THE ANALYSIS OF *SAPONARIA PUMILIO*'S GROWTH STRATEGIES IN ALPINE MEADOWS FROM ROMANIA

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REZUMAT. Regiunile alpine sunt caracterizate de condiţii de mediu particulare cum sunt temperaturile extreme, altitudini mari, cantitatea redusă de nutrimente din sol şi perioada scurtă de vegetaţie. Chiar daca pentru un număr mare de specii, condiţiile amintite sunt restrictive, vegetaţia alpină conţine un număr mare de specii rare, relicte şi endemice. *Saponaria pumilio* (L.) Fenzl. Ex. A. Braun este un relict terţiar care vegetează în pajiştile alpine din Alpii Estici şi Carpaţii de Sud. Ca o urmare a adaptării la mediul alpin, *S. pumilio* deţine caracteristici specifice acestuia: tulpini scurte, flori mari, frunze dispuse după un unghi ascuţit, formând perniţe. În acest context, scopul acestei lucrări constă în prezentarea unor strategii de creştere pe care le dezvoltă această specie în ecosistemele în care trăieşte.

Cuvinte cheie: alpin, planta, ecologie, mediu.

ABSTRACT. The alpine regions are characterized by particular environmental conditions such as extreme temperature, high altitude, soils poor in nutrients, short vegetation period. Although for many species these conditions are particularly restrictive, alpine vegetation contains a large number of rare, relict and endemic species. Saponaria pumilio (L.) Fenzl. Ex. A. Braun is a tertiary relict which vegetates in alpine meadows from Eastern Alps and South Carpathian Mountains. As a result of adaptations to alpine environment, S. pumilio has specific characteristics: short stalks, large flowers, leave arrangement in acute angle and it forms cushions. In this context, the purpose of this paper was to reveal some growth strategies that S. pumilio developed in the ecosystems in which it lives.

Keywords: alpine, plant, ecology, environment.

1. INTRODUCTION

After a serious literature review (Wildovà and colab., 2007; Sintes and colab., 2005; Hutchings and Bradbury, 1986; Jonsdottir and Watson, 1997; Huber and Stuefer, 1997; Turner and Pollock, 1998; de Kroon and Hutchings, 1995; McLellan and colab., 1997; Klimeš and colab., 1997; Winkler and Fisher, 1999; Fagerstrőm, 1992; Wikberg, 1995; Sackmille-Hamilton and colab., 1987; Bell, 1984; Herben and Hara, 1997) [1] show the importance of studying the clonal growth strategies. In order to clarify species' perpetuation and its dynamics, the understanding of vegetative reproduction is very important.

Clonal individual are made of interconnected ramets which forms a strong network. From studies conducted by the authors mentioned above, it has been observed, that for clonal plants, the growth strategies are imposed by plant's architecture, resource translocation and intra-individual plasticity. All this processes have the capacity to improve the nutritional ability and the way in which vegetal association is structured in time and space.

[2] shows that due to its low dispersion degree, the interspecific competition of clonal plants is local and, according to spatial segregation hypothesis (Pacala, 1997) this can lead to occurrence of cushions which contain just one species.

Jordan and Nobel (1979), Jelinski and Oheliak (1992), Eriksson (1993) cited by [3] argue that population dynamics of a large number of clonal plants is often influence by ramets evolution and not by sexual reproduction.

Saponaria pumilio (L.) Fenzl. ex. A. Braun (*Silene pumilio* (L.) Wulfen, *Cucubalus pumilio* L., *Silene pumila* St. Lager, *Silene nana* Fritsch, *Saponaria pumila* (St. Lager) Janch) is a tertiary relict from *Caryophyllaceae* family that grows in cushions, being dispersed in the Eastern Alps and Romanian Carpathians [4]. Its origins are in Alps and the ecosystems in which is present are characterized by low temperatures and humidity, medium to poor-acid skeletal, siliceous soils [5].

2. METHODOLOGY

In the distribution area of *Saponaria pumilio* from Iezer-Papusa Mountains were carried out a series of scientific investigations to observe the growth strategies of this species.

From two heterogeneous resorts, were collected samples with surface of 25 cm^2, trying, where was possible, to maintain the depth imposed by the species size. Due to the horizontally extended root system, the surface (25 cm^2) that was initially set was exceeded. The species' individuals were unearthed so the length of the root can be measured. After the samples were washed, the spatial arrangement of the root was observed.

The steam's (cushions') distribution and their abundance were evaluated by using sample units.

3. RESULTS AND DISCUSSIONS

Saponaria pumilio is a plant with short stems (1-8 centimeters) that forms cushions up to 80 cm long (Fig. 1).

Fig. 1. Saponaria pumilio-general view.

The spatial arrangement of this species is given by its modular structure (Fig. 2).

Fig. 2. Genet's modular structure to *Saponaria pumilio*.

Saponaria pumilio is a clonal plant and its ramets can survive even if they are detached from the genet. This characteristic was revealed by cutting some ramets and transplantations them into a new habitat (flowerpot, 20 degrees):

30.08.2011 – The detached ramet (being a genet now) was put into a cooling room;

30.08.2011-01.09.2011 – The plant, accompanied by soil and some other species from its natural environment, was kept at a constant temperature of 2 degrees. No significant transformations were observed.

01.09.2011-01.10.2011 – The temperature was raised up to 4 degrees. The flowers start to wilt;

01.10.2011 – Transplantation. When the plant was transplanted the leaves were still green;

05.10.2011 – Leaves begin to turn yellow;

07.10.2011 – The accompanying species start to grow;

11.10.2011 – *Saponaria pumilio* begin its first regeneration;

20.10.2011 – The stems are 0.7-1 cm long;

6.01. 2012 – The plant starts its second regeneration and this time the process was much slower.

In the same time, another ramet was kept in similar climatic condition, but without accompanying species (*Festuca supina, Primula minima, Vaccinium uliginosum*). By comparing these two experiments was observed that in second case the plant was not able to acclimate to the new environmental condition.

In order to evaluate the way in which the presence and the abundance of other species influence growth of *Saponaria pumilio* two samples units were used. Every sample had the same surface (4.5 m^2) and the abiotic conditions were quite similar.

I. In the first case, the vegetation was rich, with cover of 90% and the number of species was also higher than in the second case. The characteristic of *Saponaria pumilio*'s cushions are listed in table 1.

Table 1. **The cushions' characteristic from the first case**

Cushion	Length/Width (cm^2)
1	20/10
2	22/10
3	38/1
4	31/34

The other species that were identified were: *Carex curvula, Agrostis rupestris, Juncus trifidus, Loisleuria procumbens*, *Phyteuma nanum, Campanula alpina, Primula minima.*

II. In the second sample, both vegetation (20 % cover) and flora (2 species: *Primula minima*, *Phyteuma confusum*) were poorer.

As it can be seen in the table 2, the number of *Saponaria pumilio*'s cushions was higher than in the first case.

Table 2. **The cushions' characteristic from the first case**

Cushion	Length/Width (cm^2)
1	18/15
2	10/9
3	12/12
4	14/12
5	15/12
6	20/23
7	26/17
8	29/26
9	6/4
10	24/30
11	25/21
12	24/20
13	21/27
14	19/13

4. CONCLUSIONS

By transplanting *Saponaria pumilio* in two different environmental conditions (with and without accompanying species) was observed that its acclimatization depends on the presence of other species. Thereby, in order to populate other areas it is conditioned by the he relationships that establishes with other species.

After testing the influence of the number and abundance of other species upon the same parameters to *Saponaria pumilio* was observed that there is a negative correlation between these.

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