Title: **Amazing role of the plant vascular system to improve crop growth performance and yield**

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Application of nutrient fertilizers enables achievement of increased agricultural crop productivity. It has been important research programs to enhance nutrient use efficiency in crop species for permitting sustainable crop yield and, thereby ensure global food security under limited nutrient fertilizer input. During reduced mineral nutrient availability, plant roots are the first organs to recognize these stress conditions through root-localized mechanisms. These stresses can be converted into root-derived signals that are transported via the xylem for communicating these challenging conditions to the shoot. The root-derived signals, delivered into vegetative tissues, elicits generation of specific output signals that enter the phloem to transfer commands from the shoot to the root for integrating the demands for various developmental and physiological processes. Therefore, it has been proposed that the plant vascular system functions as an effective shoot-root communication route in mineral nutrient homeostasis. Recent studies have been discussed in the content of information macromolecules, including proteins and various forms of RNAs, in phloem, which function as mediators to integrate sophisticated regulatory networks between shoots and roots. It raised the question as to whether the phloem has evolved the delivery capacity of specific stress-signaling molecules for regulation of adaptive developmental responses when plants face mineral nutrient limitation. We will discuss the function of the phloem as an integrator to operate long-distance gene regulation for optimizing plant developmental and physiological processes under mineral nutrient-stress conditions, by delivering a cascade of signaling agents to various developing sink tissues.