Effect of nitrogen supplementation on yeast fermentation performance and mead quality

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Mead is a traditional drink, containing 8-18% (v/v) of ethanol, which results from the alcoholic fermentation of diluted honey performed by yeasts. However, when it is produced in a homemade way, mead producers find several problems, namely, the lack of uniformity in the final product, slow or premature fermentations arrest, and the production of “off-flavours” by the yeasts. These problems could be due to several factors, including lack of essential nutrients such as a deficiency in available nitrogen. Additionally, it has been reported that mead fermentation is a time-consuming process, often taking several months to complete, depending on the type of honey, yeast strain and honey-must composition. Since mead production is a time-consuming process, to make its production viable it is necessary to reduce the fermentation time while producing an end product of quality. Thus, the aim of this study was to evaluate the effect of nitrogen addition to honey-must on two active dry wine yeasts (ADWY) fermentation performance, as well as on the mead composition and volatile aroma compounds production.

Honey must was prepared according a recipe developed in our laboratory, and supplemented with potassium tartrate and pH adjusted to 3.7 with malic acid. Then to study the effect of nitrogen addition a part of honey-must was adjusted with diammonium phosphate (DAP) to achieve the concentration of nitrogen required by yeast to complete alcoholic fermentation. The honey-musts were inoculated in order to obtain a pitching rate of 1×10⁷ viable cells/ml. Several parameters were determined during the fermentation to evaluate the effect of nitrogen addition on yeast growth, fermentation profile, mead composition and aromatic profile. For this study as biological material were selected the ADWY Saccharomyces cerevisiae Lalvin QA23 and Lalvin ICV D47.

The supplementation of honey-must with DAP reduced fermentation length in approximately seven days, however sugars were not fully consumed, suggesting that other factors could be interfering with yeast growth. Furthermore, it was verified that both yeasts the specific growth rate and final biomass were higher in musts supplemented with DAP. Mead final composition was similar in the two experimental conditions, however, even in the honey-must to which DAP was not added about 25 mg/L of assimilable nitrogen remained at the end of fermentation. Some fermentative aroma compounds which contribute to the sensorial quality of mead, including alcohols, fatty acid ethyl esters, acetates, volatile phenols and volatile fatty acids, were identified and quantified.

Global analysis of volatile profile revealed that the concentration of fatty acid ethyl esters and volatile phenols was higher in meads supplemented with DAP. The concentration of volatile phenols was below their perception threshold but the levels of acetate and ethyl esters could contribute to enhance fruity character in meads produced. These results are very useful to optimise the mead production and improving its quality.

Keywords: mead, assimilable nitrogen, yeast performance, aromatic profile

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Effect of post mortem temperature treatment on microbiology meat quality of suckling lamb

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Chilling processes are employed to preserve the lamb carcasses from microbiological contamination and extend the shelf life. The temperature conditions during the first 24 h post mortem play a great role in the ultimate carcass quality. In this sense, the most common chilling treatment used is transferring the carcasses to a chamber at 0-2ºC immediately after dressing. In order to improve benefits as well as meat quality, other chilling treatments have been studied.

The aim of this work was to evaluate the effect of post mortem temperature treatment on microbiological carcass quality. To carry out the study, 30 Churra suckling lambs were used. Lamb carcasses were randomly assigned to three different post mortem temperature treatments: conventional (2ºC for 24 h), ultra-rapid (-20ºC for 3.5 h then 2ºC until 24 h post mortem) and slow (12ºC for 7 h then 2ºC until 24 h post mortem). Carcass pH and temperature were measured at 0, 2, 5 and 24 h post slaughter in the M. longissimus lumborum. Lamb carcasses were examined for total viable and Enterobacteriaceae counts as follows: just after dressing and 24 h post mortem, samples were taken from the leg and breast area of left side of each carcass using the excision technique to microbiological testing. A 5 cm² sample from each site was aseptically removed using a sterile scalpel and forceps, and both pieces from one carcass were transferred into a labelled, sterile stomacher bag for the microbiological analysis.

Post mortem temperature treatment had not effect on M. longissimus lumborum pH immediately after slaughter (0 hours) or at 2 hours post mortem (p>0.05). However, a significant effect (p<0.05) of post mortem treatment on carcass post mortem temperature was found. As expected, carcasses chilled at -20ºC shown the fastest rate of temperature fall, from 31.2ºC to -0.1ºC at 5 h, whereas conventionally and slow chilled carcasses reached internal temperatures of 3.8ºC and 11.1ºC, respectively. On the other hand, pH values at 5 h post mortem showed significant effect of chilling treatment (p<0.05), with ultra-rapid chilled carcasses having a higher pH than the other two treatments.

The total viable counts on lamb carcasses before and after post mortem temperature treatment were satisfactory according to Regulation (EU) 2073/2005. Regarding temperature treatment effect, at 24 hours post mortem ultra-rapid carcasses had significantly (p<0.001) lower total viable counts than conventional and slow chilled carcasses. The Enterobacteriaceae counts measured just after dressing and after 24 hours post mortem, were dependent on temperature treatment. Ultra-rapid and conventional treatment showed a decrease between samples taken just after dressing and 24 hours post mortem, whereas Enterobacteriaceae counts increased from 0 to 24 hours post mortem in slow temperature treatment. Counts after 24 hours post mortem in ultra-rapid and conventional chilling treatments were satisfactory according to Regulation (EU) 2073/2005, whereas slow temperature treatment showed counts above that limits.

Taking into account microbiological analysis results, conventional and ultra-rapid chilling treatments should be chosen, because of the higher Enterobacteriaceae counts obtained in slow chilled carcasses.

Keywords: carcass refrigeration; suckling lamb, microbiological contamination.