

# TUNNING PECTINASE ACTIVITY UNDER ELECTRIC FIELD EFFECTS TOWARDS ENHANCED CLARIFICATION OF “VINHO VERDE” WINE

## Agricultural, Marine and Food Biotechnology

### OP - (720) - TUNNING PECTINASE ACTIVITY UNDER ELECTRIC FIELD EFFECTS TOWARDS ENHANCED CLARIFICATION OF “VINHO VERDE” WINE

Pereira, Guilherme (Portugal)<sup>1,2</sup>; Queirós, Mariana (Portugal)<sup>1,2</sup>; Carvalho, Gonçalo (Portugal)<sup>1,2</sup>; **Pereira, Ricardo Nuno** (Portugal)<sup>1,2</sup>

1 - CEB - Centre of Biological Engineering, University of Minho, 4710-057 Braga, Portugal; 2 - LABBELS – Associate Laboratory, Braga, Guimarães, Portugal

#### Body

Vinho Verde (translates as “green wine”) is one of the most important and leading DOC (Denomination of Controlled Origin) product in Portugal and known worldwide by its unique aromatic profile. Pectinolytic enzymes are of the great importance in the clarification process of Vinho Verde wine must, contributing to reduce the possibility of haze formation. During last decade a growing body of knowledge have been established about the effects of electric fields as sub-lethal stress for the activation of important food enzymes. However, the influence of electric parameters is enzyme dependent, and its influence on the catalytic activity should not be generalized. This work describes for the first time the effects of electric field and electric frequency on the activity of a pectinase (PEC) in the accelerated clarification of Vinho Verde must. Moderate electrical fields (MEF) with intensities below 20 V/cm and at electric frequencies ranging from 50 Hz to 20 kHz, were applied at temperatures between 15 °C and 35 °C. Enzymatic activity was measured for 25 minutes and the initial rate of reaction was determined by coefficient of the linear plot of the galacturonic acid production as a function of time. Results have shown that electrical frequency can increase enzymatic activity depending on treatment temperature; for example, at 20 °C and electric frequency of 2 kHz and 20 kHz, the enzymatic activity increased approximately 40 % and 20 %, respectively, when compared with control sample (without application of MEF). The temperature dependence was evaluated through Arrhenius equation showing that the energy of activation ( $E_a$ ) can be reduced from 9.2 kJ.mol<sup>-1</sup> to 6.6 kJ.mol<sup>-1</sup> at sub-optimal temperatures for PEC activity with application of MEF. Electrical parameters when combined with treatment temperatures  $\leq 20$  °C reduced up to 42 % the presence of pectin in Vinho Verde wine must contributing to its final quality. This emergent treatment brings an opportunity to increase enzyme efficiency even at low temperatures, which are necessary during winemaking process, thus bringing a vision of sustainability through the reduction of energy input and process integration in relevant environment conditions.

#### Acknowledgements

This study was supported by the Portuguese Foundation for Science and Technology (FCT) under the scope of the strategic funding of UIDB/04469/2020 unit, AgriFood XXI R & D & I project, operation number NORTE-01-0145-FEDER-000041, co-financed by the European Regional Development Fund (FEDER) through NORTE 2020 (Northern Regional Operational Program 2014/2020) and Bioeno - Comércio e Serviços em Enologia Lda. Ricardo N. Pereira acknowledges FCT for its Assistant Research program under the scope of Scientific Stimulus Employment with reference CEECIND/02903/2017.

**Palavras-chave :** wine clarification, electrical frequency, enzymatic activity, energy of activation