Culture and uses of *Pistacia lentiscus* and *Pistacia atlantica*: an ethnobotanical exploration

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Ines Terras
Laboratory for The Eco-Development of Spaces, Department of Environmental Sciences, Faculty of Nature and Life Sciences, Djillali Liabes University Sidi-Bel-Abbes
Sidi-Bel-Abbes. Algeria
E-mail: terras.ines20@gmail.com

Okkacha Hasnaoui
Faculty of Nature and Life Sciences; Department of agronomy, University of Saida
Laboratory of Ecology and Management of Natural Ecosystems, Department of Ecology and Environment, Faculty of Nature and Life Sciences and Earth and Universe Sciences, Abou Bakr Belkaid University of Tlemcen
Tlemcen. Algeria
E-mail: okhasnaoui2001@yahoo.fr

Noureddine Halla
Laboratory of Biotoxicology, Pharmacognosy and Biological Recovery of Plants, Department of Biology, Faculty of Sciences, University of Saida
Saida. Algeria
E-mail: halla.nour@yahoo.fr

Mohamed Zouidi
Centre de Recherche en Aménagement du Territoire (CRAT), Campus Zouaghi Slimane
Constantine. Algérie
E-mail: mohamed.zouidi@crat.dz

ABSTRACT

In Algeria, ethnobotanical surveys have received increasing attention over the past two centuries, with some of these studies focusing on wild edible plants. In this context, the present work falls within the framework of valorizing two medicinal plants, *Pistacia lentiscus* L (*P. lentiscus*) and *Pistacia atlantica* Desf. (*P. atlantica*) from the Anacardiaceae family, through an ethnobotanical study conducted in the Saïda region (northwestern Algeria). This study aims to highlight the virtues and traditional therapeutic uses reported by the local population and urban herbalists

The ethnobotanical survey was conducted over two campaigns (2022 and 2023) using a questionnaire intended for the rural population and herbalists in the area. The retrieved data were sorted and organized into a matrix from which graphs and tables were generated using the statistical software R. The results obtained indicate widespread use of *P. lentiscus* and *P. atlantica* in the

region. Leaves and fruits appear to be the most commonly used parts by adults for various purposes. Women tend to hold more traditional phytotherapeutic knowledge. The preparation of medicinal plants varies depending on the specific treatment for a given illness. *P. lentiscus* is often used in oil and powder form to treat stomach ulcers (20%), digestive issues (16%), and cosmetic applications (16%). On the other hand, *P. atlantica* is used in infusion, decoction, or oil for oncological treatments (14%), cosmetics (13%), cough relief, and headaches (13%).
The study confirmed the transmission of knowledge regarding the uses and therapeutic effects of both *P. lentiscus* and *P. atlantica* not only from generation to generation but also between rural and urban environments.

Keywords: ethnobotany, herbal medicine, survey, *Pistacia*, Saida province, Algeria

RESUMO

Na Argélia, os estudos etnobotânicos têm recebido uma atenção crescente ao longo dos últimos dois séculos, com alguns destes estudos centrados em plantas silvestres comestíveis. Neste contexto, o presente trabalho enquadra-se na valorização de duas plantas medicinais, a *Pistacia lentiscus* L e a *Pistacia atlantica* Desf. da família *Anacardiaceae*, através de um estudo etnobotânico realizado na região de Saïda (noroeste da Argélia). Este estudo tem como objetivo evidenciar as virtudes e os usos terapêuticos tradicionais relatados pela população local e pelos fitoterapeutas urbanos.
O levantamento etnobotânico foi realizado ao longo de duas campanhas (2022 e 2023) através de um questionário dirigido à população rural e aos fitoterapeutas da região. Os dados recuperados foram ordenados e organizados numa matriz a partir da qual foram gerados gráficos e tabelas com recurso ao software estatístico R. Os resultados obtidos indicam a utilização generalizada de *P. lentiscus* e *P. atlantica* na região. As folhas e os frutos parecem ser as partes mais utilizadas pelos adultos para diversos fins. As mulheres tendem a deter conhecimentos fitoterapêuticos mais tradicionais. A preparação das plantas medicinais varia de acordo com o tratamento específico para determinada doença.
O *P. lentiscus* é frequentemente utilizado sob a forma de óleo e pó para tratar úlceras no estômago (20%), problemas digestivos (16%) e aplicações cosméticas (16%). Por outro lado, a *P. atlantica* é utilizada em infusão, decocção ou óleo para tratamentos oncológicos (14%), cosmética (13%), alívio da tosse e dores de cabeça (13%).
O estudo confirmou a transmissão de conhecimentos sobre os usos e efeitos terapêuticos do lentisco e do atlas não só de geração em geração, mas também entre ambientes rurais e urbanos.

Palavras-chave: etnobotânica, fitoterapia, investigação, Pistacia, província de Saida, Argélia

RESUMEN

En Argelia, las investigaciones etnobotánicas han recibido una atención cada vez mayor en los dos últimos siglos, y algunas de ellas se han centrado en las plantas silvestres comestibles. En este contexto, el presente trabajo se inscribe en el marco de la valorización de dos plantas medicinales, Pistacia lentiscus L y Pistacia atlantica Desf. de la familia Anacardiaceae, a través de un estudio etnobotánico realizado en la región de Saïda (noroeste de Argelia). Este estudio tiene como objetivo destacar las virtudes y los usos terapéuticos tradicionales reportados por la población local y los herbolarios urbanos.
La investigación etnobotánica se realizó durante dos campañas (2022 y 2023) mediante un cuestionario destinado a la población rural y a los herbolarios de la zona. Los datos recuperados se ordenaron y organizaron en una matriz a partir de la cual se generaron gráficos y tablas utilizando el software estadístico R. Los resultados obtenidos indican un uso generalizado de *P. lentiscus* y *P. atlantica* en la región. Las hojas y los frutos parecen ser las partes más utilizadas por los adultos para diversos fines. Las mujeres tienden a poseer conocimientos fitoterapéuticos más tradicionales. La preparación de las plantas medicinales varía según el tratamiento específico para una enfermedad

determinada. El *P. lentiscus* se utiliza a menudo en forma de aceite y polvo para tratar úlceras de estómago (20%), problemas digestivos (16%) y aplicaciones cosméticas (16%). Por otro lado, el *P. atlantica* se utiliza en infusión, decocción o aceite para tratamientos oncológicos (14%), cosméticos (13%), alivio de la tos y dolores de cabeza (13%).
El estudio confirmó la transmisión de conocimientos sobre los usos y efectos terapéuticos tanto del lentisco como del atlas no solo de generación en generación, sino también entre entornos rurales y urbanos.

Palabras clave: etnobotánica, medicina herbaria, encuesta, Pistacia, provincia de Saida. Argelia

1 INTRODUCTION

For centuries, plants have been utilized in traditional and folk medicine to treat and prevent diseases. Human populations worldwide have incorporated elements from their environment, particularly plants, for self-treatment against a variety of diseases (Raphael, 2011; Sawadogo *et al.*, 2012). In India, 'Ayurveda' has been practiced for over 5000 years as a natural healing system to prevent and cure diseases, with plants being an integral part of this process. Traditional Chinese medicine, employed throughout East Asia for at least 3000 years, relies on numerous plant species (Garodia *et al.*, 2007). Plants have always played a significant role in traditional medicine in developing countries and have been an integral part of the history and cultural practices of local communities (Rajalakshmi *et al.*, 2019).

According to the World Health Organization (WHO), approximately 65 to 80% of the global population turns to traditional medicines to fulfill their primary healthcare needs, often due to poverty and a lack of access to modern medicine (Omwenga *et al.*, 2015; Boissiere, 2018).

Algeria, as the largest Mediterranean coastal country, is renowned for its rich diversity of medicinal and aromatic plants, as well as its various popular uses across the country's diverse regions. These are ancestral practices passed down through generations, particularly within rural populations (Salhi, 2016). It constitutes an oral family heritage, predominantly upheld by older, often illiterate women (Ilbert *et al.*, 2016). The wealth of Algeria's flora is undeniable, with approximately 4,300 species and subspecies of vascular plants (Dobignard & Chatelain, 2010-2013). Among these, there is a significant number of species categorized by their level of rarity: 289 species are fairly rare, 647 are rare, 640 are very rare, 35 are extremely rare, and 168 are endemic species (FAO, 2012).

Among the medicinal plants found in the Algerian flora, the genus *Pistacia*, belonging to the *Anacardiaceae* family, encompasses plants with dietary, medicinal, and ornamental value. The genus comprises around twenty species, which can be evergreen or deciduous, and range from shrubs to small trees, reaching heights of 5 to 15 meters (Bozorgi *et al.*, 2013; Bassouya *et al.*,

2024). The genus *Pistacia*, consists of fifteen species, all dioecious and displaying high genetic diversity (Kozhoridze *et al.*, 2015; Aouadj *et al.*, 2022). In Algeria, it is represented by four species: the terebinth pistachio (*Pistacia terebinthus* L.), true pistachio (*Pistacia vera* L.), mastic tree (*Pistacia lentiscus* L.), and Atlas pistachio (*Pistacia atlantica* Desf.) (Ait Said *et al.*, 2011).

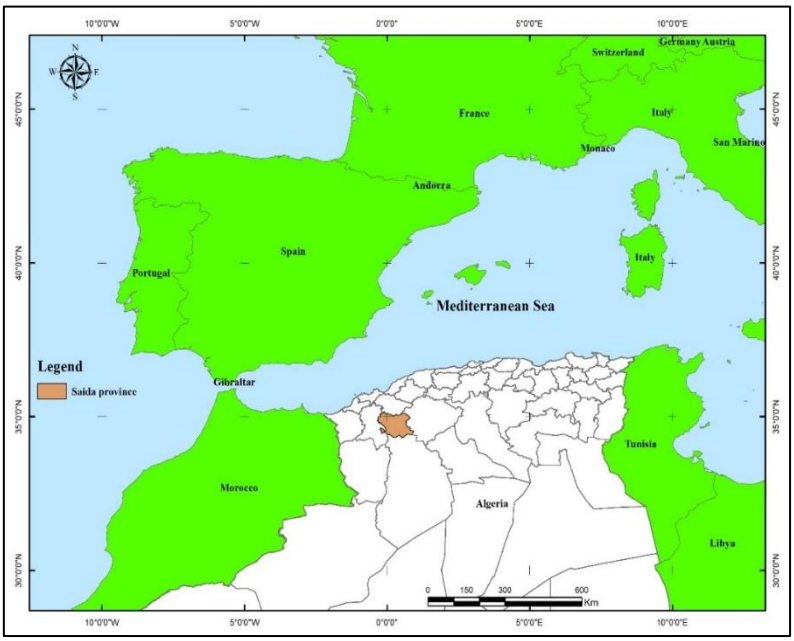
Today, ethnobotanical surveys aim to gather information related to traditional phytotherapy, including the identification of medicinal plants, the determination of the types of treated illnesses, and contributing to the existing body of knowledge in Algeria. In this context, the primary objective of our study is to conduct an ethnobotanical survey among herbalists and the local population in the Saida province, who are involved in the use of medicinal plants. The results of this survey will enable us to identify and compare the significance and potential roles of *P. lentiscus* and *P. atlantica* in traditional medicine, with the goal of promoting and preserving these plant species in Algeria.

2 MATERIALS AND METHODS

2.1 STUDY AREA

This ethnobotanical study was conducted in the Saida province, known as the 'Province of Waters' due to its numerous water sources, located in the northwestern region of Algeria (34°40′0″ N, 0°19′60″ E). With a population of 350.765 inhabitants, Saida covers an area of 5,536.73 km^2. It is bordered to the north by Mascara province, to the south by El Bayadh province, to the west by Sidi-Bel-Abbes province, and to the east by Tiaret province (Fig. 1). Its location plays a pivotal role as a link between the steppe provinces to the south and the Tellian provinces to the north, facilitating the extension of plant species biodiversity.

Figure 1. Situation map of Saida province (authors, 2024)



2.2 METHODOLOGY

Ethnobotanical field surveys were conducted over two campaigns (2022 and 2023). We devised questionnaires that we completed during our interviews with the residents of Saïda province, along with surveys conducted among herbalists, where a significant influx of clients was observed. These questionnaires encompassed information regarding the gender and age groups of the interviewees, the plant parts utilized the treated ailments, the sources of information, and the modes of preparation. Respondents were also questioned about any potential forms of toxicity or adverse effects associated with *P. lentiscus* and *P. atlantica*.

This study aims to contribute to the valorization of two species within the *Pistacia* genus, namely *P. atlantica* and *P. lentiscus*, which are prevalent in Saïda province. It is grounded in an ethnobotanical survey that seeks to comprehend the therapeutic effects of these plants by identifying their diverse traditional uses, which appear to encompass various fields, particularly therapeutic and cosmetic applications. This survey is conducted in collaboration with the local population and herbalists (around 200 participants).

2.3 LEGAL ASPECT

The interviewees were informed that the surveys were conducted within the scope of scientific research.

2.4 DATA ANALYSIS

The ethnobotanical data collected were recorded on raw data sheets in paper format and later transferred into a database (Excel file). Subsequently, they were processed and analyzed using the statistical software R. The aim was to extract sociodemographic information from the interviewed individuals, along with specific information regarding the medicinal plants, including its various uses for treating different illnesses.

3 RESULTS AND DISCUSSIONS

Field surveys revealed that knowledge about medicinal plants (parts used, properties, preparation methods) is the result of extensive experience passed down by the elders. According to several studies on phytotherapy, *P. lentiscus* and *P. atlantica* are among the most cited and used species by rural communities for treating various illnesses. These species are characterized by diverse medicinal properties. Extracts from different parts of the plants exhibit various activities such as anti-atherogenic, anti-inflammatory, antioxidant, antimicrobial, hypotensive, anticancer,

anti-arthritis, anti-gout, wound-healing, anti-asthmatic, and anthelmintic properties (Nahida *et al.*, 2012; Mahjoub *et al.*, 2018).

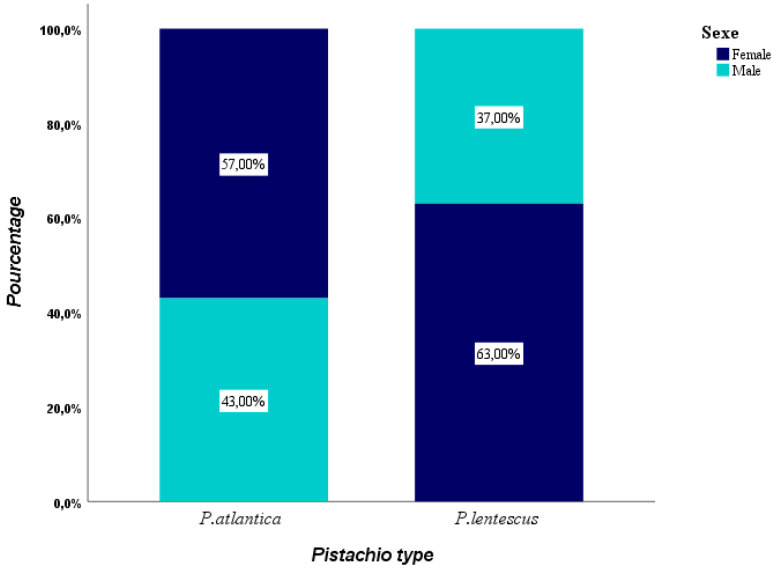
3.1 PARTICIPANT PROFILES

During our interviews, we observed a significant diversity in the linguistic profiles of the individuals surveyed. It was evident that the spoken language largely depended on the age and level of education of the respondents. The majority of participants, especially older individuals and those without access to formal education, primarily used the local dialect for communication. This regional language served as their preferred means of sharing their experiences, opinions, and reflections. However, it's worth noting that there was also a smaller group of respondents who had attained higher levels of education, having completed their studies at high school or university. These individuals had developed a more extensive linguistic competency, expressing themselves not only in the local dialect but also in French.

3.2 GENDER

The results obtained indicate that both species, *P. lentiscus* and *P. atlantica*, are more commonly used by women compared to men. For *P. lentiscus*, there is an observed usage of 63% by women and 37% by men. Similarly, *P. atlantica* is used by 57% of women and 43% of men (Fig. 2). These findings confirm the results of Benkhnigue *et al.*, (2011) and Bouallala *et al.*, (2014) conducted in Morocco and Algeria, respectively. They demonstrated that women predominantly hold traditional phytotherapeutic knowledge. In the field of inquiry, both women and men equally engage in collecting medicinal plants, while the drying, storage, and preparation of remedies for family care are predominantly conducted by women. Men typically undertake the task of collecting plants in areas considered hazardous. Women not only use medicinal plants for therapy but also, due to their role as mothers, provide initial care, especially for their children. Furthermore, women are more attentive to the health of their family members. Published ethnobotanical studies have consistently shown that women are the primary holders of traditional phytotherapeutic knowledge (Silva *et al.*, 2015).

Figure 2. Distribution of *Pistacia* genus usage percentage by gender.

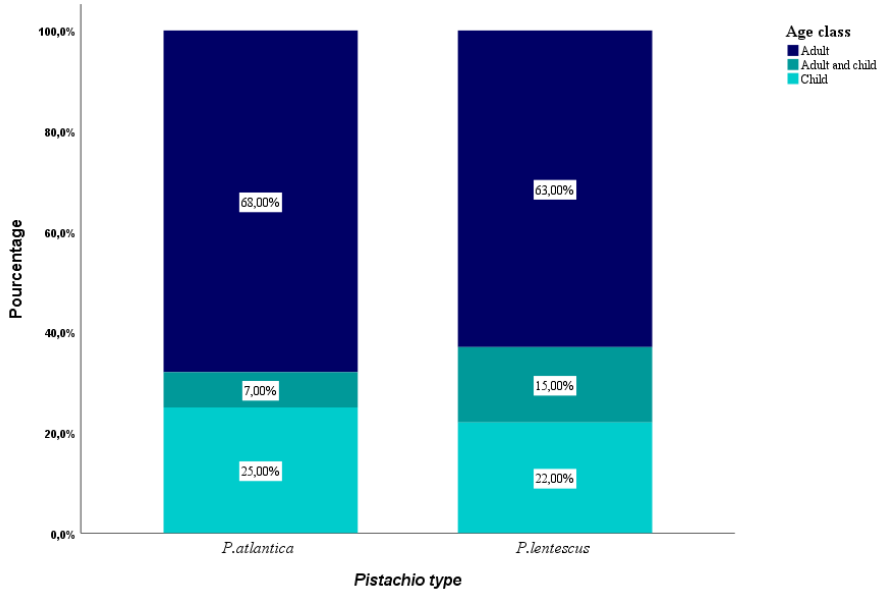


3.3 AGE CLASS

The usage of *Pistacia* species, namely *P. lentiscus* and *P. atlantica* (Fig. 3), is widespread in the province of Saïda, covering all age groups. There is a prevalence of P. lentiscus use among the adult age group, representing 63%. However, for the children's age group, this usage stands at 22%, while the combined adult and children's age group shows a rate of 15%.

Regarding *P. atlantica*, it is primarily used by the adult age group, with a high rate of 68%. For the combined adult and children's age group, the rate is very low, reaching only 7%, while the children's age group shows a rate of 25%. Our results highlight that, whether for *P. lentiscus* or *P. atlantica*, these two species are less commonly used to treat illnesses in children. While phytotherapy is generally considered safe, some medicinal plants may have side effects or drug interactions. Parents and healthcare professionals are often more cautious when it comes to administering herbal remedies to children, especially if they are already taking other medications. Some plants contain highly toxic substances and can cause severe poisoning, requiring hospital treatment and careful clinical monitoring, which sometimes may not prevent a fatal outcome. We stress the importance of raising awareness among parents about the seriousness of the excessive use of medicinal plants for their children (Oulmaati *et al.*, 2017).

Figure .3. Distribution of used percentage of medicinal plants by age class.



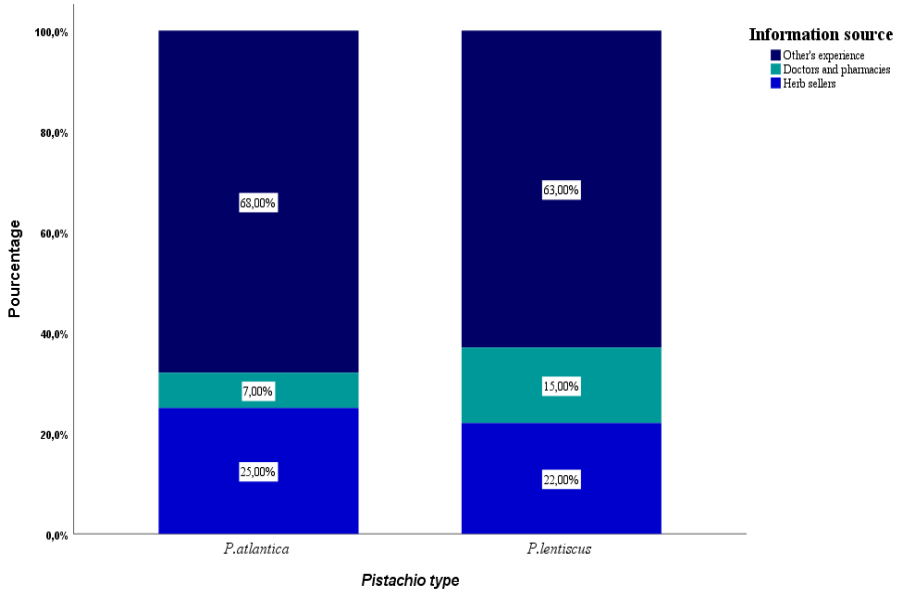
3.4 INFORMATION SOURCE

The majority of individuals surveyed regarding the source of information about the use of the two species studied in traditional phytotherapy obtained their knowledge from the experience of others: 63% for *P. lentiscus* and 68% for *P. atlantica*, through their relatives, neighbors, or friends (Fig.4).

We also noted that 22% of the individuals surveyed use *P. lentiscus*, while 25% resort to *P. atlantica* to treat ailments, as reported during their consultations with spice sellers, followed by very few recommendations from medical and pharmaceutical sources regarding the use of *P. lentiscus* (15%) and *P. atlantica* (7%). According to the World Health Organization (WHO, 2002), traditional medicine encompasses all knowledge and practices, whether explainable or not, transmitted from generation to generation, orally or in writing, used in human society to diagnose, prevent, or eliminate an imbalance in physical, mental, or social well-being, as well as moral and spiritual aspects.

The traditional practice of phytotherapy is considered a part of traditional medicine and is still widely used in some countries, particularly in developing nations. It is an unconventional medicine due to the lack of clinical studies.

Figure .4. Distribution of percentage utilization of medicinal plants by source of information.



3.5 PLANT USES

3.5.1 Parts of the plant used

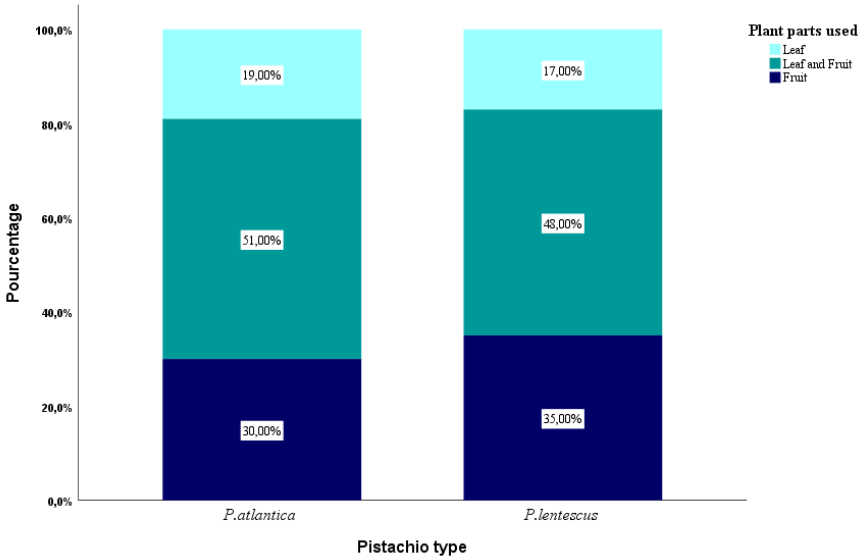
In the region we studied, the combined use of leaves and fruits is the most common method, both for *P. lentiscus* (48%) and *P. atlantica* (51%). Concerning the exclusive use of fruits, we observed a usage rate of 35% for *P. lentiscus* and 30% for *P. atlantica*. However, the exclusive use of leaves does not exceed 20% for both species (Fig. 5). The leaves, fruits, flowers, and resin of *P. lentiscus* are rich in essential oil. The composition of the essential oil varies qualitatively and quantitatively, depending on several factors including the extraction method, the gender of the plant, and the harvesting period (Benamar *et al.*, 2010).

According to Milia *et al.*, (2023), nearly every part of the plant (*P. lentiscus*), including the leaves, fruits, wood, and mastic resin, has been used as a remedy for a wide range of illnesses. The richness in antimicrobial and anti-inflammatory biomolecules could offer an alternative to chemically formulated therapies. As per Bammou *et al.*, (2015), leaves are the most commonly used parts, primarily in the form of infusions and essential oils in the Maghreb region (Borsali *et al.*, 2017). Leaf extracts had a higher content of phenols and flavonoids compared to the fruit, which conversely exhibited a higher number of tannins (Milia *et al.*, 2023). Alkaloids are present in the fruits and absent in the leaves and stems (Barbouchi *et al.*, 2018).

In North Africa, locals have long used decoctions made from the fruits or leaves of the Atlas pistachio for treating conditions such as eye infections or diarrhea. Recent research has also highlighted other properties, including antioxidant, antimicrobial, antidiabetic, and antitumor activities (Labdelli *et al.*, 2019). The fruits of *P. atlantica* are edible drupes rich in oil, used in traditional medicine for the treatment of various illnesses and widely consumed as a nutrient by

local populations (Labdelli *et al.*, 2019). Generally, the use of leaves is safe for plant regeneration and ensures the preservation of floral richness.

Figure 1. Distribution of the percentage of plant part used.



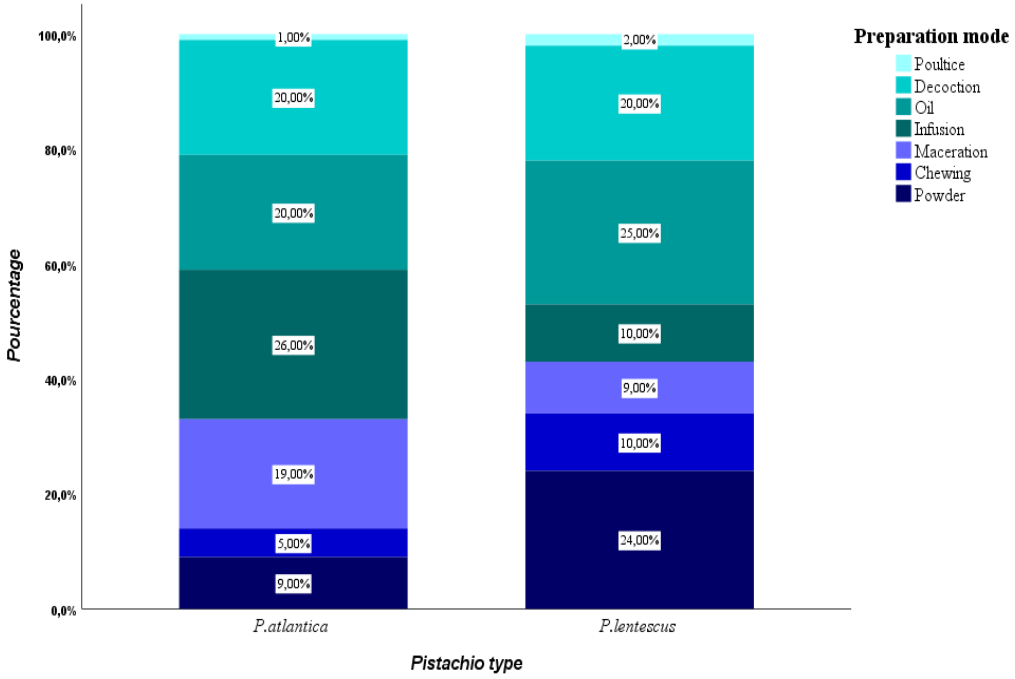
3.5.2 Preparation mode

The analysis of surveys allowed us to classify the methods of preparing *P. lentiscus* as follows: the artisanal method of fixed oil extraction used in massage was the most commonly utilized, representing an average of 25% of the respondents' answers. This was followed by powder preparation (24%), decoction (20%), infusion and chewing (10%), maceration (9%), and finally, poultice (2%).

Regarding *P. atlantica*, according to the herbalists interviewed, the most common method of usage is infusion, accounting for 26% of cases. *P. atlantica* is also employed in the form of essential oil (20%), decoction (20%), maceration (19%), powder (9%), and chewing (5%). Poultice application is rarely used (1%) (Figure 6). In light of the results, it appears that infusion stands out as the most commonly reported preparation method. This method facilitates the administration of *P. atlantica* and provides quick and effective results.

In North Africa, local populations traditionally use decoctions of fruits or leaves from *P. atlantica* to treat eye infections or diarrhea (Labdelli *et al.*, 2019). Algerian traditional medicine primarily uses the fatty oil obtained by expressing *P. lentiscus* fruits to treat minor wounds, mild burns, and erythemas (Boukeloua, 2017). According to the surveyed herbalists, the use of oil and herbal teas facilitates the plant's mode of administration and provides quick and effective results (Bammou *et al.*, 2015).

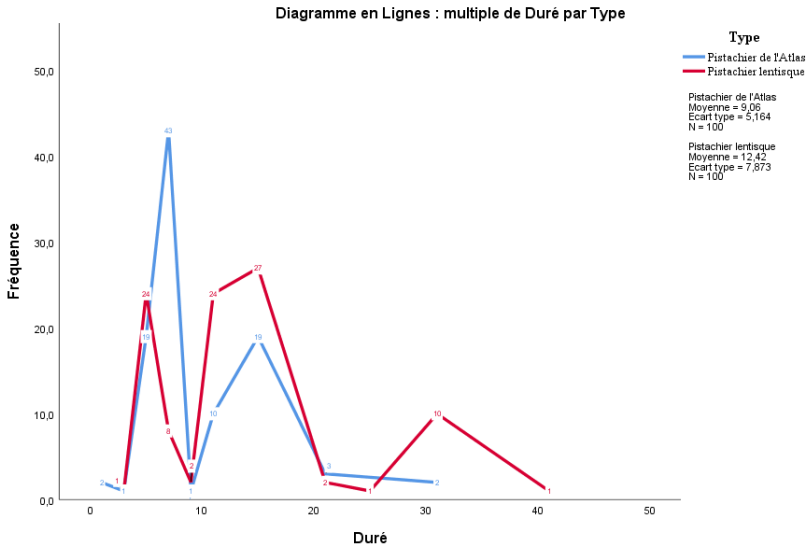
Figure 6. Distribution of the percentage of medicinal plant usage by preparation mode.



3.5.3 Duration of treatment

Statistical analysis indicates that, on average, treatment using *P. lentiscus* lasts for 13 days, with a frequency of 28, while the average treatment duration with *P. atlantica* does not exceed 5 days, with a frequency of 42 (Fig. 7). Kumar *et al.*, (2007) assert that the duration of treatment with medicinal plants varies based on the type and severity of the infection. The treatment period with a medicinal plant depends on numerous factors, and it is important to follow appropriate guidelines for each specific case. Consulting a healthcare professional or qualified herbalist is recommended to obtain specific advice on the duration of treatment using medicinal plants (Gudalwar *et al.*, 2021).

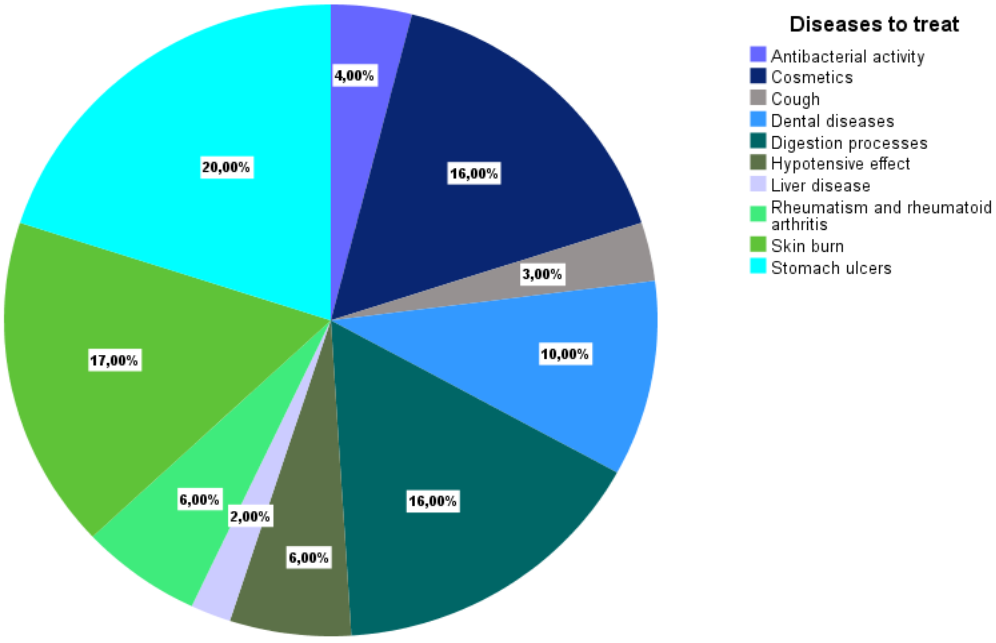
Figure 7. Duration of treatment for *P. lentiscus* and *P. atlantica* diseases.



3.5.4 Diseases treated

The interviews conducted in this study helped identify various conditions for which *P. lentiscus* is used for therapeutic purposes. It appears that four diseases stand out prominently. Stomach ulcers top the list with a treatment frequency of 20%, followed by skin burns (17%), cosmetic applications, and digestive problems (16% each). In contrast, dental diseases (10%), as well as rheumatic conditions and hypotension, are less frequently mentioned, both at an identical rate of 6% (Fig 8). Senouci *et al.*, (2019) reported that *P. lentiscus* was one of the most frequently mentioned medicinal plants by the local population in the eastern part of Algeria. Among the diseases they mentioned were gastrointestinal system disorders and skin conditions, which aligns with our findings. Researchers indicate that the natural resin extracted from *P. lentiscus* branches is valued for its therapeutic properties, particularly its anti-inflammatory and antioxidant effects. Although primarily used in the production of chewing gum, it has also gained approval for mild digestive disorders and skin issues (Soulaidopoulos *et al.*, 2022).

Figure .8. Percentage of various types of diseases treated by *Pistacia lentiscus.*

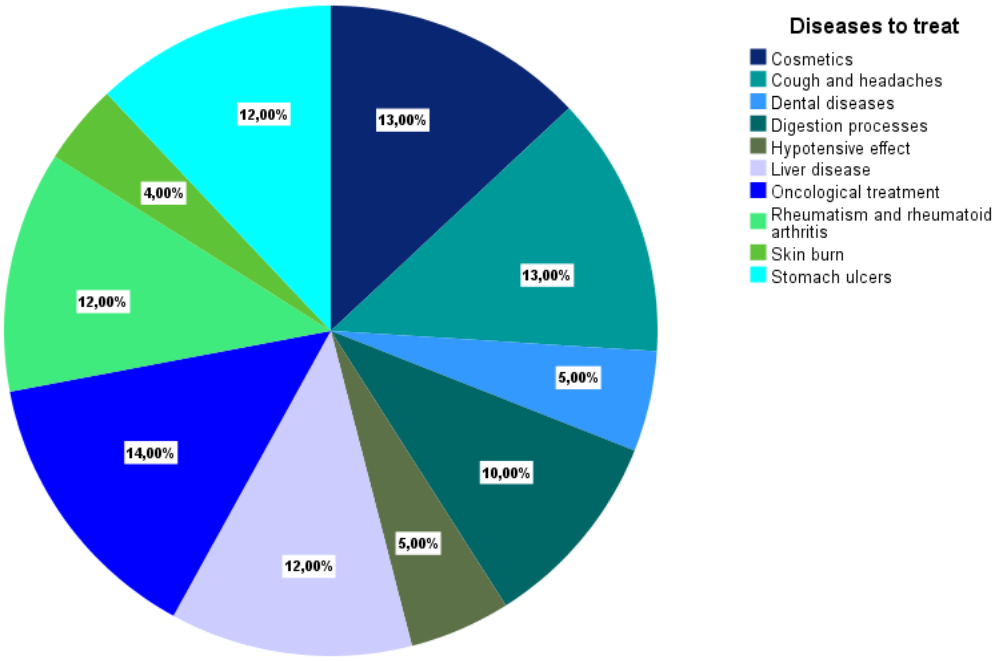


In relation to *P. atlantica*: The mentioned herbalists discussed various diseases that could be treated with this species (Figure. 9). Indeed, their clients were interested in *P. atlantica* for its potential in oncological treatments (14%), cosmetics, cough relief, and headache relief (13%), followed by stomach ulcers, rheumatism, rheumatoid diseases, and liver conditions at a rate of (12%), and the digestive process (10%). Other conditions (hypotensive effect and dental diseases) are less frequently mentioned at an identical rate of (5%). The work of several researchers has indicated that the *P atlantica* gum extract could significantly decrease cell viability and increase

apoptosis in the TC1 cell line, similarly to doxorubicin, an anticancer drug (Hashemi *et al.*, 2017; Bolandian *et al.*, 2022).

According to a study conducted by Benaradj *et al.*, (2015), frequent internal use of the Atlas Pistachio tree (*P. atlantica*) has been observed, especially for the treatment of stomach ulcers and to support liver function. Additionally, this plant is also used externally to treat *leishmaniasis*, to relieve coughs and bronchitis, to promote the healing of skin wounds, as well as in hair care (Bozorgzade et al., 2024).

Figure .9. Percentage of various types of diseases treated by *Pistacia atlantica.*



4 CONCLUSION

Medicinal plants are valuable resources for the majority of the population in Algeria, serving as the primary means through which individuals care for their health. The ethnobotanical study conducted within the scope of this research highlighted the significance of *P. lentiscus* and *P. atlantica* in the traditional phytotherapy of the local population in the considered northwestern region of Algeria.

The profiles of the surveyed individuals reveal a linguistic diversity influenced by age and education level, with a preference for the local dialect among older and less educated individuals. Concerning gender, women (63%) use pistachio trees more than men (37%), playing a key role in the collection, preparation, and administration of herbal remedies. Women also show greater attentiveness to their family's health.

The combination of leaves and fruits is the preferred method for both species (51% for *P. atlantica* and 48 % for *P. lentiscus*) while the preparation methods vary, ranging from fixed oil

extraction to infusion (35%), decoction, and maceration. *Pistacia lentiscus* is primarily used in treating stomach ulcers (20%), digestive problems (16%), and also finds applications in cosmetics for treating burns (22%).

On the other hand, *Pistacia atlantica* is frequently used for oncological treatments (14%), cosmetic applications (13%), as well as for alleviating coughs and headaches (13%).

P. lentiscus and *P. atlantica* appear to be useful as herbs with various pharmacological effects. Therefore, further preclinical and clinical studies are recommended to better elucidate their beneficial effects and risks in different conditions.

REFERENCES

Ait said, S.; Fernandez, C.; Greff, S.; Derridj, A.; Gauquelin, T.; Mevy, J.P. 2011. Inter-population variability of leaf morpho-anatomical and terpenoid patterns of Pistacia atlantica Desf. ssp. atlantica growing along an aridity gradient in Algeria. *Flora-Morphology, Distribution, Functional Ecology of Plants*, *206*(4): 397-405. https://doi.org/10.1016/j.flora.2010.08.002

Aouadj, SA.; Zouidi, M.; Allam, A.; Brahmi, M.; Djebbouri, M.; Nasrallah, Y.; Khatir, H .2022. Preliminary study of the pre-germinative treatments *Juniperus oxycedrus* L. and *Pistacia lentiscus* L. in the Saida region (Western Algeria). Biodiversity Research and Conservation, 67(1): 13-20. DOI 10.2478/biorc-2022-0011

Bammou, M.; Daoudi, A.; Slimani, I.; Najem, M.; Bouiamrine, EH.; Ibijbijen, J.; Nassiri, L .2015. Valorisation du lentisque «*Pistacia lentiscus* L.»: Étude ethnobotanique, Screening phytochimique et pouvoir antibactérien. Journal of applied biosciences, 86: 7966-7975.

Bassouya, M.; Chedadi, M.; Zahra, JF. ; Kara, M. ; Assouguem, A. ; Ullah, R. ; Bari, A. 2024. A comparative analysis of dendrometric, macromorphological, and micromorphological characteristics of *Pistacia atlantica* subsp. *atlantica* and *Pistacia terebinthus* in the middle Atlas region of Morocco. Open Life Sciences, 19(1), 20220941.

Benamar, H.; Rached, W.; Derdour, A.; Marouf, A .2010. Screening of Algerian medicinal plants for acetylcholinesterase inhibitory activity. Journal of Biological Sciences. 10(1): 1-9. DOI: 10.3923/jbs.2010.1.9

Benaradj, A.; Boucherit, H.; Bouazza, M.; Hasnaoui, O .2015. Ethnobotanique du pistachier de l'atlas (*Pistacia atlantica*) auprès la population de Béchar (Algérie occidentale). Journal of Advanced Research in Science and Technology, 2(1): 139-146.

Benkhnigue, O.; Zidane, L.; Fadli, M.; Elyacoubi, H.; Rochdi, A.; Douira, A .2011. Etude ethnobotanique des plantes médicinales dans la région de Mechraa Bel Ksiri (Région du Gharb du Maroc). Acta Botanica Barcinonensis. 53: 191-216.

Boissiere, M (2018). Consommation des plantes médicinales par les patients suivis en cabinet de médecine générale à La Réunion - Expériences, représentations et ressentis des patients dans le cadre de la communication médecin-patient, diplôme d'Etat de docteur en médecine, Université de Bordeaux, 94 p.

Bolandian, M.; Esmaeili, GGH.; Dorostkar R.; Farzanehpour M.; Jalali KB.; Najjar AF .2022. Anti-Proliferative Effects of *Pistacia atlantica* Gum Extract on the Human TC1 Cell line: In Vitro Testing. Iranian Red Crescent Medical Journal (IRCMJ), 4(2):e1314 doi: 10.32592/ircmj.2022.24.2.1314

Borsali, AH.; Dahmani, R.; Zouidi, M.; Gros, R .2017. Chemical properties and leaf traits of *Pistacia lentiscus* in link with the age of the leaves and exposure to stress. PONTE International Journal of Science and Research, 73(3):1-12.

Bouallala, M.; Bradai, L.; Abid, M. 2014. Diversité et utilisation des plantes spontanées du Sahara septentrional algérien dans la pharmacopée saharienne. Cas de la région du Souf. Revue El-Wahat pour les Recherches et Études. 7(2) : 18 - 26.

Boukeloua, A .2017. Le Lentisque, la plante aux vertus médicinales inestimables : Caractérisation physicochimique et étude pharmacotoxicologique de *Pistacia lentiscus* L. Éditions universitaires européennes, 2017.

Bozorgzade, SA.; Kalantar-Khandani, S.; Amiri, R.; Dehesh, T.; Karegar-Borzi, H. 2024. Efficacy of a Combined Herbal Product Containing Indigofera argentea, *Pistacia atlantica* and *Salvia hispanica* in Zoonotic Cutaneous Leishmaniasis Patients Treated along Glucantime. Iranian Journal of Parasitology, 19(2): 203-2013

Bozorgi, M.; Memariani, Z.; Mobli, M.; Salehi Surmaghi, MH.; Shams-Ardekani, MR.; Rahimi, R. 2013. Five Pistacia species (*P. vera, P. atlantica, P. terebinthus, P. khinjuk, and P. lentiscus*): a review of their traditional uses, phytochemistry, and pharmacology. The Scientific World Journal, 2013(1), 219815.

Dobignard, A.; Chatelain, C .2010-2013. Index synonymique de la flore d'Afrique du Nord (4 vol.). Genève : C. J. B. G.

FAO .2012. Etat actuel des ressources génétiques forestières mondiales. Rapport national Algérie. Rome : 63 p.

Garodia P.; Ichikawa H.; Malani N.; Sethi G.; Aggarwal BB .2007. From ancient medicine to modern medicine: Ayurvedic concepts of health and their role in inflammation and cancer. Journal of the Society for Integrative Oncology. 5(1): 25-37.

Gudalwar, B.R.; Panchale, W.A.; Manwar, J.V.; Nimbalwar, M.G.; Badukale, N.A.; Bakal, R.L .2021. Pharmacognosy, phytochemistry and clinical applications of traditional medicinal plants as memory booster. GSC Advanced Research and Reviews, 8(2): 019-029.

Hashemi, L.; Asadi-Samani, M.; Moradi, M.T.; Alidadi, S .2017. Anticancer activity and phenolic compounds of *Pistacia atlantica* extract. International Journal of Pharmaceutical and Phytopharmacological Research, 7(2): 26-31. DOI: 10.24896/eijppr.2017725

Ilbert, H.; Hoxha, V.; Sahi, L.; Courivaud, A.; Chailan, C .2016. Le marché des plantes aromatiques et médicinales : analyse des tendances du marché mondial et stratégies économiques en Albanie et Algérie, CIHEAM, Option méditerranéenne, Série B : Etudes et recherches, 73, France, 226 p.

Kozhoridze, G.; Orlovsky, N.; Orlovsky, L.; Blumberg, D. G., Golan-Goldhirsh, A. 2015. Geographic distribution and migration pathways of *Pistacia*–present, past and future. Ecography, 38(11): 1141-1154.

Kumar, B.; Vijayakumar, M.; Govindarajan, R.; Pushpangadan, P .2007. Ethnopharmacological approaches to wound healing--exploring medicinal plants of India. Journal of Ethnopharmacology. 114(2):103-113.

Labdelli, A.; Zemour, K.; Simon, V.; Cerny, M.; Adda, A.; Merah, O .2019. *Pistacia atlantica* Desf., a source of healthy vegetable oil. Applied Sciences, 9(12): 2552.

Mahjoub, F.; Rezayat, K.A.; Yousefi, M.; Mohebbi, M.; Salari, R .2018. *Pistacia atlantica* Desf. A review of its traditional uses, phytochemicals and pharmacology. Journal of medicine and life, 11(3), 180-186. doi: 10.25122/jml-2017-0055

Milia, E.P.; Sardellitti, L.; Eick, S. 2023. Antimicrobial Efficiency of *Pistacia lentiscus* L. Derivates against Oral Biofilm-Associated Diseases—A Narrative Review. Microorganisms, 11(6): 1378.

Nahida, A.; Ansari, S.H.; Siddiqui, A.N .2012. *Pistacia lentiscus*: A review on phytochemistry and pharmacological properties. International Journal of Pharmacy and Pharmaceutical Sciences, 4(4) : 16-20.

Omwenga, E.O.; Hensel, A.; Shitandi, A.; Goycoolea, F.M. 2015. Ethnobotanical survey of traditionally used medicinal plants for infections of skin, gastrointestinal tract, urinary tract and the oral cavity in Borabu sub-county, Nyamira county, Kenya. Journal of ethnopharmacology, 176: 508-514.

Oulmaati, A.; Hmami, F.; Achour, S.; Bouharrou, A .2017. Intoxications graves par médication traditionnelle chez le nouveau-né. Archives de Pédiatrie, 24(9): 833-836. https://doi.org/10.1016/j.arcped.2017.06.005.

Rajalakshmi, S.; Vijayakumar, S.; Arulmozhi, P .2019. Ethnobotanical survey of medicinal plants in Thanjavur and its surrounding (Tamil Nadu-India). Acta Ecologica Sinica, 39(5): 380-397. https://doi.org/10.1016/j.chnaes.2018.09.010

Raphael, E.C .2011. Traditional medicine in Nigeria: Current status and the future. Research Journal of Pharmacology, 5(6): 90-94.

Sahi, L. 2016. La dynamique des plantes aromatiques et médicinales en Algérie [Troisième partie]. Le marché des plantes aromatiques et médicinales: analyse des tendances du marché mondial et des stratégies économiques en Albanie et en Algérie, (73): 101-140.

Sawadogo, WR.; Maciuk, A.; Banzouzi, J. T.; Champy, P.; Figadere, B.; Guissou, I.P.; Nacoulma, O.G .2012. Mutagenic effect, antioxidant and anticancer activities of six medicinal plants from Burkina Faso. Natural product research, 26(6): 575-579. https://doi.org/10.1080/14786419.2010.534737

Senouci, F.; Ababou, A.; Chouieb, M .2019. Ethnobotanical Survey of the Medicinal Plants used in the Southern Mediterranean. Case Study: The Region of Bissa (Northeastern Dahra Mountains, Algeria). Pharmacognosy Journal 11(4):647-659. http://www.phcogj.com/v11/i4

Soulaidopoulos, S.; Tsiogka, A.; Chrysohoou, C.; Lazarou, E.; Aznaouridis, K.; Doundoulakis, I.; Lazaros, G .2022. Overview of chios mastic gum (*Pistacia lentiscus*) effects on human health. Nutrients, 14(3): 590.

World Health Organization WHO, 2002. The world health report, Reducing Risks, Promoting Healthy Life. https://iris.who.int/bitstream/handle/10665/42510/WHR_2002.pdf?sequence=1