QTLs for straw quality characteristics identified in recombinant inbred lines of a Hordeum vulgare x H spontaneum cross in a Mediterranean environment

Barley straw is commonly used as animal feed in many developing countries. Even a small increase in its nutritive value can have a large impact on animal production, and hence, on rural livelihood and human nutrition. Straw quality is strongly affected by environmental factors and is, therefore, difficult to improve with empirical breeding. The objective of this study was to identify molecular markers to facilitate the improvement of straw quality in barley. For this purpose, we have used the genetic linkage map that was already developed for recombinant inbred lines (RILs) of the cross between a Hordeum vulgare cultivar (‘Arta’) and a H. spontaneum line (H. spontaneum 41-1), covering a total of 890 cM. Straw parameters from RILs grown at Tel Hadya and Breda (ICARDA's research stations) in 2 years (1996/1997 and 1997/1998) were analyzed by NIRs for predicted nutritional characteristics including neutral detergent fiber, acid detergent fiber, lignin, digestible organic matter in dry matter, voluntary intake, crude protein, and straw morphology (the percentage of blades, sheaths, and stems). Localization of QTLs was performed using Windows QTL Cartographer, version 2.0. Seventy-three QTLs were identified, the majority of which (17) in the driest of the four environments. Only six QTLs were identified in two environments; in five cases, one of the two was the wettest environment. This is discussed in relation to the possibility of improving straw quality in favorable environments where yields are higher, rather than in dry environments where straw quality is already relatively good.

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