

Chapter 3

Molecular advances in plant root system architecture response and redesigning for improved performance under unfavorable environments

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3.1 Introduction

Plants, being sessile organisms, predominantly depend on their root system to adapt in contrasting environmental conditions for their morphological, anatomical, and behavioral development (Hodge, Berta, Doussan, Merchan, & Crespi, 2009; Ye et al., 2018). The plant root system architecture (RSA) comprises spatial and temporal configuration of the root system (number, biomass, volume, density, length, and fineness of lateral and primary roots) and its establishment and advancement varies with plant species, soil health and composition, availability of water and nutrients, and ubiquity and intensity of stress factors (Jin et al., 2020; Malamy, 2005). Soil is the reservoir of water and nutrients for plants on this planet and roots are the foremost channel for the conveyance of raw materials (water, vitamins, minerals, etc.) to the needy parts whereby they are converted into final products. The plants have ability to modify their RSA by instigating lateral root (LR) primordial and affect growth of their primary or secondary roots (Hodge et al., 2009). The heterogeneous nature of the surrounding soil environmental condition decides the plasticity of RSA and