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MELOMEL TECHNOLOGY – HONEY WINE FERMENTED WITH FRUITS

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Abstract

From honey fermentation honey wine or mead can be obtained. Our purpose was to study the product fermented with fruits or fruit juice addition. This product is an derivate of mead product which ferments in similar conditions. Alcohol content of melomel is higher than 10% vol v/v, and from organoleptical point of view it extracts the characteristics of the fruits added in the honey must before fermentation.

Key words: honey, melomel, glucides, alcohol content, fruits

INTRODUCTION

Romania's beekeeping potential is very high. For Romanians beekeeping represents an ancient occupation being spread all over the country, it's craft it is transmitted from a generation to another since our ancestors the Dacians. Honey is an animal origin food produced by bees from two different sources, floral nectar and honeydew (Mărghitaş, 2005). Fermentation of honey represent a good way to efficiency use honey. Honey must represents a fascinating environment totally unexplored, its fermentation being different by grape must fermentation. We can characterize honey must as being a difficult medium for fermentation due to its sugar content which is approximately three times higher than the grape must. The biochemical composition varies from one to another type of honey being directly influenced by changes in environmental factors – is difficult to obtain from a batch to another a finished product that meets the same biochemical and sensory characteristics. Because of this variables a lengthy and rigorous study is required to examine the depth and aspects that affect the production of mead, researching the raw material and the affecting factors ending with the production process and how it can be optimized (Şarba et al., 2014). There is a lack of scientific information about honey-must fermentations but it is accepted by mead makers that mead quality

improvement includes the development of the proper additive formulation and optimization of fermentation conditions (Mendes-Ferreira et. al., 2010).

In order to accelerate the fermentation process and to help the yeasts in sugar metabolization process we added sliced fruits or different fruits juices and we developed a new product called melomel, wich is fermented honey with the addition of fruits.

MATERIAL AND METHODS

The principle of alcoholic fermentation is to convert sugars into carbon dioxide and ethyl alcohol. Preparation of this alcoholic beverage is dependent of the raw material. In almost all honey types, fructose and glucose predominate. These two sugars account for nearly 85-95% of the honey carbohydrates (Finola et al., 2007).

pH and acidity were determined by automatic titration using Titrolyne Easy and Titroline Alpha10plus equipment (SCHOTT Instruments GmbH, Mainz, Germany). Alcohol content of fermented products was determinated according to official methods using Vapodest 30 distilator. Sugar profile and glycerol content was determinated following a HPLC-RID method described by Bogdanov et. al. on a Shimadzu instrument with refractive index detector, amino modified column Alltima Amino (100 A, 5μm, 250 mm X 4.6 mm), using a mixture of acetonitrile and water as mobile phase (75:25 v/v). Injection volume was 20 μL, column pressure 6.3 Mpa, and 1 mL/min the flow rate of the mobile phase. Sugar standards (glucose, fructose, sucrose, turanose, maltose, trehalose, isomaltose and erlose) were injected separately and in mixture in the range of 0-50% concentration (depending on the amount present in honey) for calibration curve and linearity range test. Glycerol standard was injected separately from sugars, in multiple concentrations, for calibration curve, linearity, limit of detection and quantification.

HMF (hydroxymethylfurfural) was determinated following a HPLC-PDA method described by Bogdanov et al. on a Shimadzu VP instrument conected to a UV-VIS photodiode array detection, using Discovery HS C18 (250mm X 4.6 mm, 5μm), Supleco collumn. Injection volume was 20 μL. The analytical results reported for pH, brix, acidity and hydroxymethylfurfural are the average of triplicate measurements, also flavons and phenols results.

RESULTS AND DISCUTION

Our main purpose was to analyze all ingredients in every step of production. We used polyfloral honey wich we diluted in spring water in order to obtain the honey must . This product was enriched with plum concentrate (60° Brix). The final honey must was fermented by two different fermentation agents: *Saccharomyces cerevisiae* and pollen. It has been shown in previous studies that increasing incoculum size of fermentative yeast led to higher concentration of alcohols (Mateo et al., 2001; Erten et al., 2006; Verbelen et al., 2009; Pereira et al., 2012). The fermentation process has taken place in the same environmental conditions.

Table 1

Sugar profile of polyfloral honey used to produce melomelo and polyfloral honey must with plum concentrate and the final product

	Fructose (%)	**Glucose (%)**	**Sucrose (%)**	**Turanose (%)**	**Maltose (%)**	**Trehalose (%)**	**Isomaltose (%)**	**Erlose (%)**	**Melesitose (%)**	**Total sugars (%)**
Polyfloral honey	43,25	27,97	0,15	2,53	1,67	0,82	0,79	1,30	Nd	78,48
Pollen	1,79	1,50	Nd	0,03	0,07	0,06	0,04	Nd	Nd	3,49
Plum concentrate	6,88	16,20	2,16	0,10	Nd	Nd	Nd	Nd	Nd	25,34
Polyfloral honey must	11,50	7,79	0,04	0,68	0,47	0,19	0,20	0,45	Nd	21,95
Plyfloral honey must + Plum concentrate	11,70	8,09	0,07	0,68	0,48	0,20	0,20	0,45	Nd	21,90
Melomel *S. cerevisiae*	0,07	0,24	Nd	0,59	0,25	0,21	0,23	Nd	Nd	1,59
Melomel *pollen*	0,08	0,38	Nd	0,63	0,24	0,23	0,33	Nd	0,01	1,9

Individual sugar profile was determinated for each material used including pollen and plum concentrate. From table 2 it cand be observed total sugar amount for the intermediary product (honey must and honey must with plum concentrate addition) abd for the final products fermented by the 2 different fermenting agents (*Saccharomyces cerevisiae* and pollen).

The metabolization rate of sugars was 92,73% for the Saccharomyces cerevisiae and 91,32% for pollen. Despite lower metabolization rate for pollen the final product (melomen with plum concentrate fermented by pollen) has the higher alcoholic content 11,48 % (v/v) (Table 2).

Table 2

Physical and chemical properties

	Acidity meq/kg meq/l	**pH**	**HMF mg/kg mg/l**	**Glycerol (%)**	**Alcoholic concentration % (v/v)**
Honey	18,17	3,75	10,18	-	-
Honey must+ Plum concentrate	84,93	3,46	0,3	-	-
Melomel with plum concentrate *Saccharomyces cerevisiae*	103,53	3,25	3,21	0,68	11,02
Melomel with plum concentrate pollen	102,07	3,43	7,30	0,73	11,48

The acidity of the products increases from 18,17 meq/kg in raw material to 84,93 meq/l in honey must after plum concentration addition. Also during fermentation acidity increases to 103,53 meq/l for melomel fermented by *S. cerevisiae* and to 102,07 meq/l for melomel fermented by pollen. Also the product fermented by pollen presents higher glycerol content and HMF content, and it can be explained by the addition of pollen wich contains extra enzymes and sugars that participate to the fermentation process.

CONCLUSIONS

In comparation with the traditional mead fermentation it has been shown that significant time can be saved in the fermentation process by adding juice or sliced fruits.

The fermentation profile of *Saccharomyces cerevisiae* was largely similar to pollen; however, a slight increase in the fermentation time was observed.

New honey-based products such as mead or melomel must be developed to maintain apiculture as a viable industry. For costumers, the sensorial characteristics of honey represent a major parameter in determination the quality of honey, and the parameters with the biggest impact are the color and the crystallization state (Moise et al., 2007). The last characteristic affects in a bad way costumer perception. In order to optimize this types of honeys, fermented honey products start to cover more and more the apiculture market.

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