

Antibacterial and antioxidant effect of natural extracts from *Baccharis latifolia* (chilca)

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ABSTRACT

The objective of the study was; to determine the antimicrobial activity of extracts of *Baccharis latifolia* (Bl) against *Salmonella*, *E. coli* and *Listeria* of food origin; as well as evaluate the antioxidant activity of these extracts. Extracts of leaves, root, stem and Bl flowers were used. After the analysis of antimicrobial activity against *Listeria* and *Salmonella*. After analysis showed that leaf and flower extracts were more effective, while against *E. coli*, flower and stem extracts. In antioxidant activity, the Bl flower extract at 60 mg/mL had a greater effect with 47.25%. In conclusion, Bl extracts, proved to be a natural alternative to partially inhibit pathogen development

Keywords: Antibacterial, antioxidant, natural extracts, chilca.

INTRODUCTION

The continuous increase of microorganisms resistant to different antimicrobial agents has been a major problem for health and food safety, this often due to mutation factors of microorganisms, as well as the lack of development of new antibiotics, especially of natural origin, derived from vegetables, which have proven to be less toxic than synthetic agents (Alós 2015; Gadea *et al.* 2015; Bayas-Morejon *et al.* 2019). On the other hand, oxidative damage caused by free radicals is related to the development of various diseases such as atherosclerosis, cancer, arthritis and others (Ahmad 2018). The use of extraction techniques to obtain substances with bioactive principles is of great importance when obtaining the component, even when orthodox medicines are available, a large percentage of the population still uses remedies based on medicinal herbs (Mostafa *et al.* 2018). The bioactive components of the plants are obtained by contact with solvents using extraction techniques such as maceration. The efficiency of the extraction generally depends on the polarity and the nature of the solvent used (Devi *et al.* 2013). The existence of synthetic substances such as BHA or BHT, which are effective free radical scavengers; but they can be considered carcinogenic (Mateos & Bravo 2007). Therefore, there is a growing interest in the search for antioxidants of natural origin, especially from plants. In most cases, the antioxidant activity of plants is mainly due to the presence of phenolic compounds, which are powerful oxygen scavengers and are also capable of inhibiting the enzymes that produce free radicals (Atmani *et al.* 2011). In this sense, *Baccharis latifolia* (chilca) could play a preponderant role, due to its anti-inflammatory, antibiotic and phenolic components, knowing that the latter is capable of inhibiting the enzymes that produce free radicals (Atmani *et al.* 2011; Sequeda *et al.* 2016). Chilca is one of more than 45 species of the *Baccharis* genus that is widely distributed in almost all the provinces of Ecuador (Valarezo *et al.* 2013) *Baccharis latifolia* has been commonly used in poultices to relieve external inflammations, dislocations, fractures, and rheumatic pain; in infusions, it is used as an antidiarrheal, menstrual pain, and even an

antimicrobial (Salcedo Ortiz & Almanza Vega 2011). With everything described, the objective of this work was; determine the antimicrobial activity against pathogens such as *Salmonella*, *E. coli*, and *Listeria* of food origin; as well as evaluating the antioxidant activity of *Baccharis latifolia* extracts.

MATERIALS AND METHODS

The leaves, stems and roots of *Baccharislatifolia* (Bl) were collected from young plants on the grounds of the Faculty of Agricultural Sciences of the Universidad Estatal de Bolívar (Ecuador).

The selected plants were clean and free of damage. The selected plants were free of physical damage and were cleaned. To obtain extracts, the leaves and stems of the Bl were placed in maceration for 6 days in 96% ethyl alcohol in a proportion of 50 gr of the vegetable matter: 100 ml of alcohol, after this time, the extracts were obtained by centrifugation. at 10,000 rpm and filtration with cellulose filters with a pore size of 2.5 µm. For the antimicrobial activity of extracts of leaves, root, stem and flowers of *Baccharis latifolia* (Bl), the disc diffusion method (Kirby Bauer) was used, The Extracts were tested against three bacterial genera, *Escherichia coli*, *Salmonella* spp and *Listeria* spp, these bacterial strains were provided by the Molecular Biology laboratory of the Universidad Estatal de Bolívar, A number of 10 isolated for each bacterial genus isolated from meats were used in the study.

The antibiotics Penicillin G and Ciprofloxacin were used as controls. For the antioxidant activity, a solution of H₂O₂ (Abs at 230 nm) in potassium hydroxide monobasic sodium hydroxide buffer was prepared.

RESULTS AND DISCUSSION

Antibacterial effect of Bl against *Listeria* and *Salmonella*

The antimicrobial activity against *Listeria* and *Salmonella* showed that leaf and flower extracts were more effective with zones of inhibition > 15 mm and > 20 mm respectively. As determined by a work developed by Yoon and Choi (2013), where the extracts of Bogolji and Gosam showed antilisterial capacity with an area diameter > 10 mm. Also, Eruteya and Badón (2014) obtained antilisteria activity of ethanol extracts from *Moringa oleifera*, with an inhibition zone > 11 mm. Similar results were obtained by Ruilova *et al.*(2017), obtained the antilisteria effect of ethanolic extracts of fruits of *Physalis peruviana*, but with zone sizes < 7 mm.

Salmonella inhibition works were performed by Shan B, Cai, Y, Brooks J & Corke H (2007), who reported that extracts of 26 medicinal herbs have an antibacterial effect on *S. anatum* (mean = 7.2 mm, 4.7-19.2 mm). Similarly, in a study conducted in South Korea, by Lee *et al.*(2006), the aqueous and methanolic extracts of *Schizandrae fructus* showed antibacterial activity against the three *Salmonella* serotypes. In addition, *Euphorbia balsamifera* root had shown a high activity against *S. typhimurium* compared to leaf and stem extracts(Kamba A S & Hassan LG 2010).

Antibacterial effect of Bl against *E. coli*

Against *E. coli*, the flower and stem extracts were the best with zones > 7.0 mm. In the research carried out by Bachir Raho & Benali (2012), they show that the essential oil of *Eucalyptus globulus* is effective in inhibiting the development of *E. coli* with halo sizes ranging from 8 to 26 mm in diameter. According to Argote-Vega, F, *et al.* (2017), mentions that the essential oils of *eucalyptus* and mandarin inhibit in 13.2 µL mL⁻¹ and lemon 14.6 µL mL⁻¹. In addition, in the research carried out by Bastos Oyarzabal M *et al.* (2011), , oregano oil was more effective against *E. coli* with an inhibition zone of 29.5 ± 3.4 mm. It is also important to emphasize that the antibiotics used as controls in our work inhibited the development of *Listeria* and *Salmonella*. However, *E. coli* isolates were resistant.

Antioxidant effect of Bl

In antioxidant activity, the Bl flower extract at 60 mg mL⁻¹ had a greater effect with 47.25% Table 1. Bl extracts of leaves and flowers were more efficient in both their antimicrobial and antioxidant capacity, which could be a natural alternative for control.

The properties present in *Baccharis* species consist mainly of flavonoids, monoterpenes, diterpenes, triterpenes, quinones, tannins as well as some phenolic compounds (Prada *et al.* 2016).

In a study developed by Guerra (2016), analyzed the antioxidant activity of the essential oil of *Baccharis latifolia*- β carotene test, with concentrations of 26 and 64 mg mL⁻¹ of *Bl* oil obtained values of 40.56% and 46.20% respectively. In our study, flower extracts were the only ones that approximated these results.

Table 1. Antioxidant effect of *Baccharis latifolia* extracts.

Extract	Concentration (mg mL ⁻¹)	% of kidnapped peroxide
Flower	20	46.36
	40	41.04
	60	47.25
Stem	20	42.08
	40	19.23
	60	18.72
Leaves	20	5.62
	40	3.92
	60	0.84
Root	20	0.00
	40	0.00
	60	0.00

CONCLUSION

This study is the first to analyze the antibacterial effect of *Baccharis latifolia* extracts (root, stem, leaves and flowers) on *Listeria*, *Salmonella* and *E. coli* isolated. Moreover, *Bl* extracts were shown to be the same or better than antibiotics for clinical use, thus considering *Bl* extracts as an alternative natural product to inhibit the development of pathogens.

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اثر ضد باکتری و ضد اکسایشی عصاره‌های طبیعی از *Baccharis latifolia* (chilca)

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چکیده

هدف از مطالعه این بود که برای تعیین فعالیت ضد میکروبی عصاره گیاه *Baccharis latifolia* (Bl) در برابر سالمونلا، *E. coli* و لیستریا از منشا غذایی؛ و همچنین فعالیت آنتی اکسیدانی این عصاره‌ها را ارزیابی کنید. از عصاره برگ، ریشه، ساقه و گل‌های Bl استفاده شد. پس از تجزیه و تحلیل فعالیت ضد میکروبی علیه لیستریا و سالمونلا. پس از تجزیه و تحلیل نشان داد که عصاره برگ و گل از اثر بیشتری برخوردار است، در حالی که در برابر *E. coli*، عصاره گل و ساقه. در فعالیت آنتی اکسیدانی، عصاره گل Bl با مقدار ۶۰ میلی‌گرم در میلی‌لیتر با ۴۷/۲۵ درصد تأثیر بیشتری داشت. در نتیجه، عصاره Bl ثابت شد که یک گزینه طبیعی برای جلوگیری از توسعه پاتوژن است.

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