

## A GENE DUPLICATION AT THE BLP1 LOCUS IS ASSOCIATED WITH THE BLACK GRAIN PHENOTYPE IN BARLEY

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Due to its wide ecological distribution, barley is considered a useful source of genetic diversity for adaptive traits. For instance, the black colour of barley grains, caused by the accumulation of phytomelanin in the pericarp and husk, has been suggested to result from environmental adaptation to biotic and abiotic stresses. By exploiting whole exome sequencing data from a collection of barley landraces of different origins (WHEALBI panel), the Black lemma and pericarp (Blp) locus responsible of the black grain phenotype was mapped at gene-resolution level on chromosome 1H and a gene coding for a Purple Acid Phosphatase (PAP) was proposed as the best candidate for the trait. Mining exome reads for heterozygous calls and depth of coverage at the locus revealed a duplication of the PAP gene in black barley genotypes, suggesting a possible neofunctionalization, in agreement with the dominant inheritance of the locus. The PAP gene duplication was confirmed by exploiting the barley pan-genome and by developing paralog-specific genomic and expression markers. An increase in the expression level of the duplicated PAP paralog was observed in black barleys during spike maturation. Screening of mutagenized populations of black barleys is underway. A correlation between the origin of black barleys and the higher incidence of solar radiation has been observed, suggesting that the accumulation of phytomelanin in the lemma and pericarp might provide an adaptive advantage in such environments. Other than representing a significant improvement on the cloning of Blp, our study is a valuable example on the integration of genetic and genomic resources for

the identification of structural variants responsible of heritable phenotypes.