

Development technology of functional drinks made from ginger extracts as products model for developing small-medium enterprises

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Abstract. As society's awareness of processed products comes from natural ingredients, research on the development of functional beverages that focussing on the antioxidant capacity of the mixture of ginger rhizome extractive products with other spices' extractive products is also growing. In accordance with the expansion of the utilization of extractive ginger products, this paper will described some research result that focuses on technology development of functional drinks based on ginger extract as a model of small - medium enterprise development products, such as (1) Composition of health drink from spices in the form of a mixtures of 17 kinds of spices that having certain active compounds and nutritious for health; (2) syrup contains ginger and lemongrass extracts and also honey; and (3) Antioxidant-rich drink of mixture red mangosteen and ginger empit extracts as basic formula, and then development of basic formula by adding spices extracts mixture of cinnamon and cloves. These three types of functional drinks are made from natural ingredients, especially ginger extracts (essential oil), not only has a distinctive flavour and aroma favoured by consumer, as well as attractive colors appearance, but also effective enough for lowering serum cholesterol levels and regularly consumption can contributed in prevention of coronary heart disease. Therefore the technology of health drink development based on ginger extract through its diversification products can be increased the economic value of ginger and other spices, improve the image of traditional food products, products price are able to compete with the types of energy drink, reduce the import of nutritional supplement product, and support the government programmes in the field of public health using natural materials.

Keywords: ginger extract, volatile compound, shelf life, health drink

1. Introduction

Generally, extracellular products of spices in the form of essential oils and oleoresins are used to give color, aroma and flavor to food. Many of the natural compounds of the spices that have been studied are related to their potential as functional food. Ginger, a type of spices is generally used as a basic ingredient in the drug industry and beverages. Various studies of the use of ginger plants show the development of knowledge about the content of active compounds that not only been used to give color, improve the aroma and flavor of food, but also processed into food and beverages that are beneficial to health. For example, the manufacture of functional beverages by boiling ginger rhizome for 6 minutes showed the capture capacity of free radicals (antioxidants) of $84.21 \pm 0.18\%$ [1]. Natural antioxidant compounds in spice plants, including ginger, are phenolic or polyphenolic compounds that can react as reducing, free-radical capture, metal chelating, and dampening of the singlet oxygen [2].



Attention to natural antioxidant compounds continues to increase because they are considered better than synthetic antioxidant compounds. In addition, antioxidants in general can counteract some chronic diseases, such as cancer, diabetes, hypertension, heart attacks and so on [3]. As society's awareness of processed products comes from natural ingredients, research on the development of functional beverages that focuses on the antioxidant capacity of the extract of ginger rhizome extractive products with other spice extractive products is also growing. Technology development of functional drinks made from ginger extract, can be in the form of essential oil or oleoresin. Essential oil is a volatile fraction obtained from the distillation process of ginger rhizome. Oleoresin is a complex mixture obtained by extraction, concentration and standardization of essential oils and non volatile components of ginger rhizome, usually in the form of viscous liquids or pastes. Oleoresin is a dark brown oil and contains 15-35% essential oils. The content of oleoresin can be determined from the type of ginger, the ginger with high spicy intensity containing high oleoresin. To expansion of the utilization of extractive ginger products, this paper will describe some research results that focus on technology development of functional drinks based on ginger extract as a model of small and medium enterprise development products. Utilization of ginger extract products needs to be increased so that the potential utilization can be more extensive and diverse, and increase the economic value of the ginger commodity and its processed products, as well as supporting government programs in the field of health and job creation for the development of new entrepreneurs.

2. Methodology

Ginger ingredients (*Zingiber officinale* Roscoe) were obtained from herbal medicine suppliers in Central Java to obtain harmonic age of harvesting rhizome for the type of ginger emprit. It is important to note, because the chemical components in the ginger rhizome depends on the age of harvest and the varieties of ginger [4]. Examples of product development models of SMEs based on ginger extract that have been done include a spice health drink called Cinna-ale; mixed syrup extract of ginger, lemongrass, and honey; and drinks rich in antioxidants from red mangosteen and ginger emprit. Description of each processing can be explained as follows: (1) Composition of health drink made from spices in the form of a mixture of 17 kinds of spices that have certain active components and nutritious for health, namely ginger, wood secang, chilli java, cinnamon, lemongrass, white pepper, black pepper, pandan leaves, cloves, nutmeg, anise, big kapol, small kapol, cumin, and mesoyi wood. The preparation process is carried out by preparing the raw material in the form of dried chopped, weighing the raw material according to the formula, mixing 1% of the beverage formula with 12% sugar in the amount of water used, then boiling for 15 minutes in medium heat, filtered, decantation done at refrigerator temperature (about 10-15°C) for 18 hours, filtered again to obtain a clear red fluid, and bottling with a head space of about 10 percent of the volume of the bottle and commercial sterilization at 105 ° C for 18 minutes [5]; (2) Preparation of ginger-based syrup, lemongrass and honey, by extraction of ginger and lemongrass with water at 60 °C for 10 minutes, followed by filtration, and decantation to obtain a clear extract; as well as formulations by mixing ginger extract (20, 25, 30%), lemongrass extract (10 and 15%) and 10% honey added [6]. The best formula is determined by organoleptic test with flavor and taste, as well as antioxidant capacity. The selected formula will be poured into sterilized dark glass bottles by hot filling, and measurement of quality attributes, including antioxidant capacity, total phenol, pH, total acid titration (TAT), Total Dissolved Solids (TDS), viscosity, and study stability of volatile components for 8 weeks of storage at room temperature; and (3) An antioxidant-rich drink of red mangosteen and ginger emprit [7], through basic formulations (red mangosteen extract and ginger emprit), and the development of a basic formulation with spice flavor. The process stages include (a) preparation and extraction of raw materials; (b) manufacture of basic formulas of functional drinks; (c) the development of basic formula flavors by the addition of spice extracts (cinnamon and cloves); (d) proximate test on selected functional beverage formulas. Subsequently, the production of the selected formula was packed in bottles and pasteurized at 67°C for 20 minutes and tested in the form of color measurement and total soluble solids, pH, TPC (Total Plate Count), antioxidant capacity, and the determination of shelf life of the

product by storage treatment at a temperature of 37°C, 45°C, and 50°C for 20 days (3-4 day of observation interval) with parameters between 1-2 months (parameters of clove aroma, cinnamon aroma, sweetness, splint, color, pH and turbidity) up to 4-7 months (TDS parameters, warm taste of ginger and spicy flavor). The shelf life of the product may be selected based on any of the above sensory quality parameters, taking into account sensory and chemical parameters considered more important as well as the product storage temperature.

3. Result and discussion

Diversification of ginger powder by blending with other spices powder in certain formula, then extract these powdered formula by boiling with water (ratio 10 :100 w/w), filtered, decantation, and obtained the mixture extracts. Specific active compounds in health drinks are red, flavor and aromatic typical of this spices a volatile aromatic compounds. Essential oils are obtained by distillation process of powdered formula steam. The composition of aromatic compounds contained by the health drink of this spice can be known from the GCMS chromatogram, including transcaryophyllene, eugenol, myristicin, alpha-terpinene, 1,8-cineol, terpineol, Z-citral, geranial, 3-carene, 1-limonene and alpha-pinene. Based on the literature study, the eleven identifiable components play a role in human health, which prevents colds, coughs, influenza, rheumatism, vomiting, improves digestion, reduces fatigue and antidiarrheal. In addition, the essential oil of powdered formulas has the inhibitory power of the test bacteria (pathogenic bacteria and food destroyer), so this health drink has a natural durability and as an antidiarrheal. The antioxidant capacity of essential oil of formula has an IC₅₀ value of 56.70, and it represents a stronger antioxidant capacity when compared to the synthetic antioxidant capacity of BHT (Butylated Hydroxytoluene), ie IC₅₀ of 60.81. In vivo test results using male Sprague Dawley rats showed that 10% (w / v) spices of health drinks with pH 5.74 and total soluble solids of 3.83° brix were effective enough to lower serum cholesterol levels at a dose of 1 ml / day. In other words, the consumption of health drinks from spices regularly can contribute to the prevention of coronary heart disease.

In the manufacture of ginger-based syrup, lemongrass, and honey, the best formula of syrup consists of 25% ginger extract, lemongrass extract 15%, and 10% honey. The main volatile components of the syrup include citral, neral, zingiberene, curcumene, beta-bisabolene, and cineol (1,8). Storage for 8 weeks at room temperature results in a decrease in the area of citral, neral, curcumene, and beta bisabolene. Different things are shown in cineoles (1.8) and zingiberne which have increased area during storage. In the syrup quality attributes, which include antioxidant capacity, total phenol, pH, total titrated acids, total dissolved solids, and viscosity, showed that not appear to be any significant change for 8 weeks of storage. These components are reported to be beneficial to health. Syrup quality attributes include antioxidant capacity, total phenol, pH, total titrated acids, total dissolved solids, and viscosity unchanged significantly for 8 weeks of storage.

Red Mangosteen Skin Extract (*Garcinia forbesii*) is believed to have health benefits, because of the xanthone content. Utilization of the extract by adding ginger ratio (5: 3 w / w) and sugar (10% w / w) is able to mask the sour taste, and is called the base formula. Next, increase the flavor of the basic formula by adding a mixture of cinnamon and clove extracts, and testing of shelf life in selected formulas. Based on the results of organoleptic test, the basic formula mixture with cinnamon and clove extract (3: 3 w / w ratio) is still less favorable, so the basic formula of ginger extract and red mangosteen extract (5: 5 w / w) and sugar 15% (w / w). The results of observation on organoleptic parameters, microbiological physico chemical properties and functional properties stated beverage product of mixed red mangosteen skin extract, ginger extract extract, cinnamon extract and clove extract (ratio 5: 5: 3: 3 v / v) is a rich drink of antioxidants (4493 AAE µg / ml) which is red and resistant to room temperature for 42 days.

4. Conclusion

The three types of functional drinks described above are made from natural ingredients readily available in the local market, have a distinctive flavor and aroma favored by the consumer, as well as attractive color appearance. This is due to the presence of volatile components of ginger extract and spices extracts, each other type of spices used in the product formula. In addition, processing technology is very practical using simple equipment, producing ready-to-eat products that provide the sensation of warming the body when consumed. Spices have a natural durability, so there is no need to add synthetic preservatives into beverage products and syrups, and also the product has a natural antioxidant capacity. Therefore the technology of health drink development based on ginger extract through the diversification of the utilization of ginger and spice as well as increase the economic value of ginger / spice; and product prices are able to compete with the types of energy drinks circulating in local and national markets; improve the image of traditional food products, reduce the import of nutritional supplement products, and support government programs in the field of public health using natural materials. Functional beverage products as above are very prospective to be developed as a model of Small Medium Enterprises product development.

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