Abstract

The aim of this study was to compare the main ferments selected to be used in the process of mead making: Saccharomyces cerevisiae yeast and pollen, the latter having been used in ancient times as ferment. It has only been recently that the market has exhibited significant interest in developing foods containing functional ingredients. Honey has been a corollary of hidden nutritional and medicinal value for centuries. Mead is the result of alcoholic fermentation, by mixing different proportions of honey with water and pollen, as a fermentation agent. The fermentation process was monitored by collecting samples periodically and analyzing the alcohol concentration, total extract, the level of fermentation, the pH, as well as the yeast number with the Thoma cell counting chamber. Additionally, physicochemical (acidity and vitamin C) and sensory parameters were determined for the final products. Results and discussion: Pollen-fermented beverages have a higher alcohol concentration than beverages fermented with Saccharomyces cerevisiae, which is explained by the additional intake of carbohydrates induced by the addition of pollen.

Keywords: functional beverage, honey, mead

Introduction

Recently, the focus of scientific investigations has shifted from the primary role of food as the source of energy and body-forming substances to the more subtle action of biologically active food components on human health, also, to some compounds, most often of vegetal origin with proved pharmacological action (Granato et al., 2010; Salanţă et al., 2016; Tero-Vescan et al., 2016; Tero-Vescan et al., 2017). Bioactive compounds are part of the daily diet, creating the opportunity to use food as an effective prevention strategy, especially in the early stages of the diseases (Uifălean et al., 2015; Uifălean et al., 2016). Honey is comprised primarily of fructose (38.2 %), glucose (31 %) and water (17.1 %). However, the remaining 13.7 % of honey provides manufacturers with some remarkable benefits. Among those components are a variety of other sugars, enzymes, amino acids, antioxidants, vitamins and minerals (Belkhodja et al., 2017). Honey has been a corollary of hidden nutritional, medicinal value and antimicrobial activity for centuries (Dezmirean et al., 2017). Mead is broadly considered to be the oldest alcoholic beverage (Gupta and Sharma, 2009). Mead is the result of alcoholic fermentation, by mixing honey in different proportions with water and pollen as a fermentation agent (Iglesias et al., 2014; Cuenca et al., 2015). Mead can represent a good solution to honey over-production and a way of valorising honey of lower quality (Gomes et al., 2015). Despite the fact that traditional mead is simply a fermented mixture of honey and water, many variations have existed throughout the ages, ranging from the traditional to complex mixes of fruit juices and spices. Nowadays, local food and beverages products are redeveloped into commercial products (Brătă, 2017). The
most common are metheglin (mead containing spices or herbs), melomel (mead with fruit juices), hippocras (with herbs and spices) and sack mead (produced with superior concentration of honey) (Iglesias et al., 2014).

The aim of this study was to compare the main ferment selected to be used in the process of mead making: Saccharomyces cerevisiae yeast and pollen, used in ancient times as ferment. Thereby, two beverages were developed, exhibiting high levels of biologically active compounds from honey, Rosa canina (Măceșemel) and Zingiber officinale (Ghimbimel).

Materials and methods
Multi-floral honey (made from nectar of different plant species), pollen and ginger were acquired from the local market. Fruits „marc” of Rosa canina (Rosehip) were obtained from a local manufacturer. Pollen and yeast (Saccharomyces cerevisiae) were used for the fermentation substrate formulation. The yeast (Saccharomyces cerevisiae) is used by brewers repeatedly (usually 4-6 times) and is the second main byproduct of the brewing industry (brewer’s yeast) (Ferreira et al., 2010).

Quality of mead depends on the source of honey and yeast (Pereira et al, 2009). We obtained four types of beverages (two with pollen as an agent of fermentation and two with yeast). The beverage recipe (1 and 2): 200 ml honey, 200 ml lime juice, 600 ml water, 20 g ginger; 0.15 g/l yeast/ 30 g pollen respectively; recipe (3 and 4): 200 ml honey, 200 ml fruits „marc” of Rosa canina, 600 ml water, 0.15 g/l yeast/ 30 g pollen, respectively. The fermentation process was monitored for 21 days, by periodically collecting samples and analyzing the alcohol concentration, total extract, the level of fermentation, pH (according to methods described by Kempka and Mantovani, 2013, with some modifications), as well as the yeast number with the Thoma cell counting chamber (according to the American Society of Brewing Chemist, 1998 rev. 2001). The pH was measured using a digital pH-meter, set 315 WTW Germany. The alcohol content, extract and fermentation grade were determined using the automatic Fermentostar analyzer (Funke-Gerber, Germany). This measurement is based on methods of thermoanalytical measuring combined with mathematical algorithms. The accuracy of each measurement resolution (as defined by the manufacturer) is 0.01 % for each parameter (Coldea et al., 2014). The sample containing 20 ml of beverage, prepared as described before, was rinsed into a measuring cell by means of a pump. The alcohol content and extract were measured using thermal measuring effects. The result appeared on the apparatus screen. The physico-chemical (acidity and vitamin C) and sensory parameters were determined for the final products, according to AOAC standards, methods 967.21 and 985.33 (vitamin C) and 942.15 (acidity) (Association, 2000). The determination of ascorbic acid was achieved through titration with a solution of potassium iodate (KIO₃). The functional beverages were organoleptically evaluated for sensory parameters such as colour, taste, flavour and overall acceptability. The 9 point hedonic scale was employed for sample evaluation.

Results and Discussion
The yeasts took three days to accommodate with the fermentation conditions. Once this occurred they developed and multiplied reaching their maximum level. Subsequently, their number decreased as the alcoholic strength increased. Finally, after 21 days, they were totally destroyed. During pH monitoring, a slight decrease at the beginning of the samples was observed, but afterwards pH remains constant until the end of the process (3.6-3.8). The results resemble those reported by Gupta and Sharma, 2009.

While the sugar is converted into ethyl alcohol by yeast, the extract and the alcoholic strength of the samples indicated an increase in the sugar content. In the case of pollen-fermented samples, both the extract and the alcoholic strength records increase on the basis of the carbohydrate intake therein. The beverages with pollen as the fermenting agent, have higher alcohol concentrations (8.38-10.45 %). The alcoholic content of mead can vary between 7-22 % (Gupta and Sharma, 2009). Acidity contributes directly to the formation of flavours, indicating the degree of maturity or freshness of beverages, the values varied from 3.75-5.77 g/l between samples. The acidity concentration varies between 0.06-2.14 % for mead obtained from fruits in the study of Gupta and Sharma, 2009. The beverages with Rosa canina have a higher vitamin C content (10.56-14.08 mg/100g) compared to ginger beverages.
(5.28 mg/100g). The sensory evaluation revealed that beverages were assessed on the hedonic scale between „pleasant” and „extremely pleasant”. Because of the sweet taste, the beverages with Rosa canina were preferred by female, and those with ginger by male. The most of female prefer a fruity kind of flavors and smell, while men are known for tolerating any kind of smells better than women (Salanță et al., 2017).

Conclusion

Pollen-fermented beverages have a higher alcohol concentration than beverages fermented with Saccharomyces cerevisiae, which is explained by the additional intake of carbohydrates induced by the addition of pollen. The development of honey-derived products can be an alternative to provide innovative drinks with health benefits to the consumers, as well as to increase the profit of the beekeeping industry.

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References