Original Research Articles

Blending Canarium Flavor (*Canarium album* L.) for Soft Candy from Natural Materials in Vietnam

ABSTRACT

Aim and Objectives: The aim of this study is to create Canarium flavor with the main ingredient (Body note) being *Canarium album* (Lour.) Raeusch essential oil and natural essential oils found in Vietnam for soft candy product.

Materials and Methods: All the materials for making the Canarium flavor were from natural sources in Vietnam. Materials for making soft candy such as gelatin, sugar, and lemon juice were purchased in Vietnam market.

Flavor assessment experiment was conducted by olfactory. The created flavor of Canarium was tested on soft candy with 0.3% by weight.

Results: After the experiment, the flavors SC1, SC2 and SC3 having the ideal taste and smell for soft candy, were selected. The structure of flavors SC1, SC2 and SC3 included Grassy note, Green note, Fruity note, Woody note, Spicy note, Floral note, Sweete note and Spicy note. Flavors SC1, SC2 and SC3 had the same composition of 80% by weight, of which the main ingredient was Canarium oil (*Canarium album* L.) accounting for 50% by weight.

Conclusions: The flavors SC1, SC2 and SC3 were created from natural materials in Vietnam for soft candy product. Flavors SC1 and SC2, SC3 had natural, gentle and attractive scent. Flavor SC1 featured a Canarium odor and a Lemon leaf flavor. Flavor SC2 contained the characteristic aroma of Canarium and the sweet-spicy flavor of Cinnamon bark. Flavor SC3 was made up of Canarium odor and the spicyhot flavor of ginger. The flavor and taste of SC1, SC2 and SC3 were very suitable for soft candy.

Keywords: canarium, flavor, food, natural product, soft candy.

1. INTRODUCTION

Nowadays, natural flavorings are becoming popular and replacing synthetic flavorings in food. Scientists have come up with various standards to control natural flavors for food to ensure safety for users [1,2,3]. The aroma composition of foods has been the subject of research in recent years. The presence of

volatile compounds and their composition determines the characteristic aroma and the taste of the resulting products. Essential oils from nature are the primary source of flavors used in food because they typically contain antibacterial and antioxidant properties, making them a very effective food preservative. Essential oil is a mixture of volatile substances with aroma, which can be used as a flavoring agent for food products [4,5]. Furthermore, with the strong development of biotechnology, some food flavorings can be obtained from biosynthesis by enzymes [6,7,8].

Among the essential oils used in food, Canarium oil has a pleasant aroma of plants (Green note) that is appropriate for many food products, such as wine, beverage, candy, cake and jam. Canarium genus belongs to family Burseraceae with hundreds of species distributed mainly in Africa, Australia and Asia [9,10]. Parts of canarium tree such as wood, fruit, and resin are precious materials. Many researchers have studied canarium resin and fruit for their chemical composition [11,12,13], antibacterial and antioxidant properties [14,15]. In life and industry, Canarium fruit is processed into many types of products such as wine, syrup, beverage, jam, and apricot. Aromatic resins are used in the aromatherapy, cosmetic and therapeutic industries. Medical research has shown that Canarium resin can treat many respiratory and skin diseases [16,17].

Among the genus of Canarium, the species with the scientific name *Canarium album* (Lour.), has attracted the attention of many researchers because it is a common species and its wood, fruit and resin contain numerous valuable components that are utilized in both industry and daily life [18,19].

In Vietnam, *Canarium album* (Lour.) Raeusch is distributed in most of the northern provinces, the Central Highlands and the Southeast. The tree grows quite commonly at an altitude of 200-700 m, where there is a lot of rainfall. *Canarium album* L grows along the edges of forests, roads, around villages, along rivers and streams, is a light-loving and fast-growing tree. In the past, at Vietnam, *Canarium. album* L. was grown mainly for timber, presently, it has been cultivated in several areas for resin and fruit [20,21].

Today in Vietnam, the use of natural aromatic compounds as food flavor for confectionery, wine, beverage, and jam has been focused. People often choose Fruity notes such as Lemon, Orange, and Strawberry for traditional flavors for candies. Some throat lozenges have a mint, melaleuca, and cinnamon smell. Despite having a mildly pleasant and natural scent (Green note), Canarium is rarely used in the production of candies on the market. Currently in Vietnam, there are many types of cakes and candies, in which hard candies and soft candies are popular. Soft candy is a kind of soft type snack product made from sugar, or mixture of sugar with gelatin and other sweeteners, with or without the addition of permitted food additives. A soft candy is less sticky to teeth, and has a light and rich eating texture and a sufficient chewability. The main differences between hard and soft candy are moisture content and textural properties. Hard candies are boiled to high temperatures and due to that they have very low moisture content changing in the range of 2-5%. Soft candies have higher moisture content, 8-22%, and softer texture [22].

Therefore, the purpose of this study is to create a Canarium flavor with the main ingredient (Body note) being *Canarium album* (Lour.) Raeusch essential oil and other natural essential oils found in Vietnam for soft candy. The research has practical significance to take advantage of the rich resources of essential oils as food flavor.

2. MATERIALS AND METHODS

2.1 Materials

2.1.1 Materials were used to prepare the fragrance

Citronella oil, Lemongrass oil, Cajeput oil, Canarium oil, Orange oil, Sweet orange oil, Mandarin oil, Grapefruit oil, Lemon oil, Lime oil, Sassafras oil, Pepper oil, Peppermint oil, Palmarosa oil, Jasmine oil, Basil oil, Membrane oil, Marjoram oil, Ginger oil, Cinnamon bark oil and Lemon leave oil were extracted from plant sources available in Vietnam. Vanillin was bought in the market.

2.1.2 Materials were used for soft candy

Gelatin is widely used in some food products, including soft candy (one of the food products preferred by children). Most of the gelatin available in the market is derived from pigs, bovine [23,24,25] and fish [26].

Gelatin, sugar, and lemon fruit juice purchased in Vietnam market

2..2 Preparation of Soft Candy

- Step 1: Weigh the ingredients such as gelatin, sugar, and lemon fruit juice
- Step 2: Stir, dissolve the sugar with distilled water and heat until the sugar dissolves
- Step 3: Mix with gelatin, and lemon fruit juice
- Step 4: Cool the mixture down to 60°C
- Step 5: Add the created flavor to the candy solution at the rate of 0.3% weigh and stir
- Step 6: Pouring into the mold.

Step 7: Let cool to room temperature and pack soft candy.

2.3 Method of Preparation and Assessment odor

2.3.1 Methods were used to prepare Canarium flavor

Structure of Canarium flavor were Top group, Body group, Support for Body group, Harmony group and

Fantasy group (Table 1).

N ⁰	Structure of flavor	Function in flavor
1	Top group	Make it easy for olfactory to recognize odors
2	Body group	Body group is the main component of the flavor and determines the nature and characteristics of the odor.
3	Support for Body group	It supports the main aroma, making the scent of flavor more perfect and attractive
4	Harmony group	It creates harmony and comfort for the flavor
5	Fantasy group	The fantasy group has changed a part of the flavor to create an attractive taste

Table 1. Structure and Function of Canarium flavor

Notes of Canarium flavor were Green note, Fruity note, Woody note, Spicy note, Floral note, Grassy note and Sweet note . (Table 2.)

N ⁰	Notes of	Fragrant substance	Attention	
	Canarium flavor			
1	Green note	Green note of odor of Canarium oil (Canarium album L.)	Main ingredient	
2	Fruity note	Fruity note of Orange oil, Sweet orange oil, Mandarin oil, Grapefruit oil, Lemon oil and Lime oil.	Main ingredient	
3	Woody note	Woody note of Sassafras oil.	Sub-ingredients	
4	Spicy note	Spicy note of Pepper oil, Peppermint oil, Ginger oil and Cinnamon bark oil	Sub-ingredients	
5	Floral note	Floral note of Palmarosa oil and Jasmine oil.	Sub-ingredients	
6	Grassy note	Grassy note of Basil oil, Membrane oil and Marjoram oil	Sub-ingredients	
7	Sweet note	Sweet note odor of Vanillin	Sub-ingredients	

Table 2. Main notes in the Canarium flavor for soft candy

2.3.2 Method of evaluation

To select the best fragrance combination and evaluate the quality of the scent, we **followed** the method of the international experts of the project VIE86033 training [27]. Aromatic substances were selected with the initial recipe on a small scale about of 10g. The ingredients were mixed according to the original preliminary formula, heated at 50°C for 4 hours with a magnetic stirrer, then left at room temperature for 72 hours to assess the flavor. After evaluating, the experimental group discussed and decided to add or remove ingredients to proceed with the next formula. The experiment continued until a relatively complete formula was selected, after that, we carried out on a large scale of 100g to get the fragrance into the test for products. The fragrance was tested on soft candy with 0.3% weight.

3. RESULTS AND DISCUSSION

After the experiment, we selected flavors SC1, SC2 and SC3 for soft candy (Table 3.).

			Flavor % weight				
N°	Material	Science name	SC1	SC2	SC3	Note of odor	Structure of flavor
1	Citronella oil	Cymbopogon winterianus Jowitt.		5			
2	Lemongrass oil	Cymbopogon citratus Stapf.			5	Grassy note	Top group
3	Cajeput oil	<i>Malaleuca cajuputi</i> Powel	5				
4	Canarium oil	<i>Canarium album</i> (Lour.) Raeusch	50	50	50	Green note	Body group
5	Orange oil	Citrus nobilis Lour.	3	3	3		
6	Sweet orange oil	<i>Citrus Sinensis</i> (L.) Osbeck	2	2	2		
7	Mandarin oil	Citrus reticulata Blco.	2	2	2	Fruity	Support for Body
8	Grapefruit oil	<i>Citrus grandis</i> (Linn) Osbeck	1	1	1	note	group
9	Lemon oil	Citrus aurantifolia Sw.	1	1	1		
10	Lime oil	Citrus hystrix	1	1	1	-	
11	Sassafras oil	Cinnamomum parthenoxylon Meissn	1	1	1	Woody note	

Table 3.	The	composition	of	Canarium	flavor
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12	Pepper oil	<i>Piper nigrum</i> Linn.	1	1	1	Spicy	
13	Peppermint oil	<i>Mentha arvensis</i> Linn.	1	1	1	Floral	
14	Palmarosa oil	Cymbopogon martinii Wats	2	2	2		
15	Jasmine oil	Jasminum sambac (L.)	1	1	1		
16	Basil oil	Ocimum basilicum Linn.	1	1	1		
17	Membrane oil	<i>Litsea cubeba</i> (Lour.) Pers	2	2	2	Grassy note	
18	Marjoram oil	<i>Elsholtzia ciliata</i> Hyland	1	1	1	-	
19	Vanillin	Vanilla planifolia	10	10	10	Sweete note	Harmony group
20	Ginger oil	Zingiber officinale Rosc.			15		Fantasy
21	Cinnamon bark oil	<i>Cinnamomum cassia</i> Presl.		15		Spicy note	group
22	Lemon leaves oil	Citrus aurantifolia Sw.	15				
	Total		100	100	100		

3.1 Canarium Flavor for Soft Candy

3.1.1 Flavor SC1

Flavor SC1 was mixed by Cajeput oil, Canarium oil, Orange oil, Sweet orange oil, Mandarin oil, Grapefruit oil, Lemon oil, Lime oil, Sassafras oil, Pepper oil, Peppermint oil, Palmarosa oil, Jasmine oil, Basil oil, Membrane oil, Marjoram oil, Vanillin, Lemon leaves oil. The outstanding feature of Flavor SC1 is the light lemon scent due to the combination of Canarium oil and Lemon leaves oil. We selected Flavor SC1 as the fragrance for soft candy for those who like the smell of lemon.

3.1.2 Flavor SC2

Flavor SC2 was mixed by Citronella oil, Canarium oil, Orange oil, Sweet orange oil, Mandarin oil, Grapefruit oil, Lemon oil, Lime oil, Sassafras oil, Pepper oil, Peppermint oil, Palmarosa oil, Jasmine oil, Basil oil, Membrane oil, Marjoram oil, Vanillin, Cinnamon bark oil. The outstanding feature of Flavor SC2 is the light Cinnamon scent due to the combination of Canarium oil and the sweet-spicy flavor of Cinnamon bark. We selected Flavor SC2 as the fragrance for soft candy for those who like the smell of Cinnamon.

3.1.3 Flavor SC3

Flavor SC3 was mixed by Lemongrass oil, Canarium oil, Orange oil, Sweet orange oil, Mandarin oil, Grapefruit oil, Lemon oil, Lime oil, Sassafras oil, Pepper oil, Peppermint oil, Palmarosa oil, Jasmine oil, Basil oil, Membrane oil, Marjoram oil, Vanillin, Ginger oil. The outstanding feature of Flavor SC1 is the light Ginger scent due to the combination of Canarium oil and spicy-hot flavor of Ginger. We selected Flavor SC3 as the fragrance for soft candy for those who like the smell of spicy-hot flavor.

Canarium flavors SC1, SC2 and SC3 were a combination of many scents including Green note, Fruity note, Woody note, Spicy note, Floral note, Grassy note, Sweete note, Spicy note mixed together to create an attractive natural odor, suitable for food product like soft candy.

3.2 Structure of Canarium Flavor for Soft Candy

3.2.1 Top group

The role of the Top group is to stimulate the sense of smell so that the olfactory senses can easily recognize the main odor in the natural flavor complexes. Aromatic substances for Top notes often have a strong odor, quickly evaporate and account for a low percentage. Depending on the type of the product, the components of Top group are accordingly chosen.

We used a 5% weight ratio for Top group including aromatic components suitable for soft candy such as Citronella oil, Lemongrass oil, and Cajeput oil.

3.2.2 Body group

Body group is the main group, the backbone that determines the nature of the fragrance. The proportion of this group is often very high compared to the whole flavor complexes. In order to make the fragrance more attractive while retaining the essence of the Canarium odor, Canarium oil (*Canarium album* L.) was chosen as the primary component accounting for 50% weight of the entire natural flavor complexes.

In addition, the scent of Canarium oil is fresh, mellow and seductive, which is the scent of a natural product, consequently, it is ideal for all kinds of aromas for food.

3.2.3 Support for Body group

This is the group that supports the smell of the main group and contributes to the attraction of the flavor complexes. Support for Body group included Fruity note, Woody note, Spicy note, Floral note and Grassy note. Fruity notes including Orange oil, Sweet Orange oil, Mandarin oil, Grapefruit oil, Lemon oil, and Lime oil, primarily supported the Body group of the flavor complexes. Woody note was enhanced by the addition of Sassafras oil component. The ingredient contributed to Spicy notes including Pepper oil and Peppermint oil. The components of Jasmine oil, and Palmarosa oil supported the Floral notes. Basil oil, Membrane oil, and Marjoram oil are the Grassy note of the flavor.

3.2.4 Sweet group

In Table 3. the composition of Canarium flavor was a collection of many aroma groups including Green note and supporting groups are Fruity note, Woody note, Spicy note, Floral note, and Grassy note. The

Harmony group has the role of creating harmony between the components in the fragrance. Vanillin components have a mild aroma that supported different aroma notes that work together to create a more attractive aroma. Therefore, Vanillin having a gentle scent was chosen to support different notes working together to create a more attractive fragrance.

3.2.5 Fantasy group

To make the fragrance become more appealing, the natural flavor complexes were added with some components that have a strong odor and are distinct from the main odor, which is called Fantasy group. The role of Fantasy group is not only affecting the sense of smell but also affecting taste to create attractiveness for food. The Lemon leaves oil, Cinnamon bark oil and Ginger oil were chosen for Fantasy group to create the smell and taste of the soft candy.

4. CONCLUSION

From natural materials in Vietnam, we created the natural, gentle and attractive scent of SC1, SC2 and SC3 for soft candy. Flavors SC1, SC2 and SC3 have the same composition 80% by weight of which the main ingredient is Canarium essential oil (*Canarium album* L.) accounting for 50% by weight. The main difference is the mild spicy of SC1, the sweet-spicy flavor of SC2, warm-spicy of SC3. The flavor and taste of SC1, SC2 and SC3 are very suitable for soft candy. Although everyone has different taste and smell preferences, but we discovered Flavor SC1 with its natural lemon smell to be favored by many.

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