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A Concise Summary of Abiotic and Biotic Stress

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Perspective

Plants are vulnerable to a variety of environmental stressors, which diminishes and limits agricultural crop yield. Plants are subjected to two forms of environmental stresses: (1) abiotic stress and (2) biological stress. Abiotic stress, which includes radiation, salinity, floods, drought, temperature extremes, heavy metals, and other factors, causes the loss of key agricultural plants globally. Biological stressors, on the other hand, include disease attacks from fungi, bacteria, oomycetes, nematodes, and herbivores. Because plants are sessile in nature, they have little choice but to respond to environmental cues. Plants have evolved a variety of defence systems to deal with biotic and abiotic stressors. Stress in plants refers to external factors that have a negative impact on plant growth, development, or productivity. Stress causes a variety of plant reactions such as changed gene expression, cellular metabolism, changes in growth rates, crop yields, and so on.

Plant stress is typically caused by abrupt changes in environmental conditions. Exposure to a single stress, on the other hand, leads to adaptation to that specific stress in a time-dependent way in stress-tolerant plant species. Plant stress can be classified into two types: abiotic stress and biotic stress. Abiotic stress imposed on plants by the environment might be physical or chemical, whereas biotic stress imposed on crop plants is a biological unit such as illnesses, insects, and so on. Living organisms, specifically viruses, bacteria, fungus, nematodes, insects, arachnids, and weeds, induce biotic stress in plants. The agents that cause biotic stress deplete their hosts of nutrients, which can lead to plant mortality. Because of pre- and postharvest losses, biotic stress might become severe. Plants, while lacking an adaptive immune system, may combat biotic stressors by generating sophisticated mechanisms. The defence mechanisms that plants use to combat these challenges are genetically controlled by the genetic code that is stored in them. Hundreds of resistance genes against various biotic stressors are encoded in the plant genome.

Abiotic stress, which is placed on plants by non-living variables such as salinity, sunshine, warmth, cold, floods, and drought, is not the same as biotic stress. Drought (water stress), over watering (water logging), severe temperatures (cold, frost, and heat), salinity, and mineral toxicity all have a negative impact on crop and other plant growth, development, yield, and seed quality. It is expected that fresh water scarcity would worsen in the future, increasing the degree of abiotic pressures. As a result, there is a pressing need to produce crop types that are resistant to abiotic stressors in order to assure food security and safety in the next years. The roots are a plant's initial line of protection against abiotic stress. If the soil in which the plant is growing is healthy and biologically diverse, the plant has a good chance of surviving severe conditions. Plants are subjected to a variety of abiotic stressors, which have a global impact on crop output. These abiotic stresses are interrelated and can manifest as osmotic stress, ion distribution failure, and plant cell homeostasis. A response induced by a collection of genes changing their expression patterns affects growth rate and production.

Plants face a variety of biotic stressors generated by various living organisms such as fungi, viruses, bacteria, nematodes, insects, and so on. These biotic stress agents induce a variety of illnesses, infections, and crop plant damage, reducing crop output. However, different strategies for overcoming biotic stressors have been created through research methodologies. Plants, being immobile in nature, must respond to environmental perturbations with appropriate physiological, developmental, and biochemical alterations. Abiotic stressors cause more than half of crop plant losses worldwide, accounting for the majority of crop loss. Polyamines are one of the most effective types of compatible solutes against excessive environmental stress. Polyamines are aliphatic nitrogen compounds with low molecular weight that are positively charged at physiological pH. Plant polyamine research at the molecular level has resulted in the isolation of a number of genes encoding polyamine biosynthetic enzymes from a variety of plant species [1-5].

Changes in cellular polyamines caused by stress provide clues about their likely role in stress, but they do not provide proof of their role in stress resistance. Exogenous polyamines can be used to boost endogenous polyamine levels, which have been tried before and during stress. Anthropogenic activities such as overuse of fertilisers, inefficient irrigation, and overexploitation of metal resources can all contribute to salt stress to a great extent. Plants will most likely be subjected to both biotic and abiotic stressors more frequently under these conditions. It is the responsibility of plant breeders to develop stress-tolerant cultivars in order to assure food security and farmer safety.

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