

## Preliminary assessment of medicinal plants used as antimalarials in the southeastern Venezuelan Amazon

### Avaliação preliminar de plantas medicinais usadas como antimaláricos no sudeste amazônico Venezuelano

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#### ABSTRACT

*Eighteen species of medicinal plants used in the treatment of malaria in Bolívar State, Venezuela were recorded and they belonged to Compositae, Meliaceae, Anacardiaceae, Bixaceae, Boraginaceae, Caricaceae, Cucurbitaceae, Euphorbiaceae, Leguminosae, Myrtaceae, Phytolaccaceae, Plantaginaceae, Scrophulariaceae, Solanaceae and Verbenaceae families. Antimalarial plant activities have been linked to a range of compounds including anthroquinones, berberine, flavonoids, limonoids, naphthquinones, sesquiterpenes, quassinoids, indol and quinoline alkaloids.*

**Key-words:** *Ethnomedicine. Phytotherapeutic. Medicinal plants. Malaria. Venezuelan amazon.*

#### RESUMO

*Dezoito espécies de plantas medicinais usadas no tratamento da malária no Estado Bolívar, Venezuela, foram estabelecidas e pertenciam às famílias Compositae, Meliaceae, Anacardiaceae, Bixaceae, Boraginaceae, Caricaceae, Cucurbitaceae, Euphorbiaceae, Leguminosae, Myrtaceae, Phytolaccaceae, Plantaginaceae, Scrophulariaceae, Solanaceae e Verbenaceae. As atividades antimaláricas destas plantas parecem estar ligadas a um grupo de compostos que incluem antroquinonas, berberina, flavonoides, limonoides, naftquinonas, sesquiterpenos, quassinoides, indol e alcalóides de quinolina.*

**Palavras-chaves:** *Etnomedicina. Fitoterapêutica. Plantas medicinais. Malária. Amazonas Venezuelano.*

Malaria is the most important and devastating parasitic infection in the world<sup>16,23</sup>. Malaria cases are frequently recorded in Bolívar state territory, which comprises sweeping grassy plains, as well as areas along the Orinoco River and tropical forests inhabited by gold and diamond miners. The area is also inhabited by near nineteen Amerindian groups who live scattered throughout the jungle and highlands. For several years, the standard antimalarial drugs which include quinoline derivatives, sulphur drugs and antifolates have been employed in the treatment of malaria by the National Malaria Control Program. Preparations based on plants used in traditional medicine have been widely employed in the Bolívar State as an alternative to pharmaceuticals<sup>14</sup>.

The Amazon has not been botanically explored as have the savannas, scrublands, the surrounding lowland and upland forest and even mountains, most of which are now considered to be intensively studied and therefore taxonomically known<sup>14</sup>. As part of a project aimed at improving the antimalarial

therapeutics in Venezuela, we organized an ethnobotanical survey on traditional medicinal plants used in the treatment of malaria in Bolívar State, Venezuela. During 5 years this study was conducted in Bolívar State, in a tropical humid forest area at Domingo Sifontes municipality. This southeastern area (65000km<sup>2</sup>) of the state is the most densely populated region and is situated at 07° 15' N latitude and 61° 26' W longitude<sup>15</sup>. Data were obtained using standard ethnobotanical collecting techniques<sup>19</sup>. The information was collected from Kariña, Akawayo, North Arawak Amerindians and miner population. Three regions were explored: Tumeremo (capital of the Domingo Sifontes municipality), El Dorado and Las Claritas. The most knowledgeable members of each community were identified and interviewed. The basic question underlying the interviews was "do you use any plants to treat or to cure malaria"? Specimens of the plants used were then collected in the field with the informants, and details of their modes of preparation,

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<sup>†</sup>This paper is dedicated *In memoriam* of Dr. Alejandro Caraballo who died while this work was being finishing.

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Table 1 - Some plants used in the treatment of malaria in the Domingo Sifontes municipality, Bolivar State, Venezuela.

Bolivar State data				Comparative data	
Species	Family	PU	PP	species	Details
<i>Azadirachta indica</i> A.Juss.	Meliaceae	1	d	<i>Azadirachta indica</i> A.Juss	Used to treat malaria in India and Sudan <sup>3 9</sup>
<i>Bixa orellana</i> L.	Bixaceae	1,r	d	<i>Bixa orellana</i>	Used to treat malaria in Brazil and Peru <sup>8 18</sup>
<i>Carica papaya</i> L.	Caricaceae	ft	j	<i>Carica papaya</i>	Used to treat malaria in Brazil and Surinam <sup>18 19</sup>
<i>Cedrela odorata</i> L.	Meliaceae	sb	mwv	<i>Cedrela odorata</i>	Used to treat malaria elsewhere <sup>12</sup>
<i>Eucalyptus globulus</i> Labill.	Myrtaceae	1	d	<i>Eucalyptus globulus</i>	Used to treat malaria in Venezuela <sup>12 13</sup>
<i>Heliotropium indicum</i> L.	Boraginaceae	1	d	<i>Heliotropium indicum</i>	Used to treat malaria in Venezuela <sup>1</sup>
<i>Momordica charantia</i> L.	Cucurbitaceae	1	d	<i>Momordica charantia</i>	Used to treat malaria in Brazil, Colombia, Guyana, Trinidad, West Indies, and Venezuela <sup>1 4 8 12 13 17 20 24</sup>
<i>Parthenium hysterophorus</i> L.	Compositae	r	d	<i>Parthenium hysterophorus</i>	Used to treat malaria in Venezuela <sup>1</sup>
<i>Petiveria alliacea</i> L.	Phytolaccaceae	Ep	d	<i>Petiveria alliacea</i>	Used to treat malaria in Brazil <sup>8 20</sup>
<i>Phyllanthus niruri</i> L.				<i>Phyllanthus niruri</i> and <i>Phyllanthus niruri</i> spp	<i>P. niruri</i> used to treat malaria elsewhere <sup>9 20</sup> and other spp Used in Brazil, Cuba and Surinam <sup>13 20 21</sup>
<i>Plantago australis</i> Lam.	Plantaginaceae	1	d	<i>Plantago australis</i>	Used to treat malaria in Venezuela <sup>14</sup>
<i>Scoparia dulcis</i> L.	Scrophulariaceae	1, r	d	<i>Scoparia dulcis</i>	Used to treat malaria in Colombia and Venezuela <sup>1 6 11 12</sup>
<i>Senna occidentalis</i> L.Link.	Leguminosae	1, r	d	<i>Senna occidentalis</i>	Used to treat malaria in Brazil, Colombia and Venezuela <sup>2 5 7 8 12 18 19</sup>
<i>Solanum</i> spp.	Solanaceae	ep	d	<i>Solanum</i> spp	Used very widely to treat malaria <sup>5 20 21 22 23 24</sup>
<i>Spondias mombin</i> L.	Anacardiaceae	l	d	<i>Spondias mombin</i>	Used to treat malaria in Venezuela <sup>1</sup>
<i>Taraxacum officinale</i> Web.	Compositae	L,r	d	<i>Taraxacum officinale</i>	Used to treat malaria in Venezuela <sup>1</sup>
<i>Verbena litoralis</i> H.B.K	Verbenaceae	l	d	<i>Verbena litoralis</i>	Used to treat malaria in Venezuela <sup>1</sup>
<i>Vernonia</i> spp	Compositae	sb	d	<i>Vernonia</i> spp	Used to treat malaria in Brazil, Colombia and Venezuela <sup>2 7 12 20</sup>

PU: part of the plant part used: ep = entire plant; ft = fruit; l = leaf; r = roots; s = seed; sb = stem bark. PP: preparations: d = decoction; j = juice; mwv = macerate in white wine.

administration and use were recorded, as well as local names and any other relevant data. Information was double-checked with more than one interviewee. The standard herbarium specimens were collected for subsequent identification of the species.

Parts of the plants screened by antimalarial activity were those that people recommended (roots, leaves, etc). The pieces were air-dried in the dark when possible, but in the sun when the humidity was too high.

Eighteen plants species of 13 families used in the treatment of malaria at Domingo Sifontes Municipality were identified. Details of the use of some of these plants together with comparative data are presented in Table 1.

The plants recorded in this survey were used in the treatment of the disease and not as prophylactics. The majority were used as decoctions and were generally administered three times daily until malaria was cured. Some plants were used both internally and externally (as baths), and in a few cases they were applied as compresses to the swollen spleen.

The antimalarial activity has been linked to a range of compounds including anthroquinones, berberine, flavonoids, limonoids, naphthquinones, sesquiterpenes, quassinoids, indol and quinoline alkaloids and many of the genera represented by the plants collected in this work have been shown to contain these compounds<sup>21</sup>.

The most frequently used plant parts were: leaves (70%); roots (15%); fruits (10%); and stalks (2%). The enormous

frequency of the leaves in traditional compounds is related to their abundant availability and easy collection.

The knowledge of plants used in the treatment of malaria in the Domingo Sifontes municipality, combined with the high level of correlation found with the uses of these plants (or related species) in diverse parts of Latin America, indicates the inheritance of our ancestors' knowledge in the whole continent. It represents sometimes the only available alternative malaria treatment in remote communities of the municipality and its surroundings.

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