Involvement of production opposite sulfite

Selection of two opposites sulfite producers

Phenotyping: Enological conditions Study of the phenotypes distribution through the population

Genotyping: DNA microarray (Affymetrix) Identification of molecular markers

Constitution of a recombinant population

Identification and dissection of a QTL on the XIVth chromosome

Involvement of a double QTL region in 4 phenotypes of interest

A correlation analysis between the phenotypes of interest reveals strong relationships:

- SO2 production
- H2S production
- Acetaldehyde production
- Propanol

A linkage analysis reveals that a QTL region located on the XIVth chromosome is linked to four phenotypes of interest:

- SO2 production
- H2S production
- Acetaldehyde production
- Propanol

An accurate observation of the QTL region point out two peaks of LOD score:

Identification of two candidate genes in the QTL region

SKP2 (YNL311C): F-box protein part of an SCF ubiquitin protein complex, involved in regulating protein levels of sulfur metabolism enzymes (excluding MET14p)

2 non-synonymous SNP

MET2 (YNL277W): L-homoserine O-acetyltransferase, catalyses the conversion of homoserine to O-acetyl homoserine

1 non-synonymous SNP

Thanks to a QTL approach, we succeed to decipher the mechanism underlying the low SO2, but also low H2S and acetaldehyde production of a wine yeast strain. We identify two genetically linked alleles responsible for a simultaneous control of the flux through the sulfate reductive sequence and of the conversion of O-acetylhomoserine to homoserine. We demonstrate that the transfer of those alleles in a high SO2/H2S/acetaldehyde producer strain is responsible for a huge diminution of their production (Patent). Furthermore, we assume that the combination of those alleles is strong enough to control the production of those sulfur compounds in any other wine yeast strain and we succeed to transfer them into a good fermentative strain to improve it. This new strain, Lalvin-ICV OKAY®, has already demonstrated its very good enological properties in many trials (very low SO2/H2S/acetaldehyde production, very good fermentation activity, low nitrogen needs, intense fruity aroma, freshness and balance in mouth) and is now commercially available.

Thanks: Blondin, B., Noble, J., Sanchez I. Méthode de contrôle de la production de sulfites, d’hydrogène sulfureux et d’acétylalcool par des levures. PCT/FR2011/059253

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