GENETIC VARIABILITY IN TWO-ROWED BARLEY FOR IN VIVO β-GLUCAN DEGRADATION

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Two-rowed barley genotypes, varieties and advanced lines have been studied for enzymic β-glucan degradation. Malt β-glucan content is an important quality feature and, in turn, it depends upon barley β-glucan content as well as on β-glucanase activity during modification. Another enzyme, β-glucan solubilase, has been repeatedly, but unsatisfactorily, suggested to precede β-glucan depolymerization by β-glucanase. Actually, neither solubilase has been univocally identified, nor solubilizing activity has been uncontroversially proven to be different from that of β-glucanase itself.

Our approach was the following: barley genotypes were characterized for parameters related to malting quality; some of these genotypes were selected for their wide differences and monitored for the degradation of β-glucans and the development of β-glucan-degrading enzymes during malting (a dedicate assay for the measurement of β-glucan solubilization activity was developed). A biphasic model for β-glucan degradation implying sequential action of solubilase and β-glucanase was compared to a monophasic model that assumes all β-glucans are essentially depolymerized by β-glucanase. The comparison was performed by formulating these models in terms of in vivo kinetics, so that confirmatory regression analysis could be used to test their fitting to the observed data.

Results showed β-glucan degradation is mostly monophasic, notwithstanding the role of a small fraction of ‘masked’ β-glucans in malting quality remains unclear. However, the genotype-dependent kinetic rate constant (indicating β-glucan degradability), in addition to β-glucanase activity, is suggested to play a relevant role in malting quality.

We identified the variety Scarlett as the best one for this trait; consequently, Scarlett is confirmed to be at top level for malting quality, but even one of our advanced lines, Fior 7054, had high values of β-glucan solubilase.