Crop Responses and Adaptation to Environmental Stresses in the Era of Climate Change

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Abstract

'How will we feed the world in the next decades?' is one of the frequently asked questions among the agricultural scientists. The main evolution that will increase the demand for food is a continued rise in the number of people on our planet. While the world's population consists of 7.3 billion people today, the UN projects that the number will increase by 1.2 per cent annually, amounting to 8.5 billion people in 2030 and almost 10 billion people in 2050. Unfortunately, the population growth is high in developing countries that have the least area of arable lands per capita. Although plant scientists are successful in enhancing crop yield, food crisis is still remaining due to lack of advanced technologies. Plants are the major providers of staple foods for human. But as a sessile organism plants cannot avoid environmental adversities. Due to the climate change different adverse environmental factors like salinity, drought, extreme temperatures, toxic metals/metalloids, waterlogging/flooding, ozone etc. are reducing plant productivity significantly. The complex nature of the environment, along with its unpredictable conditions and global climate change, are increasing gradually, which is creating a more adverse situation. Abiotic stress may reduce crop yield up to 70%. The episodes of drought and heat stress is very common now-a-days. In the last couple of years, we have experienced record breaking high temperature. In contrary, both chilling and freezing are common in many temperate countries and also in other part of the world during winter. Some of the toxic metals/metalloids, e.g. cadmium, lead, arsenic etc. are exceeding their allowable limits which are also major concern for crop production and human health as well. Abiotic stresses modify plant metabolism leading to harmful effects on growth, development and productivity which ultimately affect food security. Therefore, understanding the molecular and physiological mechanisms of abiotic stress tolerance and to find the ways that would increase stress tolerance in plants are crucial in agriculture. Recently, scientists have explored the underlying mechanisms of stress-induced damages and the tolerance mechanisms. They also developed various techniques in conferring environmental stress tolerance in plants. Learning from the tolerant plants and transferring these traits to sensitive plants to gain productivity is now a major concern. With the advancement of molecular tools tailoring of stress responsive genes become possible for the development of tolerant genotypes. Some eco-friendly approaches like phytoremediation has also drawn attention to researchers for the mitigation of metal/metalloids-induced damages. It is possible to minimize losses in agricultural production due to abiotic stresses by a judicious blend of knowledge in crop physiology and crop husbandry procedures. Since environmental stress is concerned with multidiscipline like agriculture, plant science, plant breeding, molecular biology, soil science, chemistry and many other field of biological science an integrated approaches with coordinated and sustainable research may attain the goal.

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