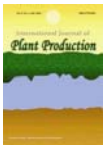

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A review on partial root-zone drying irrigation

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Abstract

Available fresh water resources are subjected to an ever-increasing pressure due to extensive agricultural water demand for irrigated lands. A long-term perspective in shortage of fresh water resources, especially in arid and semi-arid area, highlights an urgent solution for innovative irrigation strategy and agricultural water management. This paper is a review on the wide applications of the partial root-zone drying irrigation (PRD) on diverse plant species. The PRD irrigation is a novel improvement of deficit irrigation in which half of the root zone is irrigated alternatively in scheduled irrigation events. In the last decade, scientists across the world, especially from arid to semi-arid countries, have extensively evaluated this irrigation as a water-saving irrigation strategy on agronomic and horticultural plants. This review paper focuses on the physiological and morphological aspects of PRD on plants and its ultimate impact on yield and water productivity. Overall, under limited water resources where water is precious, PRD is a viable irrigation option to increase water productivity while margining the yield, rather than only increasing the economic yield without concerning the value of water in limited water environments.

Keywords: Partial root-zone drying irrigation; Full irrigation; Water productivity; Field crops; Vegetables; Trees.

Introduction

Irrigated agriculture is the main user of the available water resources. About 70% of the total water withdrawals and 60-80% of total consumptive water use are consumed in irrigation (Huffaker and Hamilton, 2007). There is a conflict in global increase in food demand and decrease in water resources that should be resolved. Food security can be achieved by irrigated agriculture since irrigation on average double the crop yield compared to that usually is produced in rain-fed conditions. The irrigated area should be increased by more than 20% and the irrigated crop yield should be increased by 40% by 2025 to secure the food for 8 billion people (Lascano and Sojka, 2007). Therefore, water resources should be used with a higher efficiency or productivity. To achieve this goal improvement in agricultural water management is a promising way.