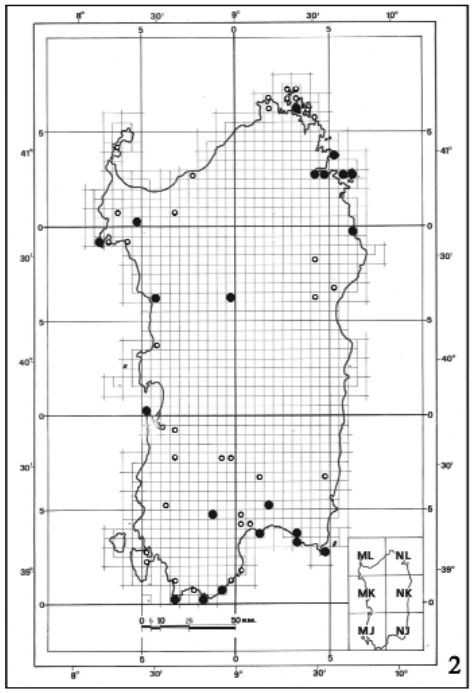
Asparagus acutifolius L. Sp. Pl.: 314 (1753) typus in LINN: 434/9(!)

A. acutifolius is a rhizomatous Geophyte common in shrubs communities, *Quercus ilex* woods, wood glades, edges, marginal areas, from sea level to 1000-1100 m asl. The shoot architecture of *Asparagus* is highly complicated. In *A. acutifolius* the young shoots (turions) rise from March/April when the shoots of the previous year begin to dry. Flowering period is comprised from the end of August to October, flowers on one-year-old shoots. Fruiting from October to Dicember. *A. acutifolius* is a Mediterranean taxon, its distribution includes: Lu, Hs Bl, Ga, Co, It, Sa, Si, Croatia, Slovenia, Al, Gr, Cr, Bu, Tu, An, Cy, LS, IJ, Eg, Li, Tn, Ag and Ma (Bozzini 1959; El-Gadi 1978; Pignatti 1982; Sibthorp & Smith 1823; Valdés 1980). Distribution in Sardinia in Figure 1. The chromosome number, $2n = 20$, is the first report from Sardinia and it is confirmed in all the investigated populations.

Table 1. The sites of populations sampling in Sardinia.

***Asparagus acutifolius* L.**	***A. albus* L.**	***A. horridus* L.**
La Crucca 85 m., 40° 45' N, 8° 29' E	Tramariglio 50-75 m., 40° 36' N, 8° 10' E	Bosa Marina 5-10 m., 40° 17' N, 8° 29' E
Porticciolo 27-30 m., 40° 38' N, 8° 12' E	Capo Caccia 100-120 m., 40° 34' N, 8° 10' E	S. Giovanni in Sinis 12-40 m., 39° 53' N, 8° 26' E
Platamona 15 m., 40° 49' N, 8° 31' E	Piano Multas 125-150 m., 40° 17' N, 8° 30' E	Cala Regina 50 m., 39° 11' N, 9° 22' E
Monte Doglia 40-50 m., 40° 39' N, 8° 16' E	Cala Regina 50 m., 39° 11' N, 9° 22' E	Capo Carbonara 35-50 m., 39° 06' N, 9° 31' E
Osilo 542 m., 40° 46' N, 8° 40' E	Capo Carbonara 35-50 m., 39° 06' N, 9° 31' E	
Ittiri 218 m., 40° 38' N, 8° 32' E		
Macomer 560-640 m., 40° 17' N, 8° 47' E		
Tempio 100-120 m., 40° 51' N, 9° 01' E		





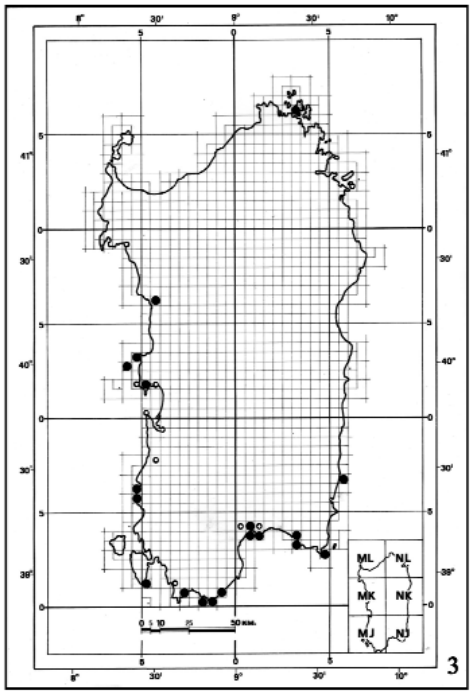


Fig.1-3. Distribution of: **1)** *Asparagus acutifolius* L., **2)** *A. albus* L., **3)** *A. horridus* L. in Sardinia (white dots: based only on literature data).

Asparagus albus L. Sp. Pl.: 313 (1753) typus LINN: 434/7(!)

A. albus is a rhizomatous Geophyte or fruticous Chamephyte characteristic of arid and xeric sites especially, but not exclusively, close to the sea. This taxon occurs on arid slopes, low shrubs communities, cliffs, walls, edges, from sea level to 1000 m asl. Aerial shoots pluriennial, but phylloclades generally fall at the end of the first year's vegetative season (in summer). At the axil of the leaves (reduced to thorns) vegetative and floral buds are present, that generate new phylloclades in spring and flowers in summer. By the activation of these meristems, a plant, can flower and form new phylloclades, in a very short time, even after a summer rain. New shoots grow at the beginning of spring, they differentiate and lignificate quickly. In the Sardinian populations of *A. albus* observed, flowers come out on shoots of the year at the end of the summer when, most of phylloclades are already fallen down. Later on, during autumn and winter new cladodes are formed. Fruiting from October to December. This species is W Mediterranean, its distribution includes: Lu, Hs, Bl, Co, It (Calabria), Sa, Si, Li, Tu, Ag, Ma (Bozzini 1959; El-Gadi 1978; Pignatti 1982; Valdés 1980). In Figure 2 the distribution in Sardinia. The chromosome number, $2n = 20$, is the first report for Sardinia and it is confirmed in all the populations investigated.

Asparagus horridus L. in J. A. Murray, Syst. Veg., ed. 13: 274 (1774) typus in LINN: 434/10(!)

Synonyms: *A. stipularis* Forssk.; *A. aphyllus* L. b *stipularis* (Forssk.) Fiori; *A. horridus* L. fil. (1781); *A. aphyllus* var. *stipularis* Baker (1875).

A. horridus is a rhizomatous Geophyte or fruticous Chamephyte, mainly present in the coastal rocky places and in open and low shrubs communities from 0 to 500 m asl. New shoots rose numerous at the beginning of spring. Flowering from the second half of May to June; Bozzini (1959) reports an earlier flowering period (April-May). Flowers come out on the shoots of the year. Fruiting at the beginning of summer with a second flowering period in Autumn, as reported in Fiori (1923) and Bozzini (1959). *A. horridus* is Mediterranean taxon, its distribution includes: Lu, Hs, Bl, Canary Islands, Sa, Si, Me, Cr, Gr, LS, IJ, Sn, Eg, Li, Tn, Ag, Ma (Bozzini 1959; El-Gadi 1978; Pignatti 1982; Sibthorp & Smith 1823; Valdés 1979, 1980). Distribution in Sardinia in Figure 3. Chromosome number is $2n = 20$, it confirms Bozzini (1959) report from Capo S. Elia (Cagliari).

Species excludendae or incertae

In Bozzini (1959) *A. aphyllus* L. is a taxon somehow intermediate between *A. acutifolius* and *A. horridus* (sub *A. stipularis* Forssk.), but morphologically closer to the first. The main differences from *A. acutifolius* are due to the diverse cladode's length present at each node in *A. aphyllus* as in the Linnaeus (1753) description: "*Asparagus aphyllus*, *spinis fasciculatis inaequalibus divergentibus*". In Fiori (1923), presumably following Baker (1875), *A. aphyllus* L. includes the taxon *A. horridus* (sub *A. horridus* × *stipularis*). Following this interpretation the two names, *A stipularis/A. aphyllus*, were used, at least by Italian authors, to indicate the same taxon, at least at specific level. More studies are needed to clarify the circumscription of *A. aphyllus* in the entire Mediterranean region. In this work *A. aphyllus* is excluded from the Sardinian flora on the basis of different characters that include: chromosome number, cladode's number and length at each node, number of vascular bundles per cladode. The presence of taxa belonging to the *Asparagus*

officinalis L. group is supported by only two specimens in Ancona's and CAG herbaria (!). In both cases they could be collected from cultivated or escaped isolated plants. Since natural populations couldn't be found, the presence of *A*. *officinalis*, or that one of any other of its allied taxa, i.e. *A*. *maritimus* Mill., in Sardinia is still to be confirmed.

Conclusions

The presence in Sardinia of three taxa is here confirmed: *Asparagus albus* L., *A*. *acutifolius* L. and *A*. *horridus* L. The same chromosome number, $2n = 20$, was assessed from the three taxa studied. This is confirm for *A*. *horridus* L. in Sardinia, but it is a new report for *A*. *albus* L. and *A*. *acutifolius* L. In the latter this diploid number, is the second report from the W Mediterranean region. Sardinian populations of *A*. *acutifolius* are differentiated from the Italian and Sicilian ones studied by Bozzini (1959) and related to the NW Mediterranean ones by their diploid chromosome number. The extensive distribution of the diploid type (all the investigated populations) can be interesting for a possible horticultural exploitation of the Sardinian *A*. *acutifolius*. The occurrence in Sardinia of *Asparagus officinalis* L. or of any other related taxa, i.e. *A*. *maritimus* Mill., is still to be confirmed. On the contrary *A*. *aphyllus* L. is to be excluded from the flora of the island, especially on the basis of cladodes' anatomy and of chromosome investigations.

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