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Medicinal plants used to cure cutaneous Leishmaniasis and their effectiveness in the Costa Rican Caribbean

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Abstract

Leishmaniasis is a disease that affects people in at least 98 countries. Currently used pharmacological drugs have significant side effects in up to 25% of patients. Alternatively, communities all over the world have been healing cutaneous leishmania using plants. This article describes the most promising plants used against cutaneous Leishmaniasis in the Costa Rican Caribbean. For this purpose, experts, doctors, local therapists, and people who recovered from the disease only using natural remedies, were interviewed. Twelve plants were successful. It is concluded that it is possible to cure the disease with natural methods but that much more research is needed to be able to adequately compare methods and develop a naturopathic protocol.

Keywords: cutaneous *Leishmania*, Costa Rica, ethnobotany, medicinal plants, naturopathy

Introduction

Cutaneous leishmaniasis affects at least 600,000 to 1,000,000 people a year in 98 countries all over the world (OMS, 2022). In Latin America, this illness has existed since prehispanic times, which means that the indigenous people must have developed remedies or methods to heal it. *Leishmania* can be either visceral (the most severe form) or cutaneous. Cutaneous *Leishmania*, known as “papalomoyo” in Costa Rica begins as a very small lesion, which continues to grow and is rarely self-healing. It can cause secondary lesions and about 3% of the cases can evolve into mucocutaneous *Leishmania* which attacks the nose or ear tissues.

Leishmaniasis is caused by the bite of the female sandfly, with at least three different species identified in Costa Rica: *L. braziliense*, *L. panamensis* and *L. guyanensis*. The severity of the infection will depend on the species of *Leishmania*, the number of parasites, and the conditions of the immune system of the patient.

The countries with the most cases in America are Brazil (16432 cases) and Colombia (6161 cases). Costa Rica reported in 2021 a rise in cases of 21% (Organización Panamericana de la Salud, 2021). In Costa Rica, between 20 to 30% of the patients are children, and another particular tendency in the Americas is an exceptional number of women (over 35%)- since leishmaniasis is more prevalent in adult men.

In recent times, modern medicine has developed several methods to heal *Leishmania*. Up until 2022, in Costa Rica, the main treatment is with pentavalent antimonials, with a cure rate of 77-90% (OMS, 2010). Unfortunately, these drugs can cause a high level of toxicity, with side effects including articular muscular pain, headache, lack of appetite, abdominal pain, nausea, and/or vomiting in up to 25% of patients [51]. The most serious side effects include toxicity to the liver, kidneys, and heart [22, 51]. It is this situation that has spurred scientists worldwide to look for new approaches- going from an individualized treatment based on the patient and the type of lesion to the development of vaccines.

In this context, learning from ancient and local time-tested remedies is wise. Costa Rica is a country where herbalism is very popular, so it is common to see people using plants recommended by neighbors or in general people with experience. In studies on this topic in Latin America, it is possible to find several anthropological studies that enlist species used by an ethnic group, but none of these studies measure the efficacy. Other studies have been done *in vitro*- but technically these are not necessarily the same as in studies with real people because the reaction vector and immune system is very complex with leishmaniasis. That is why it is so important to search out people who had had leishmaniasis themselves and who had

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been able to heal themselves without using antimonials, to discover the plants and methods used and their efficacy.

Materials and Methods

A non-probabilistic, intentional sampling was carried out, interviewing three different populations: medical personnel experts in *Leishmania*, local therapists, and people who having had *Leishmania*, had healed by using only medicinal plants.

Five national experts were found: Jaramillo Antillón, (a dermatologist well known for his research in *Leishmania*), and Dr. Heinz Acosta. Dr. Alfredo Castro (researcher from the University of Costa Rica), and Dr. Carlos Mata (researcher from the Costa Rican Institute of Health and Nutrition).

Local therapists included an indigenous healer from the Bribri community, a local herbalist who mainly cures *Leishmania*, and a local kinesiologist, who also had experience healing *Leishmania*.

The interviews of patients were carried out in four counties of the Costa Rican Caribbean: Turrialba, Guácimo, Pococí, and Talamanca. Turrialba and Talamanca have local indigenous populations. In all four counties, there is a traditional incidence of *Leishmania*. People were sought out by using community chats or referred to me by doctors, therapists, or word of mouth. Only patients who had a clear diagnosis of *Leishmania* and who had only used plants or other natural remedies were interviewed, discarding any person who had used pentavalent injections. A total of 25 interviews filled these criteria. Initially, it was thought that only recent cases should be included, but because of the prevalence of the use of pentavalent injections which is the standard treatment of the local clinics, cases that appeared before the historical use of pentavalent antimonials were included in the study. It should be noted that *Leishmania* is a very hard-to-heal disease in Costa Rica, and most people can remember the remedies used quite accurately. Another popular practice is combining plants with pentavalent injections or using plants when the injections have not healed the lesions- but these cases are not included in this article. The interviews were made with a standard survey that covered questions such as where they lived, when they became infected, how they knew it was *Leishmania* (a lab test, traditional knowledge, etc.), a description of the lesion, and a detailed description of the plants and methodology used. This includes the species, how it was prepared, how often it was applied, and for how long, until they were healed. It was also inquired if they used antimonials before, during, or after the treatment. If the answer to any of these possibilities was yes, we did not include the plant as a successful healer of the illness.

Finally, an extensive revision of literature was done to identify plants used in tropical Latin America for *Leishmania* to be able to compare the results obtained locally.

Results

The following plants were all described as effective in healing *Leishmania*.

Breadfruit *Artocarpus altilis* Family: Moraceae



Fig 1: Breadfruit [70].

This remedy was used by a family 50 years ago when pentavalent injections were not available. The latex was used directly in the lesions, daily.

Locality: Jiménez de Pococí.

Galangal. *Dichorisandra thyrsiflora* Family: Commelinaceae



Fig 2: Blue ginger [7]

This report stems from a family, where several members had *Leishmania*. The plant was washed and the mucilage from the stem was put directly in the wound, once a day. The informant says it only took three days to heal the lesions.

Locality: La Rita, Pococí.

Lime: *Citrus limon* Family: Rutaceae.



Fig 3: Lime

Seven limes of the species *Citrus limon* are used (other varieties or species are not used). The juice is extracted and simmered until it produces a “cream” which is then put in a clean jar. Drops from this lime concentrate are then put in the lesion, four times a day. The lesion is then covered with a clean gauze. The patients report positive effects in 2 weeks. One person only used it once.



Fig 4: Before and after

Locality: Suerre de Pococí, Guácimo and Talamanca.

Göevos de caballo: *Tabernaemontana donnell-smithii*
Family: Apocynaceae



Fig 5. Göevos de caballo [72]

The caustic latex from the fruit is dropped into the lesion. One person states it healed the lesion with only one use. Locality: Guápiles, Pococí

Cobrizo, leche de sapo: *Euphorbia cotinifolia* Family: Euphorbiaceae



Fig 6: Barbasco, cobrizo

In San Clemente, it is used by a traditional phytotherapist

recognized locally and nationally for curing the disease with this plant. He has managed to heal cases with multiple injuries. The healer, however, asks people to inject themselves additionally at least four times, to avoid mucocutaneous *Leishmania*. In this research, a person was interviewed who did not use Glucantime at all and was cured. Even cases of muco-nasal leishmaniasis have been cured with this plant.

The fresh, white, very caustic sap is used, and placed carefully in each lesion by the therapist since it is very caustic. Droplets of sap from the leaf stems are placed inside the wound on all lesions. It is generally applied only once. The lesions are not washed for several days to avoid eliminating the remedy, but care must be taken so that they do not get dirty. If they are not cured with the first application, a second application is applied. It is normal for the injury or around it to become inflamed, painful, and even bleed.

Locality: San Vicente, Limón, and Turrialba.

Viborana: *Asclepias curassavica* Family: Apocynaceae.



Fig 7: Viborana [73]

The fresh white sap is used directly in the lesions. Locality: This is a traditional remedy commonly used by indigenous people of the Cabécar tribe, in Siquirres.

Gavilana with salt: *Neuroleana lobata* Family: Asteraceae.



Fig 8: Gavilana [74]

This remedy was used by a family where several members had *Leishmania*.

The leaf of the plant is heated up in a pan with a little bit of water. Salt is put into the lesion and then it is covered by the hot leaf, which is tied onto the limb, and left on overnight.

Locality: Liverpool, Limón

Oreja de ratón; *Geophila macropoda* Family: Rubiaceae.



Fig 9: Oreja de ratón

This remedy was used by a local therapist, who selected it through the use of kinesiology. It is traditionally used by the Yanasha indigenous people of Peru to cure skin problems. However, he used it in combination with other plants selected in the same way. Finally, in approximately 5 months the wound was closed.

Method: The plant is crushed and tied over the injury - day and night.

Locality: Puerto Viejo, Limón

Tekol: *Simarouba amara* Family: Simaroubaceae.



Fig 10: Árbol de Tekol

This plant is used in the Bribri Indigenous territory and is recommended by a local healer.

The bark is reduced to ashes, ground and put in the lesion. This healer recommends cutting the bark on the side of the tree that is receiving sunlight.

Locality: Talamanca

Leaves of pata de danta *Gurania makoyana*- Cucurbitaceae, with Anatto (*Bixa Orellana*- Bixaceae) plus the bark of achiotillo (*Vismia baccifera*- Hypericaceae).



Fig 11: Leaf of pata de danta [79]

The leaves of the *Gurania* reduced to ashes and mixed with the annatto plant. Locality: Talamanca

Carnauba oil



Fig 13: *Copernicia prunifera*

One of the most surprising and most mentioned remedies. People use black shoe polish, which is put into the lesion. An important ingredient in shoe polish is carnauba oil, which comes from the *Copernicia prunifera* palm. Localities: Pococí, Talamanca, and Turrialba

Discussion

The main objective of the study was to find plants that can heal leishmaniasis. It was found that plants are being used to heal *Leishmania* successfully in the Caribbean. This is a novel discovery for Costa Rica because although healing with plants is a common occurrence. For example, in an anthropological study on plants used for *Leishmania* in Puriscal by Dobles y Perriard [24] and Monestel [25], it is only reported which species are used traditionally, yet no mention is made of whether they were successful in healing this troublesome skin disease. In

this case, it has been presented, that there are plants that have worked well in this sense. Of the 10 plants mentioned by Dobles and Perriod for Acosta ^[24], three were used with success in the Caribbean.

It is interesting to note that shoe polish was mentioned as a very effective alternative in Puriscal ^[24], Turrialba, and Guápiles. This can be explained since one of shoe polish's main ingredients is carnauba oil extracted from a palm- and has been a substance proven to be antileishmanial in scientific trials.

Five of the plants described, are also mentioned in scientific literature for other countries for healing *Leishmania*. These are *Neuroleana lobata*, used in Peru ^[31], *Asclepia curassavica*, used in Mexico and Peru ^[29, 68], *Piper auritum*, in Cuba, *Tabernaemontana donnell-smithii* in Peru, and *Citrus limon*, used in Ecuador, Venezuela and Peru ^[38, 68].

It is also important to note that the different localities where interviews were done included different cultures: mainly mestizo and indigenous people. Since the interviews included the method used, indigenous people often include the concept of "diet", where the person should avoid sugar, salt, and sometimes meat, during their treatment. Mestizo people will try plants that have been suggested by family, friends or neighbors- whereas indigenous people tend to have more experience and use one or two main plants.

Another important observation is the fact that most people usually use one plant, and do not combine or change plants frequently. In one interview, the person who had tried many different methods was not successful. Healing leishmaniasis depends on the specific species of *Leishmania* treated, the immune system of the patient, and probably variables that are still unknown, so it is logical to think that different plants will have different effects on different people: probably there is no one species that will cure all.

The mention of a plant that was effective after only one or a few uses is also a surprising find since *Leishmania* is so hard to heal. It can take months using most natural methods. A standard antimonial treatment is at least 20 injections, one each day. This was the case of góevos de caballo, blue ginger, and limes.

Interestingly, most people remembered which plant was used, even if they were only children at the time. The fact that people could remember least was: how many days it takes to heal. They did remember if the plant was used only once though.

Also, although the research was based on plants, the interviews revealed very valuable information, such as the knowledge or beliefs people have about how the illness is transmitted, how to avoid it, and factors that can improve the treatment such as diet, hygiene, etc. One person interviewed also stated that they had observed that there were more sandflies present when the natural environment was disturbed, such as clear-cutting a pasture-field, with a consequent increase in people affected that lived around the area

Conclusion

The cultural diversity present in Costa Rica has generated a diversity of remedies, and these are shared locally among families and communities. A special mention must be made of the indigenous communities that have developed methods that have been used for thousands of years.

It is concluded that it is possible to heal *Leishmania* in some cases without the use of pentavalent antimonials. Twelve plants have been identified for the Caribbean of Costa Rica that have been successful, all of them having antileishmanial

properties. These remedies varied from a once-only use to a longer use period. In reality, it is the people in the communities who are continually experimenting and observing the efficacy of naturalistic methods inherited by tradition or suggested by a neighbor. Researchers must support communities in their search for alternatives with scientific backup.

Very little is done in terms of education about *Leishmania* which should be a priority in rural areas where it is prevalent and among tourists that also visit these areas, unaware of *Leishmania* and often misdiagnosed in their country of origin. The use of insect repellent, closing windows at night, and using insect nets are simple ways of avoiding this hard-to-cure lesion. When local people know how to identify the illness quickly, they can treat it before it grows, has a larger parasitic load, and is harder to heal. In this sense education and information sharing is vital.

Finally, research on this topic is urgent. The combination of herbology and local injections of antimonials could be promising. It is known that *Leishmania* sequesters the immune system, yet

how to work with the immune system to assist the patient is not known. Does diet affect this disease's progression? Much more research must be done to discover the relationship between specific species of sandflies and the most effective plants and other variables that can improve success rates. The use of essential oils, homeopathy, thermotherapy, and other methods have yet to be explored in Costa Rica.

As a result of many conversations with people who have healed themselves or someone in their family, we launch a call to integrate traditional knowledge of communities that have dealt with "papalomoyo" (a local word derived from the Nahuatl language of central Mexico and Central América), "shame" in Cabecar language and "Kinúwo" in Bribri. Healing can benefit from the integration of naturopathic and allopathic approaches with the hope of joining forces, to eradicate this disease.

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