Kimberly Paige Hendrikx-Georgius

The Influence of Selected non-*Saccharomyces* Yeast Strains Used in Sequential Inoculations on Fermentation and Fermentative By-Products in Riesling Wine

Jury Members: 1st Supervisor: Professor Dr. Doris Rauhut
Fachgebiet Mikrobiologie und Biochemie
Geisenheim Research Center
2nd Supervisor: Professor Dr. Olga Laureano
Departamento de Agro-Indústrias e Agronomia
University of Lisabon

Abstract:

One of the most exciting advances in winemaking technology has been the inoculation of grape juice with selected cultures of *Saccharomyces cerevisiae* and non-*Saccharomyces* in order to improve flavor and fermentation characteristics. Recent advances in wine making technology have proven that non-*Saccharomyces* yeasts can play a crucial role in the metabolic dynamics during fermentation and increase the aroma complexity of wines as well. This is in contrast to the former and widely held belief that non-*Saccharomyces* were primarily spoilage yeasts that had negative enological characteristics and were of secondary significance to flavor and fermentation. It has now been shown that a carefully timed inoculation with non-*Saccharomyces* and *S. cerevisiae* in sequential form can actually modify the negative enological characteristics of non-*Saccharomyces* and that some positive flavor and fermentation characteristics unique only to non-*Saccharomyces* yeast strains can be enhanced as well. The aim of this thesis was to investigate this so called synergistic effect of non-*Saccharomyces* of *S.cerevisiae* in mixed cultures through the examination of several commercial yeast products in sequential form for specific by-products and fermentative behavior when inoculated in Riesling must.

The methods used for this thesis involved performing timed laboratory scale fermentations in triplicate using two specific commercial yeast sequential inoculation kits: Level 2 TM TD (Lallemand, Canada) and SIHAFERM PURE NATURE (BEGEROW-Germany) and 650 mL sterile Riesling must. In addition, the non-*Saccharomyces* yeast strain, Zymaflore®*Alpha* TD (Laffort, France) was combined in a sequential inoculation with a suggested *S.cerevisiae* strain from the same company

Zymaflore ®X5. Two commercial *S.cerevisiae* strains, in addition to the three aforementioned *S.cerevisiae* strains were tested as well including: Uvaferm GHM® (Lallemand Canada) and Lalvin EC 1118 (Lallemand). In total, six sequential fermentations were performed in triplicate and eight single fermentations (three with non-*Saccharomyces* and five with *S.cerevisiae*) were performed in triplicate as a control.

The results were positively conclusive, on average (67%) for the sequential inoculations in regard to improved fermentation kinetics and enhancement of specific by-products. It can be suggested that this average could have been even higher if the trials had not encountered difficulties due to difficult must conditions and if the inoculations had been performed at pilot scale.

Keywords: Sequential inoculations, mixed cultures, non-*Saccharomyces Torulaspora delbrueckii*, commercial sequential inoculation kits, enhancement by-products, wine yeasts.

Corresponding contact:

Professor Dr. Doris Rauhut: doris.rauhut@fa-gm.de

Professor Dr. Olga Laureano: olgalaureano@isa.utl.pt