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### ENVIRONMENTAL STRESS, SALINITY AND PROLINE RELATIONSHIP IN MARINE ALGAE

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*Résumé*

*L'augmentation de la salinité dans l'eau marine est directement proportionnelle à l'augmentation de la quantité de proline dans les Macrophytes. Cette augmentation est plus caractéristique chez Phodophyta et s'explique par leur évolution et leur modèle métabolique. Les Macrophytes ayant de grandes quantités de proline sont capables de tolérer plus facilement le stress de la salinité environnante.*

Abstract

The effect of salinity on the amount of the free amino acid proline in marine algae has been studied.

Increase of the sea water salinity is directly related to the increase of the proline quantity in marine macrophyta. This increase is more characteristic in Rhodophyta explained by their evolutionary and metabolical pattern. Macrophyta with great proline quantities are able to tolerate environmental salt stress more easily.

Environmental stress is known to cause a series of morphological and physiological transformations on terrestrial plants. Due to pronounced environmental conditions these changes can be temporary becoming permanent most of the times (McNamer and Stewart, 1973; Shevyakova, 1984). Increase in the amount of the free amino acid proline when plant organisms are subjected to environmental stress which is due to increase of the salt quantity (salt) stress, water decrease (drought stress) and to intensive or perpetual light stress (Shevyakova, 1984; Kemble and Macpherson), is one of these differentiations. As a free amino acid proline acts upon photophosphorylation and it has been found that along with threonine they protect the developmental membrane activity of the plastid thylakoids from freezing (Kemble and Machpherson; Sciuto et al.; 1980). Finally it has been experimentally proven that proline is encountered in greater quantities in the younger plant tissues (shoots and leaves) rather than in the adult ones.

In the present study an attempt was made to indicate whether proline follows the same pattern in marine algae as the one in higher plants. Insofar there have been but a few studies on this field and they have shown .that the sterile thalli contain more proline than the fertile ones (tetrasporiophytes and carposporiophytes) (Sciuto et al. (1980). Experiments have proven that doubling of the NaCl quantity in the culture solution results in the intense composition of the free amino acid glycine and proline (Shevyakova, 1984).

Collections of marine macrophyta were performed in biotopes of Thermaikos and Chalkidiki accompanied by simultaneous measurements of the salinity in the biotope. Free amino acids were then analysed, while total nitrogen, proteins and the contained in macrophyta samples alogones were measured (Cohn, and Brand).

We observe that initially the salinity values do not present considerable differences, though a seasonal grading is evident. Fluctuation in the amount of total nitrogen does not vary markedly in several macrophyta categories; however a rather greater percentage is more pronounced in Rhodophyta. Protein is more differentiated in Chlorophyta and Rhodophyta than in Phaeophyta.

Proline generally is built on the equation: higher S%-greater quantities of proline. Slight differences are detected as regards the same alga but in different biotopes. The presence of other environmental parameters causing stress is a probable explanation of the above stated phenomenon. Two relative studies conducted on algae encountered in the Adriatic Sea concluded that the proline quantity has nothing to do with the biotope (habitus) (Sciuto et al., 1980).

The amount of proline detected in Rhodophyta is strikingly larger among the classes of marcophyta. It is also higher under natural conditions, a fact that could probably be explained by the assumption regarding Rhodophyta as the least evolved macrophyta. It should be noted that Rhodophyta are metabolically similar to Cyanophyta which as known employ a rather peculiar way to metabolize. The primitive structure of rhodoplasts in Rhodophyta can be rendered as a possible answer to this question: (Sciuto, et al., 1980). The GLU/GLN ratio also bears similarities, being higher in Rhodophyta with Chlorophyta following.

Conclusively we may support the view that proline increase presupposes a direct increase in salinity, which is larger in Rhodophyta and is associated with their pattern of evolution and metabolism. Algae with high proline quantities are more tolerant under environmental salt stress. In general amounts of free amino acids can be used for chemotaxonomic purposes.

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## B-I4

### MARINE FLORA OF N. SPORADES : COMMUNITIES ON THE SMALL ISLANDS OF KIRA PANAGIA AND PIPERI (AEGEAN SEA, GREECE)

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*La biologie marine des zones eulittorales et sublittorales des îles Kira Panagia et Piperi (Sporades du Nord) est étudiée ci-après. Les recherches sur six biotopes de ces zones mettent principalement en évidence les caractéristiques d'espèces des régions exposées et agitées : les Photophiles à Cystoseira crinita, trouvées jusqu'à quatre mètres de profondeur et le Sciophile Udoteo peyssonnelietum, qui se situe dans des zones encore plus profondes.*

This study is concerned with the investigation of the marine flora on the small desert islands Kira Panagia and Piperi situated N.NE of Alonisos, Aegean Sea, Greece, and the creation of a marine park built for the protection of the Mediterranean seal (Monarchus monarchus).

Insofar there have been relatively few studies dealing with the benthic marine flora of N. Sporades and those are restricted to the investigation of mid- and sublittoral zones of the islands of Skiathos, Skopelos, Alonisos and Skyros (1,2,3,4,5). Our interest was concentrated on the identification of several taxonomic algal groups developing to a depth of 20 m. on the two small islands and the sample collections were performed in July 1984. Double samplings were carried out in each biotope by means of a metal frame 25x25 cm. Samples were cleaned and classified into different categories.

Features of plant communities: The calcareous community of Udoteo-Peyssonnelietum, with the intense presence of the Chlorophyta calcareous Halimeda tuna were encountered to a depth of 20 m. in all instances. This community is a variation of the Neogoniolithon-Lithophylletum plant community initially identified by Molinier in 1959/60 and is typical of shady, exposed, wavy biotopes with a hard usually calcareous or granite substrate.

Another plant community to be dominant only down to 4 m. depth is that of Phaeophyta Cystoseira. Its composition is the following: Cystoseria crinita- Sphacelaria cirrosa - Sphacelaria tribuloides - Dictyopteris membranacea - Dictyota dichotoma - Dictyota linearis - Padina pavonica - Dilophus spiralis.

Molinier (1959/60) had been the first to locate this community on the coasts of W. Mediterranean; yet it was also encountered on the Eastern Mediterranean and the Aegean Sea (6,7) especially in steep biotopes with no pollution, largeley exposed to waves with lots of light. No representatives of the so-called indication forms were met. In other words, the algal species which nowadays characterized certain biotopes as polluted, have either not been found at all or they have been completely scattered and isolated.

The biological balance in these biotopes is stressed by the large diversity present in all plant communities. The data we have gathered lead us to the following:

a) The biotopes examined are remarkably covered with marine phytobenthos.
b) Substrate is usually hard therefore suitable for the clinging of benthic plant communities.
c) Two are the dominant communities; Cystossira crinita encountered at 2-4 m and the skiophile community of the Udoteo-Peyssonnelietum.
d) The investigated plant communities known by similar studies conducted on both the Eastern and Western Mediterranean, characteristically develop in clean exposed to waves biotopes. Based on this observation and on the absence of algae-indicators we have concluded that these biotopes are still ecologically and biologically intact.

Therefore these small islands could possibly be utilized for the creation of a marine park which is to become an excellent shelter for the mediterranean seal that is gradually becoming rarer in the Mediterranean.

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