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Pepper pseudocaryophyllus (Myrtaceae): An integrative review

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ABSTRACT
The *Pimenta pseudocaryophyllus* (Gomes) Landrum among the species of the genus Mytaceae is the only Brazilian representative. Craveiro-do-mato, as it is popularly known in the Southern Region of Brazil, is an aromatic tree species, with popular use for medicines, condiments, and flavoring of beverages due to its flavor very similar to cloves. The Brazilian species has been widely used in traditional medicine for the treatment of various ailments, in addition to being linked to other traditional practices, such as the use of wood for internal carpentry works. However, there are not enough studies on its potential through biological activity. This study highlighted the botanical characteristics as well as the importance of expanding research regarding the chemical and biological activities of the species *Pimenta pseudocaryophyllus* (Gomes) Landrum.

Keywords: *Pepper pseudocaryophyllus*, Medicines.

1 INTRODUCTION

The Myrtaceae family is composed of vegetation considered pantropical, that is, they belong to the tropical regions of some continents. With about 140 genera, approximately 3000 species and two subfamilies classified as Myrtoideae and Leptospermoideae, its location stands out in the Americas and Australia. In Brazil, its varied number of species occupies a large part of the Atlantic Forest and, some rarely, the Cerrado (Silva; Mazine, 2016). Plants in this group are classified as angiosperms, considered the second largest Brazilian biome (Ribeiro et al., 2023).

Among the 140 genera of this family, the genus *Eucalyptus* stands out, which is considered the most famous group, its use in modern medicine is vast for having the ability to treat diseases related to the respiratory system, since it has expectorant, anti-inflammatory, and antiseptic properties (Hua et al., 2022).

The representatives of the Myrtaceae family have greater notoriety for the fact that they produce abundantly the essential oils that are produced due to the existence of secondary metabolites in their composition (Silveira, 2023). This group of plants has a great variability of secondary compounds, but its main composition is made up of tannins, flavonoids, and terpenes.

One of the groupings also relevant belongs to the genus *Myrcia, in which among the main species are:* Myrcia *uniflora and* Myrcia *palustris*. The first is popularly known as stone-ume-caá or vegetable insulin, and helps in the treatment of patients suffering from diabetes through the infusion of its dried leaves. The second, on the other hand, has the vernacular of pitangueira-do-mato, culturally it is used to treat dyspepsia and other gastric problems. In addition, its essential oil has antimicrobial activity against *Staphylococcus aureus* and *Bacillus subtílis* (Santos, 2019).

Pepper species play multiple roles in everyday life, whether in the medicinal, gastronomic or pharmacological field. In addition, they are present in aromas, flavors or even in colors that are sometimes vivid and, therefore, have been part of societies for millennia (D'Angelis, Negrelle, 2021).

Most species belonging to the genus *Pimenta* have arboreal characteristics, reaching heights of up to 20 meters. Some variations within this genus can manifest in the form of shrubs. The geographic distribution of these species is mainly concentrated in the Caribbean and Central America, with the exception of the species *Pimenta pseudocaryophyllus,* which is native to the southeastern region of Brazil (Paula *et al*., 2010).

1.1 GENUS *PEPPER*

The genus *Pimenta* has the following general characteristics: Indumentum and hair: The indumentum can vary between species, and density is useful to distinguish them. The hairs can be unicellular, simple or symmetrically dibrachial, with whitish, yellowish or reddish-brown hues. Leaves: The leaves are generally persistent, usually leathery, although in some situations they may be submembranous. The lateral ribs, in most cases, are prominent and often form a right angle with the midrib (Paula *et al.*, 2008)

Peppers are notable for their ability to cause sensations of heat and stinginess in the mouth when consumed. These sensations are predominantly attributed to two groups of chemical compounds: capsaicinoids and volatile compounds (Pinto; Dick; Maidens, 2013).

Capsaicinoids are mainly responsible for the heat of chili peppers. Capsaicin is the most notable capsaicinoid and is responsible for much of the burning sensation we feel when consuming chili

peppers. However, other capsaicinoids, such as dihydrocapsaicin and nordihydrocapsaicin, also obeyed this sensation. The concentration of capsaicinoids varies from one variety of pepper to another, and even between fruits on the same plant. This variability is one of the reasons why some peppers are much spicier than others (Rivera, 2018).

In addition to capsaicinoids, chili peppers also contain a variety of volatile compounds that have created for their distinctive flavor. These compounds include terpenes, aldehydes, ketones, and alcohols, which impart aromatic, floral, and citrus notes to pepper varieties. Volatile compounds are responsible for the aromas we associate with peppers, from the fruity and sweet aroma of habanero peppers to the earthier aroma of jalapeño peppers. The presence of these compounds contributes significantly to the sensory richness of peppers, making them an essential ingredient in many cuisines around the world (Cruz and Carneiro, 2012).

Peppers, with their wide variety of colors, shapes, and levels of spiciness, are more than just spices to flavor foods. They also have a fascinating biological activity that has aroused the interest of the scientific community. The secret behind the "hotness" of chili peppers lies in a substance called capsaicin. This molecule, found mainly in the spicier varieties, plays a key role in various biological responses. Studies show that capsaicin may have influential effects on human health (Brito; Silva; Fluminhan, 2019).

1.2 CHARACTERISTICS OF THE SPECIES

Pimenta pseudocaryophyllus (Gomes) Landrum is the only Brazilian representative species of this genus of *Myrtaceae*. Its use is popularly used in the treatment of ailments, condiment and flavoring of beverages due to its flavor very similar to cloves. To a lesser extent, it is used in carpentry and urban afforestation. This biological heritage is a source of genetic, symbolic, and economic material resources for these peoples, who, in turn, possess rich knowledge of the natural world (D'angelis, A. S. R.; Negrelle R. R. B., 2014).

The Brazilian species is popularly known as Cataia ("leaf that burns" in Tupi-Guarani) on the coast of Paraná and in the Ribeira Valley (SP); tea-de-bugre, carnation-of-the-wood, laurel, carnation laurel, pau-cravo - Paraná and São Paulo; pink peel, lemon from the state of Goiás; tea-of-the-earth, cloves-of-the-earth, laurel-of-the-earth, false laurel, false-carnation - São Paulo; Craveiro-Paraná. (D'angelis, A. S. R.; Negrelle R. R. B., 2014).

The carnation, *Pimenta pseudocaryophyllus*, is an aromatic tree species of 4-10m in height, endowed with a very characteristic rounded crown. Trunk, usually erect 10-30cm in diameter, with fissured bark. Axillary inflorescences in simple dicases or composed with two to three very fragrant white flowers. Fruit, subglobose berry, dark when ripe and containing one to two seeds. It blooms from

October to January and bears fruit from May to September. It produces a moderate amount of viable seeds annually (Brandão *et al.*, 2006)tag.

There is also the *Pimenta pseudocaryophyllus* var. *pseudocaryophyllus*, which is a small tree typical of forests and mountainous areas of southeastern Brazil; *Pimenta pseudocaryophyllus* var. *Fulvescens* (A. P. de Canolle) Landrum is a small tree or shrub that is located in dry regions in south-central Brazil, with some specimens in Bolivia; and *Pimenta pseudocaryophyllus* var. *Hoehnei* (Burret) Landrum is a small tree confined to the coastal forest region of southeastern Brazil, from Santa Catarina to São Paulo. (Paula, J.A.M *et al.*, 2010).

The three varieties differ especially by the size of the leaves and petiole, with the largest measurements found in Pimenta pseudocaryophyllus var. fulvescens, and the smallest in Pimenta pseudocaryophyllus var. hoehnei. They are also differentiated by the number of flowers in the inflorescences, and in the *varieties pseudocaryophyllus* and *fulvescens* the inflorescences are in a dicasium or panicle of usually seven to fifteen flowers, while in the Hoehnei variety the inflorescences are in a digase with a maximum of three flowers (Landrum, 1986., Paula, J.A.M et al., 2010).

This family has a diversity of species with medicinal applications already studied. This statement is illustrated by the work of Gottlieb et al. (1970), Suárez et al. (2000), Fernández et al. (2001), García et al. (2004), Silveira et al. (2005), Apel et al. (2006) and Biavatti et al. (2007), (Brandão et al., 2006).

The species *Pimenta pseudocaryophyllus* (Gomes), L. R. Landrum has been widely used in traditional medicine for the treatment of various diseases, in addition to being linked to other traditional practices, such as the use of its fruits to season food and wood for internal carpentry works (Morgante *et al.*, 2010). Its leaves are widely used by the population of the interior of the state of Minas Gerais, Brazil, in the preparation of anti-flu teas (Paula *et al.,* 2008) and, in the municipality of Campos do Jordão, São Paulo, Brazil, in the preparation of soothing teas that regulate digestion and menstruation (Nakaoka-Sakita *et al.*, 1994).

Another important use of the species, which began in the 80s, was the flavoring of brandy with leaves of the plant, now commercialized along the coast of the states of Paraná and São Paulo. In general, the use of the species is based on extractive action in forest remnants where it occurs spontaneously, a fact that can compromise the population dynamics and the maintenance of the natural stock of the species, in addition to the quality of the product, since the chemical composition is influenced by climatic and edaphic variations (Morgante *et al*., 2010).

The berries of the species, after being dried, are used as a substitute for cloves in jams and jellies, according to a custom dating back to the mid-1800s (Lullez, 1991), due to the similarity of smell and flavor of these two species (Farias, 2009). Since the nineteenth century there have been correlations between these species, and the specific name of the plant itself refers to the similarity

between them, pseudocaryophyllus means something like "false cloves", given that the scientific name of cloves is Caryophyllus aromaticus (Farias *et al.*, 2009; Neves *et al.*, 2009).

Carnation wood is heavy (density 1.00 g/cm3), hard, with a fine to medium texture, used by the small dimensions available only locally for internal carpentry works, as well as for firewood and charcoal. The tree has ornamental qualities that recommend it for urban afforestation, especially for narrow streets and under electrical networks. It is also recommended for energy and preservationist reforestation (Lorenzi, 1998).

2 FINAL THOUGHTS

There is little study about the species analyzed in this study. An attempt was made to elucidate the taxonomic classification and importance of *Pimenta pseudocaryophyllus* (Gomes) Landrum, not only in the botanical context, but also in relation to potential applications in several areas, including medicine, gastronomy and biodiversity conservation.

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