

## STUDY ON THE AROMA-THERAPEUTIC EFFECTS OF TEXTILES FUNCTIONALIZED BY HERBAL EXTRACTS

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This study, referring to the biologically active compounds compatible with textile materials, reveals its influence on human psychophysiological activity. In the COFUND-MANUNET III-AromaTex project, essential oils extracted from lavender, rosemary, mint, thyme were studied and selected to be used for obtaining of aroma-therapeutic effects on textiles, as well as other various effects, such as: skin hydration and anti-acne, revitalizing and reducing stress, improving of microcirculatory blood flow and cellular metabolism. In recent years, electrophysiological studies have been reported worldwide that have shown that different flavors affect spontaneous brain activities and cognitive functions that can be measured by the EEG encephalogram. The presented study contributes to the optimization of formulations which contain essential oils adapted to the conditions of technologies application for deposition and immobilization on textiles, with a particular emphasis on the desired therapeutic effect and the controlled release of essential oils. Aromatherapy application in textile industry led to a series of value-added products that give besides comfort a number of other properties (anti-acne, antimicrobial, fragrance, anti-inflammatory sedation, or soothing properties). In recent years, aromatherapeutic textiles were applied in many fields such as food, cosmetics, medicine, tobacco, textiles, leather, papermaking and pharmaceutical industries. The purpose of this chapter was to present the essential oils used in textile finishing, textile supports used for aroma finishing, embedding methods and the controlled release of essential oils.

Keywords: aromatherapy, essential oils, textile materials.

## INTRODUCTION

Aromatherapy is one of the complementary therapies which use essential oils as the major therapeutic agents to treat several diseases. The essential or volatile oils are extracted from the flowers, barks, stem, leaves, roots, fruits and other parts of the plant by various methods. It came into existence after the scientists deciphered the antiseptic and skin permeability properties of essential oils. Inhalation, local application and baths are the major methods used in aromatherapy that utilize these oils to penetrate the human skin surface.

Although medicinal plants have been used for centuries as remedies for human diseases, in Romania in recent years, they have reached a great interest due to their low toxicity, pharmacological activities and economic viability. It shows a more pronounced shift from chemical and unsustainable products to natural products that are not harmful, biodegradable and with health and wellness benefits (West and Annett-Hitchcock, 2014; Boulekbache-Makhlouf *et al.*, 2016).

Natural additives from plants can be compounds, groups of compounds, or essential oils (Boulekbache-Makhlouf *et al.*, 2016). Among natural additives, essential oils present a particular interest due to multiple benefits it shows such as antiviral, antifungal, antibacterial, antioxidant, antiparasitic, insecticidal, radical-scavenging properties, anti-inflammatory, antiseptic, germicide, healing and emollient effects.

Essential oils are made up of complex mixtures of several hydrocarbons (alcohols, terpenes, aldehydes, esters, phenols, oxides and ketones) and are obtained by conventional or advanced methods (Figure 1) (Ghosha and Chipot, 2015; El Asbahani *et al.*, 2015).

Essential oils are fat soluble and thus they have the ability to permeate the skin membranes and drained into the systemic circulation, which reaches all targets organs (Radulovic *et al.*, 2011; Kandori, 2002). Essential oils are considered “vital force” of the plants.

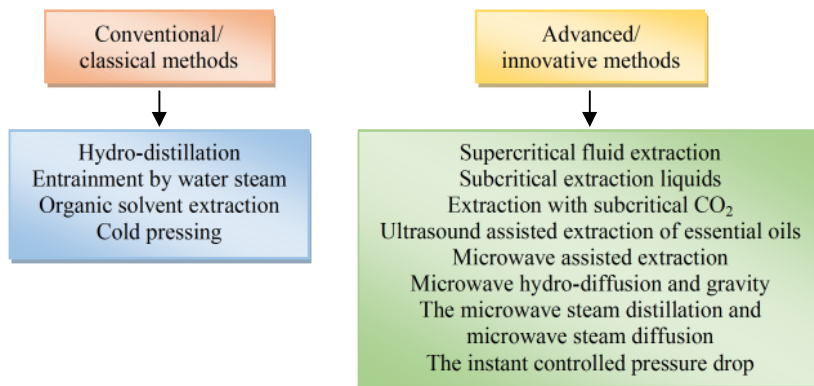


Figure 1. Extraction methods of essential oils (Cerepei 2017)





The role of these oils in plants is similar to that of the blood in the body. Fat-soluble structure of essential oils is similar to that of cells and tissues in the human body. This makes them compatible with human proteins and allows them to be easily identified and accepted by the body. Due to the fat-soluble structure and very small-size molecules, essential oils serve as transport agents that easily penetrates the cell membrane. Only one application of essential oils is sufficient to stimulate and revitalize the entire body. Recent research has shown that essential oils are able to penetrate the barrier blood/brain due to their small size ( $\leq 500$  amu) (Balabai, 1988).

## CHEMICAL COMPOSITION OF THE MAIN ESSENTIAL OILS USED IN RESEARCH

Essential oils represent less than 5% from vegetal dry matter and are complex mixtures of volatile compounds extracted from plants (Abraham *et al.*, 2013; Rachwalik *et al.*, 2012).

Chemical composition of the main essential oils used in textile industry, identified by gas chromatography (GC) and GC-mass spectrometry (GC-MS), is presented in Table 1 (Duhamela *et al.*, 2016; Skalicka-Wozniak and Walasek, 2014; Timung *et al.*, 2016; Jamali *et al.*, 2013; González-Rivera, 2016; Kumar *et al.*, 2010).

Table 1. The chemical composition of the main essential oils to be used in the project

Essential oil	Chemical type	Main compounds Composition	Composition (%)	References	
Peppermint 	Oxygenated compounds	Menthol	36	10,11,12	
		Menthone	21,24		
		Menthyl acetate	6.92		
		Eucalyptol	6.58		
		Isomenthone	4.71		
		Neomenthol	4.06		
Lavender 	Monoterpenes	$\alpha$ -Pinene	3.4%	15	
	Oxygenated monoterpenes	1,8-cineole	33.0%		
		Camphor	23.1%		
		$\alpha$ -Bisabolool	14.1%		
Rosemary 	Monoterpene	$\beta$ -Pinene	4.1%	15	
	Bicyclic	$\alpha$ -Pinene	28.2%		
	Monoterpenes				
Thyme 	Oxygenated compounds	Oxygenated compounds	14.1–77.6 0.5–27.8	13,14	
		Thymol	0.2–16.3		
	Monoterpenes	Borneol	0.2–16.3		3.8–6.6
		$\gamma$ -Terpinene			3.5–7.9
		p-Cymene			1.2–7.8
		$\alpha$ -pinene			

## INFLUENCE OF THE PHYSICO-CHEMICAL AND MICROBIOLOGICAL PROPERTIES OF ESSENTIAL OILS ON TREATED TEXTILES

Antiseptic of the respiratory, analgesic, sedative and balancing of the central and vegetative nervous system (Boucekrit *et al.*, 2016; Leimann *et al.*, 2009).

Indications: insomnia, neurasthenia, and in cases of palpitations of nervous origin of the heart, in general, in all cases of psychosomatic diseases. Due to its sedative effect it is recommended in migraines and other headaches.

Applied externally it is very effective to calm rheumatic pains, whether of joint or muscular origin. Useful in dislocations, sprains, contusions and muscular strains. As an antiseptic and healing agent it is used to wash ulcers and infected wounds, as well as in minor burns. Physicochemical properties and microbiological properties are presented in tables 2 and 3 (Cerempei, 2017; Zarrad *et al.*, 2015; Al-Jabri and Hossain, 2016).

Table 2. Physicochemical properties

Relative density	0.9400 – 1.0950
Density of alcohol	0 – 10 G.L.
Relative ph	4.50 – 8.00

Table 3. Microbiological properties

Determination	Limit (UFC / mL)	Method used
Aerobic mesophilics	105	NOM-092-SSA1-1994
Mushrooms and yeast	103	NOM-111-SSA1-1994
Escherichia coli	10	NOM-113-SSA1-1994

## FUNCTIONALIZATION OF TEXTILES WITH PLANT EXTRACTS AND APPLICATIONS IN MEDICINE

Due to essential oils that can act both at local level and through odor, they have great important applications in many fields such as food, cosmetics, medicine, tobacco, textile, leather, papermaking, pharmaceutical and perfume industries (Hu *et al.*, 2001).

Essential oils add much value to the textile materials. The most commonly used essential oil in aroma finishing is lavender essential oil due to its properties: anti-acne, antibacterial, calming, anti-inflammatory, treatment of eczema and dermatitis. The introduction of the concept of aromatherapy for textiles has brought increasing demands for consumers in terms of quality, comfort and functionality of textile products. There was a shift in their values.

Aroma finish is a process by which the textile materials are treated with bioactive systems (e.g., chitosan/essential oil, alginate/essential oil systems) and finally get the multifunctional properties such as therapeutic effects and a feeling of well-being and freshness in the wearer.

Aromatherapy textiles are used in medicine and alternative healing, home textiles, body-care textiles, household cleaning and cosmetic products.

The aromatherapy materials that first appeared on the market were socks for women who like fragrances. Hosiery and intimate apparel have been the more widely explored product categories to apply aroma finishing. In recent years, a number of companies around the world turned their attention to aromatherapy textiles. Woolmark™ is applying aroma technology to hosiery, lingerie, socks, outdoor clothing, underwear, carpeting and other interior textiles.

### The Benefits of Aromatherapy

- It's fast;
- It's efficient;
- It's discreet;
- Makes long-term transformations;
- It's nice;
- It's the fastest way to raise your personal vibration;
- Helps a lot of healing processes;
- Increases the power of medication assimilation;
- Maintains a reference standard in thinking, feelings and human experiences;
- It gives great chances to special cases, prevents various aspects of bacterial and fungal diseases;
- It's a system for treating the environment in which people work;
- Creates a pathogen-damaging environment (viruses, bacteria etc.).

## CONCLUSIONS

The complex studies carried out in this new field have revealed that bioactive compounds (essential oils) have more than a therapeutic but also ecological, social effect, contributing to the increase in the value of the products and their quality.

The techniques proposed in the project are ecological, with no environmental consequences. Ecological, biodegradable and biocompatible products will be used in the project to obtain aroma therapeutic and skin/body care textile products. The environmental impact is as low as possible, contributing to life and health quality.

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