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Using the Natural Fixative from Benzoin Resin of Vietnam

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ABSTRACT: *The aim of this study is to manufacture a natural fixative from Benzoin Siam (Styrax tonkinensis Pierre) available in Vietnam to replace the artificial fixative synthesized from chemicals. Styrax tonkinensis*
The crude resin extracted by solvent, compounds in the material will be dissolved into the solvent. After extraction, we distillate to isolate solvent at low pressure to obtain the Benzoin resin.
Evaluation method of the ability of Benzoin resin is performed by comparing it with other fixatives in fragrances. We use this fixative substance in combinations of floral, woody smells and comparison with traditional artificial fixative as Musk ketone, Musk xylene, Musk ambrette.
The comparison results show that the ability to keep the fragrance of fixative from Benzoin resin is lower than musk ambrette, musk ketone but it is better than musk xylene. Thus, Benzoin resin can be used as a natural fixative to replace artificial fixative in fragrance. Through research and experiment, we can see Benzoin resin is precious. It can be used as a good fixative in aromatherapy. This is a natural resin, a kind of resource available in Vietnam.

Keyword: *Benzoin, Extraction, Fragrance, Natural fixative, Styrax*

I. INTRODUCTION

Benzoin resin is a balsamic resin obtained from the bark of several species of trees in the genus Styrax. There are two common kinds of benzoin, benzoin Siam and benzoin Sumatra [1,2,3]. There have been many studies on the chemical composition [4,5,6,7], biological activity [8], the curative effect [9], and the applications in aromatherapy of Benzoin resin. Benzoin resin has substances such as benzonic acid, cinnamic acid, vanillin, benzyl benzoate, cinnamyl cinnamat, benzyl cinnamat, alcohol coniferilic, and siaresinolic acid [10,11,12,13,14]. Benzoin is a common ingredient in incense-making and perfumery because of its sweet vanilla-like aroma and fixative properties [15]. Gum benzoin is a major component of the type of church incense.

Benzoin Siam is obtained from Styrax tonkinensis, found across Thailand, Laos, Cambodia, and Vietnam. Benzoin Sumatra is obtained from Styrax benzoin, which grows predominantly on the island of Sumatra.

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Benzoin Siam in Vietnam has 4 species : *Styrax tonkinensis Pierre, Styrax annamensis Guill, Styrax agrestis G. Don, Styrax benzoin Dryand. Styrax tonkenensis Pierre* is the most abundant species, trees growing in midland forests especially in the fields of Hoa Binh, Son La, Nghe An, Ha Giang, Tuyen Quang, , Lai Chau, Lao Cai, Vinh Phu, Ha Tinh and Thanh Hoa.

There are hardly any researches on Benzoin resins for fixative substance in Vietnam. With the aim to exploit the strengths of natural resources, the research focuses on materials available in Vietnam for research and application. The purpose of this study is to manufacture a natural fixative from Benzoin Siam (*Styrax tonkinensis Pierre*) available in Vietnam to replace the artificial fixative synthesized from chemicals. Styrax tonkinensis Pierre resin has the local name " Cánh kiến trắng, An tức hương, Bồ đề" belongs to the family Styracaceae. This is a natural resin obtained from the Linden tree in Vietnam. Research to create fixative substance from Benzoin resin to make fragrance closer to nature and with health benefits.

The study of the fixative substance from Benzoin resin is very significant in terms of science and practice. In terms of science, it is contributing meaning to the field of creating the fragrance, this is a new field and less research in Vietnam.

II. MATERIALS AND METHODS

Material

We obtained Benzoin resin from Styrax tonkenensis Pierre tree in A district, Ha Giang province, Viet Nam. Trees have a long life, the odor of resin is good. Benzoin resin is white crystals in color. The resin has a warm, pleasant aroma. When harvesting resin, people often choose trees that have resin or choose perennial trees (over 5 years).

The raw material used in the experiment for the natural fragrance was taken from the Project VIE86033 and applied according to Indian Standards for aromatherapy. In our experiments, we used the volatile solvent is a solvent of alcohol 96%, and an odorless solvent diethyl phthalate (DEP).

Method of creation Benzoin resin:

This method is based on the principle of using an appropriate solvent to dissolve the constituents bring scent into solvent , at room temperature. The crude resin extracted by solvent, compounds in the material will be dissolved into the solvent. After extraction, we distillate to isolate solvent at low pressure to obtain the Benzoin resin. 200 grams of Benzoin resin was dissolved in 800 g of ethanol for 24 h. After filtration and solvent evaporation, the resinoids were obtained in 158 g (yields 79%).

Method of assessment of product quality:

The structure of the fragrance in this experiment included the Top notes, the Body note, and End note To select the best fragrance combination and evaluate the quality of the scent, we have followed the method of the international experts of the project VIE86033 training [16].

Nowadays, in the field of fragrance, the smell is mainly measured by the human olfactory. These three main theories explain odorant as chemical theory, physical theory, and basic biology based on olfaction. The fragrance is diluted 10-20 times by odorless solvent diethyl phthalate (DEP), then use paper and olfactory of the nose to evaluate the aroma. Record of odor quality and odor retention time for comparative assessment.

Table 1. Descriptive statistics on the ability to retain odor by smell.

Rating level	Classifying odor rating	Description of the smell
5	The smell is very strong	The original aroma of the sample
4	The smell is quite strong	The initial odor is slightly reduced
3	The smell is normal	Smell initially decreased significantly

2	The smell is weak	The odor was mild
1	The smell is very weak	The smell was initially very difficult to receive
0	The smell is gone	The smell did not recognize

III. RESULTS AND DISCUSSION

3.1 Harmony of fixative substance Benzoin resin with odors

Fragrance W.1 belongs to the woody aroma group with main constituents of Poumu oil, Sandalwood oil, Cedar wood oil, and Vetiver oil with aroma of woody.

Fragrance R.1 has a rose scent belonging to the flower scent group with main constituents: Citronellol, Geraniol, Palmarosa oil, Geranyl acetate, Geranyl butyrate, Geranyl formate, Citronellyl acetate, Citronellyl butyrate, Citronellyl formate.

Fragrance F.1 has a fruity aroma, it belongs to the fruity aroma group with the main ingredients Orange oil, Grapefruit oil, Lemon oil, Mandarin oil, Lime oil, Limonene, Citral diethyl acetal, Methylheptenone.

The fragrance groups W.1, R.1, F.1 are structured with Top notes being aldehydes, Body note is the main constituents of the fragrance of the group, and End note is the fixative substance from Benzoin resin (Table 2). Experimentation has shown that fixative substance from Benzoin resin is more harmonious with woody odor W.1 than rose odor R.1 and fruity odor F.1

Table 2. The composition of aromatic groups

N°	Material	Fragrances % weight						Note
		W.1	R.1	F.1	W.2	W.3	W.4	
1	Anisal dehyde	1	1	1	1	1	1	**Top note**
2	Cinnamaldehyde	2	2	2	2	2	2	
3	Citronellal	2	2	2	2	2	2	
4	Vetiver oil	8			8	8	8	Body note
5	Cedar wood oil	10			10	10	10	
6	Sandalwood oil	18			18	18	18	
7	Poumu oil	5			5	5	5	
8	Canarium absolute	3			3	3	3	
9	Agarwood absolute	3			3	3	3	
10	Heliotropin		6					
11	Tecpineol		4					
12	Tecpinyl acetate		3					
13	Hydroxy citronellal		4					
14	Palmarosa oil		9					
15	Citronellol	1	9	1	1	1	1	
16	Geraniol	1	9	1	1	1	1	
17	Citronellyl acetate		2	5				
18	Citronellyl butyrate		2	5				
19	Citronellyl formate		2	4				
20	Geranyl acetate		2	5				
21	Geranyl butyrate		2	5				
22	Geranyl formate		2	5				
23	Linalool	2	2	2	2	2	2	
24	Linalyl acetate	1	1	5	1	1	1	
25	Linalyl cinnamate		1	5				

26	Ionone	9	7	4	9	9	9	
27	Methyl ionone	8	7	4	8	8	8	
28	Ginger oil	1	1	1	1	1	1	
29	Ylang Ylang oil	3	5		3	3	3	
30	Jasmine oil	3	5		3	3	3	
31	Eugenol	1	1		1	1	1	
32	Isoeugenol	2	1	1	2	2	2	
33	Extract laurel flower	2	1		2	2	2	
34	Orange oil	1		5	1	1	1	
35	Grapefruit oil	1		6	1	1	1	
36	Lemon oil	1		6	1	1	1	
37	Mandarin oil	1		6	1	1	1	
38	Lime oil			6				
39	Limonen			3				
40	Citral diethyl acetal	1	1	2	1	1	1	
41	Methylheptenone	2	1	1	2	2	2	
42	Benzoin resin	7	7	7				End note Fixative group
43	Musk ketone				7			
44	Musk xylene					7		
45	Musk ambrette						7	
	Total	100	100	100	100	100	100	

3.2 Evaluate the fixative substance from Benzoin resin in fragrance

We know that the fixative substance from Benzoin resin is suitable with woody odor, we choose this odor to judge the fragrance capacity of Benzoin resin with other fixative substance. The top notes and body notes of W.1, W.2, W.3 are the same, but the group of fixative substances is different. The fixative substance of W.1 make from Benzoin resin, the fixative substance of W.2 make from artificial musk ketone, the fixative substance of W.3 make from artificial musk xylene, the fixative substance of W.4 make from artificial musk ambrette.

Table 3. Review and evaluate the odor storage capacity of W.1, W.2, W.3, W.4

N°	**Time (hours)**	**Fragrance**			
		W.1	**W.2**	**W.3**	**W.4**
1	0	**5**	**5**	**5**	5
2	2	4	4	4	4
3	6	4	4	4	4
4	12	3	3	2	3
5	24	2	3	2	3
6	36	2	2	1	2
7	48	1	2	1	2
8	60	1	1	0	2
9	72	0	1	0	1
10	84	0	0	0	1
11	96	0	0	0	0

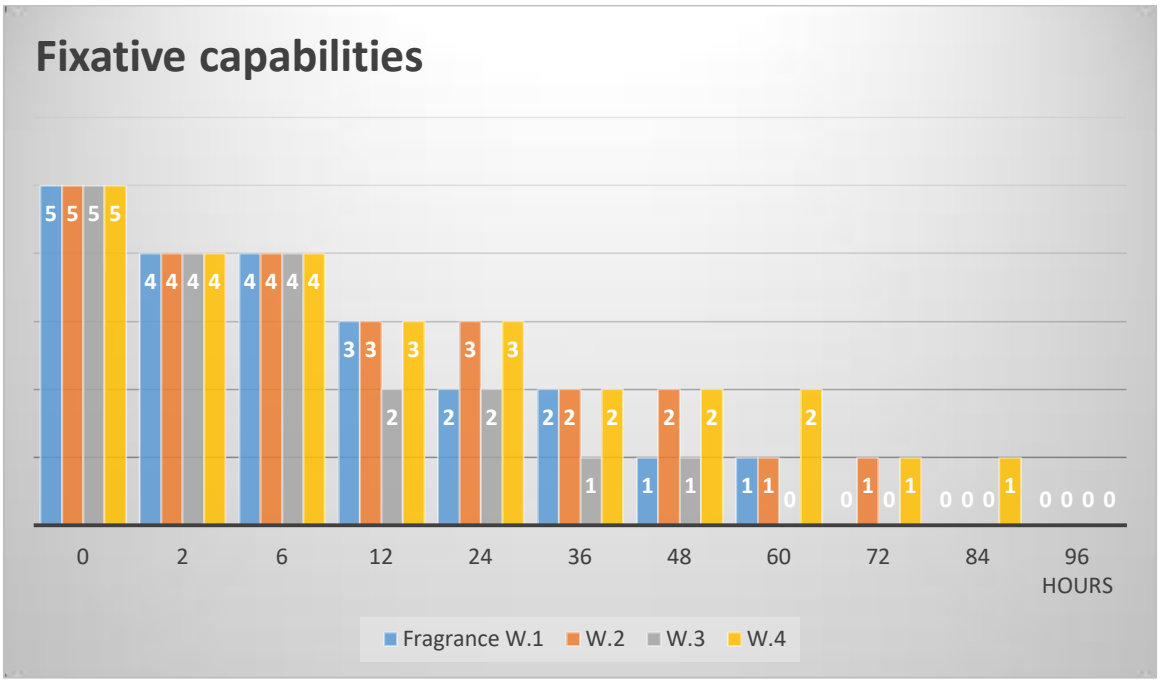

Figure 1. Fixative ability of fragrance W.1, W.2, W.3, W.4

The original woody odor of the fragrance W.1, W.2, W.3, W.4 is very strong, after 6 hours the initial odor of them is slightly reduced but the difference cannot be distinguished. After 12 hours, the fragrance W.3 using the musk xylene, the fixative reduces the odor more than the other three fragrances.

After 60 hours, the scent of W.3 gives no smell.

After 72 hours, the scent of W.1 gives no smell.

After 84 hours, the scent of W.2 gives no smell.

After 96 hours, the scent of W.4 gives no smell.

From the experiments, Benzoin resin can make the fixative substance in fragrance. The fixative capability of Benzoin resin is weaker than artificial musk ambrette, musk ketone but better than artificial musk xylene.

IV. CONCLUSION

We have refined and processed cruse resin from Styrax tonkenensis Pierre into Benzoin resin using as the natural fixative substance for aromatic compounds. We created a scent of woody, floral, fruity (W.1, R.1, F.1) by natural Vietnamese material with fixative from Benzoin resin. From experimental research, we found that: the resin is extracted from Benzoin resin has a pleasant odor. The experiment has been shown that Benzoin resin is suitable for woody odor than floral and fruity odor.

Evaluation and comparison of the possibility fixative of Benzoin resin with some other artificial fixative are often used, showing the fixative from Benzoin resin has a good retention ability. However, its ability to keep the fragrance of scent is lower than musk ambrette, musk ketone but it is better than musk xylene.

Through research and experiment, we can see Benzoin resin is precious resin. It can be used as a good fixative in fragrance. This is a precious natural resin, a kind of resource available in Vietnam. Therefore, it is recommended for further research, exploitation, and effective use of this resource.

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