

# Essential oils as a source of bioactive molecules

## Introduction

Essential oils (EOs) are complex mixtures of volatile organic compounds produced in the form of secondary metabolites in plants that can contain about 20-60 components in very different concentrations.<sup>1,2</sup> They are characterized because they contain two or three main components in relatively high concentrations (20-70%) compared to other components present in minimal amounts.<sup>3</sup> They may consist of monoterpenes, sesquiterpenes, and phenylpropanes, which may contain different functional groups (alkanes, alcohols, aldehydes, ketones, esters and acids).<sup>1,2</sup>

In nature, EOs plays an important role in the protection of plants such as antibacterials, antivirals, antifungals, insecticides and also against herbivores, reducing their appetite for these plants. They are also responsible for the characteristic smell of plants, which can attract some insects to favor the dispersal of pollen and seeds, or repel other undesirable ones.<sup>3</sup> Around 3000 of the essential oils are known and 10% of them having commercial importance in the cosmetic, food and pharmaceutical industries, and in agriculture.<sup>3,4</sup> Therefore, they are generally recognized as safe by the FDA (Food and Drug Administration). Its composition can vary considerably between species of aromatic plants and varieties and within the same variety of different geographical areas.<sup>1</sup>

The EOs has a wide application in pharmacology, especially for their antimicrobial properties,<sup>5</sup> the hydrocarbon and oxygenated monoterpenes are able to destroy the cellular integrity and therefore inhibit respiration and transport of ions.<sup>6</sup> The terpenes; Pine, myrcene, limonene, Ocimene, linalool, and verbenum are related to the antimicrobial activity of the essential oil of *Bidenspilosa*.<sup>6</sup> Essential oils with an abundance of phenylpropanoids and phenols inhibit platelet aggregation. The  $\alpha$ -terpineol has cytotoxic properties, D-limonene, anticancer in male rats,<sup>4</sup> perillic alcohol used in the treatment of different types of cancer, which is found in Phase I and II clinical studies,<sup>7</sup> antiseptic, anti-inflammatory, antioxidant, antifungal, antidepressant, aphrodisiac and other properties present in a greater or lesser degree in all oils.<sup>8,9,3,4</sup> They are also used for their relaxing or stimulating effects on the Central Nervous System, bronchial, urinary infections and those caused by cuts and burns.<sup>3,10</sup>

Many studies carried out with essential oils have reported that they have a broad microbiological activity such as: antifungal,<sup>11</sup> antibacterial<sup>19,12,13</sup> acaricide,<sup>14</sup> insecticide<sup>15,16</sup> antimalarial,<sup>17</sup> quorum sensing<sup>18</sup> and antiviral.<sup>19</sup> They also have properties such as: analgesics,<sup>6</sup> antipyretics,<sup>20</sup> anti-inflammatories<sup>6,21</sup> anticonvulsants,<sup>22</sup> as an estrogenic agent,<sup>23</sup> hepatoprotective,<sup>24</sup> anticancer<sup>25</sup> and antimutagenic.<sup>26</sup> They are also used in the treatment of gastric ulcer and different types of cancer.<sup>3</sup> The EOs has shown antiviral activity against species of the *Flavivirus* genus. In fact, it has been shown that the EOs of *Lippiaoriganoides*, *Oreganumvulgare*, *Lippiaalba* and *Artemisia vulgaris* have an antiviral effect against the yellow fever virus.<sup>27</sup> Nowadays, there are reports of the antiviral activity of essential oils against the dengue virus. Authorssuch as Meneses et al.<sup>27</sup> Pajaro Castro et al.<sup>28</sup> Ocazonez et al.<sup>29</sup> Meneses et al.<sup>30</sup> Duschatzky et al.<sup>31</sup> and García et al.<sup>32</sup> has revealed the antiviral properties of these natural products. In the field of agriculture, EOs have been recognized for their repellent activity<sup>33,34</sup> insecticide and fumigant.<sup>28,35,36</sup>

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In summary, EOs is an excellent source of metabolites with a wide range of bioactive molecules that can be used in different areas of our lives, because they have been shown to be safe for humans and the environment.<sup>37-40</sup>

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## Conflicts of interest

Author declares that there are no conflicts of interest.

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