

Effectiveness of *Piper nigrum* essential oil in the treatment of back pain

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Abstract

Essential oils are the pure “essence” of a plant, composed by a complex mixture of chemical compounds that have been studied over the years. The oils have been found to provide both psychological and physical benefits when used correctly and safely.

In Traditional Chinese Medicine, *Piper nigrum* is considered to be pungent and hot. Although its chemical constituents and respective pharmacological properties have been described by several authors, the volatile fraction is still underestimated as a therapeutic agent. The aim of this study was to evaluate the analgesic properties of the volatile fraction of *Piper nigrum* essential oil, in patients presenting back pain. Fourteen patients presenting back pain, were included in a randomized, double-blind, placebo-controlled study, in May of 2015. The patients were randomly divided into two groups, and asked to inhale a vial containing *Piper nigrum* essential oil, or a vial containing a placebo (sesame oil), for 15 minutes. A numerical pain scale was applied before and after the inhalation.

Results showed decrease of 49,91% in back pain intensity in the patients that inhaled the *Piper nigrum* essential oil, while the placebo group patients showed 2,33% of small change in back pain intensity.

Although the results are preliminary due to the limited sample size and short inhalation time, the volatile fraction of the *Piper nigrum* essential showed promising results in reducing back pain.

Keywords: black pepper, essential oil, placebo, back pain

Introduction

Today aromatherapy is in greater demand than ever before. Besides the clinical and home use, Spas are opening throughout the world catering to people of all walks of life. Rene-Maurice Gattefossé, a French chemist, published a book in 1937 about the anti-microbial effects of the oils and first used the word, “Aromatherapy”. In 1964, Dr. Jean Valnet, a French medical doctor, was impressed by Gattefossé's research and began experimenting in his clinic with essential oils as medical therapy. Impressed by Dr. Valnet's work, Margaret Maury began to apply Valnet's research into her beauty therapy, customising beauty treatments for her clients individually. She was the first person to set up Aromatherapy clinics in Switzerland, London and France that introduced the use of oils to maintain healthy, youthful skin, now known as the day spa. Essential oils are a complex mixture of low molecular weight compounds, from a variety of chemical

classes, extracted from various parts of aromatic plants, such as stems, flowers, leaves and roots [1]. Small volatile molecules, such as terpenes, enter the blood stream through the nasal or lung mucosa. These compounds can also cross the blood-brain barrier and may act on the Central Nervous System, by binding into receptor sites or interacting with enzyme systems. Terpenes, such as linalool, have been found in the blood of rodents exposed to essential oils by inhalation [2].

Chemical analysis of *Piper* species have demonstrated that it contains diverse secondary metabolites, including lignans, neolignans, terpenes, chalcones, flavones, alkaloids, amides and propenyl phenols, corresponding to diverse biological activities such as antioxidant, immunomodulatory, anti-inflammatory, analgesic, antinociceptive, antipyretic, anticoagulant, antifungal, anticarcinogenic, gastroprotective, anxiolytic and anti-depressive [3, 4, 5, 6, 7, 8].

According to Chinese Medicine, *Piper nigrum* is pungent [9], and the nature of its temperature is hot, consequently its behavior is to warm up the body. The objective of this work was to evaluate the effectiveness of the volatile fraction of *Piper nigrum* (black pepper) essential oil, in treating patients presenting back pain.

Methods

The study was conducted according to the principles of the Helsinki Declaration and approved by the ethics committee of the Hospital-School of the University Fernando Pessoa. All participants were volunteers and signed a written informed consent to participate in the study.

In this study, 14 patients presenting back pain were recruited at the Physiotherapy Unit at the Hospital-School of the University Fernando Pessoa, in May 2015. A group of patients that inhaled essential oil (n=7) and a placebo (n=7) group were compared in a randomized, double-blind, placebo-controlled trial. The *Piper nigrum* essential oil and placebo (sesame oil) were placed in identical vials, marked with the code A and B, respectively. Both patient and investigator weren't aware of the code significance. The inclusion criteria were being over 18 years of age, presenting back pain and the availability to participate in the study. The exclusion criteria were pregnant women or nursing mothers, pain medication in the last 8 hours, active pathologies of the superior respiratory tract, medication that could interact with the olfactory system.

The patients were previously informed about the objectives of the study and its possible risks, and asked to read and sign an informed consent. Afterwards, a basic questionnaire was applied in order to characterize the patient. The patient was then asked to indicate the intensity of the pain, in a numerical pain scale, numbered successively from 0 to 10, where the rating 0 corresponded to "No pain", and 10 to "Maximum pain" (maximum intensity of imaginable pain) [10]. Finally, patients were asked to inhale the attributed vial for 15 minutes. The numerical pain scale was applied again after inhalation.

For this purpose, statistical analysis was performed with SPSS Statistics 22 (IBM Corp., Armonk, NY, USA). This analysis focused in the back pain evolution in the two groups, essential oil (A) and placebo (B).

Results

Sample Characterization

The average patient age was 39,29 years, with a standard deviation of 15,65, the minimum was 21 and the maximum was 73 years. In group A (essential oil), the average patient age was 39,00 years with a standard deviation of 19,07, the minimum was 21 years and the maximum was 73 years. In group B (placebo), the average patient age was 39,57 years, with a standard deviation of 12,91, the minimum age was 24 years and the maximum was 61 years.

From the 14 patients, 64,29% were female and

35,71% were male. Group A was composed of 85,71% female patients and 14,29% male patients. Group B was composed of 42,86 % female patients and 57,14% male patients.

Back Pain Intensity

Regarding the back pain intensity before inhalation, taking into consideration all the patients, the average was 6,07 ±1,49, with a minimum value of 3 and a maximum value of 8. In group A, the average was 5,71 ±1,70, with a minimum value of 3 and a maximum value of 8. In group B, the average was 6,43 ±1,27, with a minimum value of 5 and a maximum value of 8 (Fig. 1).

Concerning the back pain intensity after inhalation, taking into consideration all the patients, the average was 4,57 ±2,38 with a minimum value of 1 and a maximum value of 8. In group A, the average was 2,86 ±1,77, with a minimum value of 1 and a maximum value of 6. In group B, the average was 6,29 ±1,50, with a minimum value of 4 and a maximum value of 8.

Statistical analysis

The results presented in Figure 1, express the back pain evolution in group A (essential oil) and B (placebo). Taking into account the average values of back pain intensity before (T0) and after inhalation (T1), it was observed a reduction of 49,91% in pain

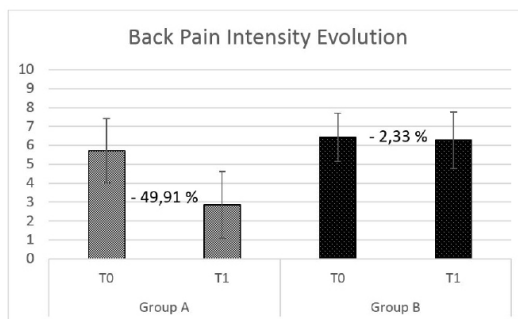


Figure 1 – Back pain intensity evolution in group A (essential oil) and group B (placebo), before and after inhalation, respectively.

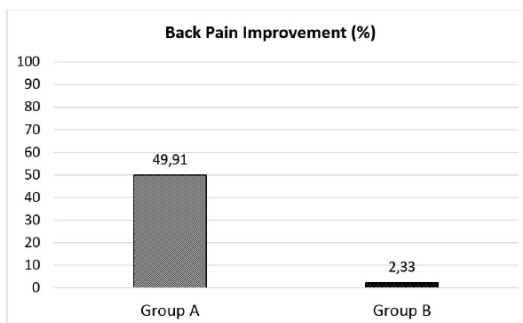


Figure 2 – Back pain improvement, in percentage, in group A (essential oil) and group B (placebo) after inhalation.

intensity in group A and 2,33% in group B. This result is clearly presented in Fig. 2.

Discussion

Essential oils and aromatherapy have been used in the care of women for centuries. The published research has used small samples and often combines other complementary therapies with aromatherapy. Aromatherapy continues to gain popularity, mainly among nurses, who desire to use a holistic

approach in patient care. The intent of aromatherapy oils is to maintain calm, balance, and rejuvenate mind, body, and spirit. Despite these positive beginnings research into aromatherapy is still in its infancy, not only with regard to the absorption of essential oils but also due to their unique therapeutic properties. This is highlighted by the disparity between the type and or blend of essential oil used and who chose the oils ⁽¹¹⁾.

The present work concerning the effect of *Piper nigrum* on back pain, follows restrict study conditions in a randomized, double-blind, placebo-controlled study in order to obtain more adequate and correct evaluations and conclusions.

Piper nigrum is one of the most popular spices in the world, and its essential oil has been used in traditional medicine systems for centuries. The presence of active volatile compounds such as carophyllene, 1,8-cineol, sabinene, linalool, among others, appoint this oil as an important ally of modern medicine ^(7, 8).

In this study, a group of patients that inhaled *Piper nigrum* essential oil and a placebo group were compared in a randomized, double-blind, placebo-controlled trial, at the Hospital-School of the Fernando Pessoa University, Portugal.

The sample was constituted mainly by women (64,29%), and patients ranged from 21 to 73 years of age.

The back pain intensity before inhalation varied extremely in the diverse patients, with the average intensity of 6,07, a minimum value of 3 and a maximum value of 8. The back pain intensity after inhalation varied in the diverse patients, with the average intensity of 4,57, a minimum value of 1 and a maximum value of 8.

From statistical analysis, it was demonstrated that patients that inhaled *Piper nigrum* essential oil presented superior decrease in the intensity of back pain than the placebo group (Figs. 1 and 2).

This result is in consonance with the analgesic properties of *Piper nigrum* essential oil, since it may interact with diverse pain receptors in the human body, such as opioid and cannabinoid receptors. Studies have demonstrated the analgesic potential of linalool, a chemical constituent of *Piper nigrum* essential oil, and its relation with opioid analgesia ^[12, 13]. β -caryophyllene, a chemical constituent of *Piper nigrum* essential oil, has proven to be an agonist of cannabinoid receptor 2 (CB2) by Klauke and colleagues in 2014 ^[14].

The results are also supported by Traditional Chinese Medicine. According to this Medicine the essential oil of black pepper belongs to the water element. The energy of this element tones the kidneys and nourishes the bones throughout the body. In this context, *Piper nigrum* essential oil is traditionally considered to be effective in the treatment of back pain.

It is important to refer that, due to time constrains, this study was performed with a small sample size and a short inhalation time, limitations that should be adjusted in further studies. However, the results were very promising and opened new perspectives

regarding the therapeutical use of essential oils.

Acknowledgements

The authors acknowledge the support and assistance of the Physiotherapy Unit staff, at the Hospital-School of the University Fernando Pessoa, in recruiting patients for this study. The authors also acknowledge Fundação Fernando Pessoa (FFP), Fundação para a Ciência e Tecnologia (FCT) and the Fundo Europeu de Desenvolvimento Regional (FEDER), through COMPETE 2020 – Programa Operacional Competitividade e Internacionalização (POCI).

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