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Technology for obtaining fresh goji fruits liqueur with almond milk

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Abstract

Many studies have shown the importance of goji fruit and almonds to human health. Due to the high content in carotenoids, phenolic compounds, vitamins, minerals and polysaccharides these fruits play an important role in strengthening the immune system, prevention of cardiovascular diseases, such as cancer and slowing the aging process. Through studies and researches carried out in the context of this work, we aimed at obtaining a liquor assortment of goji fruit with the addition of almond milk. Goji fruit liqueur and almond milk are natural products produced without heat treatment and low in sugar. After obtaining, we conducted laboratory tests physicochemical, aiming at determining antioxidant capacity, alcoholic strength, total dry extract, content of flavonoids, sugar, total acidity, pH, polyphenols. Following the evaluation of the results it was found that goji fruit liqueur fall within the limits of STAS on obtaining and marketing of liqueurs, liqueurs being classified as desert.

Keywords: liqueur, without thermal treatment, goji, analyses

1. Introduction

Liqueurs originated in the thirteenth century in Italy, where they were nothing but sweetened medicines. The first known liqueur producer was the popes' doctor, Arnoldus Villanovanus. This drink has a history of over seven centuries, the name comes from the Latin word "Liquifacere", which meant *dissolving*. The role of alcohol was that the medicinal herb did not alter. After the discovery of America, when the spice price fell and the products became more affordable, the monks started to add sugar, honey, coffee, cocoa, cinnamon, vanilla and other plants that brought new flavors to their liqueur and greatly improved their taste. Chartreuse, Benedictine and Chambord are among the oldest and most famous liqueurs [1].

Liqueurs are strong alcoholic beverages with an alcohol content above 15% vol. of alcohol, sweetened, colored and flavored with various fruit or plant extracts or different essences. Water, alcohol and sugar are the ones that offer consistency to the liqueur, while the essences, the herbaceous herbs and colorants serve to the olfactory and gustatory flavor of these beverages.

Liqueur is a liquid with a syrupy, clear appearance, with no sediment, taste and pleasant smell, which has a characteristic flavor for each assortment. A characteristic of cream liqueurs is that they have a high viscosity [2].

Since ancient times, moderate and regular alcohol consumption has been associated with health benefits without any scientific basis. However, over the past two decades, several studies around the world have shown that alcohol intake produces positive effects determining the antioxidant capacity, lipid profile and clotting system [3], which

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may explain the reduction in the risk of cardiovascular disease [4,5], general mortality [6] and other diseases encountered in moderate consumers.

Several studies have shown that those who consume moderate alcohol have chances to live more compared with abstainers [7]. Current evidence also suggests protective effects of moderate alcohol consumption on cardiovascular events such as coronary heart disease (CHD) [8], ischemic stroke [9], peripheral arteriopathy and congestive heart failure [10]. The beneficial effects of moderate alcohol consumption on atherosclerosis were attributed to its antioxidant and anti-inflammatory effects, as well as to its vascular function. From this point of view, effects can be attributed to polyphenols, because these compounds exhibit antioxidant properties [11], anti-carcinogenic [12], anti-inflammatory [13], hypotensive [14] or even anticoagulants [15].

Since the French paradox was described two decades ago [16], several studies have focused their attention on red wine because of the bioactive properties of grapes related to the presence of alcohol [17].

Hence the idea of harvesting goji fruit that have been known for over 2,000 years in Tibet and used in traditional medicine due to its numerous curative benefits [18].

Goji Berry (*Lycium barbarum*) belongs to the Solanaceae family and it is considered an excellent source of macronutrients, including carbohydrates (46%), proteins (13%), fats (1.5%) and dietary fiber (16%). It also contains significant concentrations of micronutrients such as riboflavin, thiamine, nicotinic acid and minerals (Cu, Mn, Mg and Se) [19]. In addition to the macro- and micro-nutrients present, several bioactive components such as carotenoids and phenolic are associated with the health benefits of goji fruit [20].

Other properties reported by recent studies show that goji fruits boost the immunity system [21], they are pituitary antioxidants [22] and they have anticancerigenic effects [23, 24].

So far, there have been relatively few studies on the development of new goji products. For example, betaines, beta-carotene and phenolic compounds from goji berries have been shown to increase the antioxidant capacity of the alcoholic product they have been marinated in [25]. Goji fruits improved the probiotic level and increased consumer acceptability when added to yogurt [26].

Thus, the purpose of this paper is to capitalize on the fresh fruits of goji and almond milk in order to obtain a liqueur rich in biologically active principles.

2.Material and Method

2.1. Fresh goji fruit liqueur with almond milk production

Goji fruit (fresh, harvested from Salicea County, Cluj County), the ethyl alcohol of agricultural of 96 °C and almond milk were used as the main raw materials for the production of liqueur, while water and sugar were used as auxiliary raw materials (Fig. 1). The liqueur was obtained as follows: ethyl alcohol of agricultural origin of 96 ° C was brought to a lower concentration and then the raw materials were dosed: the goji fruit that had been minced before, the almond milk was added afterwards, followed by the formation of a sugar syrup (sugar and water).

The dosing operation was followed by the creation of the mixture, then the beverage was macerated for 20 days at 18-20 ° C for efficient extraction. At the end of the maceration period, the product was subjected to the filtering operation, thereby obtaining the liqueur.

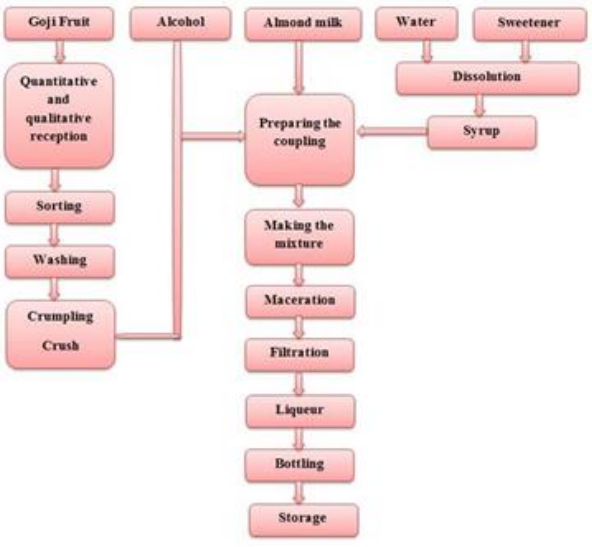

Figure 1. Technological flow for obtaining fresh goji fruits liqueur with almond milk at laboratory scale

2.2.Methods

2.2.1. Total acidity

The total acidity was performed by neutralization with sodium hydroxide solution (0.1 N) in the presence of phenolphthalein as indicator Eq.(3).

$$\text{Total acidity} = \frac{V_1 \times 0.0075}{V \times 1000} \text{ g/l} \quad (3)$$

where: V_1 – volume of NaOH 0.1N used for titration;

V– sample volume in ml;

0.0075 - corresponding amount of tartaric acid 1ml of NaOH 0.1N. [27]

2.2.2. Total dry extract

The total dry extract represented by the colloidal substances, dissolved or non-volatiles, was assessed by product evaporation at boiling water temperature Eq.(4).

$$\text{EUT} = \frac{m_2 - m_1}{V} \times 100(\%) \quad (4)$$

where: EUT – the total dry extract; m_2 – weight of the dry extract and capsule [g]; m_1 – weight of the empty capsule [g]; V – volume of the sample [ml] [28]

2.2.3. Determination of moisture

Moisture content was determined according to AOAC Official Method. This determination was carried out by oven drying at 103°C ± 2°C for 3 hours; the operation was repeated until it reached a constant mass. The samples were cooled in a desiccator for one hour, and then they were weighed [29]

2.2.4. Determination of soluble solids content

The goji fruits which were analyzed were ground and homogenized using a mortar and pestle and then filtered. The resulting juice was analysed by means of a Carl Zeiss refractometer. The refractive index is correlated to the amount of soluble solids (°Bx) using a conversion table or direct reading on the scale refractometer [30]. After each time the refractometer prism was washed with distilled water and then dried.

2.2.5. pH level

The principle used for determining pH was proposed by Rosnah [31] with minor modifications. We used a Hanna Instruments pH meter that was previously calibrated with pH 4.0 and pH 7.0 buffer solutions. The pH meter electrode was fully immersed into sample for accuracy of the results. All determinations were performed 3 times, at a temperature of 4°C.

2.2.6. Determination of esters

Saponification of the esters with a 0.1 N sodium hydroxide solution after having been previously neutralized with NaOH in the presence of phenolphthalein.

Esters

$$(CH_3COOC_2H_5) = \frac{0.0081 \times V_1 \times 100}{V \times 1000} \frac{mg}{100} ml\ alcohol$$

were: 0,00881 - the quantity of ethyl acetate corresponding to 1 ml of sodium hydroxide, 0,1 N solution in g;

V1 - total volume of sodium hydroxide solution 0,1 n used to titrate excess sulfuric acid in ml;

V-volume of the product to be analyzed to be determined in ml [32].

2.2.7. Alcoholic concentration

The alcoholic concentration is the ethanol content (% vol) at 20 °C. The method used for the wine samples relies on distillation and determining the alcoholic concentration using an alcoholmeter and a temperature conversion table [33].

2.2.8.The total phenolic assay

Total polyphenol content of fresh goji fruits liqueur with almond milk was determined according to the method described by Mureşan [34]. An aliquot of 25µL sample was transferred into a glass test tube. Then, 1.8 mL of distilled water and 120 µL of Folin–Ciocalteu phenol reagent were added. After 5 min, 340 µL of sodium carbonate aqueous solution (7.5%, w/v) was added to the mixture. After incubation for 90 min at room temperature, in dark, the absorbance was read at 750 nm, using a Shimadzu UV-1700 PharmaSpec spectrophotometer, against the blank, in which the sample was replaced with methanol. Standard curve was performed using different concentration solution of gallic acid and the results were expressed as mg of GAE/100 g sample.

2.2.9. Antioxidant capacity assessment by DPPH method

The antioxidant activity was determined using the 2,2- diphenyl-1-picrylhydrazyl (DPPH) method according to [35, 36]. An amount of 30µl of the

methanol extract was transferred into a glass test tube with a screw cap, then 270 µL of distilled water and 11.7 mL of DPPH solution in methanol (0.025 g/l) were added. The incubation of the test sample was carried out in dark, at room temperature for 30 min. The absorbance value was read at 515 nm against methanol with a doublebeam UV-VIS spectrophotometer (Shimadzu 1700 UV-VIS). The positive control was prepared using a gallic acid solution (0.5 mg/mL). The negative control was prepared using methanol. Results were expressed as percent over standard DPPH absorbance according to Eq.(1).

$$\text{RSA } [\%] = \frac{A_{DPPH} - A_p}{A_{DPPH}} \times 100 \qquad (1)$$

where, A_{DPPH} is the absorbance of DPPH free radical in methanol and Ap – sample is the absorbance of DPPH free radical solution mixed with the sample.

3. Results and Discussion

The addition of fresh goji fruits has been made aiming the improvement of nutrition and sensorial quality of the final product.

The quality parameters of goji fruit and almond milk goji liqueur are shown in Table 1.

Acidity is a quality parameter. The obtained liquor has a lower acidity than the used fresh fruit due to the technological process.

The liquor total dry extract was determined, high values being obtained close to those of the controlled-quality wine and quality steps (DOCC) [28].

Humidity registered lower values in the case of fresh fruit 81%, compared to liquor 84%. The same variation is also obtained for pH, with values of 4.8 for the fresh fruit and 5.8 for the liquor.

The esters influence the taste properties of the liquor, with values of 28.19 mg / 100 ml and the alcoholic strength% V / V at 20 ° C being 40.

As it can be observed in Table nr. 2, the fresh goji fruit has a high amount of polyphenols of 139.21 mg GAE / 100 g and a high antioxidant capacity of 19.39%. The results obtained for antioxidant activity are related to Endes [37] and the results for polyphenols in methanol extractions can be correlated with those obtained by Ionica [38].

The properties of the Goji fruit are found in a smaller quantity in the finite product as well: 53.88 mg GAE / 100 g total amount of polyphenols and an antioxidant capacity of 9.58%.

Table 1. The content of total acidity, total dry extract, moisture, total soluble solids, pH, esters and alcoholic concentration of fresh goji fruits and fresh goji fruits liqueur with almond milk

Sample	Total acidity [% malic acid]	Total dry extract [g/100 ml]	Moisture [%]	Total soluble solids [°Bx]	pH	Esters [mg/100 ml]	Alcoholic concentration [% V/V la 20°C]
Fresh goji fruits	0.122	-	81	15	4.8	-	-
Fresh goji fruits liqueur with almond milk	0.077	22.43	84	-	5.8	28.19	40

Table 2. Total polyphenols and antioxidant capacity of fresh goji fruits and fresh goji fruits liqueur with almond milk

Sample	Total polyphenols mg GAE/100g	Antioxidant capacity [%]
Fresh goji fruits	139.2132	19.39
Fresh goji fruits liqueur with almond milk	53.8884	9.5854

4. Conclusion

Following the study, we can see the development of an innovative fresh goji fruit liqueur product with almond milk, obtained through maceration, with a high content of antioxidants.

The presented results are important to the food industry contributing to the diversity of this range of products; moreover, due to the high content of total phenolic compounds, the liqueur can also be used as a small dietary supplement.

Compliance with Ethics Requirements. Authors declare that they respect the journal's ethics requirements. Authors declare that they have no conflict of interest and all procedures involving human / or animal subjects (if exist) respect the specific regulation and standards.

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