Abstracts of the 5th European Plant Science Organisation Conference, Finland. 2010

Screening chickpea resistance to water deficits– the yield perspective

Session: Achieving sustainability – Breeding tools and strategies

Duarte I*
Silva LL†
Simões N*‡
Imtiaz M+
Pinheiro C‡
Lourenço E†
Chaves MM‡

*INRB, I.P./INIA, Elvas, Apartado 6, 7350-951 Elvas. Portugal.
†Universidade de Évora, Instituto de Ciências Agrárias e Ambientais Mediterrânicas (ICAAM). Apartado 94, 7002-554 Évora, Portugal.
+ International Center for Agricultural Research in Dry Areas, P.O. Box 5466 Aleppo, Syria.

Chaves MM‡
Instituto de Tecnologia Química e Biológica, Apartado 127, 2781-901 Oeiras.
mchaves@itqb.unl.pt

Screening a wide range of germplasm from our major crops (including legumes) to search for genetic variation of traits involved in stress resistance is extremely relevant in the context of predicted increase in aridity in several areas of the world, including the Mediterranean (1,2). On the other hand, the keystone of ‘crop drought resistance’ relies on the effective use by the crop of a limiting water supply (3,4). This can be achieved by choosing the appropriate genotype and/or agronomical practices such as the adjustment of crop phenology to its environment or the use of deficit irrigation. In the framework of the EU project KBBE-2008-212337 ‘*Sustainable water use securing food production in dry areas of the Mediterranean region* (SWUP-MED)’ we are studying a wide range of chickpea (*Cicer arietinum* L.) accessions in two sites (South Portugal and Syria/ICARDA) in what concerns yield potential under limiting and non-limiting soil water and the physiological traits underlying those responses. Chickpea is a widely grown grain legume offering high-quality protein, besides providing an input of N_2 into the soil and a disease break in rotation with other crops. However, yield is still low in many of the growing regions, especially when terminal drought is likely to occur (5). We have identified a significant genetic variability in what concerns yield (from 1000 to above 2000kg. ha^{-1} under rainfed conditions), harvest index (from 25 to 60%) and plant water status under similar available soil water. Phenological differences may play an important role in explaining yield differences in the accessions studied. In addition to yield we will study seed quality traits as affected by the genotype and the environment. Our results will be used to model crop water requirements, predict yields and support breeding efforts (6).

(1) Chaves MM and WJ Davies 2010 Research Front on Drought Effects and Water Use Efficiency: Improving crop adaptation to dry environments. *Functional Plant Biology*, 37: iii-vi (2) Chaves MM, Oliveira MM. 2004. Mechanisms underlying plant resilience to water deficits. Prospects for water-saving agriculture. *Journal Experimental Botany* 55: 2365-2384; (3) Blum A 2009 Effective use of water (EUW) and not water-use efficiency (WUE) is the target of crop yield improvement under drought stress. Field Crop Research 112: 119-123.; (4) Passioura J. 2007. The drought environment: physical, biological and agricultural perspectives. *Journal of Experimental Botany* 58: 113-117; (5) Turner et al 2007 Osmotic adjustment in chickpea (*Cicer arietinum* L.) results in no yield benefit under terminal drought. *Journal of Experimental Botany* 58: 187-194; (6) Ragab, R., N. Malash, G. Abdel Gawad, A. Arslan and A. Ghaibeh, 2005. A holistic generic integrated approach for irrigation, crop and field management: 1. The SALTMED model and its application using field data from Egypt and Syria. *International Journal of Agricultural Water Management*, 78 (1-2) 67-88.