

PHYTOCHEMICAL AND THERAPEUTIC USE OF *CECROPIA MUTISIANA* MILDBR. (URTICACEAE) AN ENDEMIC PLANT FROM COLOMBIA.

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Abstract

Cecropia mutisiana is known in traditional medicine for its diverse medicinal properties. Thus, it is used to cure a varied gamut of diseases. In Colombia *Cecropia mutisiana* is a plant commonly known as agrumo, calentano, guarumo, orumo, or yarumo. Among its different medicinal properties this plant is used to treat mild respiratory diseases including bronchial and lung diseases, cough and whooping cough, asthma stress, and can be used as an anti asthmatic. In addition, it has been used in pathologies related to bile or liver, diabetes, used as an anti-inflammatory medicine or to treat infections. It can also induce scar formation, treat sunburns, and relieve chorea. Related to the heart it has been reported as a cardiac toner, it can treat cardiac deficiencies, and heart hypertrophy. It can also be used as a diuretic and reduce hypertension. The medicinal properties of this plant represent the valuable source of medicinal compounds it contains. This work encompasses information concerning the taxonomy, ethnobotany, phytochemistry, biological activities, and toxicity of this species

Keywords: *Cecropia mutisiana*, ethnobotany, phytochemical, plant medicinal, Colombia.

Introduction

Cecropia mutisiana Mildbr. is an endemic plant with distribution in five Departments in Colombia. Specimens deposited in the Colombian National herbarium indicate this species can be found in Cauca, Cundinamarca, Huila, Quindio, and Tolima [1]. In Colombia it is known as agrumo, calentano, guarumo, orumo or yarumo.

This species is only found along the Magdalena river banks in the Oriental mountain range, in the lowland neotropical jungle and the Subandean forest. It is widely distributed in the highlands of the Magdalena river valley in the Departments of Cundinamarca, Caldas, Huila, Quindío, and Tolima. *Cecropia mutisiana* can grow between 500 and 1800 m.a.s.l.. However, it can also grow below 500 m.a.s.l., as low 200 m.a.s.l. in the Department of Caldas [2].

Some authors have described the presence of *Azteca* spp., ants in *Cecropia mutisiana* Mildbr., defining it as a Myrmecophyte species, since it provides both nourishment and shelter to ants [3]. In 2011 the mutualistic association between *Cecropia mutisiana* Mildbr. with *Azteca* spp. ants was determined, since there is no direct relationship with the nutritional characteristics and the *Azteca* spp. ants. These ants prevent colonization by other ant genus and species and offer protection against predators and other organisms in exchange of shelter and food [4].

Taxonomy

Cecropia mutisiana Mildbr. presents the synonyms of *Cecropia ibaguensis* Cuatrec., and *Cecropia tolimensis* Cuatrec.,. Its general morphology is not distant from other *Cecropias* with the exception of its leaves and Müllerian bodies [2, 5].

The plant belongs to the Plantae kingdom, Division: Magnoliophyta, Class: Magnoliopsida, Order: Urticales, Family: Urticaceae, Genus: *Cecropia*, Species: *C. mutisiana*. The National Herbarium of Colombia has classified this species under the voucher COL575453. It is a myrmecophyte tree 6 – 12 m high. It possess thick and strong petioles 22 to 50 cm long. The lamina is bright green, coarse, and papery, while the back is whiteish with abundant curved trichomes. When leaves dry they become tobacco brown, due to sap air exposure. Leaves are palmately lobed about 34 – 50 cm x 33 – 43 cm, dividing into 10 – 11 elliptical lobes or rounded at the apex of which the largest (42 x 32 cm) are usually twice as large as the smaller ones (18 x 15 cm). The leaves are radially divided with rounded apices and pinnate burgundy venation at the

lamina and redish in the back. It possess two masculine inflorescences with 2 cm long bracts, 6 – 8 cm long peduncles, with 13 – 18 rachis, 9 – 10 x 0.2 cm, and 1.1 – 1.6 cm long flowers. In addition, it has a feminine inflorescence with 3 – 5 cm long peduncle, with 4 rachis, 17 – 21 x 0.8 cm, and 1.5 – 2.0 cm long flowers [2], [6]. A main difference between *Cecropia mutisiana* and other closely related *Cecropias* is based on their palmately lobed leaves with numerous lobes, feminine inflorescence with large rachis and short peduncles with masculine inflorescence containing bracts [2].

Traditional use

Cecropia mutisiana in folk medicine has many therapeutic uses such as to treat mild respiratory diseases including bronchial and lung diseases, cough and whooping cough, asthma stress, and can be used as an anti-asthmatic. In addition, it has been used in pathologies related to bile or liver, and diabetes. It has also been used as an anti-inflammatory medicine or to treat infections. It can also induce scar formation, treat sunburns, and relieve chorea. Related to the heart it has been reported as a cardiac toner, it can treat cardiac deficiencies, and heart hypertrophy, it can be used as a diuretic and reduce hypertension. Cooking its roots and leaves can be used to treat bile and liver diseases, and their extracted dye is a cardiac tonic. Yarumo infusion sweetened with sugar or honey is antiasthmatic and efficient in treating chorea [7, 8]. It is employed as a cardiac tonic, diuretic, to treat inflammation and hypertension [6]. To treat sunburns its bark is cooked and a compress can be applied in the forehead, neck and armpits. Leaf infusion is useful to treat whooping cough. For heart hypertrophy and asthma stress it is recommended to take extract of yarumo water. Yarumo syrup is considered antiasthmatic and good for lung diseases. Cooking leaves of the genus *Cecropia* is the most traditional use of its ample diffusion. In addition, it is useful in bronchial and lung disease, asthma and diabetes. As a form of a compress its leaves are used to avoid infections and accelerate scar formation in cattle wounds [6, 9, 10]. According to medicinal plant Colombian vademecum this species is used to treat mild breathing diseases as a dye (1:10 dilution in alcohol) and as an infusion taken twice a day. No adverse effects have been reported in humans and/or animals associated with plant consumption [10].

Phytochemistry

Phytochemical analysis through successive extractions until depletion evidenced the presence of

resin, non-saturated sterols, alkaloids, reducing sugars, tannins, cellulose, carbonates, sulphates, phosphates, and calcium. The total content of nitrogen in leaves was 2.35 g/100 g dried leaves. In addition, the gravimetric value of reducing sugars was 1.22 g dextrose/100 g dried leaves [11].

Later studies performed on leaf ethanol extract from this species detected compounds of phenol type, flavonoids, terpenes, steroids, lactones, sesquiterpenelactones, tannins, coumarins, and cardiotoxic glycosides [6, 9, 12]. Total phenol content from petroleum ether extracts, ethyl acetate, dichloromethane, and ethanol, demonstrated a 24.6, 60.0, and 169.6 mg gallic acid value per gram of sample respectively [12].

Medicinal properties

Cardiotonic activity measured in heart of mice in models *in situ* and isolated hearts with ethanol and water extracts did not present any activity [11]. Leaf ethanol extract activity on central nervous system and the neuropharmacological profile displayed a slight central depression, evidenced by animal's passive behavior [9, 10]. Leaf extract anxiolytic activity at a concentration of 1000 mg/kg was low. A 125 mg/kg dose protected 50% of the animals of a tonic-clonic seizure. The extract did not present activity at the assay dose (125 mg/kg) when the animals were induced to clonic convulsions by pentylenetetrazol (PTZ). However, the 1000 mg/kg dose protected 40% of the animals from dying [9, 10]. The pharmaceutical recipe recommended is as an infusion and dye at 1:10 dilution in alcohol by the Colombian Medicinal Plant vademecum [10].

Its antioxidant capacity measured as IC₅₀ for petroleum ether extracts, ethyl acetate (EtOAc), dichloromethane, and ethanol (EtOH) using the ABTS methodology defined the following ppms: 2554 ± 21, 414 ± 16, 2332 ± 12, and 253 ± 2 respectively. In contrast, DPPH antioxidant assay determined ppm values of 5576 ± 62, 3843 ± 54, 1496 ± 90 and 631 ± 11 respectively [12]. Antimicrobial susceptibility testing using disc diffusion test revealed relative percentage inhibition of 16.6, 9.8, 7.9, and 7.4% against *Pseudomonas aureginosa*, *Staphylococcus aureus*, *Salmonella* spp., and *Bacillus cereus* for ethyl acetate (EtOAc), dichloromethane, ethanol (EtOH), and petroleum ether, respectively [12].

Toxicity

Leaf extract at a 125 mg/kg or 1000 mg/kg oral

administration given to mice did not present any neurotoxicity [9, 10]. Intraperitoneal administration in mice at a 4 g/kg was not toxic [10, 11]. Ethanol extract oral administration to rats at a 2000 mg/kg dose did not register any mortality [10].

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