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Research note

Usos de *Juniperus gracilior* var. *gracilior* Pilg. en comunidades rurales de la Cordillera Central en República Dominicana

Uses of *Juniperus gracilior* var. *gracilior* Pilg. in rural communities of the Central Mountain Range in the Dominican Republic

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Abstract

The species of the genus *Juniperus* have been widely used by humans as a source of phytochemicals, in traditional medicine and for timber harvesting; however, little has been known so far about the ethnobotanical uses of Caribbean species and in particular the taxa of Hispaniola, currently classified under different threat categories. This work aimed to reconstruct the spectrum of ethnobotanical uses given to *Juniperus gracilior* var. *gracilior* by the inhabitants of 14 rural communities on the southern slope of the Central Mountain Range. These human settlements are located near five population relicts of the *gracilior* variety where approximately 80 % of the individuals of the taxon are found in natural conditions. Through field explorations, visits and structured interviews with local people, information was collected that indicates that 74.1 % of the variety is used for timber for different applications, 25 % for traditional medicine with important efficiency in the treatment of respiratory, digestive and menstrual cycle diseases, and 0.9 % for ornamental and handicraft uses. The data obtained in this study provide basic knowledge for the development of conservation strategies, management, and sustainable utilization of the species.

Key words: Bark, fruit, leaf, wood, traditional medicine, ornamentation.

Resumen

Las especies del género *Juniperus* han sido ampliamente utilizadas por los seres humanos como fuente de fitoquímicos, en medicina tradicional y para su aprovechamiento maderable; sin embargo, poco se conoce hasta

ahora de los usos etnobotánicos de las especies caribeñas y en particular de los taxones distribuidos en La Española, actualmente clasificados bajo diferentes categorías de amenaza. Este trabajo tuvo como objetivo reconstruir el espectro de las aplicaciones etnobotánicas dadas a *Juniperus gracilior* var. *gracilior* por moradores de 14 comunidades rurales en la vertiente sur de la Cordillera Central de República Dominicana. Estos asentamientos humanos se ubican próximos a cinco relictos poblacionales de *Juniperus gracilior* var. *gracilior*, en los que se localiza en condiciones naturales aproximadamente 80 % de los individuos del taxón. Mediante exploraciones de campo, visita y entrevistas estructuradas se recopiló información que indica que 74.1 % de sus usos corresponden a propósitos maderables, 25 % a medicina tradicional con importante eficiencia en el tratamiento de enfermedades respiratorias, digestivas y del ciclo menstrual, el resto (0.9 %) se utilizan con fines ornamentales y artesanales. Los datos obtenidos en este estudio proveen una base de conocimiento esencial para el desarrollo de estrategias de conservación, gestión y aprovechamiento sostenible de la especie.

Palabras clave: Corteza, fruto, hoja, madera, medicina tradicional, ornamentación.

Juniperus gracilior var. *gracilior* Pilg. (Cupressaceae) is one of the three varieties of the species *J. gracilior* Pilg. endemic to the island of Hispaniola, naturally distributed on the southern slopes of the Central Mountain Range, the *Sierra Martín García* and the *Sierra de Bahoruco* (Zanoni and Mejía, 1989), above 1 000 masl. From multiple factors, their natural populations have decreased to less than 1 000 individuals, with few adult specimens and slow regeneration (Farjon, 2013); currently, the species is classified under the category of Endangered B2ab(ii,iii,iv,v), according to the Red List of the International Union for Conservation of Nature (IUCN) (Farjon, 2013) and Endangered Critical CR A2acd+4acd; B2ab(i,ii,iii,iv,v) according to the Red List of Vascular Flora in the Dominican Republic (García *et al.*, 2016).

The factors that have driven the decline of their populations are, mainly, the advance of agricultural and urban frontiers, forest fires and the unplanned use of natural forests (Adams, 1983; Peguero and Clase, 2015).

Although species of the *Juniperus* L. genus have been widely used by humans in the production of fragrances (Borja *et al.*, 2010), as a source of phytochemicals (Raina *et al.*, 2019), in traditional medicine (Albrecht and Madisch, 2022), as a timber forest resource (Borja *et al.*, 2010), among others, very little is known about the

ethnobotanical value of Caribbean species, especially those distributed in Hispaniola and in particular the infraspecific taxon *J. gracilior* var. *gracilior*.

In this work, the ethnobotanical uses of *J. gracilior* var. *gracilior* were identified in 14 rural communities on the southern slope of the Central Mountain Range, where at least five population remnants persist, representing the last relics in the region. The fundamental purpose was to understand the relationship that humans from these communities have with the taxon and reconstruct the spectrum of applications it has in their daily lives.

Through literature review (Zanoni y Mejía, 1989; Farjon, 2013; Adams, 2014; MESCyT, García *et al.*, 2016; Juncá *et al.*, 2021), consultation with experts and field explorations, five population remnants of *J. gracilior* var. *gracilior* were detected. Data collection was carried out in 14 rural communities (Figure 1) that are located within a radius of less than 7 km from the protected area and in which semi-structured interviews with open and closed questions were applied to 102 people.

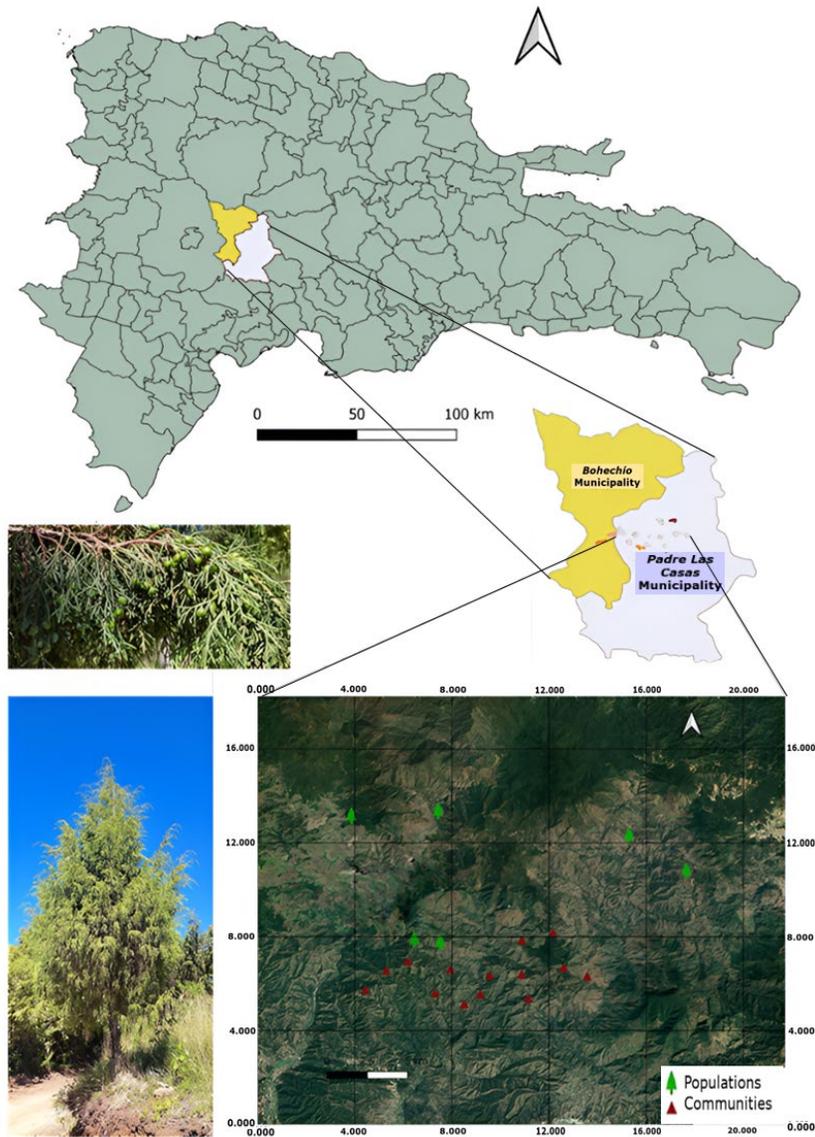


Figure 1. Map of the study area and location of the communities on the southern slope of the Central Mountain Range.

In addition to the interviews, observations were carried out in the rural communities studied to highlight the uses of the species. This involved visits to joinery workshops and sawmills, as well as tours to identify homes built or roofed with materials

obtained from individuals of the species under study. People who prepare homemade concoctions for healing purposes were also visited, with the purpose of understanding their ethnomedicinal uses. The ethnobotanical categories were defined according to the criteria proposed by Albán-Castillo *et al.* (2021).

The interviewees were selected based on their relationship with the species; roles such as farmers, foresters, builders, cabinetmakers, housewives, herbalists, park rangers, among others, were included. The age range of the interviewees was defined between 30 and 87 years, with 71.5 % of them equal to or older than 50 years, and four people older than 80 years. Of the 102 interviewed, 16 were women and 86 were men. In general, the group was engaged in various activities: 82 in agriculture, 10 women were housewives, and another 10 were involved in unregulated cutting and informal trade of dried forest trees, including *J. gracilior* var. *gracilior*. The data obtained were analyzed using the InfoStat statistical software version 2020 (Di Renzo, 2020) for the multivariate study of the ethnobotanical uses of the different structural parts of the *J. gracilior* var. *gracilior* tree.

In the communities on the southern slope of the Central Mountain Range, all respondents have used different parts of *J. gracilior* var. *gracilior*. The most commonly used are the stem (67.46 %), leaves (15.08 %), bark (9.52 %), branches (7.14 %) and fruits (0.79 %).

The wood is used from standing trees and from individuals affected by natural forest fires or caused during the execution of agricultural practices. The clandestine use of wood is mainly intended for the construction of rural homes, through the manufacture of posts that are placed vertically on the perimeter and internal divisions of houses built with boards and reinforced concrete. The posts, buried approximately 60 cm below the surface of the ground, act as support for the zinc roof. Of the total of those interviewed, 23.5 % admitted to having used posts in the construction of

their houses, fences and as tie beams for pack animals in the corrals. The presence of posts in some homes supports these testimonies (Figure 2G).



A = Interview with a community member; B, C, D and E = Houses in the town of *Los Fríos* with doors, blinds and boards of the species; F = Men sawing a log of a dry timber tree, in the same way as *J. gracilior* var. *gracilior* for the extraction of timber pieces; G = Post on the balcony of a house; H = Posts for house construction.

Figure 2. Evidence of the ethnobotanical uses of *J. gracilior* var. *gracilior*.

Boards of different sizes are also made from wood, depending on the construction needs. The boards are obtained by using a traditional manual saw, in which two people pull down and up at the same time (Figure 2F). These are mainly used for the construction of walls in rural homes (Figure 2B-D) and in furniture such as doors, windows, floors, beds, tables, drainers, furniture, mirror frames, drawers, closets, sections, barbecues, stoves, pans, shoe shiners, pulpits, seats, truck beds and even the construction of boats and coffins. Likewise, 62 % of the people surveyed said they used small overlapping boards to cover the roof of their houses, kitchens or ranches to create a type of waterproof surface to replace the usual palm *yaguas* (sheaths from the leaves of different palm trees).

Among those surveyed, 10 % indicated using medium-sized pieces of branches to construct everyday utensils such as hole sticks, ax handles, hoes, pickaxes and shovels, canes, chairs and pylons. Pieces of wood that are not usable in any type of construction end up as firewood for cooking food or making commercial charcoal.

According to the respondents, the wood of *J. gracilior* var. *gracilior* is of high quality. Some of his comments regarding this were: [...] *that wood is not finished, No one finishes that wood, That hardwood yearlings*; an 85-year-old woman commented: *My husband and I built my house when I was 20 years old, I am now 85 years old and the posts in the house that are made of juniper (common name of the species) are just the same.*

In the surveys, 28.43 % of the participants indicated using different parts of the plant for medicinal purposes. Among the ailments that have been treated with infusions and home treatments are respiratory diseases such as flu; to do this, they use boiled leaves and bark, supplemented with cinnamon and other medicinal herbs. This concoction is taken once or twice a day. The leaves, bark and young branches are used by 10 % of those interviewed, for a considerable time, to which they add a little salt to treat digestive ailments and stomach upsets. A 78-year-old

woman uses the same tea to treat “tummy ailments”, but not orally, but anally as a kind of “washing”, using a handmade prototype of an anal suppository that allows her to “cleanse” the intestines of gases.

On the other hand, 10 people (9.8 %) mentioned using or knew about the use of *J. gracilior* var. *gracilior* for the treatment of “disorders” or lack of control of the menstrual cycle, especially abnormal bleeding. In this regard, a 62-year-old woman revealed that she had applied it to one of her daughters to treat delayed menarche (menstrual period). For this type of treatment she used leaves, bark and young branches boiled without any other ingredients, taken twice a day for three days or more, with quite effective results according to those interviewed.

Although the interviewees did not mention ornamental uses, during visits to various communities it was observed that the species is used in buildings and public spaces, such as schools, clinics and streets. In addition, one interviewee commented that she used small pieces of wood without bark as flavorings, placing them in closets or suitcases to impregnate clothes with their fragrance. Also, he described how she made a handmade perfume, for which she soaked the pieces of wood in alcohol for several days before using the liquid to scent different areas of her home.

The research results indicate that the ethnobotanical uses of *J. gracilior* var. *gracilior* include many more activities than furniture manufacturing, ornamentation and fuel (firewood). Uses of wood for the construction of houses were also recorded. These results, although more extensive, coincide with what was stated by Farjon (2013) and contrast with those of Adams (2014), who did not attribute any particular ethnobotanical use to *J. gracilior* var. *gracilior*.

Of the chemical compounds present in *Juniperus gracilior* (Juncá et al., 2021), according to the testimony of community members, some of them in the bark, leaves and fruits of the species seem to be effective in the treatment of digestive,

respiratory and hormonal ailments. Studies in different non-Caribbean *Juniperus* species (Öztürk *et al.*, 2011; Carpenter *et al.*, 2012; Khan *et al.*, 2012) have active components that are applied in the treatment of intestinal and respiratory diseases. These evidences in other species of the *Juniperus* genus support a probable explanation for the historical uses of *J. gracilior* var. *gracilior* in the treatment of ailments of the digestive system, and to which the communities of the southern slope of the Central Mountain Range of the Dominican Republic attribute curative effects.

Probably, the abusive and unplanned use of *J. gracilior* var. *gracilior* is one of the main causes of the population decline of the taxon. In that sense, the rescue of the species requires a continuous effort and the collaboration of various sectors that assume, among other issues:

- Develop collaborative work tables that carry out an evaluation at an infraspecific level of the *J. gracilior* complex, in which the pending tasks for its conservation are reflected.
- Collect germplasm of the species and develop plant propagation protocols for use in the rehabilitation and restoration of population relics.
- Carry out taxonomic research that incorporates molecular techniques to establish clear differentiations between the varieties and other species of *Juniperus* that coexist on the island.
- Strengthen environmental education programs in communities near *Juniperus* populations, to promote the conservation and possible sustainable use of the species.
- Establish a payment strategy for environmental services for owners who have land where natural or planted populations of the species still exist.

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Conflict of interests

The authors declare that they have no conflicts of interest with the contents of this work.

Contribution by author

Aridio Delgado Aybar, Elí Misael Bobadilla Peñaló and Luis Enrique Rodríguez De Francisco: designed the research idea, methodology, instruments, among others. Aridio Delgado Aybar: field work; Aridio Delgado Aybar and Elí Misael Bobadilla Peñaló: analyzed the data and wrote the work. All authors participated in the final review of the work and its discussion.

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