Diversidad de pteridofitas de la localidad la gloria en Apulco, Puebla, México

Pteridophytes diversity of the town gloria in Apulco, Puebla, México

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Resumen

De los 217 municipios que comprende el estado de Puebla, sólo de 43 municipios ha sido estudiada su pteridoflora, sin embargo en La Gloria ubicada en el municipio de Apulco, Puebla, México no se tiene ningún registro. Por tal motivo en este trabajo se investigó la diversidad de Pteridofitas de la localidad de La Gloria.

Se obtuvieron en total 30 ejemplares de los cuales se identificaron siete familias (Aspleniaceae, Blechnaceae, Dryopteridaceae, Hymenophyllaceae, Pteridaceae, Polypodiaceae y Thelypteridaceae), 13 géneros y 25 especies. El género más abundante fue Thelypteris con seis especies (T. balbisii, T. cheilanthoides var. cheilanthoides, T. ctenitis aff. equestris, T. concinna, T. pilosa y T. rudis), seguidas por las representantes del género Polypodium con cinco especies (P. falcaria, P. furfuraceum, P. lepidotrichum, P. madrense, P. plebeium), Asplenium con tres especies (A. alatum, A. blepharophorum y A. miradorense) y Pleopeltis con dos especies (P. crassinervata y P. angusta var. stenoloma). Lo cual representa el 8.62 % del total de especies reportadas para el estado de Puebla.

En dicho trabajo se muestran gráficos y tablas sobre la diversidad de Pteridofitas en La Gloria

Palabras clave: Pteridofitas, diversidad, La Gloria, Apulco, Puebla.

Abstract

Of the 217 municipalities comprising the state of Puebla, only 43 municipalities have been studied your pteridoflora, however in La Gloria located in the municipality of Paulco Puebla, Mexico does not have any records. For this reason in this work we investigated Pteridophytes diversity of the town of La Gloria.
We obtained a total of 30 individuals, of which seven families were identified (Aspleniaceae, Blechnaceae, Dryopteridaceae, Hymenophyllaceae, Pteridaceae, Polypodiaceae and Thelypteridaceae), 13 genera and 25 species. The most abundant genus
was Thelypteris six species (T. balbisii, T. cheilanthoides var. cheilanthoides, T. ctenitis aff. equestris, T. concinna, T. pilosa and T. rudis), followed by representatives Polypodium genus with five species (P. Falcaria, P. furfuraceum, P. lepidotrichum, P. Madrean, P. plebeium), Asplenium with three species (A. alatum, A. blepharophorum and A. miradorense) and Pleopeltis with two species (P. crassinervata and P.
angusta var. stenoloma). Which represents 8.62% of total species reported for the state of Puebla.
In this paper we show graphs and tables on the diversity of Pteridophytes in the glory.

Key words: Pteridophytes diversity, La Gloria, Paulco Puebla.

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Introduction

Pteridophytes are a group of plants made up of what are commonly called ferns. True ferns are plants that are basically characterized by the presence of vascular tissues (xylem and phloem) that conduct water and mineral salts, by the absence of flowers and fruits, by producing spores instead of seeds, and by depending on external water to reproduce. . (Ceron, 2011).

On the underside of the leaf are the sori formed by sporangia, which are small capsules that contain thousands of spores. When the sporangia mature spores are released, these can be brown, yellow, white, black, etc. (Mendoza-Ruiz and Pérez-García, 2009). The sori are a group of sporangia, they have taxonomic importance, mainly due to their shape, position and form of protection. It can be located along the margin or on the abaxial side. It is mostly found in a vein or at the tip of a vein. Its shape is mainly rounded, although in some ferns the sori can merge with each other, forming a linear sori called a coenosore. If the sporangia diffuse through and between the veins, covering the surface, it is called acrosticoid sorus (Rodríguez, 2001).

They present: rhizomes (they can be long, creeping or climbing, they can also be short and compact, called caudex); and leaves (the latter is divided into petiole and blade, which can be simple or have different degrees of division and the petiole is called stipe). Fern structures may have scales or hairs, especially on the true roots (Australian National Botanic Garden, 1999; Rodríguez, 2001).

The leaf blade of fern leaves is covered by numerous veins, which can be simple, free near the margin, and their apex is narrowed to a point, or obtuse, claviform, punctiform or ending in a whitish and translucent tip (Conzatti, 1981). . . When the vein branches and the ribs are free and diverge, they are said to be pinnate; if they retain a certain parallelism, they are called forked and if they subdivide without losing their apparent parallelism, but separating from the primary vein in the form of a fan, they are called flabellate (Conzatti, 1981; Australian National Botanic Garden 1999).

They can be found in a wide variety of habitats, from tropical to desert areas, where they have some adaptations to these conditions (Cerón, 2011). Ferns have several life forms. They can be terrestrial, climbing, aquatic or subaquatic, epiphytic, hemi-epiphytic and arborescent. Its distribution is conditioned by factors such as light, temperature,

humidity, etc. So depending on their tolerance to these we can find them growing exposed to the sun in arid areas, under the shade of trees, in forests and jungles or growing on the surface of lakes and freshwater ponds or anchoring their roots in muddy soils under the Water. There are even species that can be found in marshy areas of coastal lagoons (mangroves) with brackish water (Mendoza et al. 2009)

BACKGROUND

There are 12,000 species of ferns worldwide, of which 10,400 have been described. In America around 3,250 species have been described (Campos, et al. 2006). Among the countries with the greatest diversity of ferns is Colombia with 1,300 spp, Ecuador with 1,298 spp, and Mexico with 1,008 spp. Which correspond to between 10 and 12% of the world's pteridophytes (Vázquez et al. 2006; Arreguin-Sanchez et al. 2009).

Mexico ranks third among the countries with the greatest diversity of ferns. It is composed of approximately 1,008 species, of which 186 are endemic. The states that have a high richness of ferns highlight Oaxaca with 690 spp. Chiapas with 609 spp. and Veracruz with 572 (Mickel and Smith 2004). Tahuilan et al. (2003) reported three genera, eight species and one new hybrid; the genera are Onocleopsis, Plecosorus and Polystichum (Aspleniaceae-Pteridophyta) in the Balsas river basin, Mexico. Later Rodríguez-Jiménez et al. (2005) in the Balsas river basin carried out an inventory of endemic vascular plants; In this work, 12 species belonging to the families: Pteridaceae (7), Woodsiaceae (2), Aspleniaceae, Polypodiaceae and Thelypteridaceae with one species each were found. Polystichum smithii ceased to have the category of endemic in the portion of Oaxaca due to the expansion of its distribution area.

In the state of Puebla, several studies have been carried out on the pteridoflora, one of the works carried out is that of Mickel and Beitel (1988) who published the work of the pteridophytes of Oaxaca where they treat 850 species, of which 183 species are reported for the state of Puebla. Mickel's (2004) work includes descriptions and diagrams of 124 genera, 1008 species and 16 varieties of Mexican pteridophytes, of which 77 genera and 290 species are found in the state of Puebla. Mainly in the northern part of the state of Puebla, despite having different types of vegetation, it has been little studied. The genera with the highest percentage of endemic species are found in

seasonally dry habitats. Some predominant genera of humid forests (Asplenium, Elaphoglossum, Polypodium) presenting endemic species in dry regions.

In the work of Cerón et al. (2006) who carried out a study in the area of Tlatlauquitepec, Puebla, where they found 35 genera and 66 species; three genera and six species of which (Adiantum tetraphyllum, Asplenium auritum, Blechnum gracile, Danaea cuspidata, Macrothelypteris torresiana and Sphaerpteris horrida) are new records for the state of Puebla.

With the work carried out for the Tehuacán-Cuicatlán Valley, where five families, 12 genera and 33 species are present, the state now has approximately 81 genera, 288 species of pteridophytes, belonging to 24 families, with the Pteridaceae and Polypodiaceae being the most important. diverse. The genera with the highest number of species are Polypodium, Asplenium and Thelypteris (Cerón, 2011).

There are registered collections in 43 municipalities of the 217 that comprise the state of Puebla, the municipalities with the most collections are Tlatlauquitepec, Teziutlán, San Nicolás de los Ranchos, Cuetzalan del Progreso and Aljojuca (Cerón, 2011). However, in the area of La Gloria there is no knowledge of the pteridoflora, hence the importance of making this list.

MATERIAL AND METHODS

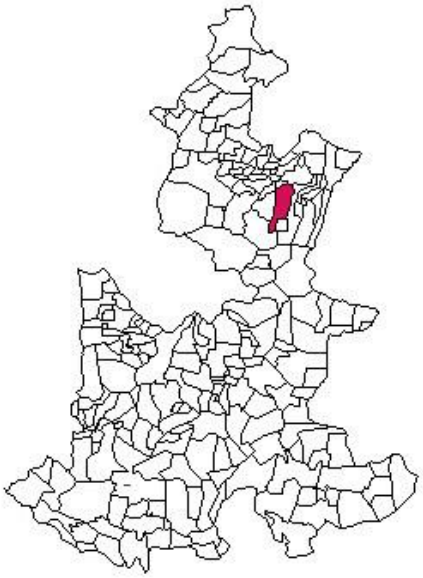
Sampling. The samplings were carried out from March 2009 to March 2010, transects located parallel to the Apulco River were carried out, where the samples were collected, placed between newspaper and pressed. Subsequently, the specimens were placed in a dryer to dehydrate them and thus prevent their decomposition, and they were immediately assembled.

A total of 30 specimens were obtained, which were identified with the keys of Mickel and Smith 2004 and "Pteridophytes of Oaxaca" Mickel and Beitel 1988. DESCRIPTION OF THE STUDY AREA

La Gloria waterfall is located 15 minutes from the highway

Zacapoaxtla-Cuetzalan. Its coordinates are 19º54´14.08´´ to the north and 97º37´04.55´´ to the west at 1520 m. above sea level. It belongs to the municipality of Zacapoaxtla located in the northern part of the state of Puebla, bordering Cuetzalan del Progreso and Nauzontla to the north, and Tlatlauquitepec and Zaragoza to the east. To the south with Zautla, and to the west with Xochiapulco and Nauzontla (Figure 1).

Figure 1. Location of the municipality of Zacapoaxtla, Puebla



Orography

It is located within the morphological region of the Sierra Norte which has steep mountain ranges, the relief is quite rugged and has a general south-north slope, ranging from 2400 meters to less than 1000 meters above sea level. One type of lithosol soil can be identified.

Hydrography

The municipality belongs to the northern slope of the State of Puebla, formed by partial basins of the rivers that flow into the Gulf of Mexico. The Municipality is located within the Tecolutla river basin; Due to its location, orography and dimensions, it has a complex hydrological system, numerous rivers that run encased between the mountains and later join the Apulco, a tributary of the Tecolutla. The Apulco River has a mighty current with a long journey through the northern mountains, bathing the northern part from west to east and serving as a boundary for more than 10 kilometers with Xochitlán,

Nauzontla and Cuetzalan. It has numerous intermittent streams that join adjoining rivers, springs and aqueducts.

Climate

The municipality is located in the transition zone between the temperate climate of the Sierra Norte and the warm ones of the decline of the Gulf. Therefore, it presents a great variety of climates arranged in latitudinal bands.

On the banks of the Apulco River, the climate is temperate and humid with frequent rains throughout the year and dense banks of fog..

Ecosystems

The municipality has lost much of its original vegetation; however large wooded areas can still be found. Along the Apulco River you can see areas of cloud forest, made up of tree species such as soapberry, liquidambar and beech. As for fauna, there are wild varieties.

RESULTS

From the material collected in the area of La Gloria, Puebla, 7 families were found (Aspleniaceae, Blechnaceae, Dryopteridaceae, Hymenophyllaceae, Pteridaceae, Polypodiaceae and Thelypteridaceae), 13 genera and 25 species (Table 1). The most abundant genus was Thelypteris with six species *(T. balbisii, T. cheilanthoides var. cheilanthoides, T. ctenitis aff. equestris, T. concinna, T. pilosa and T. rudis), followed by representatives of the genus Polypodium with five species (P. falcaria, P. furfuraceum , P. lepidotrichum, P. madrense, P. plebodium), Asplenium with three species (A. alatum, A. blepharophorum and A. miradorense) and with two Pleopeltis species (P. crassinervata and P. angusta var. stenoloma),*

The genera with one representative are Blechnum appendiculatum, Phanerophlebia remotispora, Polystichum hartwegii, Trichomanes radicans, Adiantum capillus-veneris, Pityrogram ebenea, Pecluma atra, Dennstaedtia cornuta and Phlebodium areolatum., (Graph 1), therefore, approximately 8.9% of the total species registered for the state of Puebla and 16.88% of the genera are found in the La Gloria area (Graph 2).

Graph 1: Representation in percentage of the genera present in the zone of estudio

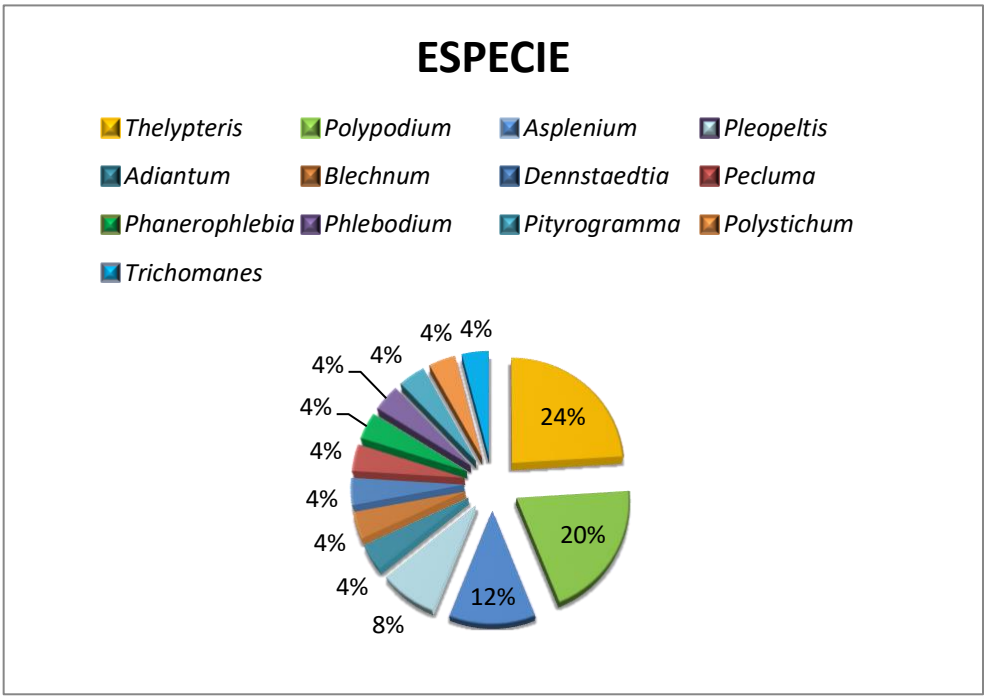
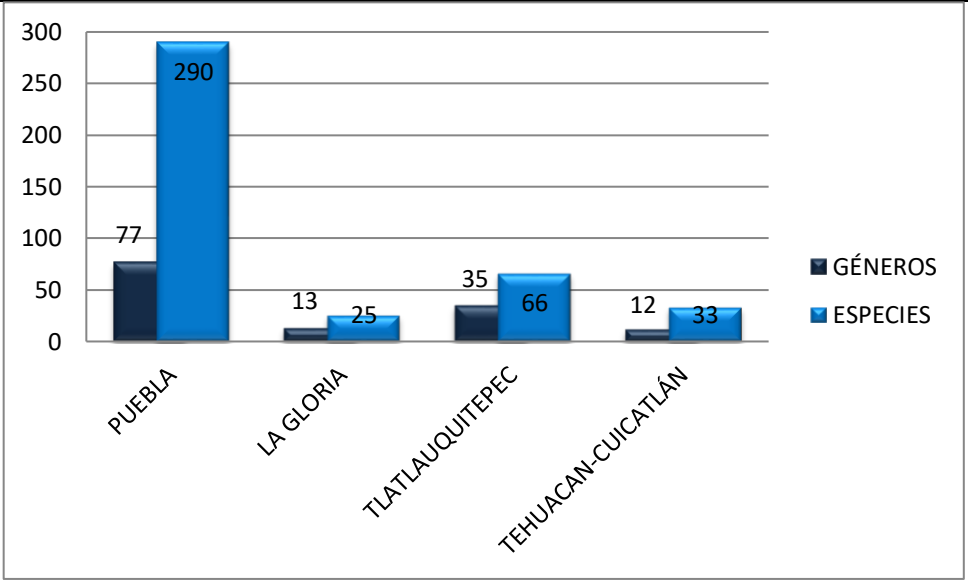


Table 1: List of species from La Gloria Apulco, Puebla

FAMILIA	GÉNERO	ESPECIE	VARIEDADES
Polypodiaceae	*Pecluma*	*P. atra*	
	Dennstaedtia	*D. cornuta*	
	Polypodium	*P. madrense*	
		P. plebeium	
		P. falcaria	
		P. lepidotrichum	
		P. furfuraceum	
	Phlebodium	*P. areolatum*	
	Pleopeltis	*P. crassinervata*	
		P. angusta	var. *stenoloma*
Pteridaceae	*Pityrogramma*	*P. ebenea*	
	Adiantum	*A. capillus-veneris*	
Dryopteridaceae	*Polystichum*	*P. hartwegii*	
	Phanerophlebia	*P. remotispora*	
Hymenophyllaceae	*Trichomanes*	*T. radicans*	

Blechnaceae	*Blechnum*	*B. appendiculatum*	
Aspleniaceae	*Asplenium*	*A. alatum*	
		A. miradorense	
		A. blepharophorum	
Thelypteridaceae	*Thelypteris*	*T. pilosa*	
		T. ctenitis	Aff. *equestris*
		T. concinna	
		T. rudis	
		T. cheilanthoides	var. *cheilanthoides*
		T. balbisii	
7	13	25	



Graph 2: Comparison of the main areas studied in the state of Puebla

conclusion

In accordance with the work carried out by Mickel and Smith (2004) for the state of Puebla, 77 genera and 290 species are considered, of which 30 specimens were obtained

for the locality of La Gloria, belonging to 13 genera, and 25 species being a 8.62% of the Pueblan pteridoflora.

However, compared to the work carried out in the Tehuacán-Cuicatlán valley, where 12 genera and 33 species of pteridophytes are listed, where the area is larger than that worked in the La Gloria zone, in spite of that, approximately 75% of the species, thus presenting a great wealth. This may be due to the fact that the Tehuacán-Cuicatlán valley is considered a semi-desert zone, while the locality of La Gloria presents a higher humidity as it is included in a cloud forest of the mountain, presenting a greater diversity in pteridophytes.

Likewise, the work carried out in the municipality of Tlatlauquitepec where 35 genera and 66 species are reported, including the Cyathaeceae, Sellaginellaceae, Marattiaceae and Lycopodiaceae families; however, it should be noted that our work is only focused on the collection of true ferns (Pterophyta). Therefore, the locality of La Gloria has a wide diversity of Pteridophytes competing with the municipality of Tlatlauquitepec and the Tehuacán-Cuicatlán valley, thus increasing the pteridofloristic diversity of the state of Puebla.

In our work, seven families were reported, of which the most diverse was Polypodiaceae (10), later Thelypteridaceae (6) and Aspleniaceae (3). According to the work of Cerón *et al. (2006) in the municipality of Tlatlauquitepec, 12 families were registered, of which the Polypodiaceae (18) had the highest number of species, followed by Pteridaceae (13) and with six species Aspleniaceae, Dryopteridaceae and Thelypteridaceae. This is in agreement with our results. While the most abundant gene reported by Cerón et al. (2006) were Polypodium (6), Thelypteris (5), Pleopeltis, Adiantum and Asplenium (4) and Blechnum (3). In our work, Thelypteris (6) was the most abundant genus, followed by Polypodium (5) and Asplenium (3).*

However, Cerón (2011) mentions that of 288 species belonging to 24 families in the state of Puebla, the most diverse family is Pteridaceae and Polypodiaceae, while *Polypodium, Asplenium, Cheilanthes* y *Thelypteris* are the genera with the highest number of species, which again coincides with our results..

Therefore, both at the national and state levels, the Polypodiaceae family is one of the most diverse, having a greater number of reported species, as well as the most abundant genera are *Thelypteris, Polypodium* y *Asplenium*.

On the other hand, Arreguín-Sánchez et al. (2009) mentions Cheilanthes as an abundant genus and Cerón (2011) proposes Pteridaceae as a very diverse family, it is possible that our results vary because the Pteridaceae family is from an arid region just as Cheilanthes is from hot, dry regions. and rocky. And since we were working in an area of cloudy mountain forest, our results gave Polypodiaceae as the most abundant family and Thelypteris as an abundant genus, followed by Polypodium and Asplenium, which according to Mickel (2004) the most predominant genera of humid forests are Asplenium, Polypodium and Elaphoglossum therefore there is agreement with our results.

La Gloria presents a pteridofloristic richness since despite being a small area it has a wide variety, this may be due to the fact that the species found are from humid climates (tropical) and that the work of Cerón (2006) where they found more genera and species was in places with higher humidity, as Arreguín-Sánchez et al. (2009) determined that the greatest richness of Pteridophytes is found in the mountain cloud forest

More research work is required both in Gloria and in the rest of the municipalities, since a better knowledge of the generic richness can help to have a better scenario of what is the true richness of pteridophytes in shorter periods of time. in the state of Puebla.

Bibliography

Arreguín-Sánchez, M., Fernández Nava, R., Quiróz-García, D. & Acosta-Castellanos, S. (2009). Análisis de la distribución de las especies de helechos y afines del Valle de México, notas ecológicas y florísticas. *Polibotánica*, (28), 15-36.

Australian National Botanic Gardens (1999). Pteridophytes: The ferns and their allies. Recuperado de http://www.anbg.gov.au/fern/

Campos Jiménez, J., Cruz Pérez, A. & Vázquez Torres, M. (2006). Helechos: Joyas naturales desapercibidas. La ciencia y el hombre, *Revista de divulgación científica y tecnológica de la Universidad Veracruzana*, XIX (1), Recuperado de

http://www.uv.mx/cienciahombre/revistae/vol19num1/articulos/helechos/index.htm

Cerón Carpio, A., Arreguín Sánchez, M., & Fernández Nava, R., (2006). Listado con anotaciones de las pteridofitas del municipio de Tlatlauquitepec, Puebla, México y distribución de las especies en los diferentes tipos de vegetación. *Polibotánica*, (021), 46-60.

Conzati, C. (1981). Flora taxonómica mexicana. México.

Mendoza-Ruiz, A. & Pérez-García, B. (2009). Helechos y Lycopodios de México Vol. I. México: CONABIO, UAM, Iztapalapa.

Mickel J.T. & Smith A.R. (2004). The Pteridophytes of Mexico. New York: Memories of the New York Botanical Garden. NYBG press,

Rodríguez Duque, W. (2001). Estudio de las plantas vasculares sin semillas (Helechos, Licopodios, Selaginelas y Equisetos) del parque regionales Arví. Medellin-Colombia: Corporación autónoma regional del centro de Antioquia

Rodríguez-Jiménez C., Fernández-Nava, R., Arreguín-Sánchez, M. & Rodríguez-Jiménez, A. (2005). Plantas vasculares endémicas de la cuenca del río Balsas, México. *Polibotánica*, (20), 73-99.

Tahuilán Martínez, J., Arreguín Sánchez, M. & Fernández Nava, R. (2003). Revisión de los géneros Onocleopis, Plecosorus y Polystichum (Aspleniaceae-Pteridophyta) para la cuenca del río Balsas, México. *Polibotánica*, (015), 113-146.

Vázquez Torres, M., Campos Jiménez, J., & Cruz Pérez, A. (2006). Los helechos y plantas afines del bosque mesófilo de montaña de Banderilla, Veracruz, México. *Polibotánica*, (022), 63-77.