



Revista Brasileira de Farmacognosia

BRAZILIAN JOURNAL OF PHARMACOGNOSY

www.journals.elsevier.com/revista-brasileira-de-farmacognosia/



Original article

Documentation of the medicinal knowledge of *Prosthechea karwinskii* in a Mixtec community in Mexico

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ARTICLE INFO

Article history:

Received 16 October 2013

Accepted 27 March 2014

Keywords:

Ethnobotany

Medicinal plants

Oaxaca

Traditional knowledge

Traditional medicine

A B S T R A C T

In Mexico, native orchids are appreciated for their ornamental value and traditional uses and in many indigenous communities they comprise part of a biocultural heritage. The orchid *Prosthechea karwinskii* (Mart.) J.M.H. Shaw, Orchidaceae, is particularly relevant in this context, although some of its traditional uses have been attributed to a very similar species, *P. citrina*. A recent study of *P. karwinskii* reported unknown medicinal and other traditional uses by the Mixtec community in Mexico. Unfortunately, increasing acculturation of indigenous communities has resulted in a loss of the community's traditional knowledge, thus, we herein documented the worldview and practices associated with the medicinal use of *P. karwinskii* as well as the socioeconomic aspects that characterize the holders of this knowledge. People with this knowledge are mainly indigenous women with little or no schooling, who learned the medicinal practices from family tradition. They use pseudobulbs, leaves, or flowers of the plant to treat coughs (infusions), wounds and burns (poultices), diabetes (tea or chewed), to prevent miscarriages and to assist in childbirth (infusions). These results show a promising future for ethnopharmacological research on *P. karwinskii*.

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Introduction

Medicinal plants are the most important traditional therapeutic resource of many indigenous communities where access to health services is scarce or nonexistent. In many cases, the virtues of these plants are based on empirical practices dating from ancient times. In some cases these have been confirmed by current pharmacology (Viesca, 1993). In many cases, knowledge regarding these practices is verbal, maintained and transmitted among few people, scarcely accessible to others, and rarely incorporated into formal studies. For this reason,

it is important to document this information before it is lost due to processes of acculturation or cultural erosion suffered by indigenous people (Argueta and Aguilar, 1993; Sanfilippo, 1993; Naranjo, 1995; Pardo-Santayana and Gomez-Pellon, 2002; Reyes-Garcia et al., 2004; Boege and Chan, 2008).

In Oaxaca, Southern Mexico, the Mixteca is a region inhabited by people of Mixtec and Triqui ethnicities, for whom the native surrounding plants have traditional uses and are part of their biocultural heritage (Boege and Chan, 2008). Such plants include orchids, appreciated for their ornamental, medicinal and ceremonial value, and are also used as edible

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herbs (Hagsater et al., 2005; Solano et al., 2010; Cruz-Garcia, 2013). A particularly valued orchid in the Mixteca is *Prosthechea karwinskii* (Mart.) J.M.H. Shaw, Orchidaceae, endemic to Southern Mexico where it grows as an epiphyte in oak or pine-oak forests, this plant has showy yellow flowers with a very pleasant aroma.

The use of *P. karwinskii* in traditional medicine has not been previously reported. Until recently, this orchid was confused with its sister species, another Mexican endemic orchid known as *P. citrina* (La Llave and Lex.) W.E. Higgins; it is a very similar species, so in the past the available information for the first was invariably attributed to the second. In the present study we agree with Pridgeon et al. (2005) and Soto et al. (2007) on including both species in *Prosthechea* genus and not in *Euchile*, which is synonym of the first, according to these authors. The literature reports few medicinal uses for *P. citrina* or any of its synonyms (*Cattleya citrina*, *Encyclia citrina*, *Euchile citrina*, *Epidendrum citrinum*, or *Sobralia citrina*). Francisco Hernández, a Spanish physician who visited Mexico in mid-16th century illustrated an orchid named *cozticoatzontecoxochitl* by the Aztecs, which means "yellow pendant flower snake-like" (Hernandez, 1959). This plant was used by Aztec doctors to heal infected wounds. Urbina (1903) identified Hernandez's drawing as *Cattleya citrina*. Garcia-Peña and Peña (1981), Hagsater et al. (2005), and Ossenbach (2005) reported that poultices were the way in which this plant was used to heal wounds.

Regarding other traditional uses for *P. karwinskii*, Hagsater et al. (2005) described the "agua de gloria" (glory water) prepared in the Mixteca of Oaxaca, which is a scented water made with flowers of this orchid used at processions during Easter. Moreover, Solano et al. (2010) indicated that during Easter, in several towns from Oaxaca, people create

elaborate ornaments with these flowers and these are placed in churches, streets and homes. Cruz-Garcia (2013) mentioned that in Tlaxiaco, Oaxaca, this orchid is used for ceremonial and food purposes, as an inspiration for artistic expressions, and is used to treat several diseases or conditions in traditional medicinal practices. Given that there was previously not known medicinal use for this orchid, and as the process of globalization and acculturation is becoming more common in indigenous communities causing the loss of traditional knowledge, the purpose of this work was to document the remaining medicinal and traditional knowledge of *P. karwinskii* of the people from Tlaxiaco.

Materials and methods

This study was conducted in the municipality of Tlaxiaco (17°16' North latitude, 97°41' West longitude, 2040 m elev.), one of the most important settlements in the Mixteca of Oaxaca, Mexico. A previous study in the community documenting the traditional knowledge of Orchidaceae in this zone (Cruz-Garcia, 2013) recorded two of the 37 orchid species sold there as medicinal, *P. karwinskii* (Mart.) J.M.H. Shaw, Orchidaceae, and *P. michuacana* (La Llave and Lex.) W.E. Higgins. The latter is used to treat kidney problems while the first has more medicinal uses that are herein documented.

Much of the traditional knowledge about wild plants prevails in people for whom these are a resource. Keeping this in mind, weekly visits (every Saturday) were made between September 2011 and August 2012 to the Tlaxiaco's market and *tianguis* (a weekly open-air street market) in which a total of 56 orchid dealers were identified. All of them agreed to answer a semi-structured questionnaire (see format in Annex 1) and

Annex 1

Interview format for informants of orchids' medicinal uses.

Date: ____/____/____
Name: _____ Age: _____
Occupation: _____ Schooling: _____
Place of origin: _____
Do you speak a native language? _____ What language? _____
Do you belong to a society of traditional healers? Yes ___ NO ___ Which? _____
How did you acquire the knowledge about traditional medicine? _____

Do you practice traditional medicine? _____
For how many years have you practiced traditional medicine? _____
How did you acquire your knowledge about the use of orchids in traditional medicine? _____

Do you authorize the inclusion of this information in a publication of the results of this study providing that your name is kept anonymous? _____

participate in an open-ended interview about the medicinal uses for the orchids that they sold, following Martin (2000) and Albuquerque and Lucena (2004). However, only three dealers were able to provide information for *P. karwinskii*. Three more informants were located and interviewed in the Hospital of the Organization of Indigenous Physicians of the High Mixteca (OMIMA, for its Spanish acronym), and the municipal headquarters of the Commission for Development of Indigenous People (CDI for its Spanish acronym). Using techniques such as participant observation, free listings, and open-ended interviews, information about non-medicinal uses for this orchid was obtained, which is also herein documented. Each informant consented to the publication of the information provided, however their names remain anonymous to ensure their privacy and dignity as well as to avoid possible effects resulting from the research, in accordance with the guidelines of the Research Ethics Committee of the National Institute of Medical Sciences and Nutrition Salvador Zubiran (INNSZ, 2014), which in turn are based on the Helsinki Declaration of the World Medical Association (WMA, 2014). Some specimens were acquired from interviewed sellers; they were pressed, taxonomically determined by one of the researchers (RS), and deposited in the OAX herbarium of the National Polytechnic Institute (IPN for its Spanish acronym).

The questionnaire and interview were focused on the following three topics: i) the worldview associated with the traditional knowledge and practices using orchids; ii) the socio-economic aspects that characterize people who maintain this knowledge (age, gender, schooling, knowledge of an indigenous language, occupation, place of origin and means by which knowledge was acquired); and iii) the diseases or conditions for which *P. karwinskii* is employed, part of the plant used, preparation method, doses used, and characteristics of people to whom it is recommended.

Results and discussion

Socioeconomic aspects of informants

Chart 1 summarizes the socio-economic data of the informants interviewed. Only six respondents provided information about medicinal uses for *Prosthechea karwinskii* (Mart.) J.M.H. Shaw (Fig. 1), Orchidaceae, the rest of respondents either did not have any medicinal information or it was about another species. Regarding the informants who had knowledge about medicinal uses of this orchid, four of them were women and two were men. All of them were middle-aged or elderly adults, whose age ranged from 45 to 83 years. Five of them live in Tlaxiaco and one in a nearby village. In terms of schooling, two women did not have any formal instruction, one woman had three years of elementary school and the fourth woman completed elementary school. In contrast, both men had completed high school. Two of the women work in the orchid trade as their main economic activity, one is a housewife, and the other is a cook. One of the men is a teacher and the other works in a restaurant. The two women who lack schooling speak the native language of the region, Mixtec, in addition to Spanish, whereas the rest of the informants only speak Spanish. Finally, regarding the mode of acquisition of traditional medicinal knowledge, three women learned it from their mothers and the rest from a father, grandmother or grandfather.

Worldview

If worldview is understood as the people's conception of the natural and social environment that surrounds them and from which traditions that are shared, transmitted and sometimes modified to be part of the local culture are derived, then, in the Mixteca of Oaxaca, as it is an important component of their forests and an element present in many manifestations of the regional culture, orchids are part of the Mixtec's worldview.

Chart 1

Socioeconomic data from informants who provided information regarding the medicinal uses for *Prosthechea karwinskii*.

N° informant	Gender	Age	Schooling	Language	Place of residence	Main activity	Medicinal use	Source of knowledge
1	F	51	PES (3)	S-M	Tlaxiaco	Orchid dealer	Cough	Mother
2	F	65	NS	S-M	Santo Domingo Ticua	Orchid dealer	Wounds, burns	Mother
3	F	83	NS	S	Tlaxiaco	Housewife	Cough	Mother
4	M	45	HS	S	Tlaxiaco	Teacher	Miscarriage, childbirth	Grandfather-father
5	M	51	HS	S	Tlaxiaco	Restaurant owner	Diabetes	Father
6	F	45	SES	S	Tlaxiaco	Cook	Miscarriage, childbirth	Grandmother

F, female; M, male; PES, primary elementary school; SES, secondary elementary school; HS, high school; NS, no schooling; S, spanish; M, mixtec. The number of years of schooling is in parentheses.

According to the informants interviewed, orchids are “fine flowers” that are “different from other plants” because of their various shapes, sizes, colors, and aromas. In the Mixtec language of Tlaxiaco, epiphytic orchids are known by the name *ita ndeka*. To avoid confusion with other orchids from the region that also grow as epiphytes, the color of the flower is added to the name, so *P. karwinskii* is called *ita ndeka “amarilla”* (yellow). This name does not have an accurate translation in Spanish; in Mixtec the word *ita* means flower, while *ndeka* can be translated as raspy wall, raspy rocks, stuck to something raspy, or glued to the oak. Two teachers interviewed (Elizabeth Martinez and Julia Lopez Simon, CDI, Tlaxiaco) indicated that it would be more accurate to call the orchid “*flor de encino amarilla*” (yellow oak flower) because it grows on these trees (*Quercus* sp., Fagaceae), or “*flor de campo amarilla*” (yellow field flower).

Medicinal practices

Chart 2 summarizes the medicinal uses of *P. karwinskii*. Most informants mentioned that *P. karwinskii* is employed to calm coughs, heal wounds and burns, treat diabetes, prevent miscarriage (spontaneous abortion), and to assist in childbirth. Its use in wound and burn healing has also been reported for its sister species, *P. citrina* (Hernandez, 1959; Garcia-Peña and Peña, 1981). Informants mentioned that the parts of the plant employed as remedies are the pseudobulbs, which are used for the treatment of coughs, burns and diabetes; the flowers, to prevent miscarriages and assist in childbirth, and to soothe coughing; and the leaves, to treat diabetes.



Figure 1 - *Prosthechea karwinskii* in its habitat. Photo by R. Solano.

Chart 2

Summary of medicinal uses of the orchid *Prosthechea karwinskii*.

Disease or condition	Part used	Method of use	Doses	Type of patients
Cough	Pseudobulbs, flowers	Infusion	3 days, taken during the night	Any age
Cough	Flowers	Infusion, add two cudweed branches	3 days, taken as drinking water	Any age
Wounds and burns	Pseudobulbs	Poultice	Until the wound heals	Any age
Diabetes	Pseudobulbs	Infusion	Taken as drinking water, until the glucose level becomes stable	Older than 18 years
Diabetes	Leaves	Chewed	Daily, until the glucose level becomes stable	Older than 18 years
Miscarriage, childbirth	Flowers	Infusion, add a gold coin or jewel	For a month, taken as drinking water	Pregnant women
Miscarriage, childbirth	Flowers	Infusion, add a gold coin or jewel plus a potter wasp	Several days	Pregnant women

The orchid may be prepared as a poultice made with pseudobulbs for the treatment of wounds and burns, infusions are drunk to treat coughs or diabetes, and to prevent miscarriage and assist in childbirth, or the leaves may be chewed and the sap swallowed to treat diabetes. For treating a cough, there are generally two preparations, infusions prepared with pseudobulbs and flowers of the orchid, or flowers and branches of "gordolobo" (cudweed, *Gnaphalium* spp., Asteraceae). In some cases a treatment seems to imply magical or superstitious beliefs, as it is the case of preventing miscarriages, for which a gold coin or jewel is added to the infusions prepared with the flowers, and in other cases a potter wasp (*Eumenes* spp., Vespidae) is added.

Lawler (1984) and Chinsamy et al. (2011) reviewed the traditional uses of orchids, including some species that have been used to assist in childbirth by different civilizations around the world. In reference to Mexico, there was only one previous report of an orchid employed this way in traditional medicine by indigenous people: *Myrmecophila tibicinis* (Bateman) Rolfe, used by Maya people (Hartmann, 1972). To heal wounds and burns, as well as coughs and respiratory problems, orchids have been used in all regions where this group is part of the vegetation (Lawler, 1984; Handa, 1986; Chinsamy et al., 2011; Hossain, 2011). For wounds and burns, some reviews (Hartmann, 1972; Berlin et al., 1974; Lawler, 1984; Garcia-Peña and Peña, 1981; Hagsater et al., 2005) report that Mexican traditional medicine has employed species such as *Bletia purpurea* (Lam.) DC., *Calanthe calanthoides* (A. Rich. and Galeotti) Hamer and Garay, *Catasetum integerrimum* Hook., *Cyrtopodium macrobulbon* (La Llave and Lex.) G.A. Romero and Carnevali, *Laelia autumnalis* (La Llave and Lex.) Lindl., *L. speciosa* (Kunth) Schltr. and *Rhyncholaelia digbyana* (Benth.) Schltr.

In this study new knowledge was acquired regarding the use of a wild orchid in traditional medicine, which may be employed to improve existing practices by its validation. The medicinal uses reported here for *P. karwinskii* indicate a promising future in terms of ethnopharmacological research on this species, highlighting the necessity to evaluate its biological activity and the active principles responsible for it. Recent studies have shown the potential of *P. karwinskii* for the treatment of illnesses related to metabolic syndrome and its antioxidant activity (Rojas-Olivos, CIIDIR Oaxaca-IPN, unpublished data).

Non-medicinal uses

In addition to the medicinal utilization of *P. karwinskii*, the informants also described non-medicinal, such as cosmetic, food and ceremonial uses for this orchid. The traditional physician Luisa Chaves Reyes (OMINA Hospital, Tlaxiaco), prepares a cosmetic mixture by adding the flowers of this plant to a jar of commercial oil which is left to stand for fifteen days and then used as a hair gel.

The ceremonial use of this plant was observed during Easter (Friday to Sunday) in the community of Guadalupe Hidalgo, Tlaxiaco. A group of people is responsible for collecting flowers in the forests of the region on Friday

and then using them to decorate boats containing water, which are brought to the parish on Saturday, where they are blessed by the priest. On Sunday, the water is distributed among Catholics. Mr. Arcadio Antonio Cruz (from Guadalupe Hidalgo, Tlaxiaco) says that this tradition has existed since 1904; people believe that the pleasant aroma of the flowers reaches the spirit of the saints, and thus they gain their protection. This ceremony confirms the use of the glory water at the Mixteca reported by Hagsater et al. (2005). In the same season, it is common to see religious images in churches and houses decorated with *P. karwinskii* in addition to people wearing wreaths of these flowers during the processions that take place during Easter.

Finally, Mr. Roberto Santos Perez (from Santa Maria Yucuhuite) mentioned that in Santa Maria Yucuhuite and Ocotepic, towns near Tlaxiaco, people prepare some local foods using the orchid flowers as an ingredient and that they can also be eaten alone. Furthermore, Mr. Roman Lopez Espiritu (from Santo Domingo Huendio) said that in Santo Domingo Huendio, another town in the region, residents use the flowers in some dishes because of their sweet and sour flavor.

Conclusions

Prosthechea karwinskii is highly valued in the Tlaxiaco region based on its medicinal, ceremonial, edible, and cosmetic uses, as it is, consequently, part of the worldview of the Mixtec people of Oaxaca. Most informants who provided information about the medicinal uses of this orchid are women of Mixtec ethnicity with little or no schooling whose knowledge has been passed down by family tradition. The medicinal practices consist of using the pseudobulbs, leaves, or flowers of this orchid to treat coughs (infusions), wounds and burns (poultices), diabetes (teas or chewed), and to prevent miscarriages and assist in childbirth (infusions). This orchid has more uses in traditional medicine than those previously known for its sister species, *P. citrina*; thus, *P. karwinskii* has a promising future in ethnopharmacological research.

Authors' contributions

GCG (graduate student) collected the information in the study zone, conducted the interviews, organized information, and preserved the specimen for its inclusion in the herbarium. RS designed the study, identified the plant material, and drafted the manuscript. LLR conducted the review about medicinal uses of orchids to enhance the discussion of this study and contributed with a critical reading to the manuscript. All the authors have read the final manuscript and approved the submission.

Conflicts of interest

The authors declare no conflicts of interest.

Acknowledgment

The authors thank all people who provided the information presented in this study. National Polytechnic Institute (IPN) provided financial support for this study through the project SIP 20121328. Scarlett Jones revised the English wording of the manuscript.

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