



MEDICINAL AND AROMATIC (ODORIFEROUS) PROPERTIES OF MUÑA (*MINTHOSTACHYS MOLLIS*)

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ABSTRACT

Objective: The purpose of the research is to provide relevant scientific information on the medicinal and aromatic properties of muña.

Theoretical background: Based on the literature on the medicinal and aromatic properties of muña (*MINTHOSTACHYS MOLLIS*).

Method: It was a research with quantitative approach, which consisted of a bibliographic search of articles, scientists and theses in the database such as Google Scholar, Scimedirect, Elsevier, Scopus, Web of Science, Scielo, Redalyc, Doaj and Dialnet, second specialty, master's and doctoral theses, which were grouped and the bibliographic background was organized in a matrix according to the type of research, methodology and study participants (species).

Results and conclusions: Research results that evaluate and demonstrate the medicinal, aromatic, antioxidant and essential oil properties of muña are shown.

Originality/value: It shows the medicinal and aromatic properties of muña (*MINTHOSTACHYS MOLLIS*) for being a very powerful herb in the treatment of diseases to improve health. Its use in health is very beneficial, thanks to the properties it contains such as antibacterial and antitumor activity of the essential oil, as a natural medicine, insecticides, biological pest control, among other benefits.

Keywords: Oil, Antibacterial, Anthelmintic, Oil, Insecticide, Medicine.

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PROPRIEDADES MEDICINAIS E AROMÁTICAS (ODORÍFERAS) DA MUÑA (*MINTHOSTACHYS MOLLIS*)

RESUMO

Objetivo: O objetivo da pesquisa é fornecer informações científicas relevantes sobre as propriedades medicinais e aromáticas da *Muña*.

Fundamentação teórica: Baseada na literatura sobre as propriedades medicinais e aromáticas da *muña* (*MINTHOSTACHYS MOLLIS*).

Método: Trata-se de uma pesquisa com abordagem quantitativa, que consistiu em um levantamento bibliográfico de artigos, trabalhos científicos e teses em bases de dados como Google Scholar, Sciencedirect, Elsevier, Scopus, Web of Science, Scielo, Redalyc, Doaj e Dialnet, segundo especialidades, teses de mestrado e doutorado, que foram agrupadas e o acervo bibliográfico foi organizado em uma matriz de acordo com o tipo de pesquisa, a metodologia e os participantes do estudo (espécies).

Resultados e conclusões: São apresentados os resultados das pesquisas que avaliam e demonstram as propriedades medicinais, aromáticas, antioxidantes e do óleo essencial da *muña*.

Originalidade/valor: Mostra as propriedades medicinais e aromáticas do *muña* (*MINTHOSTACHYS MOLLIS*) como uma erva muito poderosa no tratamento de doenças para melhorar a saúde. Seu uso na saúde é muito benéfico, graças às propriedades que contém, como a atividade antibacteriana e antitumoral do óleo essencial, como medicamento natural, inseticidas, controle biológico de pragas, entre outros benefícios.

Palavras-chave: Óleo, Antibacteriano, Anti-Helmíntico, Inseticida, Medicamento.

PROPIEDADES MEDICINALES Y AROMÁTICAS (ODORÍFEROS) DE LA MUÑA (*MINTHOSTACHYS MOLLIS*)

RESUMEN

Objetivo: El propósito de la investigación es proporcionar información científica relevante sobre las propiedades medicinales y aromáticas de la *muña*.

Referencial teórico: Basados en la literatura que aborda las propiedades medicinales y aromáticas de la *muña* (*MINTHOSTACHYS MOLLIS*).

Método: Fue una investigación con enfoque cuantitativo, que consistió en la búsqueda bibliográfica de artículos, científicos y tesis en la base de datos como Google Académico, Sciencedirect, Elsevier, Scopus, Web of Science, Scielo, Redalyc, Doaj y Dialnet, tesis de segunda especialidad, maestría y doctorado, las cuales fueron agrupadas y se organizaron en una matriz los antecedentes bibliográficos de acuerdo al tipo de investigación, la metodología y los participantes de estudio (especies).

Resultados y conclusiones: Se muestran resultados de investigaciones que evalúan y demuestran las propiedades medicinales, aromáticas, antioxidantes y aceites esenciales de la *muña*.

Originalidad/valor: Da a conocer las propiedades medicinales y aromáticas, la *muña* (*MINTHOSTACHYS MOLLIS*) por ser una hierba muy poderosa en el tratamiento de enfermedades para mejorar la salud. Su aprovechamiento en la salud es muy beneficioso, gracias a las propiedades que contiene como la actividad antibacteriana y antitumoral del aceite esencial, como medicina natural, insecticidas, el control biológico de plagas, entre otros beneficios.

Palabras clave: Aceite, Antibacteriano, Antihelmíntico, Insecticida, Medicina.

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1 INTRODUCTION

The increase of the population on a global scale has caused an increase in the incidence of diseases caused by bacteria, fungi, viruses among others, therefore plant biodiversity provides alternatives of insecticides, antibacterials, medicinal, due to its chemical components (Carhuapoma et al., 2009; Gleiser et al., 2007). Under these considerations there is the general understanding of medicinal plants, which involves integrating various perspectives. One of these primary perspectives involves investigating the properties of plants, identifying components with proven activity and potentially integrating them into Western medicine. On the other hand, it highlights the importance of maintaining the ancestral practice of using plants in their most natural form, respecting their traditional uses and differentiating them from simple modern adaptations (Salaverry, 2005).

Based on these considerations, the muña, whose scientific name is *MINTHOSTACHYS MOLLIS*, is a shrub plant, with a wide variety of medicinal properties, which grows between 2500 and 3500 masl naturally in the Andes and belongs to the family of Labialadas, its leaves and flowers are used as natural and traditional medicine in infusions and has digestive, antibacterial, anthelmintic, antidiarrheal properties, in the treatment of respiratory, urinary and analgesic system infections, also demonstrating its antibacterial and insecticide effect (Alcalá-Marcos et al., 2011; Hammond et al., 1998; Ry, 2005).

The wrist is frequently used by the inhabitants, it is ingested as mentioned above in addition to infusion to treat various digestive disorders (such as diarrhea, heartburn, halitosis, indigestion and colic) and respiratory diseases (such as influenza, bronchitis and asthma), among other ailments, in addition the leaves are mainly composed of flavonoids, tannins, phenols and pulegone (Bustamante-Paulino et al., 2021).

On the other hand, the compounds of the wrist are the essential oil, saponin, tannins, alkaloids, glycosides, sterols, carbohydrates. Likewise, the wrist contains high content of Calcium (Ca), Phosphorus (P) and Iron (Fe), menthol (National Institute of Health, 2009) cited by (Angeles & Rangel, 2019). And according to other researchers, 18 main compounds were found in the essential oil of *MINTHOSTACHYS MOLLIS*, the most prominent being carvacril acetate, carvacrol and chin. In addition, the essential oil showed a strong antioxidant activity (Rojas-Molina et al., 2024).



2 THEORETICAL FRAMEWORK

2.1 MUÑA (*MINTHOSTACHYS MOLLIS*)

Muña, an herb that grows spontaneously in the Andes, has been used since ancient times for natural treatments in the form of tea, or mattes taking advantage of its leaves and flowers for their digestive and analgesic qualities. It belongs to the family Lamiaceae, genus *Minthostachys* and its scientific name is *MINTHOSTACHYS MOLLIS*. This botanical family is widely diverse, comprising 236 genera and 7173 species (Pawer et al., 2018). This plant measures between 0.9 and 1.5 meters in height. Its upper part is densely leafy, with leaves arranged in opposite ways and with serrated edges. The petioles and the underside of the leaves are covered with hairs, where the greatest amount of essential oils accumulate (Cano, 2007). The wrist is also considered a shrub. Its habitat ranges from 500 to 3,500 m.a.s.l. In Peru it is found in the Andean Region, Amazonas, Arequipa, Cajamarca, Cuzco, Huánuco, Junín, Lima, La Libertad, Puno and Piura (Indecopi, 2014).

This plant has four known varieties: *Minthostachys andina*, *MINTHOSTACHYS MOLLIS*, *Minthostachys setosa* and *Minthostachys tormentosa* and is commonly used in the preparation of infusions, decoctions, oils and as a seasoning in several recipes. In addition, it stands out for its high calcium content, with 2,237 mg in 100 g of the edible part of the plant (Liceras & Alzamora, 2017).

On the other hand, this plant has been known since pre-Inca ancestral times, its medicinal and food usefulness is recognized, in addition to its ability to protect the tubers from pests during storage (Cano, 2007).

2.2 ESSENTIAL WRIST OILS

They are concentrates of raw material of aromatic plants, constituted by volatile and odorous phytochemicals, their chemical composition is complex, originating from the secretory tissues that are stored in glandular hairs, schizogenic cavities (Carhuapoma, 2007). These essential oils extracted from aromatic and medicinal plants of the wrist (*MINTHOSTACHYS MOLLIS*), contain chemical compounds such as terpenoids, pulegone, chin carvone, limonene, menthol, which have bactericidal properties, in addition to isomentone, antioxidants, antifungal, antimicrobial, phenolic compounds that are responsible for the blue coloring with ferric



chloride of bacterial activity (Carhuapoma et al., 2009; Marquina & Rodríguez, 2019; Torrenegra-Alarcón et al., 2016).

The production of essential oils is carried out by a variety of methods such as the process of distillation by dragging with water vapor using the Clevenger equipment, by distillation (Alcalá-Marcos et al., 2011; Gleiser et al., 2007). Also, the factors that affect the distillation process are the extraction time and the proportion of amount of plant material and distilled water that ranges between 1:3 and 1:5 to determine the process performance variable (Rojas-Molina et al., 2024).

Once extracted, the essential oil is analyzed in laboratories by gas chromatography based on the retention time of some components by quality standards (Cano et al., 2008). These essential oils, rich in compounds such as carvacrol and thymol, show effectiveness against the growth of *Candida*, both in its planktonic and sessile forms. A reduction in hyphae production was also observed, suggesting its therapeutic potential in the treatment against *Candida* spp (Ruiz-Duran et al., 2023).

On the other hand, the aromatic properties of the muña (*MINTHOSTACHYS MOLLIS*, ruyaq muña) as an aromatic plant is used in the conservation of the potato against weevils and to avoid the development of shoots, also as a medicinal plant (Linares-Otoya, 2020),

According to Carhuapoma (2007) the muña has medicinal properties, is a bactericide against gastritis, helps in conventional medical treatment, through the essential oil that helps to eliminate *Helicobacter pylori*, which is a bacterium causing gastritis and helps to protect the walls of the stomach. They also have beneficial therapeutic properties for respiratory and digestive diseases, and can be used as food preservatives due to their antimicrobial activity (Carhuapoma et al., 2009).

3 METHODOLOGY

The research was based on a literature review search (Casa-coila et al., 2022; Usman et al., 2024) that involved the collection of information from scientific articles through databases and academic search engines such as Google Scholar, Sciencedirect, Elsevier, Scopus, Web of Science, Scielo, Redalyc, Doaj and Dialnet, second specialty thesis, master's degree and doctorate. Subsequently the studies have been selected and the bibliographic background, the type of research, the methodology, the study participants (species) were organized in a matrix. Table 1 details the sample of scientific papers and theses for the review. The bibliographic references of the selected articles were analyzed in order to rescue other studies. The results of



the study were that 31 documents were reviewed which are 23 scientific articles, 08 doctoral theses, master's and second specialty. The documents reviewed provide a solid basis to support the findings.

Table 1

Detail of the sample that is part of the review

Country	Author (s) year	Type research	of Methodology	Participants (species)
Argentina	Fournet <i>et al.</i> (1996)	Article	Experimental	Muña, Bolivian plants traditionally
	Banchio <i>et al.</i> , (2007)	Article	Experimental	<i>MINTHOSTACHYS MOLLIS</i> , <i>Liriomyza huidobrensis</i>
	Goleniowski <i>et al.</i> (2006)	Article		Medicinal plants
	Van <i>et al.</i> (2014)	Article	Ward's method as an agglomeration technique	<i>MINTHOSTACHYS MOLLIS</i> Griseb
Colombia	Sarmiento <i>et al.</i> (1999)	Article	Cross section	Muña, diversos vegetales, personas
	Ruiz-Duran <i>et al.</i> (2023)	Article	Experimental	Plantas: <i>origanoides</i> y <i>MINTHOSTACHYS MOLLIS</i>
	Suárez <i>et al.</i> (2011)	Article	Experimental	<i>MINTHOSTACHYS MOLLIS</i>
	Torrenegra-Alarcón <i>et al.</i> (2016)	Article	Experimental (Conventional hydrodistillation)	<i>MINTHOSTACHYS MOLLIS</i> (muña)
Chile	Gleiser <i>et al.</i> (2007)	Article	Experimental	<i>MINTHOSTACHYS MOLLIS</i> , mosquitos de las especies (<i>culex quinquefasciatus</i>)
	Ceballos & Perea (2014)	Article	Interviews	84 Medicinal and aromatic plant species
	Rojas-Molina <i>et al.</i> (2024)	Article	Experimental	Typhus leaves (<i>MINTHOSTACHYS MOLLIS</i> [HBK] Griseb.),
Peru	Bustamante-Paulino <i>et al.</i> , (2021)	Article	Mixed: qualitative and quantitative (interviews and experimental)	10 working women Pacha-muña
	Linares-Otoya (2020)	Article	Review	Muña” peruana <i>MINTHOSTACHYS MOLLIS</i> (Benth.) Griseb y <i>Minthostachys setosa</i> (Briq.) Epling.
	Alegre <i>et al.</i> (2017)	Article	Experimental	<i>Annona muricata</i> , <i>MINTHOSTACHYS MOLLIS</i> , <i>Lupinus mutabilis</i> , y <i>Chenopodium quinoa</i>
	Carhuapoma <i>et al.</i> (2009)	Article	Experimental: water vapor drag distillation	<i>MINTHOSTACHYS MOLLIS</i> (Muña), <i>Helicobacter pylori</i> , <i>Shigella Dysenteriae</i> , <i>Salmonella typhi</i> y <i>Pseudomonas aerugi nosa</i> ..
	Rojas <i>et al.</i> (2010)	Article	Quantitative Invitro Experimental	Medicinal plants
	Pawer <i>et al.</i> (2018)	Article	Comparative Descriptive	<i>MINTHOSTACHYS MOLLIS</i> (muña)
	Mattos <i>et al.</i> (2013)	Article	Quantitative Experimental	Muña and cuyes
	Alcalá-Marcos <i>et al.</i> (2011)	Article	Experimental	<i>MINTHOSTACHYS MOLLIS</i> (muña), <i>Candida albicans</i> , Fluconazol



		Kirby-Bauer method.	
<u>Cano et al. (2008)</u>	Article	Experimental	<i>MINTHOSTACHYS MOLLIS</i> (Muña)
<u>Chirinos et al. (2011)</u>	Article	Experimental	<i>Clinopodium bolivianum</i> (Inca muña)
<u>Castillo (2017)</u>	Article	Experimental (in vitro)	(in Muña
<u>Hammond et al. (1998)</u>	Article	Case study	Medicinal plants
<u>Angeles y Rangel (2019)</u>	Master Thesis	Experimental	<i>MINTHOSTACHYS MOLLIS</i> (Muña)
<u>Espinoza (2018)</u>	Master Thesis	Experimental	<i>MINTHOSTACHYS MOLLIS</i> (muña)
<u>Cano (2007)</u>	Master Thesis	Experimental	<i>MINTHOSTACHYS MOLLIS</i> (muña)
<u>Yapuchura (2010)</u>	Master Thesis	Experimental	<i>MINTHOSTACHYS MOLLIS</i> (muña) e <i>Clinopodium bolivianum</i> (inca muña)
<u>Marquina & Rodríguez (2019)</u>	Thesis second specialty	Experimental (water vapor drag distillation method)	<i>MINTHOSTACHYS MOLLIS</i> , <i>Trichophyton mentagrophytes</i> , <i>Microsporum canis</i> y <i>Epidermophyton</i>
<u>Castillo (2017)</u>	Doctoral thesis	Experimental cross-section	Inca muña, <i>Candida spp.</i> , pacientes
<u>Carhuapoma (2007)</u>	Doctoral thesis	Experimental	Urqu muña,
<u>Malpartida (2017)</u>	Doctoral thesis	Experimental, prospective, longitudinal analytical	<i>MINTHOSTACHYS MOLLIS</i> (muña), <i>Cepas de Enterococcus faecalis</i> y orégano (<i>Origanum vulgare</i>)

Note. Own elaboration

Adapted from (Rubio et al., 2019)

Then, an analysis was carried out that focuses on the results, conclusions and discussions of the research, in order to group and examine the scientific studies.

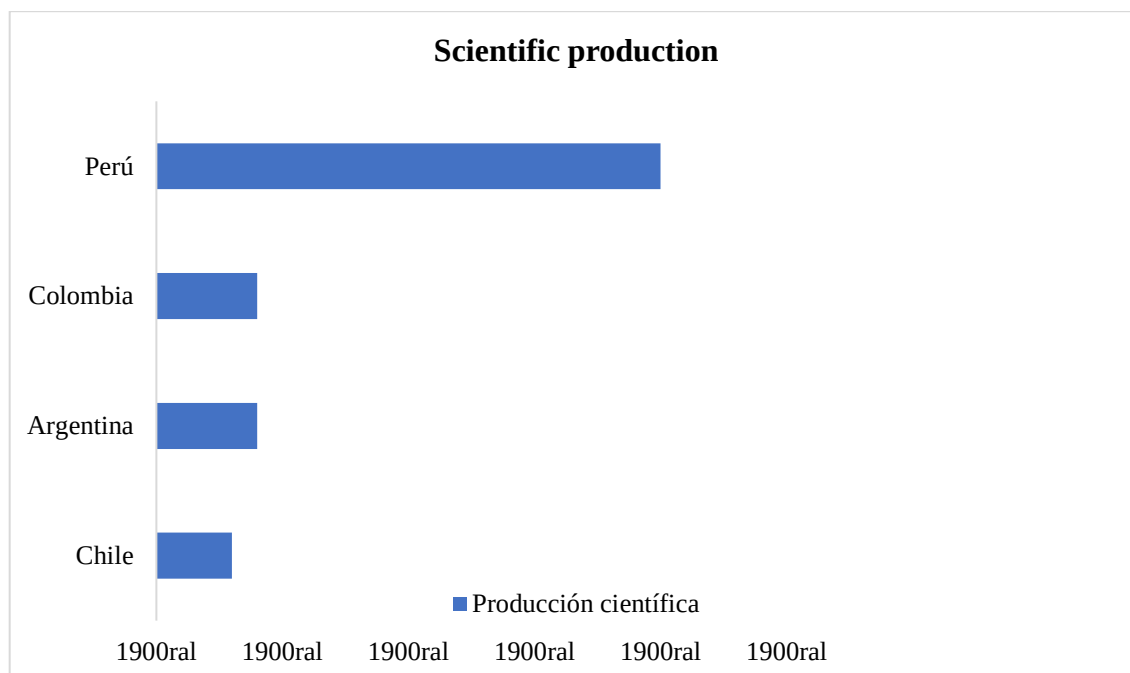
4 RESULTS AND DISCUSSIONS

The results of the review of scientific documents are shown in Figure 1.



Figure 1

Scientific documents published by country



Note. Own elaboration

Figure 1 shows that Peru has more publication regarding the medicinal and aromatic properties of the muña, as well as the extraction of essential oils with (20) scientific documents among scientific articles and postgraduate theses such as master's and doctoral, followed by Argentina and Colombia with (04) publications of scientific articles and finally Chile with (03) scientific publications. This implies the importance of the wrist for the experiments and studies carried out by researchers to publicize the properties it provides.

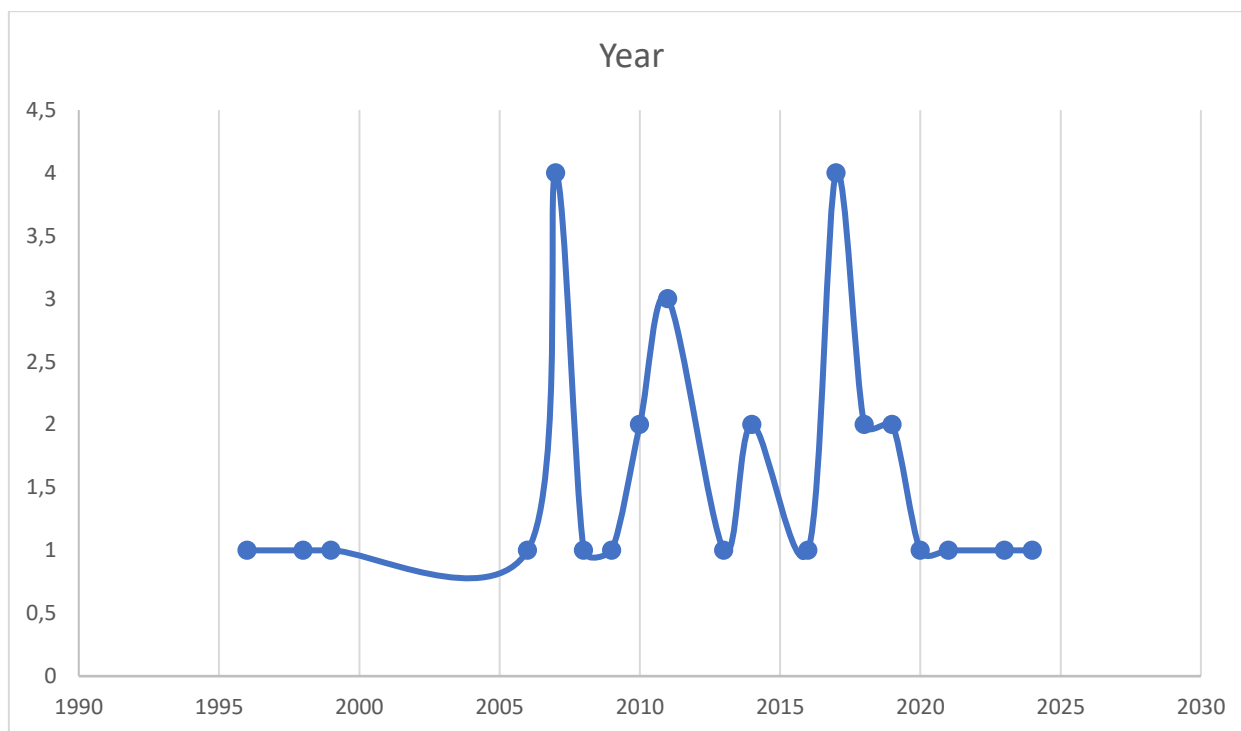
**Figure 2***Distribution of scientific production by year (1996-2024)**Note. Own elaboration*

Figure 2 presents the scientific production that were produced per year from 1996 to 2024, which shows that in the years 2007 and 2017 they had higher production (04) productions in each year, continuing in the year 2011 with (03) publications, while in the years 2010, 2014, 2016, 2018 and 2019 (02) publications in each year respectively and finally in the years 1996, 1998, 2006, 2007 2008, 2009, 2013, 2020, 2021 and 2024 (01) Scientific output in the above years.

The scientific productions of this plant is relevant for the properties it provides, in this way according to Castillo & Castillo (2010) the leaves of *MINTHOSTACHYS MOLLIS* contain saponins, tannins phenolic compounds, flavonoids, steroids and leucoanthocyanidins and that the use of the methanolic extract of the leaves *MINTHOSTACHYS MOLLIS* and *Malva sylvestris* combined are considered protectors of the gastric mucosa. It turns out that the essential oil of the leaves of the wrist (*MINTHOSTACHYS MOLLIS*) at 100% had a high effect against *Candida albicans* than Fluconazole, the antiatomic effect of Fluconazole was greater than the wrist at 25% and the same result as the wrist at 50% (Alcalá-Marcos et al., 2011). Likewise, the essential oil of *Satureja brevicalyx* “urqu muña” has anti-*Helicobacter pylori* effects, with minimum inhibitory concentrations of 1.00µg/ml, with minimum bactericidal



concentration of 2.00µg/ml, showing the antioxidant effect compared to trolox (Carhuapoma, 2007).

Studies were also found, showing that the inhibitory effect of the essential oil of *MINTHOSTACHYS MOLLIS* "muña" on Trichophyton mentagrophytes, Microsporum canis and Epidermophyton, with a concentration of 75 µL of essential oil with high inhibition values for three samples of dermatophytes that were 22.3, 20.2 and 19.7 mm which is due to the compounds that contain the essential oil such as the aldehyde, ketone, menthol and menthone structure; terpenes in greater percentage (Marquina & Rodríguez, 2019).

The chemical composition and performance of essential oils of 75 samples that have been collected during the years 2006-2009 in 40 inhabitants in the northeastern center of Argentina have been variable. Chin and pulegone chemotype were the compounds of the essential oil (Van et al., 2014). The inhibitory effect of the essential oil of *Minthostachys molli* was less than paramonoclophenol camphorate and 2% chlorhexidine gluconate in bacterial culture of *Enterococcus faecalis* at 24 and 72 hours respectively (Malpartida, 2010). On the other hand, Rojas-Molina et al. (2024) in their research found 18 main components in the essential oil of *MINTHOSTACHYS MOLLIS*, among which carvacril acetate, carvacrol and chin stand out. This essential oil showed a strong antioxidant capacity according to the FRAP and ABTS assays, with IC₅₀ values of 243.21 µmol Fe²⁺/g and 0.12 mg/mL, respectively. In addition, it demonstrated effective antimicrobial activity against various bacterial strains, including *P. aeruginosa* (ATTC 39327), *S. entérica*, *E. coli* (ATTC25922) and *S. aureus* (ATTC25923).

5 FINAL CONSIDERATIONS

It is concluded that the essential oils extracted from the leaves of the wrist (*MINTHOSTACHYS MOLLIS*), have phenolic biochemical compounds such as thymol, ketone, pulegone, flavonoids, tannins and other compounds that have antioxidant capacity, are also used to eliminate the gastric bacterium *Helicobacter pylori*, protecting the walls of the stomach, for the biological control of pests, as well as being rich in compounds such as carvacrol and thymol that show effectiveness against the growth of *Candida* spp., on the other hand, the wrist has antioxidant properties that regenerate the cells. They are also used as a natural medicine for airway decongestion, cough relief and other diseases.



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