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Editorial
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Strategies for Improvement of Horticultural Crops against Abiotic Stresses

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Introduction

Environmental stresses such as salinity, water deficiency, high water level, cold weather and low temperature affect plant growth and decrease horticultural crops productivity worldwide. It is important to improve stress tolerance of the crop plant to increase crop yield under stress conditions and reduce the yield gaps by increasing plant crops tolerance to stresses [1]. In some geographical area such as developmental countries facing several problems, because of decrease in food supply resulted from the dissertation and climatic changes of global warming. The global warming was affect plant productivity and their quality worldwide [2]. To ensure the food security for increasing world population, total crop production will need to be significantly increased with less arable land under much severe environmental conditions [3]. Different approaches, including agronomical, physiological and molecular methods have been used to produce plants grow well under environmental condition adverse. The most important strategies of plant crops improvements against stresses include several tools such as classical breeding programs, tissue culture, biofertilizers using mycorrhizae and bacteria, genetic engineering and grafting. The strategy of plant improvement against stresses is summarized as the following.

Classical Breeding Program

Earlier, the classical breeding program like selection, hybridization, backcross breeding and composite crossing and multiline were used, but faced several problems such as slow, take long time, cost money and hectic for developing resistance in crops [4]. Further, classical breeding faced some difficulty affected the hybridization such as environmental conditions in particular, low and high relative humidity, as well as low and high temperatures [5]. Furthermore, selection is the most basic and ancient procedure in plant breeding program. The selected and inbred new lines are compared with the existing commercial old varieties in their productivity and quality. Hybridization of selection, wild or domesticated plants grown in stressed atmosphere always give sunrise to obtained a new generation or mutation can be tolerant and challenged to the environmental adverse.

Tissue culture

Tissue culture is a tool for vegetative propagation of horticultural crops and clonal propagation. Through tissue culture can be obtained haploid induction, of soma clonal difference and rapidly differentiates relatively within a small space [6]. It was possible to induce the differentiation of roots and shoots from shoot tip apical meristem, seed germination, embryo culture and pollen grain culture thereby producing atypical daughter plants. Tissue culture techniques have been applied to the plant species in an attempt to produce new genotype with improved characteristics including the physiological basis for salinity tolerance. Plant tissue culture is considered as one of best effective technique for improving horticultural plants to many stressed conditions.

Plant growth promoting bacteria and mycorrhizae

Inoculation of Plant Growth Promoting Bacteria (PGPB) on the seeds and substrate can be enhance the production of more vigorous seedlings due to the protection against soil borne plant pathogens, production of growth regulators, better use of fertilizers and induction of tolerance to environmental stresses [7]. Plant growth promoting bacteria strains can assist plants by providing an additional supply of an auxin (IAA) and induce salt stress tolerance by reducing stress ethylene levels through the production of 1-aminocyclopropane-1-carboxylate (ACC) deaminase, which might improve root growth and nutrient uptake. PGPB can mediate plant growth by different direct and indirect mechanisms increased availability of nutrients, protection to plants from diseases and pests [8].

Mycorrhizae playing an important role for leaching nutrition, plant physiology and plant growth alone or when interacts with other microorganisms in the root zone area and preventing rapid degradation of environment [9]. Mycorrhizal association benefits higher plants by improving plant growth against salt stress, drought stress, heavy metals and nutrient uptake storage of carbohydrates and oils [10]. Strategies of drought avoidance in mycorrhizal plants depend on the ability to maintain an adequate drought status on the level of whole plants as identified by relative water content. Several investigations established that Arbuscular Mycorrhizal (AM) fungi enhanced plant growth in saline conditions suggested that AM fungal colonization might enhance salt tolerance of some plants.

Genetic engineering

Abiotic stress is most problems ubiquitous in the worldwide, can be affect horticultural crops yield productivity and quality. Also, biotic and abiotic stresses affect all secondary metabolites like photosynthesis, polysaccharide, protein synthesis, lipid metabolism, physiological and biochemical processes. Genetic engineering via gene transfer can be change the gene expression or activity in response to salt stress and drought stress. Genetic Manipulation (GM) or genetic modified is one of the important factors to avoid the dissertation by water shortage and plant irrigation with salty water. Transgenic plants of the many tools available for modern plant improvement programs. Gene identification and functional genomics projects have revealed multi stressed gene families, which enhance productivity improvement and acclimation to abiotic stresses. Several investigators discovered several genes in different gene family that can be introduced to different plant with different families. The approach from gene transfer is demonstrated and provides more options for selectivity of stressed and multi stressed genes from different organisms to introduce them into plants to provide resistance against different biotic stresses.

Grafting

As we know that horticultural crops facing several environmental problems especially when grown under water deficiency and salt stress. Grafting was found to be a rapid technique to avoid biotic and abiotic problems and was relatively one methods of plant breeding at the increasing environmental stresses [11]. At the moment grafting is more distributed over the world with different plant species to achieve the horticultural crops with high productivity and quality. On the other hand, the positive effect of grafting on improving the salt tolerance it also promotes water use efficiency [12]. Several investigators found an improvement plant growth and yield by grafting under salt stress and water stress [13,14]. Grafting improved the horticultural crops for yield productivity and quality under different stresses of environmental conditions. Generally, roots are powerful of supply water and nutrient uptake by the soil, or to distribute growth regulators to the grafted part. The grafting technique is very important to solve the problems facing horticulture crops when grow under salinity or drought conditions by evaluating and screening new genotypes for their rootstocks tolerance to biotic and abiotic stresses. For future outlook still we have one question: Is the new genotypes (grafted product) genetically changed or only physiologically changed coming from the rootstock?

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