DEVELOPMENT OF AROMATHERAPY CANDLES USING ESSENTIAL OILS FROM LOCAL PLANTS

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PENGHASILAN LILIN AROMATERAPI MENGGUNAKAN MINYAK PATI DARIPADA TUMBUHAN TEMPATAN

ABSTRAK

Dalam kajian ini, lilin aromaterapi telah dibuat daripada tumbuhan tempatan: Citrus limon, Citrus sinensis, Cymbopogon citratus, dan Cymbopogon nardus. Minyak pati C. limon, C. sinensis, C. citratus, dan C. nardus telah diekstrak keluar dengan menggunakan kaedah penyulingan hidro, peratusan hasil minyak pati adalah 0.41 % (w / w), 1.20 %, 0.36 % (w / w), 0.48 % (w / w) masing-masing. Minyak pati ini telah dianalisis dengan kromatografi gas dengan spektrometri jisim (GC-MS). Sepuluh sebatian seperti Limonene (48.45 %), β-Pinene (14.25 %), cis-Geraniol (4.43 %), α-Terpineol (2.74 %), 1R-α-Pinene (2.62 %), L-4-Terpineol (1.99 %), Nerylacetate (1.56 %), Geranylacetate (1.19 %), Terpinolen (1.13 %) dan β-Bisabolene (0.92 %) telah dikenal pasti dalam minyak pati C. limon manakala sepuluh sebatian seperti Limonene (91.20%), β-Myrcene (2.73%), β-Linalool (1.24%), 1R-α-Pinene (0.73%), α-Terpineol (0.36 %), 3-Carene (0.39 %), L-β-Pinene (0.30 %), β-Citrnellol (0.28 %), L-4-Terpineol (0.26 %) dan 1-Decanol (0.22 %) dalam minyak pati C. sinensis juga telah dikenalpasti. Sepuluh sebatian seperti α-Citral (33.29 %), β-Citral (28.70 %), β-Maaliene (7.78 %), tau-Muurolol (3.94 %), β-trans-Ocimene (3.25 %), β-Pinene (2.97 %), cis-Geraniol (2.45 %), cis-Verbenol (2.47 %), Juniper camphor (2.37 %) dan α-Pinene (1.06 %) dalam minyak pati C. citratus telah dikenalpasti. Komponen-komponen utama dalam minyak pati C. nardus adalah cis-Geraniol (18.53 %), β-Citronella (14.23 %), (R)-(+)-β-Citronellol (11.98 %), α-Cadinol (8.95 %), τ-Eudesmol (7.68 %), Geranylacetate (4.72 %), Citronellolacetate (3.81 %), Elemol (3.54 %), β-Linalool (3.78 %), dan akhirnya tau-Muurolol (2.94 %). Tige puluh tiga biji lilin aromaterapi dihasilkan dengan menggunakan formulasi 40 g paraffin wax campur dengan 1 mL minyak pati. Lilin aromaterapi dibuat boleh menyala selama enam jam dan membebaskan aroma selepas dua jam. Ia adalah tanpa plumbum dan sootless.

ABSTRACT

In this study, aromatherapy candles were made from aroma medicinal plants namely *Citrus limon*, *Citrus sinensis*, *Cymbopogon citratus*, and *Cymbopogon nardus*. The essential oils of *C. limon*, *C. sinensis*, *C. citratus*, and *C. nardus* were extracted using hydrodistillation method, the yield of essential oil was 0.41 % (w/w), 1.20 %, 0.36 % (w/w), 0.48 % (w/w) respectively. These essential oils were analyzed using GC-MS. Ten components such as Limonene (48.45 %), β-Pinene (14.25 %), *cis*-Geraniol (4.43 %), α-Terpineol (2.74 %), 1R-α-Pinene (2.62 %), L-4-Terpineol (1.99 %), Nerylacetate (1.56 %), Geranylacetate (1.19 %), Terpinolen (1.13 %) and β-Bisabolene (0.92 %) were identified in essential oil of *C. limon* while ten compounds which were limonene (91.20%), β-Myrcene (2.73%), β-Linalool (1.24%), and 1R-α-Pinene (0.73%), α-Terpineol (0.36 %), 3-Carene (0.39 %), L-β-Pinene (0.30 %), β-Citrnellol (0.28 %), L-4-Terpineol (0.26 %) and 1-Decanol (0.22 %) in essential oil of *C. sinensis* were identified. Ten compounds such as α-Citral (33.29 %), β-Citral (28.70 %), β-Maaliene (7.78 %), tau-Muurolol (3.94 %), β-*trans*-Ocimene (3.25 %), β-Pinene (2.97 %), *cis*-Geraniol (2.45 %), *cis*-Verbenol (2.47 %), Juniper camphor (2.37 %) and α-Pinene(1.06 %) in essential oil of *C. citratus* were identified. The major components in *C. nardus* essential oil were *cis*-Geraniol (18.53 %), β-Citronella (14.23 %), (R)-(+)-β-Citronellol (11.98 %), α-Cadinol (8.95 %), τ-Eudesmol (7.68 %), Geranylacetate (4.72 %), Citronellylacetate (3.81 %), Elemol (3.54 %), β-Linalool (3.78 %), and lastly tau-Muurolol (2.94 %). Thirty three aromatherapy candles were made with formulation of 40 g of paraffin wax mixed with 1 mL of essential oils. The aromatherapy candles made could burn for six hours long and release aroma after two hours lighting. It was lead-free and sootless.

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LIST OF SYMBOLS AND UNITS

%	Percentage
α	Alpha
β	Beta
g	Gram
mL	Mililitre
μL	Microlitre
L	Litre
°C	Degree Celcius
°F	Degree Fahrenheit
min	Minute
mm	Milimetre
cm	Centimetre
eV	Electrovolt

CHAPTER 1

INTRODUCTION

1.1 Background of Study

Aromatherapy, a therapy that uses aromas and a branch of herbology is one of the fastest growing therapies in the world today. Aromatherapy is a kind of art, an aesthetic healing art which uses essential oils, derived from various parts of aromatic plants and trees (Wildwood, 1992). Frequently, it is reported that aromatherapy lets one feeling uplifted, stimulated, invigorated, or rejuvenated but it depends on the types of oils used. When inhaled, the various aromas penetrate the bloodstream via the lungs causing physiologic changes which in turn affect the limbic system that controls our emotions and memories (Selby, 1996).

Aromatherapy aims to promote physical and psychological well-being to gain health of body and obtain serenity of mind (Wildwood, 1992). Aroma substances such as essential oils are volatile compounds which are perceived by the odour receptor sites of the olfactory tissue of the nasal cavity. The aromatic substances stimulate the

olfactory bulb and neurons. The desired emotional response such as relaxation is activated from the limbic system of the brain (Longe, 2002).

Nowadays, aromatherapy has become one of the most popular complementary therapies. Aromatherapy comes in sixth place after massage, music therapy, relaxation therapy, therapeutic touch and meditation (Dunning, 2005). According to Dunning (2005), nurses apply aromatherapy into nursing practice, especially in recuperating patients. Apart from that, Wallis *et al.* (2004) found that out of 129, 15.5% nurses working in four hospitals in Southeast Queensland uses aromatherapies. This implies that aromatherapy can thrive and bloom in this decade.

The most easiest and instant way to infuse a room with fragrance and create a light atmosphere is lighting aromatherapy candles. It adds fragrance and instant ambience into the environment. Obviously aromatherapy candle has become a symbol of stylish lifestyle in this decade. The standard of living has improved, people are willing to pay for extra pampering (Wheeler, 2000). The popularity of aromatherapy candles can be observed through the sales in gift shops, various types of it are sold. It has been one of the highly demanded gifts in recent years. Mostly because it has the capabilities to perform therapeutic function (Jerkins, 2001).

The scent of aromatherapy candles can be made by combining different essential oils with different type of waxes. Wax is the main ingredient used in candle making, the most common waxes used is paraffin wax. Paraffin wax is a type of petroleum wax, it is white, tasteless and odourless. At room temperature, it is solid and it has a range of melting temperatures from 40-71°C (104-160°F) (Jerkins, 2001).

The objective of this project was to produce aromatherapy candles using the essential oils extracted from local plants (*Citrus limon*, *Citrus sinensis*, *Cymbopogon nardus*, and *Cymbopogen citratus*).

1.2 Research Objectives

The objectives of this study were:

A. To extract essential oils from *Citrus limon*, *Citrus sinensis*, *Cymbopogon nardus*, and *Cymbopogen citratus* using hydrodistillation.

B. To analyze the essential oils using gas chromatography-mass spectrometry.

C. To make aromatherapy candles containing the essential oils.

D. To determine the burning period of the aromatherapy candle.

1.3 Scope of Study

In this study, the essential oils in aromatherapy candles were obtained using a hydrodistillation method under temperature of 60-70 °C for eight hours. The essential oils were extracted from some local plants naming *C. limon*, *C. sinensis*, *C. nardus*, and *C. citratus*. All of these local plants were bought at "pasar tamu", Kota Kinabalu. The essential oils were analyzed using gas chromatography-mass spectrometry. Several aroma and shapes of aromatherapy candles were made.

CHAPTER 2

LITERATURE REVIEW

2.1 History of Aromatherapy

Aromatherapy has been around for 6000 years or more. Our early ancestors discovered that certain aromatic plants when burnt on the fire, gave rise to altered states of consciousness (Wildwood, 1991). It was found that some aromas made people feel drowsy, others made them feel uplifted or even euphoric. The most precious of all gave rise to mystical or physics experiences. The Greeks, Romans, and ancient Egyptians all used aromatherapy oils, they are generally regarded as the true founders of aromatherapy (Wildwood, 1991). The Egyptian physician Imhotep recommended fragrant oils for bathing, massage, and for embalming their dead nearly 6000 years ago. Imhotep is the Egyptian god of medicine and healing. In Egypt, aromatics were literally a way of life. Sweet incense was burnt in the temples, city squares and during state ceremonies. Indeed, the well-preserved mummies of animals, pharaohs and queens on display in many museums bear witness to the skills of the ancient Egyptian embalmers and to the remarkable preservative powers of plant essence (Wildwood, 1991).

Hippocrates, the father of modern medicine, used aromatherapy baths and scented massage. In fact, massage with aromatic oils was deemed so efficacious that Plato is said to have reproached Herodicus for protracting the miscerable exixtence of the aged. He used aromatic fumigations to rid Athens of the plague (Wildwood, 1991). Instead, fumigation with aromatics substances to prevent the spread of infectious diseases is still used in some countries recently such as the French hospitals burnt juniper thyme and rosemary in the wards as a disinfectant (Wildwood, 1991).

The modern era of aromatherapy was dawned in 1930 when the French chemist René Maurice Gattefossé coined the term aromatherapy for the therapeutic use of essential oils. He was fascinated by the benefits of lavender oil in healing his burned hand without leaving any scars. He started investigating the effect of other essential oils for healing and for their psychotherapeutic benefits (Wildwood, 1991).

During the Second World War, the French army surgeon Dr. Jean Valnet used essential oils as antiseptics (Valnet, 1990). Later, the Austrian born biochemist Madame Marguerite Maury elevated aromatherapy as a holistic therapy. She started prescribing essential oils as remedy for her patients. She is also credited with the modern use of essential oils in massage (Wildwood, 1991). Aromatherapy works the best when it works on the mind and body simultaneously.

2.2 Aromatherapy

Aromatherapy means "treatment using scents". It is a holistic treatment of caring for the body with pleasant smelling botanical oils such as rose, lemon, lavender and peppermint. The essential oils are added to bath or massaged into the skin, inhaled directly or diffused to scent an entire room. Aromatherapy is used for the relief of pain, care for the skin, alleviate tension and fatigue and invigorate the entire body. Essential oils can affect the mood, alleviate fatigue, reduce anxiety and promote relaxation. When inhaled, essential oils work on the brain and nervous system through stimulation of the olfactory nerves (Cooksley, 1996).

However, aromatherapy is more thoroughly defined as the *skilled* and *controlled* use of essential oils for physical and emotional health and well-being (Cooksley, 1996). Aromatherapy has strong psychological benefits. The volatility of an oil, or the speed at which it evaporates in open air is thought to be linked to the specific psychological effects of an oil. As a rule of thumb, oils that evaporate quickly considered emotionally uplifting, while slowly evaporating oils are thought to have a calming effect (Longe, 2002).

Essential oils are aromatic essences extracted from plants, flowers, trees, fruits, bark, grasses and seeds with distinctive therapeutic, psychological, and physiological properties, which improve and prevent illness (Selby, 1996). There are about 150 essential oils (Selby, 1996). Most of these oils have antiseptic properties; some are antiviral, anti-inflammatory, pain-relieving, antidepressant and expectorant. Other

properties of the essential oils which are taken advantage in aromatherapy are their stimulation, relaxation, digestion improvement, and diuretic properties.

Aromatherapy is the name given to therapeutic approaches having odors and the olfactory system as main actors. It is one of the fastest growing fields in alternative medicine. It is one of the most increasingly used methods in nursing (Thomas, 2002). It is widely used at home, clinics and hospitals for a variety of applications such as pain relief for women in labor pain, relieving pain caused by the side effects of the chemotherapy undergone by the cancer patients, and rehabilitation of cardiac patients. The use of essential oils can have significant effects on both clinical and experimental pain. For example, cancer pain and the associated anxiety are alleviated by exposure to lavender aroma (Louis and Kowalski, 2002). Marchand's group (Marchand and Arsenault, 2002) has shown that odors can affect pain perception in a gender-related manner. Apart from that, it has significantly improved the sleep patterns of the patients and at the same time, reduced the amount of night sedation required (Cannard, 1996).

Aromatherapy is differentiated from other fields of practice by recourse to its specific materiality. The skillfull use of pure essential oils in conjunction with suitable carrier oils for therapeutic purposes distinguishes aromatherapy from other massage-based therapies (which use oil to lubricate physical manipulation) and beauty therapy (which uses cosmetic-grade oils rather than pure essential oils) (Doel and Segrott, 2004).

Burning candles and incense containing essential oils is one of the most convenient and inexpensive ways to experience aromatherapy benefits nowadays.

Aromatherapy candles are made with the essential oils of an alternative form of medicine that have healing and soothing effects which has become very popular in this century.

2.3 Essential Oils

A volatile ethereal fraction obtained from a plant part by a physical separation method is called an essential oil. The physical method involves either distillation (including water, steam, water and steam, or dry), expression (pressing), infusion, and extraction either by alcohol or benzene and hexane (Cooksley, 1996). Essential oils represent the odourous part of the plant material, and therefore these oils have traditionally been associated with the fragrance and flavor industry (Kirk-Othmer, 1996). Methods used to obtain essential oils from plants are shown in figure 2.1.

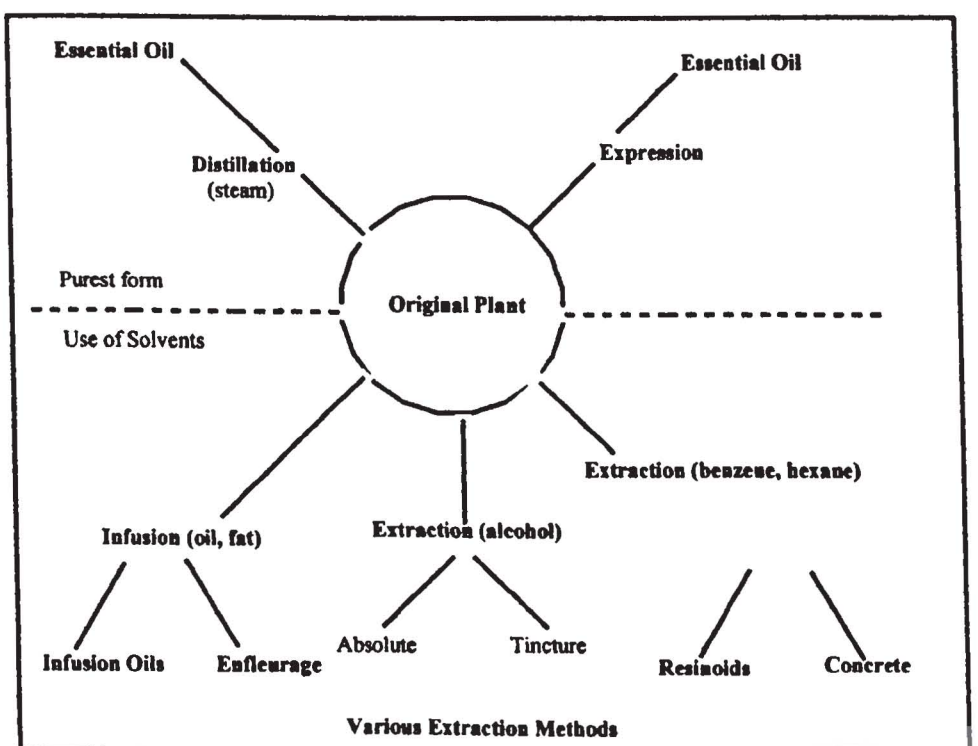

Figure 2.1 Extraction essential oils from plants (Cooksley, 1996).

Essential oils contain a mixture of many organic compounds which include alcohols, aldehydes, esters, ketones, terpenes, oxides, coumarines, lactones, acids, aromatic aldehydes, and phenols.

Table 2.1 shows the therapeutic properties attributed to each organic compound present in essential oils. The relative amount of each compound contained in each oil denotes its therapeutic value (Franchomme and Pénoël, 1990). Oils high in ketones are known for their wound-healing properties, such as *Helichrysm italicum* (everlasting flower) whereas oils high in alcohols are renowned for their antimicrobial and anti-infectious properties like *Melaleuca alternifolia terpinen-4-ol* that present in tea tree.

Table 2.1 Organic compounds present in essential oils and their therapeutic actions.

Organic compounds	Therapeutic actions
Acids	Anti-infectious, immunostimulants
Aromatic aldehydes	Anti-infectious, immunostimulants
C10 alcohol	Anti-infectious, immunostimulants
C15 and C20 alcohols	Estrogen-like activity
Aldehydes	Anti-infectious, calming, litholitic
Coumarins	Balancing, calming
Esters	Antispasmodic, calming
Lactones	Balancing, calming
Ketones	Cicatrizing (wound healing), mucolitic, litholitic, calming Expectorant, antispasmodic
Oxides	Anti-infectious, immunostimulants
Phenols	Anti-infectious, antispasmodic
Phenyl methyl ethers	Anti-infectious, cortisone-like activity
C10 terpenes	Antihistamines, anti-allergic
C15 terpenes	Antihistamines, anti-allergic

Most of the essential oils have a very light texture and evaporate quickly. Essential oils are less likely to evaporate in the much colder and denser condition. Essential oils aren't oily at all, but rather a water-like liquid (Cooksley, 1996). Essential oils are found in all the various parts of plants including the bark, roots, leaves, flowers, seed, wood, resin, and balsam. Some plants produce rather large quantities of oil, some have very low content. It's important to note that essential oils should virtually never be applied directly to the skin until mixed in carrier oil. Carrier oils are pure gentle oils, such as sweet almond oil and apricot kernel oil that "carry" the essence to the skin.

2.3.1 Application of Essential Oils in Aromatherapy

Today, essential oils are extracted from the plants used for aromatherapy, making them very concentrated. The two basic ways aromatherapy is accomplished is by applying the oils to the skin and by inhalation. For inhalation, the incoming aromatic molecules enter the body via the nose with every breath inhaled. The effect of smell is so strong and so immediate because the olfactory nerve is in direct contact with the limbic system (Selby, 1996). The nose is structured in such a way as to capture and hold aromatic molecules and to keep the olfactory hairs (cilia) moist. The olfactory nerve cells terminate in the cilia. The olfactory hairs pick up the odour molecules and bind them to receptors. Messages are sent along neurons to the olfactory bulb and directly to the limbic brain. This ancient area of the brain is where moods, sexual urges and emotions are seated (Cooksley, 1996).

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