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Low water–demand plants for landscaping and agricultural cultivations - a review regarding local species of Epirus/Greece and Apulia/Italy

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Abstract

Italy and Greece host a rich diversity of vascular plants. Among local plants some are more resistant to drought than others, a characteristic associated with their genetic structure. An extensive literature review regarding drought resistant local plants of SE Italy and NW Greece that can be used in the framework of agricultural cultivations and landscaping, is presented in this paper. As a result, classification tables containing 47 representative species of local flora fully adapted to xerothermic conditions and 9 species of xerothermic distinguished for their good probability to present low-water demands and yet profitable options for growers, have been created.

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1. Introduction

Vascular plants' diversity in Italy and Greece is very rich. It is estimated that a variety of about 7.500 species and subspecies can be found in each of these countries. They are also two of the most important areas of endemism in Europe and the Mediterranean with 1.021 and 1.278 endemic species respectively (Conti et al., 2007; Dimopoulos et al., 2013). Among the variety of local plant species, some are more resistant to drought than others, a characteristic controlled by complicated interactions between anatomy, physiology and biochemistry, which are directly or indirectly associated to their genetic structure (Bassett, 2013). Drought resistance can be considered as an advantage for periods that are characterized by higher temperatures, less frequent and heavier rain falls, and great need for water savings, regarding irrigation.

The present document consists a literature review, regarding water conservation in agricultural sector and landscaping. According to the United Nations Environment Programme/Mediterranean Action Plan (UNEP/MAP-

2009), “the issue of water will become a major challenge for sustainable development in the Mediterranean regions”. The agriculture in this area is the main consumer, as it demands the 64% of available water, while the domestic sector (including irrigation of gardens) demands about 14%. According to the same source, the efficiency of irrigation in Italy and Greece is between 60-70% (FAO, 2012). Taking into account all of the above, there is no doubt about the importance of applying methods aimed at efficient water use for irrigation in agriculture and landscaping.

2. Methods

The extensive literature review regarding drought resistant local plants of SE Italy and NW Greece that can be used in the framework of agricultural cultivations and landscaping was based on scientific articles and books, as well as official internet sites. Older and recent scientific publications were used as sources.

In order to produce the suggested final list of representative plants, from the plethora of local plants for landscaping and the fewer options existing for drought resistant crops, authors' experience had a major contribution. The criteria that were taken into consideration are the adaptation to xerothermic conditions, as well as, the coexistence of good potentials for cultivation or for use in landscaping. Especially for drought resistant crops, their good probability to present low-water demands and profitable options for farmers at the same time, was considered of major significance.

Finally, the selected plants are presented in classification tables.

3. Drought and its association with agriculture

Drought can be difficult for people to understand, because what may be considered a drought in Malaysia (annual rainfall 2.875mm/year) would certainly not be considered a drought in Kuwait (annual rainfall 121 mm/year) (data from: THE WORLD BANK). Drought is viewed also, in different ways depending on the different needs of water users. That's the reason why it is difficult to form a universal definition of drought (Bindi et al., 2009). The following is a generic approach: *drought is the deficiency of precipitation over an extended period of time*. If this period with unusually dry weather persists long enough, environmental or economic problems may occur. According to Wilhite and Glantz (1985), four different types of drought are mentioned, depending on the point of view from which the phenomenon is analyzed:

- Meteorological drought: It is based on climatic values, being a situation in which there is a significant decrease in rainfall compared to the normal, over an area.
- Agricultural drought: It occurs when there is not enough humidity in the soil for a certain crop to develop.
- Hydrological drought: Meteorological drought, if prolonged, results in hydrological drought with marked depletion of surface water and consequent drying up of inland water bodies such as lakes, reservoirs, streams and rivers and fall in level of water table.
- Socioeconomic drought: It occurs when physical water shortages start to affect the health, well being and quality of people's life or when the drought starts to affect the supply and demand of an economic product.

In a time sequence, meteorological drought would come first, then the agricultural one and finally the hydrological one.

4. Description of the study area

4.1. Climate description

From our point of view the agricultural drought is essential, because according to Gaussen's xerothermic index, the climate in Puglia and western coast of Greece is submediterranean to xerothermomediterranean (Data source: Hellenic National Meteorological Service, and World Meteorological Organization). This classification shows that there is a stress summer drought in this ecosystem (Mitrakos, 1980).

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