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Towards A New Concept of Sustainable Plant Nutrition

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PLANT nutrition is considered one of the most important plant sciences dealing with plant productivity and hencehas a great role in global food security. The proper nutrition of cultivated plants in its time, source, amount, and place is the guarantee for this satisfied production. Therefore, the science of plant nutrition is an increasingly important area in plant sciences, which has a direct and indirect link with human health. The concept of plant nutrition has been changed from theinvestigation of the application, translocation and metabolism of nutrients by plants into the "*engineering*" of these applied nutrients for human health. So, it has been established that "*feed the soil to feed the human*". Thus, recent developments in the field of plant nutrition have led to a renewed interest in the relationship between plant nutrition and human health. Therefore, this is an introduction to highlight on the new book series "*Sustainable Plant Nutrition under a Changing World*", which will be published by Springer Nature. This book series will focus on advanced issues in plant nutrition under stressful environments starting with the changing in global climate and reaching to the production of cultivated crops biofortified with desirable nutrients like iodine, and selenium.

Keywords: Nutrients, Soil, Human health, Stress, Food security, Nutrient use efficiency.

The great challenge in plant nutrition

Plant nutrition includes the study of plant growth and its development as well as the external supply of necessary nutrients under certain growth conditions. This science also expresses about the biochemistry and metabolism of different elements or nutrients in plants and factors controlling these processes. This is the traditional version of plant nutrition but now there is new insights regarding this science. These new insights may include plant nutrition under different stressful conditions such as climate changes (Alshaal et al. 2017; Henry, 2019 and Dorji et al., 2020), drought (Gessler et al., 2017; Fischer et al., 2019 and Du et al., 2020), salinity (Etesami and Alikhani, 2019; Tian et al., 2020) and waterlogging (Wollmer et al., 2019 and Peng et al., 2020). Climate changes are a real and great challenge facing the crop productivity (Raza et al., 2019). The phytoremediation, as the other side of plant nutrition, of polluted soils was and still promising issue particularlyin case of nanomaterials (El-Ramady et al., 2018c; Sharma et al., 2019 and Zhu et al., 2019). Therefore, theuptake and translocations of nutrients and/or pollutants also are needed for more investigations. The role of essential, beneficial and potentially toxic elements in plant nutrition also is one of the most promising topics. The role of soil biology and rhizosphere in nutrition of plants under different levels also need for more explanations. The

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nutrition of plant nowadays has changed based on several challenges all over the world in particular under stress. Therefore, there is no food security without plant nutrition. So, plant nutrition should take a new dimension more than just feeding the plants. Hence, it is common said "*feed the soil to feed the human*" and this soil feeding mainly depends on the soil fertility, which may synergy for the sustainable development (Schjoerring et al., 2019). The great challenge in plant nutrition not only represent in the plant production under stressful environments but also how to perform this productivity in asustainableway (Fig. 1). The production of different agricultural food systems should be harmonized with the sustainable development goals supporting the human health (Tanumihardjo et al., 2019).The security of food and nutrition is considered the main target of sustainable agro-food systems under different transitions of sustainability (El Bilali, 2019). It should make a link between the environmental sustainability and nutritional quality of real consumption patterns (Esteve-Llorens et al., 2019a,b).Therefore, it could be concluded that the agricultural production or foods mainly is considered a reflection for the nutrition of cultivated plants or crops and without the proper plant nutrition there is not enough and safe foods for human nutrition.

The book series and its importance

Several books have been published concerning the plant nutrition to cover different topics such as the principal of plant nutrition (*e.g.,* Marschner 1995; Mengel et al. 2001; Epstein and Bloom 2005; Marschner 2012 and Barker and Pilbeam 2015), the nutrition of field crops (*e.g.,* Fageria, 2009 and Fageria et al., 2011), plant nutrition under greenhouse conditions (Sonneveld and Voogt, 2009), the nutrition of citrus (Srivastava, 2012), and plant nutrition for the food security (Roy et al., 2006). The past decades has seen the rapid development of plant nutrition in many fields including the bioavailability of nutrients, absorption, transport, and utilization as well as the molecular aspects. Recently, more attention has been paid for more investigationsin different themes in plant nutrition. Therefore, this book series could be considered one step from many steps that should be achieved regarding new insights in plant nutrition. The main area of these themes includes the study of plant nutrition under adverse environmental conditions and nutritional quality of food crops (Singh and Mann, 2012). Under modern agricultural practices, plant nutritional genomics or molecular plant nutrition has become an emerging science (Bouain et al., 2019). The priorities in plant nutrition research may include how to save the human foods in sustainable ways and this is the difficult equation (Cakmak, 2002).This equation represents in how we can save the enough and safe foods for humanity under stressful conditions in the existence of scarcity of soil and water resources (Schjoerring et al., 2019). In this book series, the first volume will focus on the sustainable plant nutrition under abiotic stress, which will be edited by SzilviaVeres and GabrijelOndrasek. This volume incudes the sustainable plant production, as a complex challenge of modern agriculture, under abiotic stresses such as drought, salinity, heavy metals and waterlogging in the existence of some nutrients like silicon, selenium, zinc, copper and nitrogen.More volumes will be edited by some distinguished scientists such as QaisarMahmood (COMSATS University Abbottabad, Pakistan), Sheikh AdilEdrisi (Banaras Hindu University, India), VishalTripathi (Banaras Hindu University, India), André Rodrigues dos Reis (São Paulo State University, Brazil), and HarikeshBahadur Singh (Banaras Hindu University, India). Plants could alleviate the abiotic stresses through many approaches including plant growth-promoting rhizobacteria (Ramakrishna et al., 2019 and Goswami and Deka, 2020), application of nanomaterials (Singh and Husen, 2019) or nanoparticles of some metals/metalloids such as nano-manganese (Ye et al., 2019), nano-zinc oxide (Dimkpa et al., 2019), nano selenium (El-Ramady et al., 2018a) and nano silica (Alsaeedi et al., 2017 & 2019); application of nitric oxide (Wei et al. 2019), using of kaolin (Brito et al., 2019), and application of nutrients (El-Ramady et al., 2018b). It could be investigated the growth of plants under abiotic stress using different applications of metabolomics (Feng et al., 2019). More crucial aspectsin plant nutrition will be handled in this book seriessuch as plant nutrition, soil and human health (many publications for Eric Brevik like Brevik et al., 2019). This book series will include more emerging global soil issues and their impact on plant nutrition, the rhizosphere and soil organic matter, plant nutrition and soil carbon sequestration, plant nutrition and biofortification, as well as the role of different nutrients (*e.g.*, rare earth elements, fluorine, iodine, silicon, selenium, sodium) in plant nutrition. We hope this book series will be a valuable and strong addition in the field of plant nutrition.

Pollution and waterlogging stress

Salinity Stress

Alkalinity Stress

Fig. 1. Many constrains face the growth of cultivated plants under different environmental stresses like salinity, waterlogging, pollution and alkalinity (Photos by El-Ramady, Kafrelsheikh Uni.)

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