

A MAJOR QTL FOR RESISTANCE TO FUSARIUM HEAD BLIGHT AND CROWN ROT OF WHEAT ON *THINOPYRUM ELONGATUM* CHROMOSOME 7E: CYTOGENETIC MAPPING AND ASSEMBLING INTO BREAD WHEAT WITH VALUABLE GENES FROM *TH. PONTICUM*

KUZMANOVIĆ L.*, TUNDO S.*, FORTE P.*, MOSCETTI I.*, DE VITA P.**,
CUCCURULLO A.*, VIRILI M.E.*, D'OVIDIO R.*, CEOLONI C.*

*) Department of Agricultural and Forest Sciences, University of Tuscia, Via S. Camillo de Lellis, 01100 Viterbo (Italy)

***) CREA-CER Cereal Research Centre, 71122 Foggia (Italy)

alien gene transfer, chromosome engineering, Triticum, scab, marker-assisted selection

Among wheat relatives, the *Thinopyrum* genus represents one of the richest sources of valuable genes/QTL for wheat improvement. One notable and still unexploited trait is the exceptionally effective resistance to Fusarium Head Blight (FHB) originating from a diploid member of the genus, *Thinopyrum elongatum*. Up to date, the resistance was only associated to the long arm of *Th. elongatum* chromosome 7E (7EL), while detailed genetic mapping of the responsible gene/QTL was still lacking. We targeted the transfer of the temporarily designated *Fhb-7EL* locus into bread wheat, by pyramiding it with other valuable genes/QTL (*Lr19* for leaf rust resistance, yield-related traits) and included in a *Th. ponticum* 7e₁L segment, stably inserted into the wheat 7DL arm of line T4. Mapping of the *Fhb-7EL* QTL was here based on a bioassay with *Fusarium graminearum*, the main causal agent of FHB, of different 7EL-7e₁L bread wheat recombinant lines. Nine such recombinant types were successfully obtained without resorting to any genetic pairing promotion, but relying on the 7EL-7e₁L close homoeology. Pairing between the two critical arms was in fact observed by Genomic In Situ Hybridization (GISH) at meiotic metaphase I of F₁ plants between the 7E(7D) substitution line and the translocation line T4 (70% distal 7e₁L on 7DL), which resulted in 14% 7EL-7e₁L recombination frequency. The *Fhb-7EL* locus was mapped to the telomeric portion of 7EL, associated with marker loci *XBE405003*, *Xsdauk66* and *Xcfa2240*. FHB resistant recombinants, with useful combinations of more proximally located 7e₁L genes/QTL, could be selected. The transferred *Fhb-7EL* locus was shown to reduce disease severity at the spike level and fungal biomass in the grains of infected recombinants by over 95%. The same *Fhb-7EL* QTL was, for the first time, proved to be effective also against *F. culmorum* and *F. pseudograminearum*, predominant agents of Fusarium Crown Rot (FCR). Yield performance in preliminary field tests of the pre-breeding lines possessing a suitable 7EL-7e₁L gene/QTL assembly showed to be very promising. Given the expected inheritance as a unit of the composite *Thinopyrum* segment in cross progeny with wheat, either of the several co-dominant PCR-based markers identified in the course of the work will enable easy tracking of the novel gene/QTL assembly in transfer programs into adapted cultivars.