

THE IMPACT OF APPLE CULTIVAR AND SELECTED TECHNOLOGICAL TREATMENTS ON CHEMICAL COMPOSITION AND THE PROFILE OF VOLATILE COMPOUNDS OF APPLE DISTILLATES

The main goal of the current study was to determine the impact of apple cultivar and selected technological treatments on the chemical composition, sensory properties and the profile of volatile compounds of apple distillates. The research was divided into four stages. In the first research stage, apple musts obtained from domestic Polish cultivars (Eliza, Rubin, Topaz, Idared, Jonagored, Pinowa, Gloster, Florina, Golden Delicious, Szampion) harvested in Garlica Murowana were inoculated with RED Ethanol yeast (*Saccharomyces cerevisiae*) to initiate fermentation. In the second research stage the same experiments were repeated with Cider Yeast but also spontaneous fermentation was examined. The third research step involved defecation which is aimed at removing yeast biomass and nutrients from musts. Then musts were distilled (simple fermentation) and distillates were subjected to fractional distillation to obtain head, middle and tail fractions. In the last research stage wooden chips of various trees were added at different doses to apple spirits and matured for 15 months. Musts and fermented musts were subjected to the analysis of chemical composition. Volatile compounds in distillates were analysed with gas chromatography (flame ionisation detector) and gas chromatography with mass spectrometry to confirm the presence of particular compounds.

Chemical composition of fermented apple musts and aroma profile of distillates was determined by apple variety. Quantitative composition of terpenes profile was characteristic for each apple cultivar. Topaz, Rubin and Eliza cultivars were the most beneficial for the production of apple distillates and they were used as raw materials in research steps that followed. Only spirits made of Topaz and Eliza cultivars contained all analysed terpenes with eugenol and β -ionone as the most abundant compounds. Myrcene and limonene were typical for Topaz and Eliza spirits and β -citronelol for Rubin spirits. Ethyl acetate consisted 30% of total volatile esters. Methyl walerianate was present only in distillates made from fermented Topaz musts and it was a characteristic compound for that cultivar. Spirits obtained from Topaz fruit obtained the highest grades in the organoleptic assessment.

Spirits obtained after spontaneous fermentation of musts contained the highest concentrations of methanol, amyl alcohols, ethyl acetate and isopropyl acetate. At the same time, they demonstrated lower concentrations of some terpenes. RED Ethanol distillery yeast was the most useful for the production of apple distillates. Application of that yeast resulted in highest concentrations of guaiacol, linalool oxide, linalool, ethyl caproate, while propanol was

the lowest among all tested spirits. When Cider Yeast (*S. bayanus*) was used for fermentation, the concentration of isoamyl acetate, methyl atranilan and amyl alcohols were lowest. In the same case the concentration of isoamyl acetate and hexanol were highest. Organoleptic assessment demonstrated that the most preferable aroma of spirits was achieved by using RED Ethanol yeast and Cider Yeast, while application of RED Ethanol yeast provided the most optimum flavour.

Defecation resulted in changes of quantitative profile of terpenes in spirits, e.g. the concentration of geraniol increased with increasing concentrations of calcium chloride. Experimental variants involving defecation demonstrated slightly increased concentration of some terpenes (limonene, linalol oxide, isoeugenol, myrcene) and most of volatile esters (e.g. ethyl acetate, isoamyl acetate, ethyl laureate, methyl antralan). Defecation decreased the concentration of amyl alcohols (for about 20% in comparison to control samples). It increased the concentration of isobutanol in spirits obtained after spontaneous fermentation. Moreover, it slight decreased the concentration of hexanol in the case of variants fermented with RED Ethanol yeast. Defecation improved acceptability of spirits resulting in higher grades for sweet or fruit aroma and flavour in comparison to control samples.

Addition of wood chips to spirits (dark and medium roasted oak, cherry, apple, pear and walnut) before maturation improved the aroma of apple spirits. The dose of wood chips had lesser impact. The decrease of quantity of some terpenes was related to their oxidation, e.g. linalool was transformed to linalool oxide. Maturation increased the concentration of myrcene, methyleugenol, ethyl capronate, isopropyl acetate, butanol, hexanol and amyl alcohols (for approximately 10%). This process decreased the concentration of isoamyl acetate, propanol, isobutanol and methanol (for approximately 25%). It was determined that the intensity of roasting of oak wood chips increased the concentration of guaiacol and decreased the quantity of butanol in spirits. Spirits matured with wood chips of dark and medium roasted oak, cherry and pear demonstrated the most variable profile of volatile compounds and obtained highest results in organoleptic assessment.

Magdalena Januszek