



MORPHO-KARYOLOGICAL DATA OF *Aster albanicus* Degen. IN THE AREA OF LIBRAZH, ELBASAN, ALBANIA

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SYNOPSIS

Key words:

Chromosome, idiogram, karyogram, species, pollen granules, area.

In this article, for the first time are provided data on the determination of morphological characteristics, the number of chromosomes, chromosomal formula, karyogram, ideogram and the morphological features of the pollen granules of *Aster albanicus* Degen in Librazhd area of Elbasan region.

Through this article we aim at assessing and evaluating the probability of existence of changes in the morphological, karyological and palinological level of this specie compared to the data provided in the existing literature.

After a lot of research work we came to the conclusion that there are changes in the morphological level related to the overall length of these types of plants.

There was also found a matching of the palynological characteristics with the data of research references. A number of chromosomes $2n=24$ and the chromosomal formula $2n = 2x = 4M + 8m + 2m^{\circ} + 2sm + 2sm^{\circ} = 18$ were found as well.

INTRODUCTION

The target of this research study is the species *Aster albanicus* Degen. – Albanian Aster with its population in the area of Murrash Bridge, alongside the road Elbasan-Librazhd, Alt.233-240mT; No. 41°11'02,5"; E 020°16'20.8", in the valley of Shkumbin river (Fig.1).



Figure 1: Growing Habitat for *Aster albanicus* Librazhd (Bridge of Murrash) (photo: S. Turku).



Figure 2: *Aster albanicus* Degen. population Librazhd (photo: S.Turku).

Aster albanicus Degen. is a Balcan sub-endemic species, of which two sub-species are known in Albania: *Aster albanicus* Degen. sub-species *paparistoi* Qosja in the conifer coast and *Aster albanicus* Degen. sub-species *albanicus* in the ultra basic rocks (Kukës, Shkopet, Ulzë, Librazhd). (Zekaj et al., 2009)

The populations of *Aster albanicus* Degen are mentioned in the Gorge of Juniper (Mount Valamara) Pogradec III (1400 m a.s.l.) Black Rock (Rrajce) Librazhd (1300m a.s.l.) (Vangjeli, Proko), Mount of Gjalica (2000m) Markgraf(by Jani Vangjeli in information data; Shtama Pass (Krujë), Divjakë (Lushnje), Status R (rare). (Group of authors, 1997).

Today's tendencies in the contemporary citotaxonomy are the complex research studies in the mophological, karyological palinological level of these species and their population. Our study was concentrated on the definition of the morphological characteristics, number of chromosomes, chromosomic formula, karyogram, ideogram, morphological features of pollen granules, as well as the evaluation of the possibility of existence of differences in the morphological, karyological and palynological level compared to the data given by the existing literature.

MATERIAL AND METHODS

Raw material for the research study like seeds, cuttings with roots and rhizoma, were collected from the expeditions realized during the period of blossoming and fruit ripening (end of September) for the years 2003-2006.

About 30 plants were randomly picked from the population of Librazhdi (Fig. 2). The latter ones were measures and embeded in pots, with natural soil. The measures taken from the plants of this area were concentrated on a group of morphological characteristics like: general length, length and width of leaves,

number of flowers per plant, diameter of flowers, length of flower stems. The measures were taken with scale and caliber (in cm) depending on the size of the features analysed (Topuzi et al., 2001; Vangjeli et al., 2000).

The seeds collected on site and from the plants embeded in the mini-sunhouse of IAR were embeded Petri plates, and their roots were used for the study of mithosis. The most suitable time for the study of mithosis for this species is February.

The methodic of processing the material was based on the standard technique Heitz (Capineri et al., 1978) described by Dyer (1979).

The roots from the plants or the seeds germed are processed after the following phases:

Prefixing in colchicine water solution 0.04%;

- Fixing in Karnua (3 absolute ethilic alcohol: 1 glacial acetic acid);

- Conservation in ethilic alcohol 70°;

- Coloring in acetic orseine;

- Preparation of temporary preparates with the standard technique of pressing, and permanent technique or processing with absolute alcohol and closing with Canadian balm (Dyer, 1963).

Study of the best metaphases was done with the microscope Olimpus and the fixing of preparates was realized through photographing with digital camera Canon 5.1mg. pixel. Measuring of chromozomes and processing of data was realized with the software Cromo II (Pavone & Salmeri, 1992).

Fresh pollen material was used for the study of morphologic features of pollen granules and several processing methods were used such as:

- Simplified method of acetolisis (Avetisjan, 1950);

- Coloring method of basic phuxine (Smoljaninova & Gollubkova, 1953).

- Fixing the microscopic preparations of pollen granules was made with fixer glycerine gelatine.

RESULTS AND DISCUSSION

GENERAL BOTANICAL DATA

Family: Compositae

Genus : Aster L.

Aster albanicus Degen. (*Albanian Aster*) is widespread in the mountains bordering Jugoslavia and Albania (Tutin et al., 1980).

In our country it mainly grows in dry cliffy areas, mainly ultra-basic (200-2100 m a.s.l.) as well as less in seaside sands more or less humid. *Genistetum Hassertianae e Buxeto-Festucopsidetum. (ssp.albanicus.)* (Vangjeli et al., 2000).

Populations of *Aster albanicus* Degen. are encountered in the Gorge of Shtame (Krujë), Divjakë (Lushnje), ecc. Status R (rare). (Group of authors, 1997). The complex study of species *Aster albanicus* Degen. for the population of Librazhd is done for the first time. The growing area of this population has been damaged because of the works on road.

The data taken (March 2006) via GPS locate this area at:

Alt. 233-240mT; N 41°11'02,5"; E 020°16'20.8"

The population of *Aster albanicus* Degen. in Librazhd (Figure 1) has been spread in ultrabasic rocks, together with other kinds of plants like: *Juniperus oxycedrus* L., *Cotinus coggygria* Scop., *Phillyrea angustifolia* L., *Rubus ulmifolius* Schot., *Fraxinus ornus* L., *Quercus robur* L., Umbelliferae, Compositae, Labiatae, *Linaria vulgaris* Mill., *Satureja montana* L., *Paliurus aculeatus* Lam., Caryophyllaceae, *Poterium sanguisorba* L., Briophyta, Graminaceae, *Plantago lanceolata* L., *Galium* sp., *Dorycnium pentaphyllum* Schop., *Helianthemum nummularium* (L.) Mill. The plants were found in blooming and fruit-making, few of them in budding in the conditions of a considerable humidity and sufficient light valuated by Peci Naqellari.

This species in the Albanian Flora is described as: *Hemikriptofite*. Perennial grassy Plant 15-35 cm high. Up growing stem to higher up, with spider-like bunch of fur in the lower part. Spike upside down leaves to flat ones, glandule shape with spider-like fur. Little caps in separate loose vast beds, with long tail. The cover-up brackets in three layers, the outside and middle ones in spike-ovary shape, the inside ones sharp spiky, with wide dry skin edges. Lappet shape flowers 12-14 violet. Unequal crest hair. In dry rocky places, mainly ultrabasic (200-2100m) as well as less in seaside sands more or less humid. (Durrës-Karavasta). August-November. 2n=18.

Subsp. *albanicus*: Achen almost as long as the crest (Fig. 4). In ultrabasic rocks. *Genistetum hassertianae* and *Buxet-Festucopsidetum* (Vangjeli et al., 2000).

The following data are identified in the tested plants:

The general length of plants of this population varies from 10-28 cm, length of leaves varies from 1,3-2.7cm and width of leaves varies from 0.2-0.4, number of flowers per plant 2-5, diameter of flowers 3-3.8 cm, length of flower stems from 1.8-4.8 cm, number of lappet shape flowers from 11 up to 13.

Lappet shape flowers have a light violet color (Fig, 3).



Figure 3: *Aster albanicus* Degen. Flower details (photo: S. Turku).



Figure 4: *Aster albanicus* Degen. Crest Hair (photo: S. Turku).

Most of these plants reveal low values of the general length of the plant, less than 15 cm considered as the lowest limit of the general length in the Albanian Flora (Vangjeli et al., 2000).

Comparing our data deriving from our study measuring the plants and the data described in the book "Albanian Flora" (Vangjeli et al., 2000), it is seen that there are slight changes related to the length of stalk, length and width of leaves, the diameter of caps, number of lappet shape flowers, etc. In the plants studied, it was noticed that the crest hair was not equal and the achen is presented in the report with almost the same length as the crest (Vangjeli et al., 2000).

PALYNOLOGICAL DATA

The pollen granules measured from the flower *Aster albanicus* Degen. are three-furrow, 3 pored. Shape according to the contours is spheroidal. The diameter of pollen granule varies between 24.9-32.6(28.8) μ . In the polar position they have round threlobule shape. The furrows are deep, smooth but short. Furrow width varies between 6.3-10.4(8.2) μ . Round shape pore is found in the center of furrow, which does not exceed the measurements of furrow. Diameter of pore varies between 3.5-7.8(5.7) μ . Exine of pollen granule is two-layer with a sculpture of thorns and small thorns. Thickness of exine is 1.8-2.7(2.3) μ . Thorns are conic and sharp-pointed. Smaller and scarce thorns are in between the thorns. Length of thorn varies from 1.8-2.9(2.4) μ . Width of thorn varies from 1.6-2.7(2.2) μ .

Diameter of pollen granule for the plants of population Librazhd, varies from 27.5-32.6(29.4) μ . Width of furrow varies from 6.9-9.8(8.8) μ . Diameter of pore varies 4.3-7.8(5.2) μ . Thickness of exine is 1.8-2.7(2.3) μ . Length of thorn varies from 2.3-2.9(2.5) μ . Width of thorn varies from 2.0-2.7(2.4) μ . (Figs. 5A,B)



Figure 5: *Aster albanicus* Degen. Population Librazhd. a. Microscopic field of pollen granules.

b. Enlarged pollen granules.

From the study of pollen granules of species *Aster albanicus* Degen. It was seen that our data on the diameter of pollen, width of pollen granules, width of furrow and thickness of exine result in values approximate to the values discovered according to literature. (Avetisjan, 1950; Erdtman, 1956; Faegri & Iversen, 1989; Moore & Webb, 1978; Smoljaninova & Gollubkova, 1953).

KARYOLOGICAL DATA

In the rootlets taken from the developing seedlings *Aster albanicus* Degen., during the years 2004-2006 in the population Librazhd (Bridge of Murrash, Elbasan) it results that in the researched metaphases of this population based on the computer method Cromo II (Pavone & Salmeri, 1992) and on the basis of Nomenclature Levan (Levan et al., 1964) it results that:

The chromosomic number is $2n=18$ for the time period 2003-2006 (Turku, 2007). The chromosomic formula according to Nomenclature Levan:

$$2n = 2x = 4M + 8m + 2m^{\circ} + 2sm + 2sm^{\circ} = 18$$

Gender *Aster* L. with base chromosome number $x=9,10$ is mentioned in the Citotaxonomic Atlas of Balcans but there is no description for the taxon *Aster albanicus* in this material. (Van Loon, 1987)

The chromosome number $2n=18$ for the species *Aster albanicus* Degen. is given in the Albanian Flora (Vangjeli et al., 2000), defined by L. Puto in the populated material in the coniferous woods in the neighborhood of Durrës (Qosja & Puto, 1983), defined by Trojani (Zekaj et al., 2009).

The cariotype of kind *Aster albanicus* Degen. for the population Librazhd is shown as heterogenous with metacentric base typology 14 chromosomes (4 big metacentrics, 10 small metacentrics) and submetacentric 4 chromosomes. 2 Satellite couples are present that in most of preparations are positioned in the third submetacentric couple (chromosomes 5, 6) and in the sixth submetacentric couple

(chromosomes 11, 12) of the chromosome set mainly located in their short wings (Figs. 6 A,B).

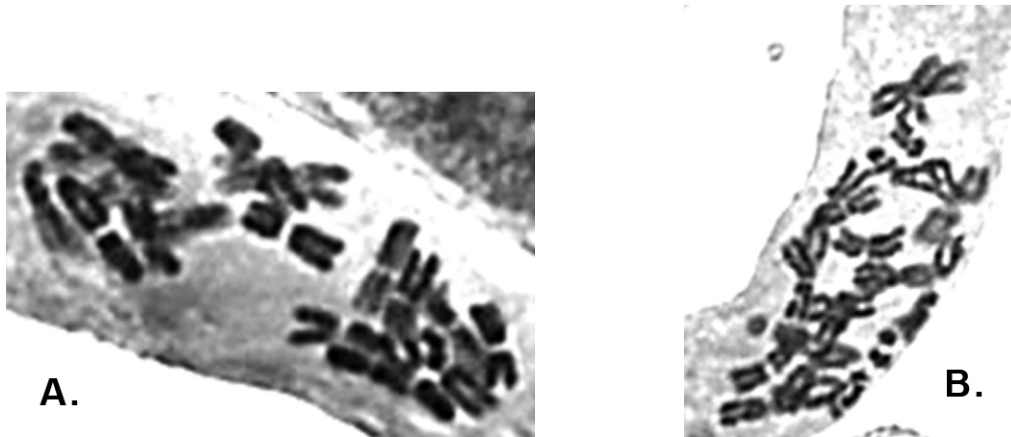


Figure 6: *Aster albanicus* Degen. a,b Metaphases of population Librazhd 2005.

Photocariogram was set up from the photos of metaphases fields (Fig. 7).

For a more detailed characterization of cariotype *Aster albanicus* Degen. for the population of Librazhd the cariotogram and ideogram were set up where apart from the number, typology of chromosomes, is also given a graphic presentation of the order of chromosomes of various types from the chromosomic set.



Figure 7: Photocariogram of *Aster albanicus* Degen. population Librazhd.

During the treatment of sprouting seeds on Petri plates the index of sprouting was estimated around 70% for the population of Librazhd and it was noticed that the sprouting seeds were fast rooted.

While the coefficient of multiplication of underground seedlings reached 1:3.5. these indicatives make us think that the multiplication of this species in the natural way is productive.

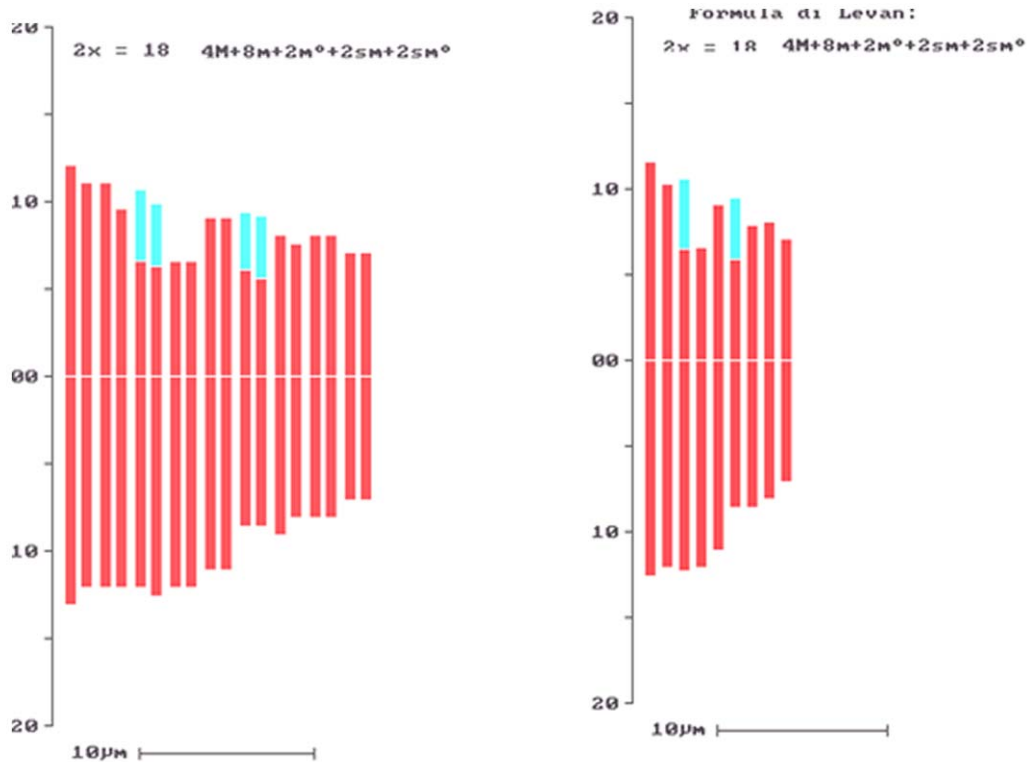


Figure 8: *Aster albanicus* Degen. population Librazhd. a. Average karyogram
b. Idiogram. Scale 100.

CONCLUSIONS

1. The measure morphological data related to a large number of features are in conformity with the data specified in the Albanian Flora, but as regards to the general length of plants of this population, lower values are shown as compared to the lowest limit of length described from literature.

2. Palynological studies complement the framework of deep studies and for the species at hand matching of the palino-morphological features with the data from literature is noticed.

3. For the species *Aster albanicus* subspecies *albanicus* for the area Librazhd (Bridge of Murrash) Elbasan it was defined:

Chromosomic number $2n=18$,

Chromosomic formula $2n = 2x = 4M + 8m + 2m^{\circ} + 2sm + 2sm^{\circ} = 18$, cariogram ideogram were set up.

4. The complex study of species *Aster albanicus* subspecies *albanicus* for the area Librazhd (Bridge of Murrash) Elbasan in the morphological, karyological, palynological level, number of chromosomes, chromosomic formula, karyogram, ideogram, helps the cardmaking, entire morpho-karyological identification of the

species and preservation of biodiversity of populations according to their natural habitat.

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