STUDY ON BEVERAGE PROCESSING FROM MEDICINAL HERBS

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ABSTRACT: *Nowadays, the market of beverages is various. However, beverages from medicinal herbs are short-supplied. In Vietnam, there are a lot of varieties of medicinal herbs with different functions such as quenching thirst, bettering eyesight, intensifying the body resistance and the secretion of the gallblader, improving the functions of the liver and blood... This paper focusses on the beverage processing from some popular medicinal herbs in South Vietnam such as Eleusine indica (L.) Geartn., Morus alba L., Pandanus amaryllifolius Roxb. (P. odorus Ridl.), Saccharum sinensis Roxb. and Zea mays L. At first, the extraction from raw material mixture was studied. The optimal parameters were as follows: raw material and water ratio - 1:8, extraction temperature and time - 75^{0}C and 40 minutes. It shows that the extract contained saponin, polyphenols, organic acids, microelements, reducing compounds... Then, the selection of mixing formula for the beverage was studied and the pasteurization was optimized in order to increase the preservation time of the finished product. Finally, a technological schema for beverage - making from the medicinal herbs was proposed.*

Key words: beverage, extraction, medicinal herbs, pasteurization.

I. INTRODUCTION

Beverage is one of indispensable foods of human being. In tropical countries, demand for beverages is specially high. Today, there are a lot of varieties of carbonated drinks with different commercial names in our country such as Tribeco, Coca-cola, Pepsi... These products can reduce the thirst and supply not only certain amount of sugar, but also small contents of coloring agents and other food additives to consumers.

Vietnam abounds in medicinal herbs. They are widely used in human life and medical treatment with different functions: quenching thirst, bettering eyesight, intensifying the body resistance and the secretion of the gallblader, improving the functions of the liver and blood... Some popular medicinal herbs are pennywost (*Centella asiatica* (L.) Urb..), artichoke (*Cynara scolymus.* L.), gingseng (*Babelmoschus sagittifolius* (Kurz) Merr.), sea – weed (*Gelidium amansii* (Lamour.), dwarf sugar cane (*Saccharum sinensis* Roxb.), plantain (*Plantago major* L.), weeds (*Eleusine indica* (L.) Geartn.,), mulberry tree (*Morus alba* L.), corn silk (*Zea mays* L.)... [3,5]. They have been considered as raw materials for beverage making on the small scale.

To exploit effectively the agro-resources in Vietnam, we try to find out a natural beverage made from medicinal herbs. This drink not only supplies sugar and other nutritive compounds to consumers but also improves the functions of some organs in the body. In addition, the product does not contain food additives. Nowadays, this tendency has been widely developed in food processing.

Selections of medicinal herbs and their weight ratio for producing a beverage influence significantly on the organoleptic and nutritive qualities of the final product. According to the results of our preliminary study, five popular medicinal herbs in South Vietnam: *Eleusine indica* (L.) Geartn., *Morus alba* L., *Pandanus amaryllifolius* Roxb. *(P. odorus* Ridl.), *Saccharum sinensis* Roxb., *Zea mays* L. were chosen as raw materials for producing our new drink.

II. MATERIALS and METHODS

Materials:

Five medicinal herbs: *Eleusine indica* (L.) Geartn., *Morus alba* L., *Pandanus amaryllifolius* Roxb. (*P. odorus* Ridl.), *Saccharum sinensis* Roxb., *Zea mays* L. cultivated in Hoc mon district, Ho Chi Minh city were used in this study.

Sugar RE (refined extra) was supplied by Bien Hoa sugar Co. Ltd. The content of sucrose is at least 99.8 % of dry mass.

Citric acid (99,5% of dry mass) in white powder was supplied by a Chinese company.

Methods:

Research diagram : selecting raw materials → studying chemical compositions of medicinal herbs → determining the parameters of medicinal herb extraction → determining the mixing formula for the finished product → determining the pasteurization parameters → evaluating and standardizing the quality for the finished product.

Analysis methods:

- Moisture content was determined by drying method [4].
- Ash content was quantified by classical method with sample heating at 500°C in an oven [4].
- Total extract of each medicinal herb was determined by the standard method [4].
- Chemical substances in medicinal herbs were alternatively extracted by ethylen ether, ethanol 96°(v/v) and water. The obtained extract were used for qualitative detection of saponin, polyphenol, flavonoid, carotenoid, organic acid, ester, reduced and polyuronic compounds according to the classical method [6].
- Sugar content was analyzed by titration method using ferricyanide reagent [7].
- Numbers of aerobic bacteria, molds and yeasts per one volume unit of the final product were quantified by the agar plat count method [2].
- Sensory analysis was carried out by the method NF ISO 8587, reported elsewhere [1].
- In the extraction experiment of medicinal herb mixture, the extraction yield [Y%] was calculated according to the formula : Y=[DM2/DM1]*100

Where :

- ✓DM1: content of dry mass of medicinal herbs in the sample used for extraction experiment (g).
- ✓DM2: content of dry mass in the obtained extract (g).

- Dry mass content of a liquid sample was determined by refractrometer method [7].

III. RESULTS and DISCUSSION

Quality evaluation of five medicinal herbs:

The experimential results were shown on figures 1, 2 and 3. It is seen that moisture and ash contents of *Eleucine Indica* (L.) Geartn. were the highest (80.92% and 23.31%) and its content of total extract was the lowest (15.2%). On the contrary, ash content of *Saccharum sinensis* was the lowest (1.95%) and its content of total extract was the highest (60.49%). Table 1 shows the presence of different substances with bio-activity in five medicinal herbs above.

Table 1 : Chemical substances with bio-activity in the five medicinal herbs.

Materials	*Eleucine Indica* (L.) Geartn.	*Morus Alba* L.	*Pandanus amaryllifolius*	*Saccharum sinensis* Roxb.	*Zea Mays* L.
Saponin	+	+	-	+	+
Polyphenol	+	+	+	-	-
Flavonoid	-	+	-	-	-

Carotenoid	+	+	+	-	-
Reduced compound	+	+	+	+	+
Polyuronic compound	+	+	-	-	-
Organic acid	-	-	+	+	-
Ester	-	-	+	-	-

(+) : positive result

(-) : negative result

From medical point of view, the extract from the five medicinal herbs would contain valuable compounds for human health.

Study of extraction process of medicinal herbs in beverage making:

Our preliminary study showed that the optimal ratios of *Eleusine indica* (L.) Geartn., *Morus alba* L., *Pandanus amaryllifolius* Roxb. *(P. odorus* Ridl.*), Saccharum sinensis* Roxb., *Zea mays* L. were 20.8%, 20.8%, 8.4%, 41.6%, 8.4% respectively of total raw materials for beverage making.

For ameliorating extraction process, each medicinal herb was cut to 4 cm in size. The mixture of five medicinal herbs above was then extracted by potable water. Extraction process was carried out in a 2.5 L reactor with a mechanical stirrer at 200 rpm – Figure 4 & 5 present influence of raw materials/ water ratio and temperature on the extraction yield.

A low ratio of raw materials and water decreases the extraction yield because the raw materials are not well-immersed in the solvent. However, a high ratio of raw materials and water increases the extraction yield but dilutes the extract. According to figure 4, the optimal ratio of medicinal herbs and water was 1/8 and the extraction yield reached 29,23%.

In principle, temperature augmentation will increase the extraction yield. According to figure 5, maximal extraction yield was about 29.23 % when the temperature was maintained at 75°C.

Evolution of extraction yield during the extraction process of medicinal herbs was visualized on figure 6. After 40 min., the extraction yield did not increase any more. The optimal time for the process was therefore 40 minutes.

Selection of mixing formula for the beverage:

In the first experiment, different contents of sucrose (90g, 110g, 130g & 150g) were alternatively added to 1L extract of medicinal herb mixture. Sensory analysis was carried out by the sensory committee according to preference terms. The statistical treament of the obtained results was calculated by the Friedman criterion. It was showed that the four samples above were confirmed to be different with 5% maximum error risk and the sample with 110g/l of sucrose addition was chosen as the best one.

In the second experiment, the pH of extract of medicinal herb mixture with 110 g/l of sucrose addition was alternatively adjusted to 3.7, 3.9, 4.2 & 4.4. The sensory analysis and result treament were realized by the same methods as discribed above. It can be concluded that the four samples above were affirmed to be different with 5% maximum error risk and the suitable pH for this beverage was about 3.90.

Study of pasteurization process:

In principle, the higher the pasteurization tempeature is, the lower the quality of food is. It can be explained that heat treatment could decrease the contents of nutritive compounds and the flavour of the product. If the pH value of food is lower than 4.0, many micro–organisms are strongly inhibited and the pasteurization temperature can be therefore maintained at 70-80°C. In this experiment, the produced beverage filled in 500 mL glass bottle was alternatively parteurized at 70°C for 10, 20 and 30 minutes. The three samples with different time of heat treatment were then analyzed and compared. The results showed that the physio-chemical, microbiological and organoleptic characteristics of the three samples were nearly similar. However, the preservation times of the three

samples treated for 10, 20 and 30 minutes were diffirent : 7 days, 30 days and 30 days respectively. Therefore, 20 minutes was chosen for the pasteurization time.

A technological schema for beverage - making from medicinal herbs was proposed as follow:

Medicinal herbs → sorting → washing → cutting (4cm in size) → extracting of medicinal herb mixture (temperature: 75°C, time: 40 min, raw materials and water ratio: 1/8) → filtering → adding sucrose to the extract (110g sucrose for 1L extract) → adjusting pH to 3.9 → bottling → pasteurizing (temperature: 70°C, time: 20 min.) → the finished product.

The finished product was transparent with yellowish color, natural flavour of medicinal herbs and sweet taste. Some physio-chemical characteristics of this beverage were as follows: dry mass content 11.2%, sugar content: 109.5 g/l, pH=3.93. In addition, the experimental results showed that the product contains saponin, polyphenol, organic acid and some reduced compounds.

IV. CONCLUSION

Beverage produced from mixture of the five medicinal herbs above is a 'natural drink'. It does not contain food additives. This beverage supplies not only nutritive compounds to customers but also the compounds with bio-activity for ameliorating the functions of some organs in the body. Therefore, the competitive potential of this product is higher in comparison with that of other soft-drinks on the actual beverage market. The proposed technological schema for beverage-making from the medicinal herbs is simple and easy- realizing. It does not require a high investment. Our study is continued with experiment on the pilot scale.

NGHIÊN CỨU CHẾ BIẾN NƯỚC GIẢI KHÁT TỪ MỘT SỐ LOẠI THẢO MỘC

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TÓM TẮT: Ngày nay, thị trường nước giải khát rất đa dạng. Các sản phẩm nước giải khát pha chế có gas hiện rất phổ biến đối với người tiêu dùng. Riêng nhóm sản phẩm nước giải khát có nguồn gốc tự nhiên (được chế biến từ thảo mộc) chưa được sản xuất rộng rãi ở quy mô công nghiệp. Việt Nam nước ta có nhiều loại thảo mộc với nhiều công dụng khác nhau như giải khát, làm mát gan, sáng mắt, giúp tăng cường sức đề kháng của cơ thể, tăng sự bài tiết của túi mật, phòng chống một số bệnh phát sinh trong mùa nắng nóng... Chúng tôi tập trung nghiên cứu sản xuất nước giải khát từ một số loại thảo mộc thông dụng ở miền nam Việt Nam như Cỏ mần trầu (*Eleusine indica* (L.) Geartn.), Dâu tằm (*Morus alba* L.), lá Dứa (*Pandanus amaryllifolius* Roxb. *(P. odorus* Ridl.)), Mía lau (*Saccharum sinensis* Roxb.) và râu Bắp (*Zea mays* L.). Đầu tiên, quá trình trích ly hỗn hợp nguyên liệu được khảo sát. Những thông số tối ưu cho quá trình này như sau: tỷ lệ nguyên liệu / dung môi (theo khối lượng) là 1/8; nhiệt độ và thời gian trích ly là 75°C và 40 phút. Dịch trích thu được có chứa saponin, polyphenol, các acid hữu cơ, các nguyên tố vi lượng và các hợp chất khử. Tiếp theo, chúng tôi nghiên cứu quá trình phối trộn tạo sản phẩm và quá trình thanh trùng nhằm mục đích tăng thời gian bảo quản nước giải khát. Sau cùng, chúng tôi đề nghị một qui trình công nghệ sản xuất nước giải khát tự nhiên từ các thảo mộc đã được chọn ở trên.

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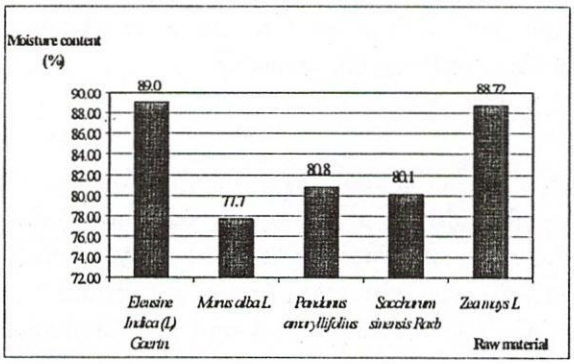

Fig. 1. Moisture content of the five medicinal herbs

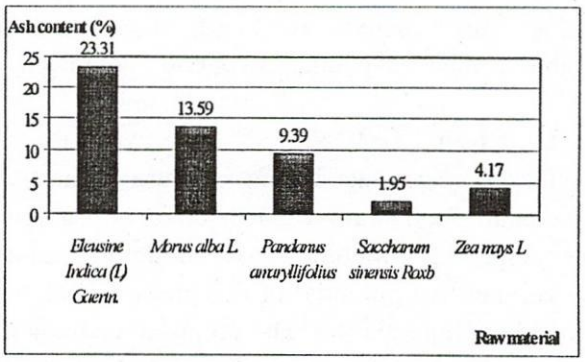

Fig. 2. Ash content of the five medicinal herbs

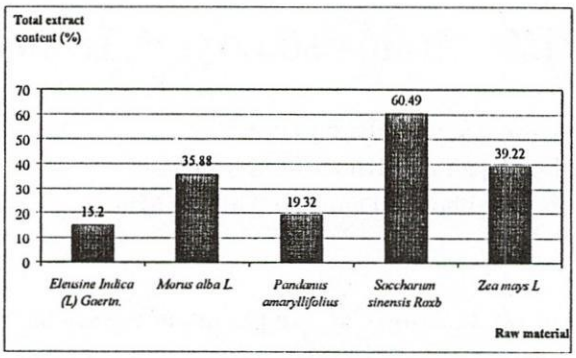

Fig. 3. Total extract content of the five medicinal herbs

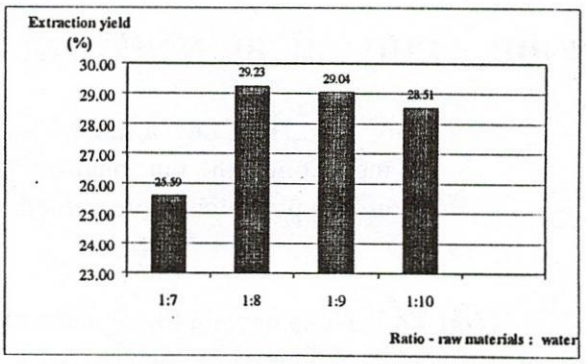

Fig. 4. Influence of raw material and water ratio on extraction yield

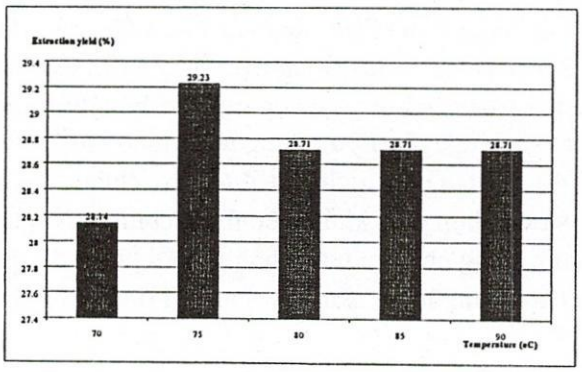

Fig. 5. Influence of temperature on extraction yield

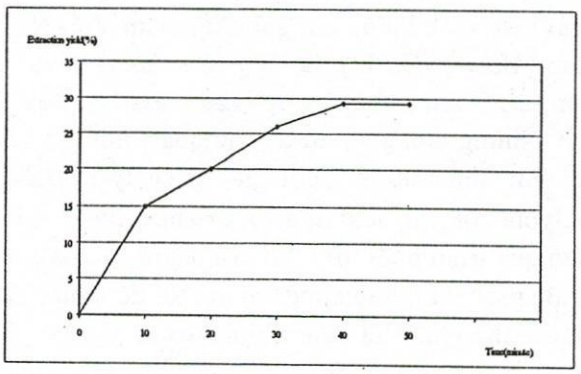

Fig. 6. Evolution of extraction yield during the extracion process of the medicinal herbs