PharmacologyOnLine August 30, 2015

Archives • 2015 • vol.2 • 14-17

PHYTOCHEMICAL AND THERAPEUTIC USE OF *BACCHARIS LATIFOLIA* (RUIZ & PAV.) PERS. (ASTERACEAE)

Sequeda-Castañeda, L.G.[1,2]; Célis, C.[1]; Luengas-Caicedo, P.E.[2]

[1]Departamento de Química, Pontificia Universidad Javeriana, Bogotá, Colombia
[2]Departamento de Farmacia, Universidad Nacional de Colombia, Bogotá, Colombia

[*]lsequeda@javeriana.edu.co

Abstract

Baccharis latifolia is a plant commonly known in South America as "Chilca". *B. latifolia* has several curative properties reported in traditional medicinal such as analgesic, treat diarrhea, vulnerary, resolvent, flatulence, heartburn, antidiabetic and in the treatment of inflammation, stomach pain and insomnia. The medicinal properties of this plant represent a valuable source of medicinal compounds. This study is collective information concerning the taxonomy, ethnobotany, phytochemistry, toxicity and biological activities of the *B. latifolia*.

Keywords: *Baccharis latifolia,* ethnobotany, phytochemistry, medicinal plant

Introduction

Baccharis latifolia, commonly known as "Chilca", is a native plant of South America and widely distributed in the Andean region extending from Merida (Venezuela) to Tucuman (Argentina) Including Colombia, growing in the tropics, with temperatures between temperate and cold temperate [1].

Taxonomy

The plant belongs to Kingdom: *Plantae*, Division: *Magnoliophyta*, Class: *Magnoliopsida*, Order: *Asterales*, Family: *Asteraceae*, Subfamily: *Asteroidade*, Genus: *Baccharis*, Species: *B. latifolia*. The National Herbarium of Colombia has classified this species under the voucher COL581316.

Tradicional use

B. latifolia has been widely used by native peoples of Latin America for medicinal purposes. The leaves are used to relieve diarrhea when they are prepared as an infusion. The leaves in the form of plaster are applied to bone fractures to reduce inflammation and also are applied as a poultice to calm rheumatic pains [2]. Infusions at doses of 5% acts as a tonic, anti-diabetic and eupeptic being widely recommended for liver disease [3].

The decoction of flowers and leaves is traditionally used to soothe coughs and bronchitis; as an ointment when mixed with animal fat for wounds disinfection [4]; It also has an emollient effect when is used in steam baths [5]. Furthermore, the decoction has an aphrodisiac effect and antidepressant [6]; with elimination of insomnia [7]; it is used to treat rheumatism, liver diseases, wounds and ulcers (8).

The Colombia Handbook of Medicinal Plants recognizes biological activities of the plant as: antidiarrheal, vulnerary, anti-flatulent, anti-diabetic and anti-inflammation, stomach pain and insomnia [9]. The decoction is used for treating rheumatism, hepatic disorders, cough, bronchitis, ulcers and in case of intestinal parasites. The plant is used externally as a poultice for cases of sprains, wounds, rheumatic pain and bruising [10].

In Peru, B. latifolia is used as traditional medicine for people of the Province of Canta. The decoction of leaves and bark are used against the head aches and muscle pain, and as anti-scarring. The tradition says that should be given a massage on the pain part with fresh leaves. The leaves are also boiled in a liter of water and when the water cools can be used to wash wounds body parts [11].

In Bolivia the main use of *B. latifolia* is as an anti-inflammatory, typically utilized in therapeutic treatments performed by physiotherapists and chiropractors; the leaves are mashed and pulverized and then heated with urine to form a cataplasm to cure contusions, luxations, and sprains [12, 13]. The infusion of the leaves is used to treat diarrhea, vulnerary, flatulence, heartburn, antidiabetic and in the treatment of inflammation, stomach pain and insomnia [9].

Phytochemistry

B. latifolia contains in leaves: resin, oxidases, baccharin, turpentine, gallic tannins, quercetin, rutin, germacrene derivatives, diterpenes, clerodanos, labdanos, eudesmane, limonene, β-cubebeno, d-germacrene, δ-cadinene, epi-α-bisabolol, dihydroisochromolaenin, ledol, friedelin and dimethoxyflavone [3, 14-18]. *B. latifolia* in Colombia's Handbook on medicinal plants reported gallotannins, essential oil, leucoanthocyanidin, phenolic compounds, alkaloids, coumarins, steroids and triterpenes as friedelin, sesquiterpene lactones and flavonoids such as quercetin, and rutin [10].

In a study conducted in Ecuador to obtain the essential oils from the aerial parts of *B. latifolia* was carried out by hydrodistillation and analyzed by gas chromatography/mass spectrometry (GC/MS) and flame ionization detector (GC/FID). Twenty-nine compounds were identified and the main constituents of the essential oil were limonene (33.72%), b-hellandrene (10.32%), sabinene (10.28%), β-pinene (6.99%) and α-pinene (5.44%) [19].

The phytochemical characterization of ethanol extracts of *B. latifolia* from Bolivia were sterol, terpenes, flavonoids and saponins [20]. The compounds found in the leaves were gallotannins, leucoanthocyanidins, phenolic compounds, alkaloids, coumarins, steroids, triterpenes, sesquiterpene lactones, flavonoids [9] and essential oil for instance limonene as the main monoterpene found, b-cubebene, germacrene D, and d-cadinene. Several monooxygenated sesquiterpenes were identified such as verboccidentalol, epi-a-bisabolol, and dihydroisochromolaenin [18].

Medicinal properties

The essential oils obtained from *B. latifolia* have shown interesting antimicrobial activity against bacterium *Staphylococcus aureus* [22] and also good activity against the fungi *Trichophytum rubrum* and *Trichophytum mentagrophytes* with an MIC of 31.25 and 62.5 µg/mL respectively and moderate activity against *Aspargillus fumigatus* (MIC=157.4 ug/ml)

[25]. They were inactive against the Gram-negative bacteria *P. aeruginosa , K. pneumoniae, P. vulgaris, E. coli, S. typhimurium,* and Gram-positive bacteria *E. faecalis* and *S. aureus* [19].

The methanol extract from leaves of B. latifolia inhibits the production of reactive oxygen species [10, 21] also exhibits anti-inflammatory activity in vitro and in vivo [23, 24] usually in the form of infusion or poultice as described in the medicinal plant Colombian Vademecun [10].

The ethanol extracts of *B. lafitfolia has no anti-proliferative properties* on cell Cac0-2 [20]. The dichloromethane extract provides anti-inflammatory activity at doses of 300 mg/kg when using mouse ear edema inhibition model [26].

The hexane and dichloromethane extracts of *B. latifolia* exhibited inhibitory activity on COX-1 with higher percentages than those presented by the reference drug indomethacin (100%), with significant effect on LTC4-release. The inhibitory effect on COX-2 was evident with with the hexane, dichloromethane and aqueous extracts in 98.8, 100 and 98.1%, respectively and similar to those of the reference drug (23). The methanol extract of *B. latifolia* had an inhibitory effect of 55% on oxygen reactive species in the production of human neutrophils stimulated with phorbol-12-myristate-13-acetate (PMA) [21].

The ethanol extract of *B. latifolia* show a significant antiproliferative activity against cell lines of Hep3B, HepG2, PLC PFR 5, SNU-182 and primary human hepatocyte test with a IC_{50} of 10.8 ± 4.6, 33.3 ± 3.4, 24.3 ± 24.3, 20.1 ± 2.2 mg/mL, respectively [27]. The acetone extract (200 mg/mL) have a percent inhibition of 82 ± 3 and 89 ± 2 against cancer cell lines of skin and tongue [28].

Toxicity

The use of *B. latifolia* is toxic in high doses [3]. The Colombian Handbook on medicinal plants stated no contraindications to the use of *B. latifolia*. The acute toxicity studies conducted in the Department of Pharmacy, National University of Colombia revealed a slight depression and loose stools. No significant changes are seen in weight gain or loss or pathological changes in animals that were given the extract. The subacute oral toxicity study in rats showed no mortality, but changes in the relative weight of organs such as the spleen and kidneys, and the renal tissue injury suggesting a slight toxic response [10].

Acknowledgments

The authors acknowledge the collaboration of Henry Yesid Bernal, professor at the Pontificia Universidad Javeriana (PUJ). This work was funded by the Academic and Research Vice-Rectory at the Pontificia Universidad Javeriana (project 5392).

References

1. Gupta, M., Plantas medicinales iberoamericanas. SECAB, editor Bogotá, Colombia 2008:1003.
2. Cordero, L., Baccharis latifolia. In: Aguado A, editor. Enumeración botánica de las principales plantas así útiles como nocivas, indinas o aclimatadas, que se dan en las provincias del Azuay y del Cañar de la República del Ecuador. Madrid, España 1950:251.
3. García, B., Baccharis latifolia. In: Imprenta Nacional, editor. Flora medicinal de Colombia Botánica Médica. Tomo III. Bogotá, Colombia 1975:308-9.
4. Girault, L., Baccharis latifolia. In: Quipus SG, editor. Kallawaya Curanderos itinerantes de los Andes Investigación sobre prácticas medicinales y mágicas. La Paz, Bolivia 1987:434-5.
5. Restrepo, Md.F., Álvarez, L., et al., Baccharis latifolia. In: Universidad de Caldas, Centro de Investigaciones y Desarrollo Científico, editors. Uso popular de plantas medicinales en tres zonas de Caldas: Manizales, Riosucio y Viterbo. Banco de la República Colombia 1987:36.
6. Baudi, O., *Baccharis latifolia*. In: América, editor. Plantas medicinales existentes en Venezuela y Latinoamérica. Caracas, Venezuela 1987:197.
7. García, N., Vargas, R.J.O., Y F. *Baccharis latifolia*. In: Empresa de Acueducto y Alcantarillado (EAAB), editor. Los cerros orientales y su flora. Bogotá, Colombia. 2006:57.
8. Abad, M., Bermejo, P., Baccharis (Compositae): A review update. Arkivoc 2007;7:76-96.
9. Vademécun Colombiano de Plantas Medicinales. Bogotá, Colombia 2008.
10. *Baccharis latifolia,* Vademécum colombiano de plantas medicinales. Bogotá, Colombia: Ministerio de Protección Social2008:74-6.
11. De la Cruz, H., Vilcapoma, G., Zevallos, P., Ethnobotanical study of medicinal plants used by the Andean people of Canta, Lima, Perú. J Ethnopharmcol 2007;11:284-96.
12. Macía, M., García, E., Vidaurre, P., An ethnobotanical survey of medicinal plants commercialized in the markets of La Paz and El Alto, Bolivia. J Ethnopharmcol 2005;97:337-3350.
13. Salcedo-Ortiz, L., Almanza-Vega, G., Use of Baccharis latifolia (Chilca) in La Paz, Bolivia. Biofarbo 2011;19(1):59-63.
14. Bohlmann, F., Kanuf, W., King, R., H R., Naturally occurring terpene derivatives. Part 196. A new diterpene and further constituents from Baccharis species. Phytochemistry 1979;18(6):1011-4.
15. Naranjo, P., *Baccharis polyantha* (*Baccharis latifolia*). In: Universitaria E, editor. Farmacología y medicina tradicional Fundamentos de Farmacología. Quito, Ecuador 1981.
16. Zdero, C., Bohlmann, F., Solomon, J., King, R., Robinson, H., Baccharis latifolia. Phytochemistry 1989;28:531-4.
17. *Baccharis latifolia*. In: CYTED, editor. 270 plantas medicinales iberoamericanas. Bogotá, Colombia. : Editorial Presencia Ltda; 1995:81-2.
18. Loayza, I., Abujder, D., Aranda, R., et al., Essential oils of Baccharis salicifolia, Baccharis latifolia and Baccharis dracunculifolia. Phytochemistry 1995;38(2):381-9.
19. Valarezo, E., Rosillo, M., Cartuche, L., et al. Chemical composition, antifungal and antibacterial activity of the essential oil from Baccharis latifolia (Ruiz & Pav.) Pers.

(Asteraceae) from Loja, Ecuador. J Essent Oil Res 2013;25:233-8.
20. Rodrigo, G., Almanza, G., Akesson, B., et al., Antiproliferative activity of extracts of some Bolivian medicinal plants. J Med Plant Res 2010;4(21):2204-10.
21. Pérez, G., Marín, E., Adzet, T., et al., Activity of plant extracts on the respiratory burst and the stress protein synthesis. Phytomedicine 2001;8(1):31-8.
22. Salcedo, L., Pillco, A., Rodrigo, G., et al., Isolation of flavonoids and study of the toxic and antibacterial activity of Baccharis latifolia extracts. Rev Bol Quim 2003;20(1):43-8.
23. Abad, M., Bessa, A., Ballarin, B., et al., Anti-inflammatory activity of four Bolivian Baccharis species (Compositae). J Ethnopharmacol 2006;103:338-44.
24. Beltrán, D., Janampa, dl.C., Sánchez, V., Determinación de la actividad antiinflamatoria de Baccharis latifolia. Perú: Universidad Nacional San Luis Gonzaga de ICA 2007.
25. Zapata, B., Durán, C., Stashenko, E., et al., Antifungal activity, cytotoxicity and composition of essential oils from the Asteraceae plant family. Rev Iberoam Micol 2010;27:101-3.
26. González, M., Ospina, L., Calle, J., et al., Evaluation of acute, subchronic and chronic inflammation activity of extracts and extracts fractions of Colombian plants. Rev Colomb Cienc Quím Farm 2007;2:166-74.
27. Carraz, M., Lavergne, C., Jullian, V., et al., Antiproliferative activity and phenotypic modification induced by selected Peruvian medicinal plants on human hepatocellular carcinoma Hep3B cells. J Ethnopharmacol 2015;166:185-99.
28. Cates, R.G., Prestwich, B., Innes, A., et al., Evaluation of the activity of Guatemalan medicinal plants against cancer cell lines and microbes. J Med Plants Res 2013;7(35):2616-27