

Identification of genetic selection footprints in barley landraces in relation to agroclimatic indices

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Landraces are populations of crop plants adapted to a particular environment. Extant landraces are surviving genetic archives, filling invaluable information of the selection processes they have undergone until settling in their current niches. Barley landraces were abundant in Spain, and were properly collected in germplasm banks over the last century. This study intends to establish relationships between genetic diversity of the Spanish landraces and the climate of their collection sites. A thorough study of a period of 30 years of past climate (1981-2010), extracted agroclimatic variables meaningful for cereal production at the collection sites of 140 barley landraces. Variables resume temperature, precipitation, evapotranspiration, potential vernalization and frost probabilities at different moments and scales (season, month). A set of maps using the climatic variables, computed from more than 2,000 temperature stations and 7,000 precipitation stations over peninsular Spain, were built to assess the relationship between the different types of barley varieties and the climate of the territory. Genotyping for the barley landraces was carried out with an Illumina Infinium assay with 9k SNPs, and by DArTseqTM, a genotyping-by-sequencing-system provided by company Triticaret. In total, close to 10,000 SNPs, were placed in the barley reference genome. They were further analysed with software Bayenv2, to assess the relationship of markers with agroclimatic variables, finding a number of associations that are currently being explored further. Markers that indicate specific adaptation to climate and other geographic features, after proper validation, can be used for focused breeding efforts towards better varieties for future climatic conditions.