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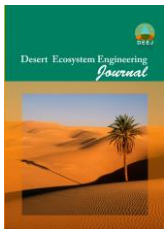

Metabolic and Ionic Changes in Leaves of Zygophyllum fabago L. Depending on Age

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Extended Abstract

Introduction: *Zygophyllum fabago* L. is a C_3 type plant and tolerant to drought with a widespread distribution in arid and semi-arid regions. For two reasons, the study of the physiological behavior of the *Z. fabago* in its natural environment is important. First, various species of *Zygophyllum* are often not used for animal feeding or fuel preparation, while all parts of the plant (leaf, stem, root and fruit) have a high drug value. Commercial cultivation of *Z. fabago* in areas that are not suitable for traditional agricultural systems, like Iran deserts, can be considered. Second, priority of recovery, improvement and protection of soil in desert environments, which will lead to the sustainability and distribution of the vital population of such ecosystems. Selection and introduction of appropriate species for retrieval have great important. *Z. fabago* shrubs are considered as the most important species in the sustainability and regeneration of desert ecosystems. Understanding the tolerance mechanism of *Z. fabago* requires study of the flexibility of its metabolism in natural habitats. Age-dependent biochemical variations in leaves may be effective in survival of plant under inappropriate conditions. The responses of plants to environmental factors come from their structural and physiological characteristics of leaves at different stages of development. In this study, metabolic and ionic changes during increasing of leaf ages in the *Z. fabago* plant were studied.

Materials and methods: To study of metabolic and ionic changes, five leaf samples, showing the young stage to the maturity, were numbered from apex to base. During maturation, a series of apparent differences and physiological and biochemical changes were occurred in leaves. The pigments, total soluble proteins content and proline concentration were measured according to Lichtenthaler, McMillen and McClendon and Bates methods, respectively. The phenol-sulfuric acid method was applied to determine total carbohydrates.

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Plant ashes were used to measure the elements. Complexometric titration was used to evaluate the total calcium and magnesium content of tissues. Sodium and potassium of tissues were analyzed with flame photometery method. Colorimetric determination of phosphorus fulfilled by phosphomolybdate method. The research was done on a completely randomized design with three replications. The data were analyzed using SPSS 16 software and comparison of the mean with Duncan test.

Result: The results showed that as the age of leaves increased, a reduction was observed in concentration of photosynthetic pigments. The values of chlorophyll *a* and *b* and total chlorophyll show a regular and significant decrease with increasing age. This decrease is occurred also about carotenoids, which leads to a relative stability of the ratio of carotenoids to chlorophyll. The data changes in this ratio are not significant in leaves with different positions on the stem. Also, the amount of total soluble protein, soluble sugars and proline showed a regular and significant reduction in leaf positions from apex to base of the stem. The magnesium, sodium, potassium and phosphorus concentrations were the highest in the young leaves.

Discussion and Conclusion: In this research, we observed different trends in changing of some biochemical and physiological characteristics *Zygophyllum fabago* plant during leaf aging. Developmental stage strongly influences the morphological, biochemical and physiological characteristics of the leaves. Generally, younger leaves are relatively rich in potassium, nitrogen and phosphorus, while older organs are calcium abundant; because when the leaves become old, they lose mobile elements. Elements that are particularly involved in growth are evacuated at the stage of aging and before falling out of the leaf. The concentrations of photosynthetic pigments in the young leaves were highest, which lead to high light harvesting and hence, growth of plants. Newly emerged young leaves that are sensitive to environment conditions become immune by elevated gross primary production. As has been observed, aging tends to reduce the amount of soluble proteins sugars. While the effect of increasing leaf age reflects the same increased metabolites mobilization trend. Therefore, the results indicate that metabolites accumulation in the young leaves of *Zygophyllum fabago* during development of leaves is a necessary mechanism to plant survives according to leaf function sensitivity to environmental conditions.

Keywords: *Zygophyllum fabago* L., Leaf Age, Metabolic and ionic Markers, Photosynthetic pigments, Proline.