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Agricultural Water Management 72 (2005) 177–194

Agricultural
water management

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Salt tolerance analysis of chickpea, faba bean and durum wheat varieties I. Chickpea and faba bean

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Accepted 3 September 2004

Abstract

Two varieties of chickpea (*Cicer arietinum* L.) and faba bean (*Vicia faba*), differing in drought tolerance according to the classification of the International Center for Agronomic Research in Dry Areas (ICARDA), were irrigated with waters of three different salinity levels in a lysimeter experiment to analyse their salt tolerance.

The drought-sensitive varieties are more salt tolerant than the drought-tolerant varieties. Under saline conditions, the drought-sensitive varieties show a much higher yield up to a salinity threshold, corresponding with an electrical conductivity (EC_e) between 2.5 and 3 dS/m for chickpea and between 5.5 and 6 dS/m for faba bean.

The drought-sensitive varieties are able to improve or maintain the water-use efficiency when irrigated with saline water. This ability can be ascribed to

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- the larger biomass production owing to the later senescence, which allows a better utilization of the irrigation water;
- the late flowering of chickpea.

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Keywords: Chickpea; Drought tolerance; Faba bean; Grain legumes; Osmotic adjustment; Pre-dawn leaf water potential; Salt tolerance

1. Introduction

Salinity is a worldwide problem in irrigated areas. In the Mediterranean area, the percentage of irrigated soils affected by salinity amounts to about 20%, varying from country to country between 7 and 40% (Hamdy et al., 1995). Moreover, fresh water resources for agricultural use are becoming limited due to the competition with human and industrial use. Therefore, use of saline water is a subject of increasing interest.

For the use of saline water, much attention is paid to salinity control by irrigation and drainage management, and to the choice of salt-tolerant crops. Less attention is given to difference in salt tolerance between varieties of the same crop (Rhoades et al., 1992; Ochs, 1998).

In 1989, the Mediterranean Agronomic Institute at Bari, southern Italy, started a long-term lysimeter experiment on plant growth under saline conditions. The plant was studied during its development by measuring the saline stress and analysing its effect on growth and yield. During the first period till 1998, the variables were salinity and soil texture, but from 1998 onwards the variables were salinity and variety. The varieties were obtained from the International Center for Agronomic Research in Dry Areas (ICARDA), together with information on drought tolerance and other characteristics. The objective was to analyse their salt tolerance and to find out whether the salt tolerance corresponds with the drought tolerance of the varieties.

The research on varieties started with cool-season grain legumes: lentil (*Lens culinaris*), chickpea (*Cicer arietinum* L.) and faba bean (*Vicia faba*). According to Malhotra (1997), these crops show little genetic diversity to salt tolerance, and therefore no information is available on varietal difference in salt tolerance. Grain legumes have multiple functions in the traditional farming systems as a source of human and animal food and in the maintenance of soil fertility, particularly in dry rainfed areas (Saxena, 1990, 1991). Since grain legumes are salt sensitive, farmers do not consider growing them in a saline environment.

The first crop was lentil, for which no information on salt tolerance was available in literature. Lentil appeared to be very salt sensitive. At an EC_e of 2 dS/m, the yield reduction was about 20% and at an EC_e of 3 dS/m, 90–100%. The variety with the largest leaf area gave the highest yield. This crop should not even be grown under slightly saline conditions (Katerji et al., 2001a).

For chickpea and faba bean, a drought-sensitive and drought-tolerant variety were selected, respectively, according to the drought classification of ICARDA. The results of chickpea were already presented in a previous publication (Katerji et al., 2001b). Since the results obtained on the salt tolerance of faba bean varieties show a great similarity

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