Addition of Aegilops U and M chromosomes affects protein and dietary fiber content of wholemeal wheat flour

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Aegilops geniculata and *Aegilops biuncialis* are tetraploid species with U and M genomes. They are known to have resistance to biotic and abiotic stresses, but also have unusually high nutritional value (high dietary fiber, Fe and Zn content). The aim of our work was therefore to determine the effects of the addition of *Ae. geniculata* chromosome on the dietary fiber content and composition of Chinese Spring wheat. Prebreeding material with increased level of dietary fiber was therefore also developed by adding *Ae. biuncialis* chromosomes to the Mv9kr1 wheat line. In addition to thousand kernel weight (TKW), Kjeldahl protein content and glutenin composition, the contents of dietary fiber (β-glucan and total (TOT) and the water-extractable arabinoxylan (WE-AX)) were measured by spectrophotometric assays of wholemeal samples. The structures of the β-glucan and AX fractions were also compared by enzyme fingerprinting, based on HPAEC (high performance anion exchange chromatography) analysis of oligosaccharide fragments released by digestion with endoxylanase and lichenase enzymes. The chromosomal positions of putative orthologs of the key genes determining these components were also identified using *Ae. umbellulata* chromosome sequences.

This study showed that the addition of chromosomes $2U^g$, $4U^g$, $5U^g$, $7U^g$, $2M^g$, $5M^g$ and $7M^g$ of *Ae. geniculata* and $3U^b$, $2M^b$, $3M^b$ and $7M^b$ of *Ae. biuncialis* into bread wheat increased the seed protein content. Chromosomes $1U^g$ and $1M^g$ increased the proportion of polymeric glutenin proteins, while the addition of chromosomes $1U^b$ and $6U^b$ led to its decrease. Both *Aegilops* species had higher proportions of β-glucan compared to arabinoxylan than wheat lines, and elevated β-glucan content was also observed in wheat chromosome addition lines 5U, 7U and 7M. The arabinoxylan content in wheat was increased by the addition of chromosomes $5U^g$, $7U^g$ and $1U^b$ while water-soluble arabinoxylan was increased by the addition of chromosomes 5U, 5M and 7M, and to a lesser extent by chromosomes 3, 4, $6U^g$ and $2M^b$. Chromosomes $5U^g$ and $7M^b$ also affected the structure of wheat arabinoxylan, as shown by the pattern of oligosaccharides released by digestion with endoxylanase. These results will help to map genomic regions responsible for edible fiber content in *Aegilops* and will contribute to the efficient transfer of wild alleles in introgression breeding programs to obtain wheat varieties with improved health benefits.

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Dry matter remobilization and compensatory effects in different plant parts of durum wheat genotypes under water stress

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The main aim of the present study was to analyse changes in performance of CIMMYT-derived spring durum wheat cultivars under conditions typical of those prevailing in the irrigated WANA (West Asia, North Africa) areas. This research was performed in Hatay / Turkey (36° 15´ N, 36° 13´ E; D 80 m) in 2009/2010 and 2010/2011. Six durum wheat cultivars were evaluated under two irrigation regimes: irrigation until physiological maturity and irrigation until anthesis. The cultivars were sown on 27 November and 10 December first and second year. Sowing was performed in eight lines of 6 × 1.2 m, each 0.2 m apart. Seeds were sown at 450 seeds m^{-2}. Whole phosphorus (60 kg P_2O_5 ha^{-1}) was mixed with the soil, while nitrate was given during planting, tillering and stem elongation (30 + 30 + 20 N ha^{-1}). Transport of dry matter from vegetative organs to grains was significantly greater in water stressed conditions (1374 mg $plant^{-1}$) than in unstressed conditions (1119 mg $plant^{-1}$). Significant differences have been identified among the varieties in terms of dry matter translocation. The translocation occurred most at Ceylan-95 (1725 $plant^{-1}$), at least (1589 mg $plant^{-1}$). In both conditions the maximum dry matter transport to the grain was attributed to the pre-anthesis period (96,51%). A significant negative correlation (r2 = −0.48 *) was found between the plant height and the DM transport before flowering in case of stress. In the unstressed condition, a positive correlation (r2 = 0.50 **) was found between the transport of the pre-anthesis DM and the transport of the DM after flowering, and vice versa under stress condition (i.e. r2 = −0,60 **). As a result, it was determined that the most important dry matter source for the grain was pre-anthesis reservoir in the water stress of the grain filling period. This contribution could reach to 100% according to the stress intensity and there was significant genetic difference among the varieties. In areas like Mediterranean ecology where water stress is frequently encountered, it has been concluded that these issues are very important and that the breeding strategies to be implemented should be taken into consideration.