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Department of Biology



Morphological and Physiological Characterization and ISSR Based Molecular Diversity of Selected Desert Plants in Al-Muthanna -Iraq

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Abstract:

This research included a descriptive study of ten selected plant species from AL-Muthanna desert it was the best growth namely (*Achillea santolina*, *Citrullus colocynthis*, *Astragalus spinosus*, *Artemisia herba-alba*, *Haloxylon salicornicum*, *Teucrium polium*, *launaea mucronate*, *Apium graveolens*, *Lycium barbarum*, *Capparis spinosa*), belonging to eight plant families namely Asteraceae, Cucurbitaceae, Fabaceae, Amaranthaceae, Lamiaceae, Apiaceae, Solanaceae and Capparaceae. Three field trips were conducted to the study site, which included Wadi Al-Kharaz, Wadi Abu Sajla, and the Al-Saqala area, located within District 1/24 in the eastern part of al-Salman sub-district, Al-Muthanna Governorate, in southern Iraq. In cooperation with the Badia Center and Lake Sawa, the selected plants were identified and classified using the Iraqi taxonomic key by Dr. Haider Mahmud Jasim, in collaboration with the herbarium of the College of Pharmacy at Al-Muthanna University. Morphological, physiological and molecular study conducted of the selected plants.

The morphological study included a study of the quantitative and qualitative characteristics of the roots, stems, and leaves. The results showed that the longest root was in plant, *Citrullus colocynthis* L. measuring 66 cm, and the shortest root was in plant *launaea mucronate* (Forssk) Muschl. measuring 7.6 cm. The longest stem was in plant *Capparis spinosa* L. measuring 160 cm, and the shortest stem was in plant *Apium graveolens* L. measuring 11.6 cm. The largest leaf surface area was recorded in plant *Citrullus colocynthis* L. measuring (9 x 6.3) cm², and the smallest leaf surface area was recorded in plant *Haloxylon salicornicum* Bung ex Boiss., measuring (0.3 x 0.2) cm².

The physiological study included identifying the relative water content, measuring the chlorophyll content of the leaves, and measuring the concentration of amino acids using HPLC. The results showed significant differences between the studied plants, and most of these plants may contribute to their adaptation to water-limited conditions, as they contain high water content and high concentrations of amino acids associated with stress responses. The highest relative water content was in plant *Citrullus colocynthis* L. at 68.67%. The highest

of total chlorophyll content was in plant *Achillea santolina* L. at 49.81mg/ 100g FW. The highest Proline concentration was found in plant *Haloxylon salicornicum* Bunge ex Boiss at 2029.38 mg/L, and the lowest concentration was found in plant *Achillea santolina* L at 176.98 mg/L. The highest concentrations of the amino acids Aspartic, Glutamate, Glycine, and Alanine were found in plant *Lycium barbarum* L at concentrations of (2016.38, 3013.38, 834.56, 1108.11) mg/L, respectively, while the lowest concentrations were found in plant *Achillea santolina* L at concentrations of (253.87, 310.54, 106.84, 149.81) mg/L, respectively.

The molecular study, the traditional polymerase chain reaction (PCR) method was used to identify the molecular variation of eight plant species belonging to eight families and to discover molecular diversity. used with a commercial kit to extract genomic DNA, and the 20 primers for molecular marker (ISSR) was used. The DNA appeared in the form of bands on agarose gel, and with the use of ultraviolet (UV) light, molecular variation were found among the studied plants.

This study demonstrates that the success and flourishing of desert plants depend on the interrelationship between their morphological and physiological characteristics, as well as their genetic codes. These codes, provide rapid responses to drastic changes in environmental conditions, enabling adaptation. Studying these characteristics, in addition to advancing scientific knowledge, opens new horizons for crop breeding and genetic applications. The characterization of these traits contributes to a better understanding of desert plant adaptation and provides a basis for farther research on the ecological and molecular characterization of native desert plant species. We recommend intensifying research on these plants, with particular emphasis on additional morphological characteristics, such as floral and pollen traits, as well as molecular variation using other molecular markers.