

## Argentine medicinal plants with potential antifungal activity

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### Summary

The Argentine flora is represented by more than 9000 higher plants, from which about 1600 are used as home remedies. The cited should be assayed for its supposed activity. In the present case, a total of 58 potentially useful antifungal plants has been identified by reviewing the data about their popular use in Argentina. The results were compiled in a table encompassing the mentioned species which are worth to be tested for its antifungal activity. The list contains (a) the binary name of each plant (genus and species), (b) botanical family, (c) indication(s) or use(s) according to the folklore medicine and its interpretation and/or (d) origin of the data.

## Plantas medicinales argentinas con potencial actividad antifúngica

### Resumen

La flora argentina se encuentra representada por más de 8.000 plantas superiores. De ellas, alrededor de 1.600 son utilizadas por la población como remedio casero. Estas especies merecen la oportunidad de ser ensayadas para determinar su supuesta actividad. En este caso se han reunido las especies potencialmente útiles como antifúngicas de acuerdo con la revisión de los usos populares consignados en diversas publicaciones botánicas y otras referencias. El resultado se encuentra compilado en una tabla que abarca un total de 58 especies merecedoras de ser ensayadas para determinar su actividad antifúngica. En ella se consigna: (a) nombre (género y especie) de cada planta potencialmente activa, (b) familia botánica a la que pertenece, (c) indicaciones o usos de acuerdo con el uso popular y probable interpretación y (d) origen del dato.

### Introduction

The eager search of medicines for the world, justifies the screening of the flora for plants having useful pharmacological activities, to use them as models or materials to prepare new drugs.

Our general objective has been the collection and classification of data related to the biological activity

of the Argentine medicinal plants in order to help in the selection of plant material to be tested for biological activity. In this particular case the potential antifungal species has been considered.

#### *Selection of the species to be scrutinized*

Most of the Argentine medicinal plants grow in the de la Plata river basin. Located in the subtropical

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**Key words:** antifungal plants - Argentine medicinal plants - Argentine medicinal flora - antifungal flora.

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region of South America, its flora has more than 9000 botanical species, that has been classified in 246 families (Zuloaga and Morrone, 1996; 1999). The words related to a potential antifungal activity, uses or toxicity were selected or else corrected according to the definition found in the Dorland's Medical Dictionary (Anderson, Jefferson Keith, Novak & Elliot).

### ***Evolution of the knowledge on South American medicinal plants***

As in other regions, the primitive population of South America learned how to treat their illnesses by using the "trial and error" procedure. Once this fact was "discovered" by the people coming from Europa, the American knowledge of the local medicinal plants was transferred to the new population living in the area, a mixture of South American and European people, and used as a "local pharmacopea". The acquisition and transference of the knowledge adopted different modalities, from an oral one (ordinary people) to a written one. In the first case people recorded the data by heart. In the written way, learned people registered the data in manuscripts, annotating the local name of the plant and, sometimes, adding a drawing of the recorded species. From the XVI Century on, these documents were usually kept in the libraries of monasteries and abbeis (Domínguez, 1905; Ricciardi et al., 1997).

Once the country was organized, trained botanists worked in the inventory of the Argentine flora, describing and naming each new species discovered and, as a consequence, publishing the corresponding conclusions. Numerous data were useful thanks to the information annotated (and published) by the botanists. The first job to accomplish was related to the "cleaning" of the language. Since 1980, we had been engaged in the inventory and study of plant species with potential pharmacological activity. The information had been fed to a databank, to be used as a guide to presume the eventual biological activity of a given species (Rondina, et al., 1999; Bandoni, et al., 2002). The information was reviewed and eventually recorded, as the consequence of the work done in 1996 - 1999, to make it easily available, together with the data on uses and presumed activity.

The field related with the plants potentially acting as antifungal was selected as an interesting field and the information on the matter put together as having activity on fungi (Table 1).

## **Experimental**

### ***Qualification and reviewing of data***

The main goal to be accomplished was the selection and recording of the species having potential pharmacological activity. Only published material coming from botanist or similar experts was registered. Some exceptions were made in atypical cases, as the personal information of data coming from persons regularly in contact with medicinal plants (Bowes R., personal communication, 1973). The species considered selectable were those having descriptions on uses or another mentions indicating the interrelationship plant / man. The data on potential biological activity were registered and copied also as part of the mentioned table.

## **Results**

As already mentioned, the results appear in the table 1, reporting the following information

- Column 1: **Binary name** of each plant (genus and species).
- Column 2: **Botanical family**.
- Column 3: **Indications**, use and / or interpreted activity, as a conclusion of the analysis of the meaning of the words used in the References. In some cases the information has been "translated", by interpreting the popular language applied to the description of use, objective and supposed activity.
- Column 4: **References** (Original source, cited in the Bibliographic References).

According to that, the table reports (a) the use and / or indication of a given plant, (b) its supposed biological activity, especially on fungi, (c) the source of the data, (d) a hypothesis on its probable pharmacological activity, if consigned by the referent (in this case ending with an interrogation mark) and (e), when available, the plant part, type of extract and way of preparation.

## **Results and discussion**

### ***Clarifying the statements on uses***

The language used in the basic documents needed, in general, to be clarified, i.e. to know what the author or informant meant (especially in Spanish), and to decide if to make a preselection was necessary.

Table 1.- Argentine Medicinal Plants with Potential Antifungal Activity

Used species	Family	Use and/or potential activity	Bibliographic reference
<i>Acacia aroma</i> Gillies ex Hook. E & Arn.	Fabaceae	Antimycotic EU (powder of the burned bark, <i>in situ</i> )	Martínez-Crovetto, 1981
<i>Acacia caven</i> (Molina) Molina var. <i>caven</i>	Fabaceae	Antimycotic EU (decoction of bark "for healing the athleta's foot")	Martínez-Crovetto, 1981
<i>Acacia caven</i> (Molina) Molina var. <i>caven</i>	Fabaceae	Antimycotic EU (powder of burned bark, <i>in situ</i> , as -)	Martínez-Crovetto, 1981
<i>Aloe vera</i> L.	Liliaceae	Antimycotic EU ("mucilage [ <i>in situ</i> ] as -")	Scarpa, 2004
<i>Aloysia gratissima</i> (Gillies & Hook. ex Hook.) Tronc var. <i>chacoensis</i> (Moldenke) Botta	Verbenaceae	Antimycotic EU (the affected area washed with decoction of leaves)	Scarpa, 2004
<i>Aloysia virgata</i> (Ruiz et Pav.) Juss. var. <i>virgata</i>	Verbenaceae	Antimycotic? ("the affected part rasped with the back of the leave and wetted with the "perspiration" [condensation of water] of an axe")	Martínez-Crovetto, 1981
<i>Anadenanthera colubrina</i> (Vell.) Brenan var. <i>cebil</i> (Griseb.) Altschul	Fabaceae	Antimycotic (the decoction of the bark, [ <i>in situ</i> ?], in Paraguay)	Basualdo, I.N. et al., 2003
<i>Anagallis arvensis</i> L.	Primulaceae	Fungicide ("fungitoxic, especially at the beginning of flowering")	Burkart, 1987
<i>Araujia angustifolia</i> (Hook. & Arn.) Decne.	Asclepiadaceae	Antimycotic EU (juice of the fruit "to fight the <i>empeine</i> ")	Martínez-Crovetto, 1981
<i>Araujia sericifera</i> Brot.	Apocynaceae	Antimycotic EU (juice of the fruit "to fight the <i>empeine</i> ")	Martínez-Crovetto, 1981
<i>Aristolochia gibertii</i> Hook.	Aristolochiaceae	Fungicide? EU (decoction of leaves, together with <i>Baccharis articulata</i> , "to treat the <i>empeine</i> ")	Martínez-Crovetto, 1981
<i>Aristolochia gibertii</i> Hook.	Aristolochiaceae	Antimycotic ([infusion?] "stems and leaves as -"), in Paraguay	Basualdo, I.N. et al., 2003
<i>Baccharis articulata</i> (Lam.) Pers.	Asteraceae	Antimycotic EU ("to treat the <i>empeine</i> ", together with <i>Aristolochia gibertii</i> )	Martínez-Crovetto, 1981
<i>Baccharis gaudichaudiana</i> DC.	Asteraceae	Antimycotic EU ("for the <i>empeine</i> ")	Martínez-Crovetto, 1981
<i>Baccharis microcephala</i> (Less.) DC.	Asteraceae	Antimycotic EU ("to treat the <i>empeine</i> ")	Martínez-Crovetto, 1981
<i>Baccharis rufescens</i> Spreng.	Asteraceae	Antimycotic ("infusion of fresh leaves, <i>per os</i> , as -")	Hilgert, 2001
<i>Baccharis sculpta</i> Griseb	Asteraceae	Antimycotic (infusion of fresh leaves, <i>per os</i> , "for vaginal mycosis")	Hilgert, 2001
<i>Baccharis trimera</i> (Less.) DC.	Asteraceae	Antimycotic EU ("for the <i>empeine</i> ")	Martínez-Crovetto, 1981
<i>Caiphora lateritia</i> Klotzsch	Loasaceae	Antimycotic (infusion of flowers, <i>per os</i> , three times a day, "for vaginal mycosis")	Hilgert, 2001
<i>Calendula officinalis</i> L.	Asteraceae	Antimycotic EU (to heal "illness of the scalp")	Freire & Urtubey, 2000

**Table 1.-** Argentine Medicinal Plants with Potential Antifungal Activity (cont.)

Used species	Family	Use and/or potential activity	Bibliographic reference
<i>Camptosema rubicundum</i> Hook. & Arn.	Fabaceae	Fungicide? EU (foments with the decoction of seeds "for vulval pruritus")	Lahitte & Hurrell, 2004
<i>Camptosema rubicundum</i> Hook. & Arn.	Fabaceae	Antifungal? EU (foments with decoction of the seeds, "for vulval pruritus")	Lahitte & Hurrell, 1998
<i>Celtis iguanaea</i> (Jacq.) Sarg.	Celtidaceae	Antimycotic EU (fresh leaves on the skin to treat the <i>empeine</i> )	Martínez-Crovetto, 1981
<i>Celtis pubescens</i> (Humb. et Bonpl.) Spreng.	Celtidaceae	Antimycotic EU (a tender leaf rubbed "on the skin affected with <i>empeine</i> ")	Martínez-Crovetto, 1981
<i>Celtis chicaepe</i> (Wedd.) Miq.	Celtidaceae	Antimycotic ("to heal the skin with <i>empeine</i> by rubbing it with fresh leaves")	Lahitte & Hurrell, 1998
<i>Cestrum parqui</i> L'Hér.	Solanaceae	Antimycotic EU (the leaves [ <i>in situ</i> ?] "against ringworm")	Rojas Acosta, 1912
<i>Cestrum parqui</i> L'Hér.	Solanaceae	Fungicide ("the leaves, as antifungal")	Toursarkissian, 1980
<i>Cestrum parqui</i> L'Hér.	Solanaceae	Antimycotic EU (decoction of the leaves "to combat the ringworm")	Lahitte & Hurrell, 1998
<i>Clematis montevicensis</i> (Spreng.) var. <i>denticulata</i> (Vell.) Bacigalup.	Ranunculaceae	Antimycotic EU (a cloth impregnated with the leave's juice, <i>in situ</i> )	Scarpa, 2004
<i>Coprinus</i> sp.	Agaricaceae	Antimycotic EU ("laminae of this mushroom placed between the feet's fingers")	Martínez-Crovetto, 1981
<i>Cucurbita moschata</i> (Duchesne ex Lam.) Duchesne ex Poir.	Cucurbitaceae	Antimycotic, in Bolivia (rosin of the fruit, <i>in situ</i> , "to heal the <i>empeine</i> ")	CABI, CYTED et al. (ONG Ed), 2002
<i>Datura innoxia</i> Mill.	Solanaceae	Fungicide EU (the decoction of leaves "for <i>empeine</i> and other illnesses")	Martínez-Crovetto, 1981
<i>Dolichandra unguis-cati</i> (L.) L. G. Lohmann	Bignoniaceae	Antimycotic (decoction [of the entire plant?]) "for vaginal mycosis")	Hilgert, 2001
<i>Erythrina crista-galli</i> L.	Fabaceae	To treat the <i>empeine</i> (the crushed fresh parts, in cataplasms, <i>in situ</i> )	Lahitte & Hurrell, 1998
<i>Eucalyptus camaldulensis</i> Dehnh.	Myrtaceae	Fungicide? EU ("the decoction for cracked skin")	Martínez-Crovetto, 1981
<i>Eucalyptus camaldulensis</i> Dehnh.	Myrtaceae	Antimycotic ? EU (the head washed with the decoction of leaves, "to treat itching and dandruff")	Martínez-Crovetto, 1981
<i>Eucalyptus cinerea</i> F.von Muell.	Myrtaceae	Antimycotic ? EU (the head washed with the decoction of leaves, "to treat itching and dandruff")	Martínez-Crovetto, 1981
<i>Eucalyptus cinerea</i> F.von Muell.	Myrtaceae	Antifungal? EU ("cracked skin in the feet")	Martínez-Crovetto, 1981

Table 1.- Argentine Medicinal Plants with Potential Antifungal Activity (cont.)

Used species	Family	Use and/or potential activity	Bibliographic reference
<i>Euphorbia hirta</i> L. var. <i>ophthalmica</i> (Pers.) Allem & Irgang	Euphorbiaceae	Antimycotic (fresh leaves frictioned <i>in situ</i> "to heal the <i>empeine</i> ")	Lahitte & Hurrell, 2000
<i>Ficus eximia</i> Schott	Moraceae	Antimycotic EU ("latex on the scalp to treat the <i>empeine de peluqueria</i> [barber's shop ringworm]")	Martínez-Crovetto, 1981
<i>Foeniculum vulgare</i> Mill.	Apiaceae	Fungicide? EU (decoction of leaves and stems to treat "fissures in skin and feet")	Martínez-Crovetto, 1981
<i>Funastrum gracile</i> (Decne.) Schltld.	Asclepiadaceae	Antimycotic EU ("latex of the fresh stems, [ <i>in situ</i> ] as -")	Scarpa, 2004
<i>Funastrum gracile</i> (Decne.) Schltld.	Apocynaceae	Antimycotic EU ("latex of the fresh leaves, rubbed <i>in situ</i> , as -")	Scarpa, 2004
<i>Geoffraea decorticans</i> (Gillies ex Hook. & Arn.) Burkart	Fabaceae	Antimycotic (latex <i>in situ</i> to heal the " <i>empeine de peluqueria</i> " [barber's shop ringworm] in the scalp)	Martínez-Crovetto, 1981
<i>Krameria lappacea</i> (Dombey) Burdet & B.B. Simpson	Krameriaceae	Antimycotic (infusion of leaves, <i>per os</i> , three times a day, "for vaginal mycosis")	Hilgert, 2001
<i>Maclura tinctoria</i> (L.) Steud. <i>subsp. tinctoria</i>	Moraceae	Antimycotic ? EU ("to heal the <i>empeine</i> by rubbing the skin with a leaf while adding oil to it")	Martínez-Crovetto, 1981
<i>Malva parviflora</i> L.	Malvaceae	Antifungal EU (decoction of leaves with other herbs, <i>in situ</i> )	Martínez-Crovetto, 1981
<i>Melia azedarach</i> L.	Meliaceae	Fungicide in ringworm (decoction of leaves with <i>Malva parviflora</i> and <i>Mentha rotundifolia</i> )	Martínez-Crovetto, 1981
<i>Mentha rotundifolia</i> (L.) Hudson	Lamiaceae	Antifungal EU ("washing, [ <i>in situ</i> ] of skin ulcers and ringworms" with a decoction made with this and other herbs.	Martínez-Crovetto, 1981
<i>Microgramma squamulosa</i> (Kaulf.) de la Sota	Polypodiaceae	Antifungal <i>per os</i> (infusion of the whole plant, sweetened with honey, for "vaginal mycosis")	Hilgert, 2001
<i>Morrenia brachystephana</i> Griseb.	Apocynaceae	Antimycotic EU? (juice of the fruit "to combat the <i>empeine</i> ")	Martínez-Crovetto, 1981
<i>Morrenia stuckertiana</i> (Kutz ex Heger) Malme <i>subsp. Grandiflora</i> (Malme) Goyder	Apocynaceae	Antimycotic EU ("latex of the fresh leaves [ <i>in situ</i> ] as -")	Scarpa, 2004
<i>Morrenia odorata</i> (Hook. & Arn.) Lindl.	Apocynaceae	Antimycotic EU (juice of the fruit "to combat the <i>empeine</i> ")	Martínez-Crovetto, 1981
<i>Morrenia odorata</i> (Hook. & Arn.) Lindl.	Apocynaceae	Antimycotic EU (latex of young stems, <i>in situ</i> )	Scarpa, 2004
<i>Morrenia odorata</i> (Hook. & Arn.) Lindl.	Apocynaceae	Antimycotic? (juice of the fruit "to heal the <i>empeine</i> ")	Lahitte & Hurrell, 1998
<i>Morus alba</i> L.	Moraceae	Antimycotic EU ("latex [ <i>in situ</i> ] for <i>empeine</i> ")	Martínez-Crovetto, 1981

**Table 1.-** Argentine Medicinal Plants with Potential Antifungal Activity (cont.)

Used species	Family	Use and/or potential activity	Bibliographic reference
<i>Morus alba</i> L.	Moraceae	Antimycotic EU (decoction of bark, <i>in situ</i> )	Lahitte & Hurrell, 2004
<i>Musa x acuminata</i> L.	Musaceae	Antimycotic (infusion of fresh leaves before breakfast, during one week, "for vaginal mycosis")	Hilgert, 2001
<i>Pereskia sp.</i>	Cactaceae	<i>Pereskia sacarosa</i> as antifungal EU, in Bolivia (part of the leave's interior)	CABI, CYTED et al. (ONG. Ed.), 2002
<i>Polygonum punctatum</i> Elliott	Polygonaceae	Antimycotic (the extract of the whole plant crushed in cold water) ( <i>in situ</i> ?)	Gattuso, 2000
<i>Pycnoporus sanguineus</i> (L.ex Fr.) Murr.	Polyporaceae-Aphylliphorales	Antimycotic EU ("powdered basidiocarpus, <i>in situ</i> , as -")	Scarpa, 2004
<i>Rhipsalis floccosa</i> Pfeiff. ssp. <i>tucumanensis</i> (Weber) Barthlott & Tayl	Cactaceae	Antimycotic EU ("fresh plant smashed with warm water, on the skin, as -")	Hilgert, 2001
<i>Senna morongii</i> (Britton) H. S. Irwin & Barneby	Fabaceae	Antimycotic (decoction of leaves, <i>per os</i> , "to treat the athlete's foot"), in Bolivia	CABI, CYTED et al. (ONG Ed.), 2002
<i>Solanum aridum</i> Morong	Solanaceae	Antimycotic EU ("mucilage of fresh fruits, rubbed <i>in situ</i> , as -")	Scarpa, 2004
<i>Solanum hieronymi</i> Kuntze	Solanaceae	Antimycotic EU ("mucilage of fresh fruits, rubbed <i>in situ</i> , as -")	Scarpa, 2004
<i>Solanum palinacanthum</i> Dunal.	Solanaceae	Antimycotic EU ("mucilage of the fresh fruits, rubbed <i>in situ</i> , as -")	Scarpa, 2004
<i>Tagetes filifolia</i> Lag.	Asteraceae	Antimycotic (infusion of branches, <i>per os</i> , "for vaginal mycosis")	Hilgert, 2001
<i>Taraxacum officinale</i> G. Weber ex F.H. Wigg.	Asteraceae	Antimycotic ("illness of the <i>empeine</i> ")	Freire & Urtubey, 1999
<i>Tessaria dodoneifolia</i> (Hook. & Arn.) Cabrera	Asteraceae	Antimycotic (infusion of fresh leaves, <i>per os</i> , "for vaginal mycosis")	Hilgert, 2001
<i>Usnea sulcata</i> Mot.	Usneaceae	Fungicide? EU ("inside the shoes, to avoid the odors produced by fungus")	Chifa, 2001
<i>Usnea sulcata</i> Mot.	Usneaceae	Fungicide? ("to heal wounds and sores in the sole of foot")	Chifa, 2001
<i>Zanthoxylum petiolare</i> A. St. - Hil. & Tul.	Rutaceae	Fungicide EU (decoction of bark, to treat the <i>empeine</i> )	Martínez-Crovetto, 1981

Abbreviations: "EU": External Use; "xxx": Textual in the reference. As already mentioned, in general, the original words and expression have been respected, interpreted or translated. In some cases, hypothesis has been elaborated on the probable activity of the plant. In these cases the corresponding phrase in the table has been marked with an interrogation sign. The sources of the data cited both in the text and in table 1 are listed in the bibliographic references.

### Reviewing of the language

From the selected species, if it was needed, a translation and interpretation of the popular language was accomplished, both into polished Spanish and also into English. It was also useful to have in mind the definition of some words as micosis (mycosis), fungicida (fungicide), antimicótico (antimycotic), fúngico (fungic), etc. According to that, the table reports the supposed biological activity of the plant on fungal infections and an interpretation of the plant activity. In some cases, an hypothesis on the pharmacological activity has been added and the corresponding field signaled with an interrogation mark (“?”). indicating doubts about the translation or meaning of the original expression. When available, the plant part used is also mentioned, and sometimes, the way of preparation of the extract according to the original source. Phrases or words (mostly in Spanish) and synonyms considered useful were also reviewed as were “micosis”, “tiña”, “fung” etc.

In each case the meaning of the supposed words or synonyms was reviewed. Some useful strings in Spanish were: “antimic”, “empeine”, “fung”, “tiña”, “micot”, etc.

Sometimes, a careful analysis of the meaning of the original therapeutical indications has made necessary to work on the text of the original reference to “translate” the information, interpreting the popular language applied to the description of use, objective and supposed activity, clarifying the language and vocabulary used to describe the activity / use relationship and making and hypothesis on the activity of the plant, trying to glimpse the presence of substances with interesting pharmacological activity.

In general, the original words and expression have been respected, interpreted or translated. In some cases, an hypothesis has been elaborated on the probable activity of the plant. In these cases the corresponding field in the table has been signaled with an interrogation mark. We hope that the present work will be useful to those interested in the systematic pharmacological screening of plants that are looking for potential sources of new drugs from natural origin.

### Conclusions

- The most cited illness related to fungi was “empeine” (Spanish). This word is used regularly, but is also considered a Spanish word.

- According to the recent data coming out of our data bank, the number of Argentine species recorded as used therapeutically (i.e. “medicinal”) makes a total of 1.537 species.
- The analysis of the registered data for potential antifungal species showed that a total of 58 species growing in Argentina should be considered as antifungal candidates.
- The present work should be useful for those working on new drugs from natural origin.

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