

## Abstract

Morphological, physiological and biochemical characteristics of some Palestinian medicinal plants including *Teucrium polium*, *Coridothymus capitatus*, *Varthemia iphionoides*, *Capparis spinosa* and *Paronychia sinaci* were studied at two sites through the four seasons. The variables were compared between the four seasons of 2007 year, and spatially between the two study sites (Al Daherya and Sorif). Results showed significantly higher leaf area, leaf length and width, plant height and average radius in Sorif than in Dahrya during summer and spring. Stomatal density was significantly higher in Dahrya than Sorif and in spring than autumn. Total chlorophyll content was higher in Dahrya than Sorif in all plants, but difference was not significant. The chemical analysis detected 98 different components in *Teucrium polium* essential oil (alpha pinene, 3-thujene, beta pinene, beta myrcene, D-lemonene, 2(10)pinene, 1,3,6-octatriene, germacrene B). In addition, there were quantitative and qualitative differences among sites and seasons in the composition of the essential oil of *Teucrium polium*. Microhabitat also revealed an effect on the essential oil composition. Morphological and physiological attributes of Palestinian medicinal plants differ upon changes in environmental conditions. These plants showed different strategies such as lower leaf area, lower plant height and radius, higher stomata number and higher total chlorophyll content as adaptations to drought stress.

## **Chapter one: Literature Review**

### **1.1 Flora of Palestine:**

Palestine's biodiversity (including viruses) comprises about 3 % of the global biodiversity. This rich biota is composed of an estimated 2,750 species of plants in 138 families (Danin, 2004), which include 60 species of natural trees and 90 species of bushes distributed all over Palestine. They encountered 149 endemic plants that do not exist in other places in the world (ARIJ, 1997; Ali-Shtayeh, 1995), and the most common plant species are *Pistacia palaestina*, *Olea europea*, *Quercus calliprinos*, *Pinus halapensis*, *Anemone coronaria*, *Artemisia herba alba*, *Calendula arvensis*, *Chrysanthemum coronarium*, *Avena sterilis*, and *Adonis cupaniana*.(ARIJ, 2007). These plant species belong to several plant families such as Compositae, Graminea, Leguminaceae, Crucifera, Labiatae and many others (Mohammad, 2005).

### **1.2 Medicinal plants in Palestine :**

For thousands of years herbal remedies and alternative medicines are used through out the world. Over 20000 medicinal herbs were recently inventoried by the World Health Organization (WHO, 2003), and about 250 species had been intensively studied. Traditional medicines, particularly herbal medicines, have been increasingly used worldwide during the last two decades. About 70-80% of the world population, particularly in the developing countries, rely on non-conventional medicine in their primary healthcare as reported by WHO (2003).

Said *et al.* (2002) conducted a survey among the most well known Arabic indigenous herbal practitioners in Palestine and found that there are 129

medicinal plant species still in use at their study area, most of these species grow naturally in the different regions and their properties are important in traditional Arabic medicine. The other important finding is that more than 30% of these herbs are rare.

Ali-Shtayeh, *et al.* (2000) carried out a survey in the West Bank and as a conclusion they enlarge the genetic resources available in this important part of the world and could offer an important potential of medicinal plants as a source of natural products for the use of man.

### **1.3 Effect of environmental factors on plant characteristics:**

Climatic conditions affect plant growth and development. Morphological and physiological variations appeared as adaptation and/or acclimation of plants to different factors, such as precipitation, temperature, light intensity and altitude (Jarvis, 1981). The outdoor environment, as perceived by plants, is rarely constant, and variations in sunlight, temperature, and humidity, are often closely linked. Changes in the amount of water in the soil over periods of days or weeks may interact with the other variables and modify their influence. Consequently, it is difficult to isolate the effect of one variable from the other (Jarvis, 1981). Plants exhibit a variety of responses to abiotic stresses that enable them to tolerate and survive adverse conditions. As we learn more about the signaling pathways leading to these responses, it is becoming clear that they constitute a network that is interconnected at many levels (Knight and Knight, 2001).

The shrub *Encelia farinosa* (Asteraceae) exhibits geographic variation in aboveground architecture and leaf traits in parallel with environmental variation in temperature and moisture (David et al., 2002). Measurements of plants occurring across a natural gradient demonstrated that plants in desert

populations produce smaller, more pubescent leaves, and are more compact and branched than plants in more mesic coastal environments (David et al., 2002). On another study, leaf morphological and physiological responses of *Quercus aquifolioides* along an altitudinal gradient were studied by Chunyang et al., (2006). Results showed non-linear responses of specific leaf area, stomatal length and index, leaf nitrogen content per unit area and carbon isotope composition. Consequently researcher suggested that 2800 m altitude is the optimum zone for growth and development of *Quercus aquifolioides* (Chunyang, et al., 2006). Drought stress is one of the most important abiotic factors which is accompanied by heat stress in dry season (Agnes et al., 2002). Semi-arid and arid regions around the world have lost a major part of their original vegetation, and about 20% of the dry lands became degraded landscapes. The semi-arid areas are characterized by low and unreliable rainfall, and hence are prone to drought. Water deficit is the main constraint on crop production in these areas (Akyeampong, 1986). Because of that, understanding the ecological mechanisms that can contribute to combat land degradation has become a global environmental priority (Anon, 2005).

In Palestine, medicinal plant characterization still lacking. The influence of environmental factors on morphological, physiological, and biochemical characteristics of medicinal plants is essential to conserve these important resources and to set management plant to utilize them.