

# Creating Lemon Scent for Food Product from Natural Materials in Vietnam

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## ABSTRACT

The aim of this study is to reproduce the lemon scent from natural substances present in Vietnam to replace the lemon scent with chemical substances. All the materials for making the lemon flavor and food products are natural sources in Vietnam. Flavor assessment by olfactory, the aroma is diluted with an odorless diethyl phthalate (DEP) solvent, followed by a special scent paper and the smell of the nose to assess the scent. The lemon flavor was tested on lemon syrup product 0.2%, lemon candy 0.5%, lemon wine 0.3% by weight. After the experiment, we have selected flavors W.1, W.2 for lemon wine, S.1 and S.2 for lemon syrup, C.1 and C.2 for lemon candy. The main aroma of lemon odor is made up of Citral, Isocitral, Citral dimethyl acetal, Citral diethyl acetal, Cyclocitral, Citralva (geranyl nitril), Citral methyl antranilate, Limonene, Lemon oil (*Citrus aurantiifolia* (Christm.) Swingle), Lemon oil (*Citrus latifolia* Tanaka), Lemon oil (*Citrus limon* (L.) Osbeck), Lemon oil (*Citrus limonia* Osbeck), Leaf lemon oil (*Citrus aurantiifolia* (Christm.) Swingle), Orange oil, Mandarin oil, Grapefruit oil, Lemongrass oil, Verbena oil, Methylheptenone, Marjoram oil, 1,8- Cineol, Linalool, Linalyl acetate, Linalyl cinnamate, Linalyl formate, Linalyl butyrate, Terpeneol, Terpinyl acetate, Citronellal, Hydroxy citronellal, Geraniol, Geranyl acetate, Geranyl butyrate, Geranyl formate, Citronellol, Citronellyl acetate, Citronellyl butyrate, Citronellyl formate.

We have created the lemon scent from natural materials in Vietnam for lemon wine W.1, W.2, for lemon syrup S.1, S.2, and lemon candy C.1, C.2. Lemon flavors W.1, W.2, S.1, S.2, C.1, and C.2 are added to lemon wine, lemon syrup, lemon candy to increase the value and appeal of the products made from Vietnam.

**Keywords:** candy, food, lemon, syrup, wine.

## I. INTRODUCTION

The lemon scent is a luxurious and pleasant scent, therefore many people now like this smell. To have a lemon scent, people often use lemon essential oil as the main ingredient. Lemon essential oil is not only fragrant but also a remedy for many diseases in the field of medicine. The most common chemical compounds present in lemon oil are:  $\alpha$ -Pinene, Camphene,  $\beta$ -Pinene, Sabinene, Myrcene,  $\alpha$ -Phellandrene,  $\alpha$ -Terpinene, Limonene,  $\beta$ -Phellandrene, cis- $\beta$  - Ocimene,  $\gamma$ -Terpinene, p-Cymene, Terpinolene, Octanal, Nonanal, Citral, Citronellal, Decanal, Linalol, Linalyl acetate,  $\alpha$ -Bergamotene, Terpinene-4-ol &  $\beta$ -Caryophyllene,  $\alpha$ -Terpineol, Neryl acetate,  $\beta$ -Bisbolene, Geranyl acetate, Nerol, Geraniol [1], [2], [3]. Limonene is the main component of lemon essential oil, it accounts for about 50-70% [4]. The smell of lemon is caused by many substances, of which citral is an important component [5].

The lemon is a flowering plant that belongs to the Rutaceae family. Citrus plants constitute one of the main valuable sources of essential oil used in foods and medicinal purposes. In foods, the lemon flavor is used a lot to make the odor for lemon wine, lemon-flavored beverages, cake, candy with lemon scent. The lemon essential oil has high antibacterial activity [6], [7], [8]. People have used the biological activity of lemon oil in healing. It can ease morning sickness symptoms, make skin healthier, act as a pain reliever, help breathe easier and soothe a sore throat. It may be effective in treating and preventing acne breakouts, helps humans feel alert and concentrated. It has antifungal properties, may promote wound healing, effective in treating and preventing acne breakouts [9], [10].

Many authors also pointed out that these components are not only present in lemon oil but also in many other essential oils such as orange oil [11], grapefruit essential oil [12], [13], [14],

mandarin oil [15]], litsea cubeba oil [16]. This is the basis for extracting the same ingredients as in lemon essential oil using incense to create the scent of lemon.

Today, the flavoring industry has extracted and synthesized many different substances, which smell like lemons. From the aromatic monomers with the smell of lemon, they are combined to get a better natural lemon scent.

Previously, to obtain lemon fragrance, people extracted or distilled lemon essential oil from lemon peel [17], [18], lemon leaves [19], [20]. Today, with the advancement of science and with modern equipment, people can create products according to their needs. Vietnam is a tropical country with many essential oils with similar chemical compositions as lemon oil.

Currently, the demand for lemon flavoring agents in the food industry in Vietnam is very large. Most of these aromatic substances must be imported from abroad while Vietnam has a very rich resource of essential oils. The technology of distilling, extracting, separating, and synthesizing flavors in Vietnam has made great progress, being implemented by many research institutes, universities, and production facilities. Currently, research on creating lemon fragrances from essential oils in Vietnam is important and necessary, so the aim of this study is to creating Lemon scent for food products from natural materials in Vietnam.

## II. MATERIALS AND METHODS

### 2.1 Materials are used to prepare the fragrance

Essential oils: Lemon oil (*Citrus aurantiifolia* (Christm.) Swingle), Lemon oil (*Citrus latifolia* Tanaka), Lemon oil (*Citrus limon* (L.) Osbeck), Lemon oil (*Citrus limonia* Osbeck), Leaf lemon oil (*Citrus aurantiifolia* (Christm.) Swingle), Orange oil, Mandarin oil, Grapefruit oil, are obtained from the food chemistry laboratory of the College of Industry and Trade of Ho Chi Minh City. Essential oils: Verbena oil, Marjoram oil, Ginger oil, Cinnamon bark oil, Pepper oil, Pimento oil, Clove oil, Basil oil, Peppermint oil, Menthol, Coriander oil, Anise oil, Dill oil, Nutmeg oil are enthrilled by steam distilled in the laboratory from raw materials in Vietnam. Single aromatic substances: Citral, Isocitral, Citral dimethyl acetal, Citral diethyl acetal, Cyclocitral, Citralva (geranyl nitril), Citral methyl anthranilate, Limonene, Methylheptenone,

1,8- Cineol, Linalool, Linalyl acetate, Linalyl cinnamate, Linalyl formate, Linalyl butyrate, Terpeneol, Terpinyl acetate, Citronellal, Hydroxy citronellal, Geraniol, Geranyl acetate, Geranyl butyrate, Geranyl formate, Citronellol, Citronellyl acetate, Citronellyl butyrate, Citronellyl formate, Cinnamaldehyde, Eugenol, Isoeugenol, Menthol, Ionone, Methyl ionone, Aldehyde anisicac extracted and synthesized from plant sources in Vietnam.

### 2.2 Method of preparation and assessment odor

To select the best fragrance combination and evaluate the quality of the scent, we have followed the method of the international experts' training [21]. The structure of the fragrance in this experiment included the Top notes, the Body note, and the Fantasy note group.

Selection of aromatic substances similar to the scent of lemon to form the main group, 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 fragrance.

After evaluation, necessary measures were taken to add or remove the ingredients as per the desired quality aimed for. Further, the experiment was continued until the desired result is obtained and then proceeded with a large scale(100g) and finally subjected to fragrance test of the product obtained. Fragrance test. The flavor was tested wine 0.3%, on syrup product 0.2%, candy 0.5%, by weight.

## III. RESULTS AND DISCUSSION

### 3.1 Top note

After the experiment, we created flavors W.1, W.2 for lemon wine, S.1 and S.2 for lemon syrup, C.1 and C.2 for lemon candy (Table 1.). flavors W.1, W.2, S.1, S.2, C.1, C.2 are the same in Top note and Body note but different in Fantasy note. We have selected Single aromatic substances Citral and its derivatives Isocitral, Citral dimethyl acetal, Citral diethyl acetal, Cyclocitral, Citralva (geranyl nitril), Citral methyl anthranilate. These are Single aromatic substances with a strong lemon smell, this group has the ability to evaporate very quickly so that people can easily recognize the lemon smell of the product. We have chosen this group to account for 10% of the amount of fragrance.

**Table 1.** The composition of lemon odor

N°	Material	Flavors% weight						Note
		W.1	W.2	S.1	S.2	C.1	C.2	
1	Citral	2	2	2	2	2	2	Top note
2	Isocitral	2	2	2	2	2	2	
3	Citral dimethyl acetal	2	2	2	2	2	2	
4	Citral diethyl acetal	1	1	1	1	1	1	
5	Cyclocitral	1	1	1	1	1	1	
7	Citralva (geranyl nitril)	1	1	1	1	1	1	
8	Citral methyl antranilate	1	1	1	1	1	1	
9	Limonene	7	7	7	7	7	7	
10	Lemon oil (Citrus aurantiifolia (Christm.) Swingle) <b>Chanh ta</b>	10	10	10	10	10	10	
11	Lemon oil (Citrus latifolia Tanaka) <b>Chanh không hạt</b>	7	7	7	7	7	7	
12	Lemon oil (Citrus limon (L.) Osbeck) <b>Chanh tây</b>	7	7	7	7	7	7	
13	Lemon oil (Citrus limonia Osbeck) <b>Chanh kiên</b>	7	7	7	7	7	7	
14	Leaf lemon oil (Citrus aurantiifolia (Christm.) Swingle)	5	5	5	5	5	5	

15	Orange oil	2	2	2	2	2	2	
16	Manderin oil	2	2	2	2	2	2	
17	Grapefruit oil	1	1	1	1	1	1	
18	Lemongrass oil	1	1	1	1	1	1	
19	Verbena oil	1	1	1	1	1	1	
20	Methylheptenone	1	1	1	1	1	1	
21	Marjoram oil	1	1	1	1	1	1	
22	1,8-Cineol	1	1	1	1	1	1	
23	Linalool	1	1	1	1	1	1	
24	Linalyl acetate	1	1	1	1	1	1	
25	Linalyl cinnamate	1	1	1	1	1	1	
26	Linalyl formate	1	1	1	1	1	1	
27	Linalyl butyrate	1	1	1	1	1	1	
28	Terpineol	1	1	1	1	1	1	
29	Terpinyl acetate	1	1	1	1	1	1	
30	Citronellal	1	1	1	1	1	1	
31	Hydroxycitronellal	1	1	1	1	1	1	
32	Geraniol	1	1	1	1	1	1	
33	Geranyl acetate	1	1	1	1	1	1	
34	Geranyl butyrate	1	1	1	1	1	1	
35	Geranyl formate	1	1	1	1	1	1	
36	Citronellol	1	1	1	1	1	1	
37	Citronellyl acetate	1	1	1	1	1	1	
38	Citronellyl butyrate	1	1	1	1	1	1	
39	Citronellyl formate	1	1	1	1	1	1	
40	Ginger oil	3		3		2		
41	Cinnamaldehyde	3		3		1		
42	Cinnamon bark oil	2		2		1		Fantasy note
43	Pepper oil	3		2		2		
44	Pimento oil	3		2		1		
45	Eugenol		2		2			

46	Isoeugenol		1		2		
47	Clove oil		1		2		
48	Basil oil		2			1	1
49	Peppermint oil			2	5	3	6
50	Menthol			3	5	3	7
51	Coriander oil					2	4
52	Ionone		1		1	1	1
53	Methyl ionone		1	1	1	1	1
54	Aldehyde anisic	2	6				
55	Anise oil	2	6				
56	Dill oil	1	1	1	1	1	1
57	Nutmeg oil	1	3	1	1	1	1
	<b>Total</b>	100	100	100	100	100	100

### 3.2 Body note

The Body note group is the main group of lemon flavor, it accounts for 70% of the weight and it determines the smell of the entire fragrance complex. Single aromatic substance limonene is the main constituent of the lemon scent, it usually accounts for more than 50% of the amount in lemon essential oil, but the aroma of limonene is weak and often less stable in the product's environment, so we have chosen a low percentage about below 10%. Essential oils of lemon peel, lemon leaves are the main components of the lemon scent. In Vietnam, there are many types of lemons such as Lemon oil (*Citrus aurantiifolia* (Christm.) Swingle) Tamarind, Lemon oil (*Citrus latifolia* Tanaka) Seedless lemon, Lemon oil (*Citrus limon* (L.) Osbeck) Lemon, Lemon oil (*Citrus limonia* Osbeck) Lemons. Lemon oil (*Citrus aurantiifolia* (Christm.) Swingle) locally known as "chanh ta" is the most grown in Vietnam. We chose it with the highest percentage in the lemon fragrance of 10% by weight.

Other essential oils have the same composition as lemon essential oil such as Orange oil, Mandarin oil, Grapefruit oil

Lemongrass oil, Verbena oil, Marjoram oil have been used at a low rate of 1-2% by weight to support the lemon scent.

Single aromatic substances such as Methylheptenone, 1,8-Cineol, Linalool, Linalyl acetate, Linalyl cinnamate, Linalyl formate, Linalyl butyrate, Terpeneol, Terpinyl acetate, Citronellal, Hydroxy citronellal, Geraniol, Geranyl acetate, Geranyl butyrate, Geranyl formate, Citronellol Citronellyl acetate, Citronellyl butyrate, Citronellyl

formate with an odor similar to that of the constituents of lemon essential oil were used at a rate as low as 1% by weight.

### 3.3 Fantasy note

This is a group that slightly changes the lemon smell but it makes the lemon smell more attractive, makes the lemon scent more harmonious, more suitable for the product, it accounts for 20% of the weight. The ingredients in this group are both aromatic and seasoning to create a feeling of warmth, spicy, and cool to attract users. We chose three products, namely alcohol, soft drink, and candy, to test the lemon scent with different groups of Fantasy notes. Lemon scent group for W1, W2 we use Aldehyde anisic, Anise oil, Lemon scent group for syrup S.1, S.2 and candy C.1, C.2 we use Peppermint oil, Menthol

The ingredients in Fantasy notes of W.1, S.1, C.1 are warm, spicy spices such as Cinnamaldehyde, Cinnamon bark oil, Pepper oil, Pimento oil.

## IV. CONCLUSION

From natural materials in Vietnam, we have formulated the lemon scent for lemon wine W.1, W.2, lemon syrup S.1, S.2, and lemon candy C.1, C.2. Lemon W.1, S.1, C.1 are natural, gentle and attractive scent with spicy, warm. Lemon W.1, W.2, S.1, S.2, C.1, C.2 with natural lemon smell increases the value of wine, syrup, and candy products. This research has not only created flavor from natural materials to replace chemical materials but also aimed at exploiting natural resources in the country to limit imports.

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#### ETHICAL APPROVAL

It is not applicable

#### COMPETING INTERESTS

The authors declare that there are no conflicts of interest regarding the publication of this paper.

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