University of Thi-Qar Journal of agricultural research

ISSN Onlin:2708-9347, ISSN Print: 2708-9339 Volume 14, Issue 2 (2025) PP 652-659

https://iasj.rdd.edu.iq/journals/journal/issue/18682 https://doi.org/10.54174/utjagr.v13i1.323

Breeding methods and their importance in improving the productivity of field crop varieties to withstand various stresses(Article Review)

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I.Abstract:

In light of the environmental challenges and stresses facing the agricultural sector, it has become imperative to seek effective solutions to enhance the productivity of field crop varieties. This includes selecting varieties that possess genetic stability and a high tolerance to salt and water stress. Environmental challenges such as drought, salinity, high temperatures, and the accumulation of heavy metals in the soil place significant pressure on agricultural productivity, especially in light of accelerating climate change.

Field crop varieties are the cornerstone of achieving food security and agricultural sustainability in the face of growing global challenges such as climate change and population growth. These varieties play a pivotal role in meeting human needs for food, feed, and industrial raw materials, while also enhancing the ability to adapt to challenging environmental conditions.

The mechanism of plant tolerance to stress (stress) is a complex molecular genetic mechanism, with interconnected actions, which varies according to the type and intensity of stress and is linked to the type of plant and its growth stage, in addition to the type of soil and other factors. These mechanisms also include the physiological, chemical and anatomical effects, reaching the phenotypic effect, in addition to the molecular effect, which overlap with each other in general to be reflected in the performance and production of the plant, so its growth rate, number, number of flowers, fertilization rate, leaf area and other characteristics of vegetative and fruit growth are affected until the yield deteriorates or may disappear under severe stress for a long period.

II.Introduction:

The agricultural sector faces numerous challenges, particularly in plant communities growing in environments subject to environmental stresses. Among these challenges are biotic stress and abiotic stress, which cause physiological disturbances in plants, negatively impacting their growth. Biotic stresses are defined as stresses that occur as a result of damage to plants by other living organisms represented by biological factors (such as insects, weeds, diseases caused by bacteria, viruses, fungi, and parasites), while abiotic stresses are defined as the negative impact of non-living factors on living organisms represented by environmental factors, including salinity, drought, waterlogging, strong winds, high and low temperatures. Hence, the role of plant breeders in breeding and improving crops to resist stresses, and deriving varieties that can withstand environmental stress using traditional and modern breeding and improvement methods, molecular breeding, and genetic engineering (Al-Burki, 2020).

Breeding Field Crops to Tolerate Salt and Water Stress:

Exposing a plant throughout its life cycle to harsh environmental conditions, such as water scarcity or high salinity, causes stress that affects all physiological and metabolic processes. Physically, stress is a set of conditions that cause marked changes in physiological processes, gradually leading to damage. Physiologically, it is a reflection of a set of environmental pressures that induce changes in plant