SHORT-TERM LOCAL ADAPTATION OF A BARLEY POPULATION EVOLVED UNDER DIFFERENT ENVIRONMENTAL CONDITIONS

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Cultivation of populations, which can adapt to the conditions under which they are grown, can represent an inexpensive way to adapt crops to climate change and to attain specific adaptation. Next Generation Genotyping will help in understanding the effects of selection and adaptation on populations’ diversity.

Effects of three years of evolution under five different environmental conditions on the diversity of a barley population (namely mix48), selected through Evolutionary Breeding (EB), were tested using seven morpho-phenological traits and 426 SNP markers in a ‘common-garden’ experiment. The contribution of the different Parental Populations (PPs) that were intercrossed to generate the mix48, to populations’ genetic diversity was also assessed.

Differences among the mix48 populations, the original and those obtained in the different locations, were detected for all the considered traits. According to our results days to heading played a key role in conferring adaptation ability to the population. The genomic analysis (about 250K data points) also showed strong differences in the genetic constitution of the populations and that the PPs differently contribute to their genetic constitution. A rapid response of the populations to climatic constrains and, in particular, to extreme temperatures and water availability was observed.

Obtained results suggest heterogeneous populations can hold sufficient genetic variability to adapt to different climatic conditions. Thus, EB appears extremely relevant for selecting varieties for sustainable agriculture where farming conditions can be highly heterogeneous, and able to adapt to climate change. We also shed some new light on the benefits that could be obtained by the application of genomic analysis to materials developed through EB.

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