

Improving Fusarium head blight resistance in durum wheat through introgression of resistance alleles from relatives



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Introduction

Durum wheat is very susceptible to Fusarium head blight (FHB), which results in yield loss and quality deterioration, as well as mycotoxin contamination that is harmful to humans and animals consuming it. Relying on fungicides has an impact on environmental pollution and exterminates beneficial microorganisms. Therefore, breeding of FHB resistant durum cultivars is an urgent need, but it is hindered by limited genetic variation in durum wheat.

The objective of this research is to broaden the narrow genetic basis of FHB resistance in durum wheat by introgression of resistance alleles from wild and cultivated relatives.

Materials and Methods

Durum breeding lines

We evaluated 900 multi-parental breeding lines, which were compressed into 17 individual sub-populations (A-Q), with resistance alleles derived from *Triticum aestivum*, *T. dicoccoides* and *T. dicoccum* introgressed in elite durum cultivars. These lines were phenotyped in the field over several seasons for FHB severity, plant height and flowering date.

Evaluation of the fungal infection was visually scored at several time points after inoculation. The scores were used to calculate an area under the disease progress curve (AUDPC) as a measure for FHB severity.



Fig. 1: (a) Artificial *Fusarium culmorum* inoculation using spray inoculation with mist irrigation; (b) FHB symptoms.

Preliminary Results

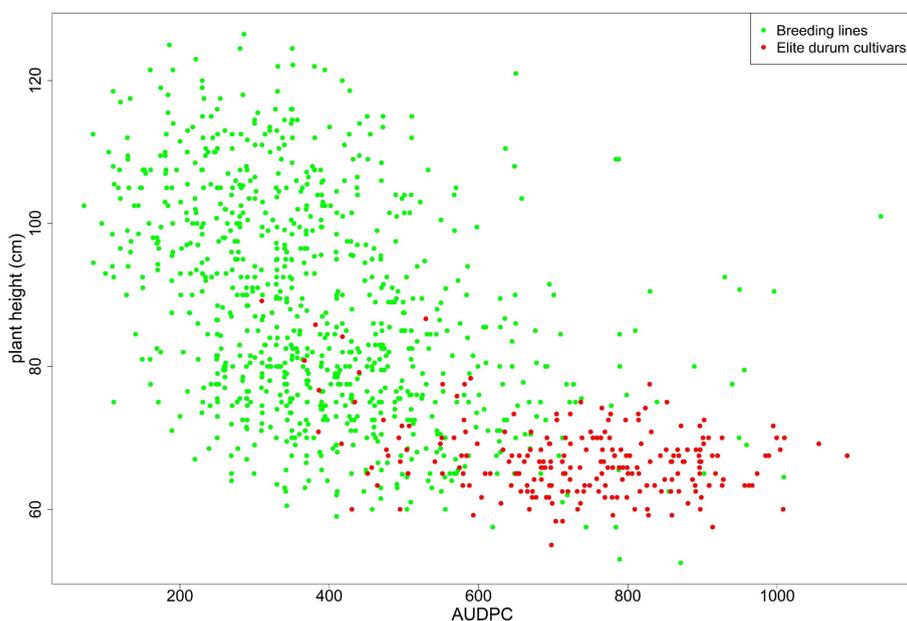


Fig. 2: Relationship between FHB severity (AUDPC) and plant height for the 900 durum breeding lines in comparison to 228 elite durum cultivars from Northern America, the Mediterranean, Europe, Australia and CIMMYT provided by M. Maccaferri. FHB severity is based on overall AUDPC BLUEs values of several years data.

Broad variation in FHB severity was observed not only among the lines, but also among the sub-populations. The FHB severity as measured by AUDPC showed high across years heritability in several sub-populations ($H^2 = 0.85$). Although a strong negative correlation ($r = -0.59$) between FHB severity and plant height was found, also short and moderately resistant lines could be identified (Fig. 2).

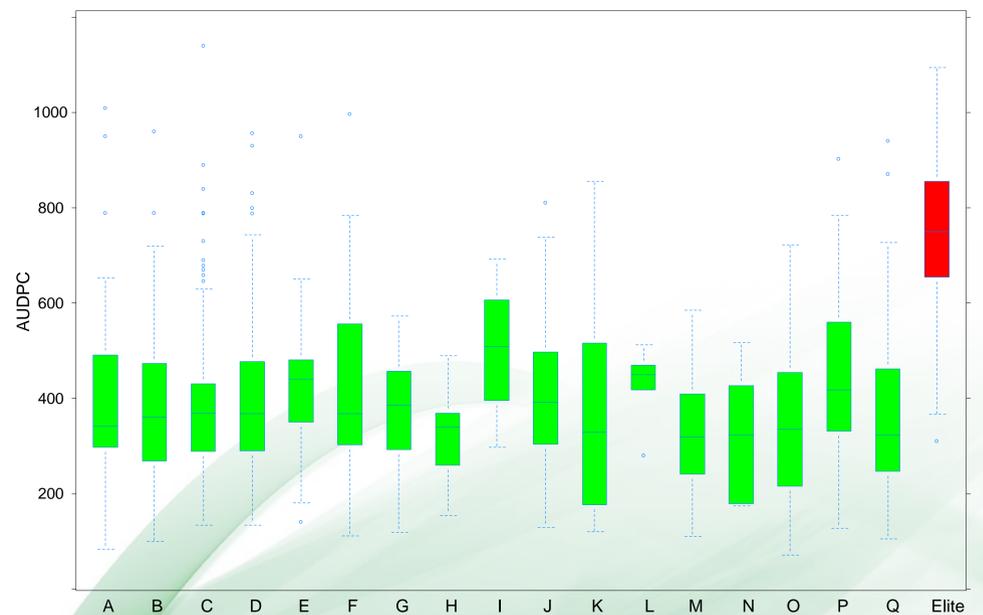


Fig. 3: FHB severity mean in the breeding line sub-populations compared with elite durum cultivars.

Comparing with the elite durum cultivars, the moderately resistant durum breeding lines represent highly breeding relevant material to achieve higher levels of resistance in elite durum germplasm (Fig. 3). The plant material will be genotyped to enable genome-wide QTL mapping and to elucidate the genetic control of FHB resistance in this population.

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