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Research article

Formulation of Borneol Camphor Solution from Essential Oil of *Amomum biflorum* Jack: a literature review

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Abstract: Wan Sao Long is a plant in the Zingiberaceae family, scientific name: *Amomum biflorum* Jack has heart-nourishing properties, an anti-flatulent, aromatic essential oil. Therefore, it is applied as a component of water pimple products in various forms such as spray, air conditioning gels or solution. In principle, the preparation of water pimples relies on the Eutectic phenomenon: the main elements of the recipe consist of volatile oil, borneol, camphor, menthol, and fatty acid. Preparing is to mix the substances that will produce eutectic, borneol, camphor, and Menthol, and then mix in the part of the oil, such as fatty acids. Stir well-using heat, leaving to cool, so add the volatile oil and Wan Soa Long extracted oil. Among the considerations for the recipe is the proportion of substances that will be mixed to achieve the Eutectic phenomenon, the amount of Wan Sao Long extracted oil, and the proper heat to make the soluble parts and fatty acids compatible.

Keywords: Wan Sao Long; Borneol camphor solution; Eutectic; *Amomum biflorum*

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1. Introduction

The Borneol camphor solution is currently one of the most favorite products during the COVID-19 epidemic era. Since the inhale preparations are useful for the respiratory system. Many products of Borneol camphor solution have been launched, such as inhale solutions, sprays, and aroma stickers. The market investigation of these products seems to have a great possibility channel for receiving the benefit and increasing income. This article reviewed the possibility and principle of formulation of Borneol camphor solution from Wan Sao Long or Amomum biflorum Jack, a useful herb in Thailand. This review article was divided into four parts. The first part mentions the characteristic of this herb to make the reader familiar with it. The second part was about the principle of formulation of Borneol camphor solution from Wan Sao Long and the eutectic principle, which is important knowledge to apply for preparation. The third part explains **th**e step of preparation. After the understanding of

preparation, the last part before a conclusion reveals the key points that should be considered during the preparation step to make a qualified and stabilized product, ending up with the conclusion of all main 3 parts concept. This reviewed article provided the information for decision-making in establishing the Borneol camphor solution business.

2. Materials and Methods

The information on *Amomum biflorum* Jack and the principle of formulation of borneol camphor solution reviewed from the literature in the following steps

2.1 Keywords: this article use these keywords; *Amomum biflorum*, Borneol camphor, Eutectic, Wan Sao Long

2.2 The secondary sources: this article use google scholar and PubMed as secondary source for searching and gathering paper materials. The inclusion criteria of the paper were the English language. The relavance of the preparation of borneol camphor soution.

2.3 Retrieved the papers evaluated and summarized in the results and discussion part.

The process of the literature review is illustrated in Figure 1

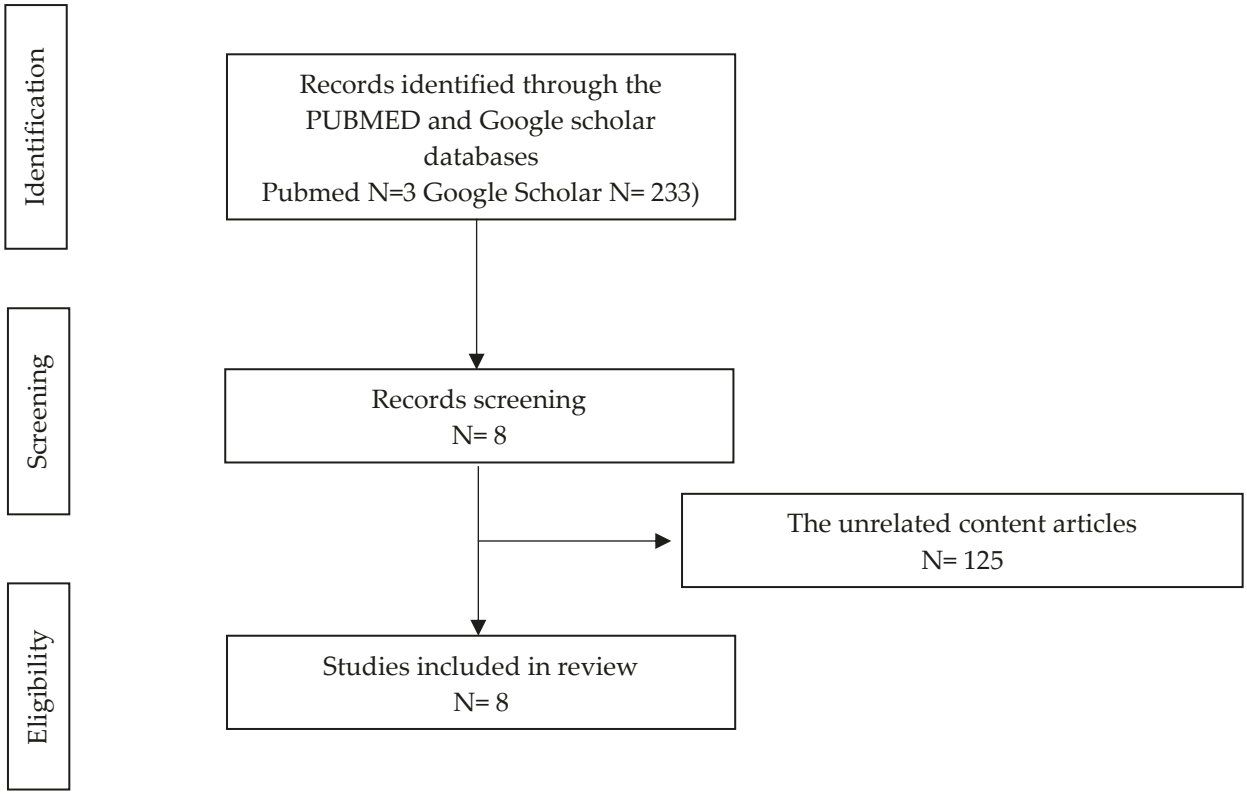

Figure 1. The literature review process

3. Results and Discussion

From the literature, we also reviewed and discussed papers on the following topic

3.1. What is Wan Sao Long?

3.1.1 Characteristics

Wan Sao Long is herbal in the *Zingiberaceae* family; the scientific name for this plant is ***Amomum biflorum Jack***. It's a fallen plant. There are rhizomes underground, above the soil 30-80 cm high, with parallel-edged leaves. Red leaves, soft hairy leaf plates covering small inflorescences. The plant is born at the rhizome,

away from the base of the artificial stem. Rhizomes, petals and white petals form a small number of flowers. The petals have a yellow stripe in the middle and white pollen. A beak extending to the top is three-pointed, round, yellowish-green.. Red thorns cover. [1-2] The picture of this plant illustrates in Figure 2

There was a study about the morphology of plants in the Amomum family, the researcher collected indigenous species of Amomum from various areas in Thailand. The scanning electron microscope (SEM) picture was used to study morphology. The study found that the reproductive part morphology applied to the identity of *Amomum biflorum* Jack from the other species. Amomum's pollen grains are spherical to subspherical, inaperturate, and the exine sculpture is either echinate or psilate. Pollen characteristics agree with the previous reports but do not correspond with the classification earlier based on morphological traits. Therefore, the pollen morphology is less useful for the subgeneric classification of Amomum [3].

3.1.2 Usages

This plant has fragrant rhizomes. It is a component of compresses and medicines for steaming herbs to nourish the heart. In addition, applying essential oils is believed to make lovers masturbate, [1-2] including relaxation [4].

3.1.3 Component

The main component of Wan Sao Long are the following [1]

(E)- but-1-enyl-4-methoxybenzene 85%

Limonene 2.2%

β- pinene 2.1%

Camphor 1.8%

Figure 2. *Amomum biflorum* Jack (Wan Sao Long)

The method of extraction of essential oil [5]

According to the literature review [5], the method of extraction of Wan Sao Long is described as the following;

The essential oils were extracted by water distillation; the distillation conditions were water steaming for 6 hours. The steaming temperature was 100 °C, and the cooling downed to 10 °C to collect the essential oils.

From this analysis review that this product contained the following volatile oil

Benzene, 1-(1-butenyl)-4-methoxy-, trans- = 92.63%

Eucalyptol = 2.13%

Bicyclo[3.1.1]heptane, 6,6-dimethyl-2-methylene-, (1S) = 1.82%

D-Limonene = 1.75%

Camphor = 1.66%

The literature review found that there has been the development of various products from Wan Sao Long essential oil in cosmaceutical, spa, [6] including inhaler products [7] which found that the customers were satisfied with the smell of 5% essential oil from Wan Sao Long. In addition, the essential oil from that plant can apply to air freshener gel [8-9].

Based on this information, Wan Sao Long is herbal and a practical challenge to develop to increase value and be a source of income for future growers.

3.2 The principle of formulation of Borneol camphor solution from Wan Sao Long

3.2.1 Core principle

Borneol camphor solution recipes use a pharmaceutical technology principle called Eutectic, in which the direction of Eutectic compound formation, by definition, belongs to two combinations that usually do not react with each other as new compounds. But if mixed in runaway proportions, there is a process of inhibiting the crystalline formation of another substance, giving the system a lower melting point than the original substance. [10, 11] Such a process can be summarized as a diagram to make it easier to understand as follows: (Figure 3)

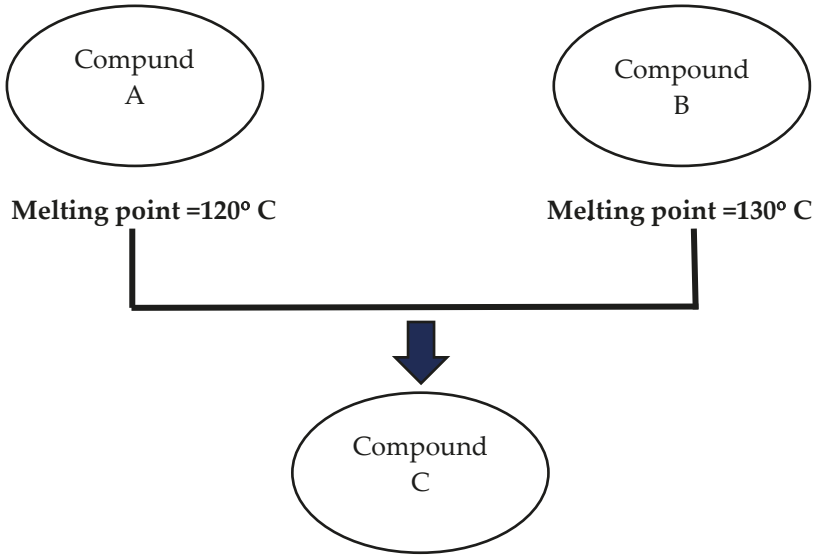

Figure 3. The Eutectic process

As a result of this principle, combined with the properties of substances that can cause eutectic reactions, liquid products are obtained from solid substances. The eutactic system, for example, is used in the pharmaceutical industry to improve drug solubility, permeability, and absorption. Based on this theory, a deep eutectic solvent was used to create a preparation from a eutactic system [10]. Examples of widely used substances with such properties include borneol, camphor, and mint, which have led to the development of a product known as "water pimpsen," which is commonly used to relieve dizziness and nasal congestion due to the presence of volatile aromatic substances in the terpenes group that, when inhaled, feel fresh and reduce nasal congestion, which in the latter, especially during the COVID-19 pandemic, is a product that has grown in popularity.

Borneol camphor solution product models that can be developed include various types. Solutions, sprays, and even stickers can be attached to clothing and face masks to reduce odors. This is because studying the principles for developing such a product is fascinating.

3.2.2 The core component of Borneol camphor solution

The core component of Borneol camphor solution is

1. Essential oils: It is the part that will cause the aroma. This recipe comes from Wan Sao Long
2. Borneol: The component in the eutectic phenomenon
3. Camphor: The component in the eutectic phenomenon
4. Menthol: The component in the eutectic phenomenon
5. Fatty acid

Borneol, camphor, and menthol, When mixed, Eutectic processes form a liquid compound at room temperature. Due to the lower melting point than the substrate. Therefore, we can use this principle to prepare it as a Borneol camphor solution product.

3.2.3 The step of preparation

The preparation process is illustrated in Figure 4.

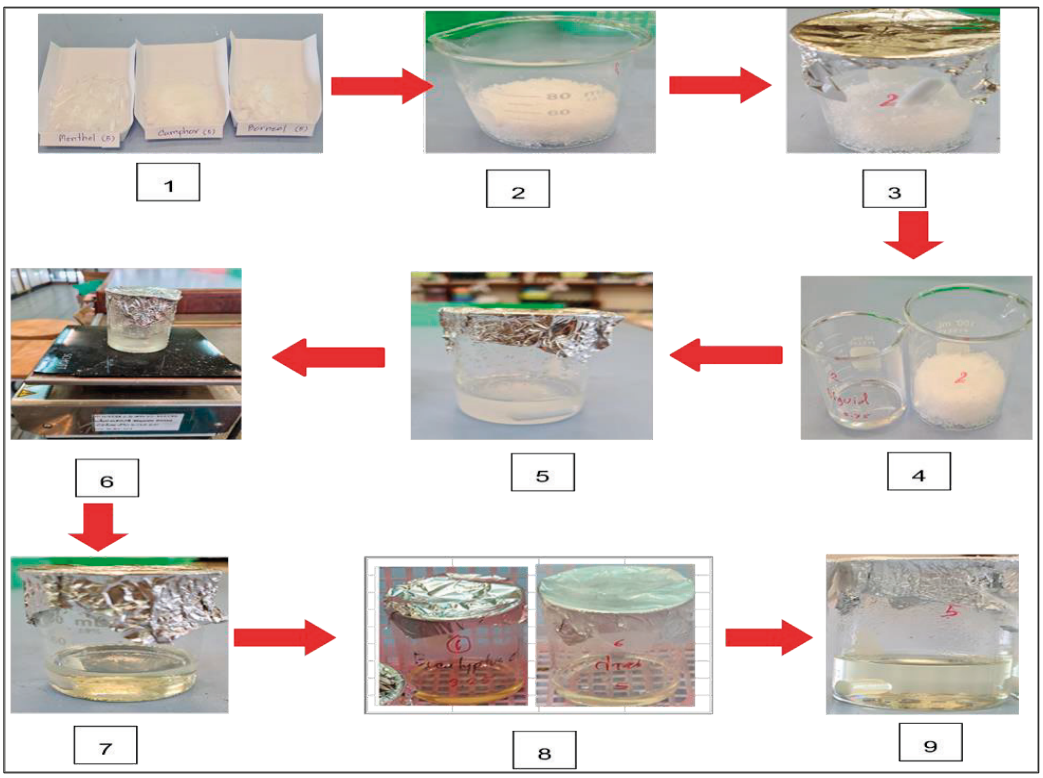

Figure 4. The process of Borneol camphor solution preparation

Step one: Mix the three compounds, camphor, borneol, and menthol, and the mixing proportions must be adjusted to make it appropriate to create a eutectic process and obtain a liquid state in the final, where the ratios used are as varied as 1:1:1, 2:1:1, 3:2:1 [6].

Step two: If there is a part of a fat-soluble substance (fatty acid) such as Liquid Paraffin, add it and stir well, it may be possible to use heat to dissolve fatty acids or oil-soluble substances early.

Step three: Leave the solution to cool and add essential oils, including essential oil from Wan Sao Long.

Step four: Stir well. They were packed in tight containers.

3.2.4 The key consideration

The are some points for consideration as the following

1. When mixing the three substances, Camphor, Borneol, and Menthol, it is important to consider about phase diagram of each substance; the example of the phase diagram is shown in Figure 5 [10].

The experiment's phase diagram must be derived to determine an optimum condition capable of producing stable eutectic systems.

As previously stated, the intended purpose is the proportion of the three substances that will remain liquid in the final state. An appropriate ratio will result in a stable and favorable end product.

2. The amount of wandering oil, as well as the appropriate essential oil, because too much may be incompatible. It appears as a floating oil droplet, affecting the product's livability and stability.

3. Heating during the fatty acid addition process If the amount of heat used is insufficient, fatty acids will clump. Liquids are incompatible. This renders the product useless.

4. Another critical point to consider before launching a product is testing finished product properties such as rheology, viscosity, surface tension, contact angle measurement, and infrared spectroscopy.

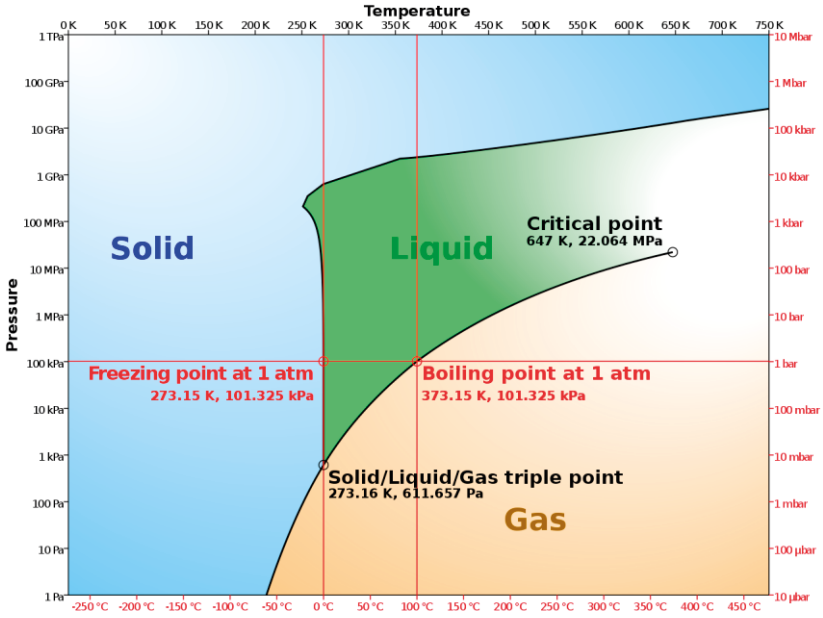

Figure 5. The phase diagram

Therefore, the quality assurance of the finished product should be considered. However, there is no standard specification of the quantity of essential oil in *Amomum biflorum* Jack established because of the variation (depending on the area and the agricultural method). Therefore the certificate of analysis is also reported as the physical and some chemical characteristics such as appearance, color, and specific gravity. The quantity of the active ingredient is not specified. No changes in appearance and smell may detect the stability of the product. If some laboratory can be developed to quantify the essential oil, it may be implemented to check the changes in the essential oil composition to confirm the stability. The analysis and identification of volatile oil can be used by gas chromatography (GC) or Differential Scanning Calorimetry (DSC). [7-9] However, the instruments were expensive. Moreover, before launching the product or producing a large scale, the satisfaction of the product should be confirmed.

4. Conclusions

To prepare borneol camphor solution products from Wan Sao Long. Despite the few steps and minimal equipment, knowing the principles of Eutectic and considerations will make the preparation of the product even more accurate and make the product more pleasant to use.

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