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Traditional Therapeutic Uses Of *Peganum harmala L.* By Local Populations In Province of Sidi-Bel-Abbes (Western Algeria)

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Abstract
The medicinal plant *Peganum harmala L*, known locally as harmal, belongs to the Zygophyllaceae family, native from North Africa to India. In Algeria, it is one of the plants most widely used by the local population as an alternative remedy for daily care and to treat various ailments. This first ethnobotanical survey of the traditional knowledge and uses of *P. harmala* was carried out in five communes in the province of Sidi-Bel-Abbès, in western Algeria, between 2021 and 2022, involving 250 informants (160women, 90men).The most commonly used parts of the plant are the seeds and leaves, but infusion, decoction, steam-cooking and fixed oil are the most common methods of preparation. The diseases most frequently treated were digestive problems, followed by urinary infections, genital problems and osteoarticular diseases, etc. The surveys carried out provided important information on the therapeutic use of the plant by the local population, as well as assessing their knowledge of the plant's toxicity and the recipes used by informants to reduce toxicity with a view to safer use, particularly by vulnerable groups such as pregnant and breast-feeding women, who use a new method of preparation (steaming) inherited from their grandmothers, which they believe to be safe.

Keywords: *Peganum hamala L*, medicinal plant, survey, therapeutic uses, Sidi-Bel-Abbes, western Algeria.

1.Introduction

The World Health Organization estimates that almost 80% of the world's population in Africa, Asia and Latin America rely on traditional medicine (TM) for their treatment and health care. (Payyappallimana,2010). Most people in these countries live in poverty and are unable to access

modern medicines, forcing them to use TM for their primary care due to the fragility of the economic and medical systems (Tabuti and al, 2003). For a very long time, the Algerian population has been using plants for relief and treats various illnesses (Reguieg, 2011). Due to its geographical location, Algeria is a country known for the richness and diversity of its medicinal and aromatic plants. There are approximately 3000 plant species, most of which are endemic and belong to different botanical families, which remain very little studied in terms of phytochemistry and pharmacology (Bouzid, 2017). *Peganum harmala.L* belongs to the Zygophyllaceae family and is a medicinal herb native to countries around the Mediterranean Sea. It is widespread in Central Asia, North Africa and the Middle East and has been introduced to America and Australia. This plant is known as "Harmel" in North Africa and "African Rue", "Espand" in Iran, "Mexican Rue" or "Turkish Rue" in the United States (Mahmoudian and al., 2002). It has been used in TM for the treatment of a variety of ailments, including cancer and inflammation, depression, hallucinations, leishmaniasis, malaria, abortion and as an emmenagogue(Herraiz and Gonzalez, 2010).Phytochemical screening of the seeds of *P. harmala* showed the presence of alkaloids, saponins, tannins, glycosides, anthraquinones, terpenoids, steroids and the absence of flavonoids, while in the leaves, the presence of alkaloids, flavonoids, saponins, tannins, glycosides, terpenoids, steroids and the absence of anthraquinones was observed (Bouabedelli and al.,2016), which gives the plant the therapeutic virtues. The total alkaloid concentration of *P. harmala* varies between 2 and 5% according to Majid (2018).The main beta-carboline alkaloids in *P. harmala* extracts were identified and quantified as harmaline, harmine, harmalol, harmol and tetrahydroharmine. The highest levels of alkaloids are found in seeds and roots, with lower levels in leaves and stems and no presence in flowers (Herraiz and Gonzalez, 2010). The *P. harmala* plant has been claimed to be an important medicinal plant, including its pharmacological and biological activities such as antioxidant effects. (Tse and al.,1991), antibacterial (Darabpour and al.,2011), antidiabetic (Singh and al.,2008), antifungal (Diba and al.,2011), antiviral (Moradi and al.,2017), antitumor(Lamchouri, 2014), anti-inflammatory and anti-arthritic effects (Akhtar and al., 2022), cytotoxic (Lamchouri and al.,2013), antiseptic (Khademalhosseini and al.,2015), insecticidal (Jbilou and al.,2008), neurological (Biradar and al.,2013), antileishmanial (Khaliq and al.,2009), antinociceptive (Monsef and al.,2004), hepatoprotective (Hamden and al.,2008), cardiovascular (Aarons and al.,1977). At high doses, its seeds are known to cause abortion (Shapira and al., 1989), neurosensory symptoms (Niroumand and al., 2015), bradycardia, hypotension (Aarons and al., 1977), vomiting, visual hallucinations, restlessness, ataxia (Frison and al., 2008) and tremor (Hideto, 2007). There are many reports on its toxic effects on humans below:

Two cases of poisoning have been reported, a young girl (27 years old) who was intoxicated after consuming 50 grams of *P. harmala* seeds, presented with an overdose consisting of hallucinations and neurosensory syndromes, bradycardia, nausea and vomiting. (Salah and al., 1986). A man (35 years old) who became intoxicated after ingesting 150 grams of seeds showed gastrointestinal distress and vomited blood. Both were hospitalized for signs of intoxication. After admission to hospital, their condition improved within a few hours. No deaths were reported (Mahmoudian and al., 2002).

This document aims to highlight the medicinal uses of plants from the Algerian flora and could constitute a database for further research in the fields of pharmacology, toxicology and clinical practice. The toxicity, side effects and clinical efficacy of *P. harmala* should be extended by in vitro and in vivo studies.

This study helped us to direct our experimental research and we chose to study in vitro the antioxidant activity and the anti-inflammatory effect of P. harmala seed extracts from a topical disease, carried out at the Biotoxicology Laboratory, which gave a very interesting result in terms of the protective effect of these extracts, the results of which are currently being processed.

Botanical classification

Embranchement : Spermatophytes

Sous embranchement : Angiospermes

Classe : Dicotylédones

Sous classe : Rosidae

Ordre : Sapindales

Famille : Zygophyllaceae

Genre : Peganum

Espèce : *Peganum harmala L* (Ozenda, 1991)

Botanical description

P. harmala L. (Zygophyllaceae) is a perennial herbaceous, glabrous plant that can grow to 30-100 cm. Its normal habitat is semi-arid rangel and, steppe areas and sandy soils (Mahmoudian and al., 2002), contains green leaves with narrow, long and irregular divisions, white flowers

appear during flowering (Figure 1). Its fruit is in the form of a spherical capsule containing cloinsons, each of which contains a large number of seeds of dark brown color, angular shape and give off a strong odour. (Asgarpanah and Ramezanloo, 2012). The seeds are obtained after drying the plant, the capsules open spontaneously, which allows the extraction of the seeds (Figure 2).

Figure1*. Different parts of the species Peganum harmala L. (a and b): flowers, (c and d): seeds (Nedjmi, 2020)*

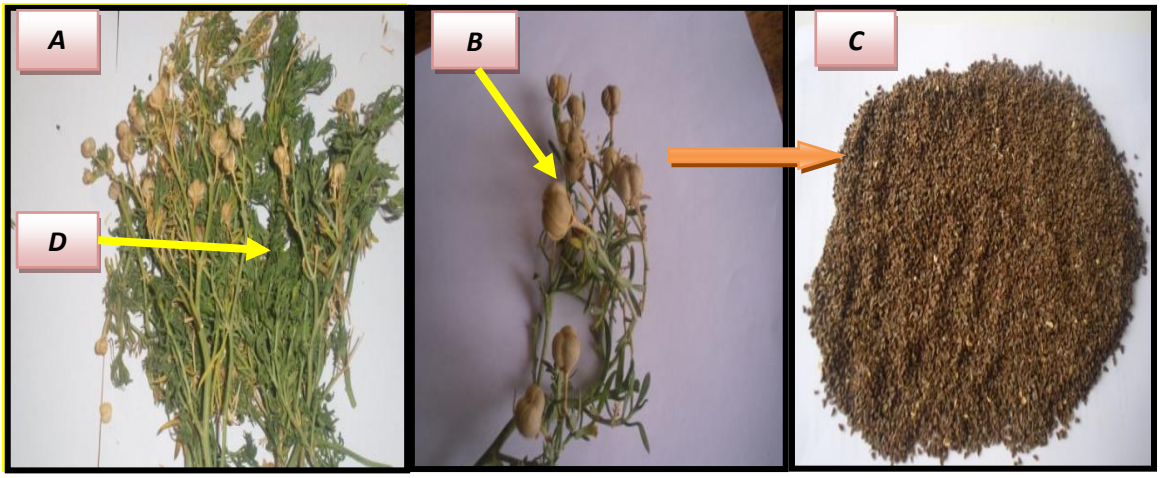


Figure 2*. **(A)**: The whole plant, **(B)**: fruits (capsules), **(C)**: seeds removed from the fruits, **(D)**: leaves.(Original photo. Aberkane,2023)*

(Harvesting and drying of the plant Peganum harmala L. for a subsequent doctoral project, Laboratory of Biochemistry, Department of Biology, Faculty of Natural and Life Sciences, University of Djillali Liabes, Sidi-Bel-Abbes).

Chemical composition

P. harmala seeds are rich in lipids, proteins, amino acids, carbohydrates, minerals, alkaloids and fatty acids, they contain palmitic acid, linolenic acid, stearic acid, etc.(Abolhasani and al.,2015). Al Yahya (1986) also states that *P. harmala* contains amino acids (phenylalanine, valine, proline,

threonine, histidine, glutamic acid), flavonoids, alkaloids, coumarins, tannins, sterols and triterpenes.

Khadhr (2016) shows that the anti-inflammatory activity of *P. harmala* seed oil mainly due to its high content of linoleic acid, g-tocopherol and polyphenols, as well as its remarkable antioxidant capacity.

Materials and Methods

1. Description of the study areas:

The province of Sidi-Bel-Abbes is located in the west of Algeria, about 343 km from Algiers, the capital, it covers an area of 9 151 km2. Lambert coordinates information are:

Latitude: 35°11´23´´ North, Longitude: 0°37´51´´ West, Altitude above sea level: 476. Retrieved from (https://dateandtime.info/fr/citycoordinates.php?id=2481007).

In this study, we have chosen five areas that are the most representative of the study area: The communes of Sidi-Bel-Abbés, Sidi-Brahim, Sidi-Lahcen, Tenira and Télagh (Figure3).

Figure 3. *Geographical location of the five study areas (western Algeria)*

1 *Sidi-Bel-Abbes;* 2 *Sidi Brahim;* 3 *Sidi Lahcen;* 4 *Tenira;* 5 *Telagh*

2. Research methodology

The ethnobotanical surveys were carried out in 2021-2022 among the 250 people concerned, including 190 residents, 30 herbalists, 20 pharmacists and 10 traditional healers, living in five different urban and rural areas, at a rate of 50 people per site.

To organize our surveys, we drew up a questionnaire which we followed in each interview.

The assessment of knowledge relating to the use of the plant by local populations was based on two parameters, namely sociodemographic profile (The age and gender of the people interviewers, level of education, their family situation and socio-professional category) and Medicinal uses of the plant (the part used, the methods of preparation, the therapeutic indications, the knowledge of toxicity and the route of administration and dosage) (Annex 1). This study provided important information on the therapeutic use of *P. harmala* by local people. In addition, they shared additional knowledge about the use of the plant.

3. Result processing :

The survey data were processed and entered into Excel 2010, then analyzed using simple descriptive statistical methods.

Results and discussion

Sociodemographic profile of respondents

1. Use of the plant according to age and gender:

The results of our survey show that herbal medicine is practiced across all age groups (Figure4),The dominant age groups are 40-65 years old with (56%). This is followed by the over 65years old and the 25-40years old with (26%) and (14%) respectively. The youngest informants under 25years old use the plant less with (4%). Several studies show that TM is mainly used by older people, they have more knowledge, which is due to their experience accumulated with age and can be explained by the transmission of knowledge from one generation to another (Bouasla and Bouasla, 2017). It is also noted that there is a loss of use of TM in certain age groups, which can be explained by the distrust of some people, especially young people. The lack of interest in herbal preparations was a reason for low knowledge among young informants due to changes in lifestyle caused by modern life (Qaseem and al., 2019).

In our study, we found that both sexes use the plant, with a predominance of women (64%) and (36%) for men (Figure 5).This predominance is explained by the fact that women are more attached to traditions than men, the information is easily transmitted between them (Jouad and al., 2001), and have more traditional knowledge of herbalist (Kadriand al., 2018; Boutabia and al., 2020).

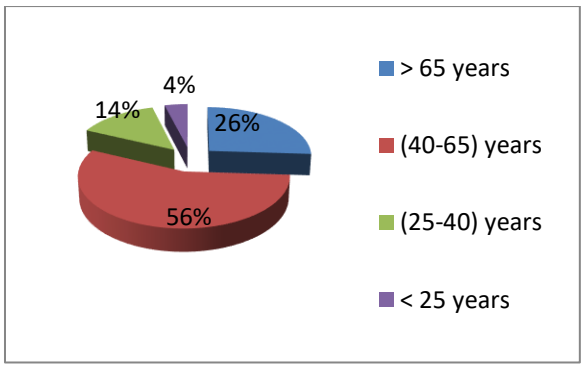


Figure 4.*The use of the plant according to age*

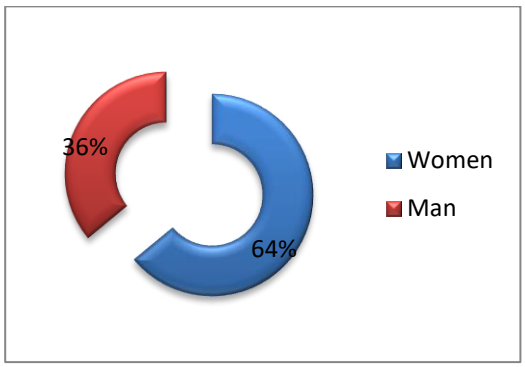


Figure 5.*The use of the plant according to gender*

2. Use of the plant according to level of education:

In the study area, the vast majority of medicinal plant users are illiterate (38%) and have primary education (34%), followed by secondary education (18%). The people with university level use this plant very little (10%) because they prefer modern medicine to traditional medicine and have access to doctors and medicines. (Figure 6). This result is directly correlated with the level of education of the local population and is almost similar to those found in the Boutabia, and al (2020) study.

3. Use of the plant according to family situation:

Medicinal plants are used more frequently by married people (52%) than by widow people (24%), it is also used by divorced people and single people with a rate of (16%) and (8%) respectively (Figure 7).The results obtained by El-Assri, and al (2021) also showed that married people mostly use traditional herbal medicine, and the high price of medical consultations influences the couple to minimize the cost of medication by using herbal medicines to treat themselves and their child (Jeddi and al.,2021).

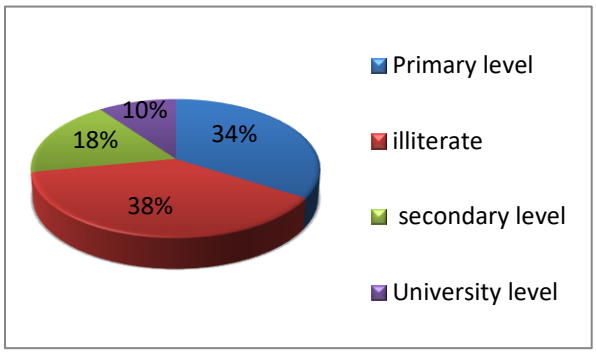


Figure 6.*The use of the plant according to the level of education*

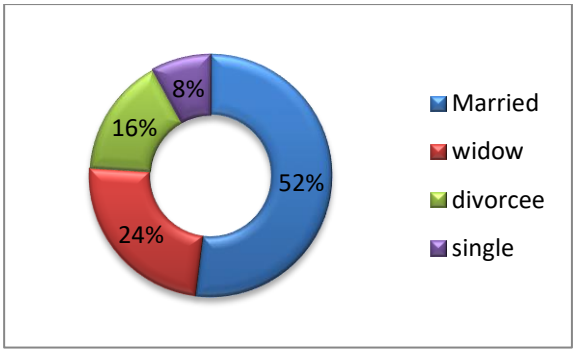


Figure 7.*The use of the plant according to family situation*

4. Use of de plant according to Socio-professional category:

The survey of the population of the five areas touched on different socio-professional categories

(Figure 8). However, employees predominate (28%), followed by retirees (17%), unemployed (15%), herbalists (12%) and liberal profession (10%).

This explains that these categories use natural care because it is safer and cheaper, in addition to their average salary. Similar results were found in another study in Sidi-BeL-Abbes (Bouasla and Bouasla,2017).

Pharmacists, healers, farmers and others are the least frequent users of this plant, with rates of 8%, 4%, 4% and 2% respectively.

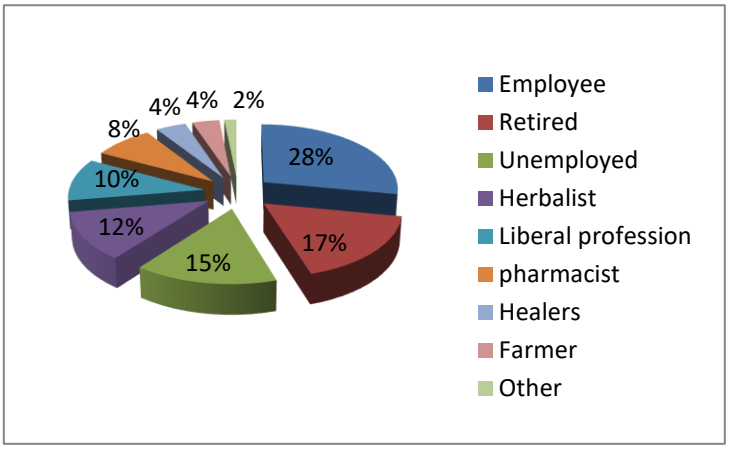


Figure 8.*The use of the plant according to socio-professional category*

Medicinal uses of the plant

1. Use of the plant according to its parts:

Most of the informants use the seeds of *P. harmala* (56%), followed by the leaves (39%). It is known that this plant is an annual, which could explain the use of seeds and dried leaves after drying the plant outside the harvesting season and throughout the year due to its availability from herbalists.

The least used parts are the roots (4%) and the fruits (1%), with no use of the flowers (0%) (Figure 9). These results are confirmed by other ethnobotanical studies on Algerian plants and the use of seeds and leaves of *P. harmala* for the treatment of different diseases (Sarri and al, 2014; Sarri and al, 2015).

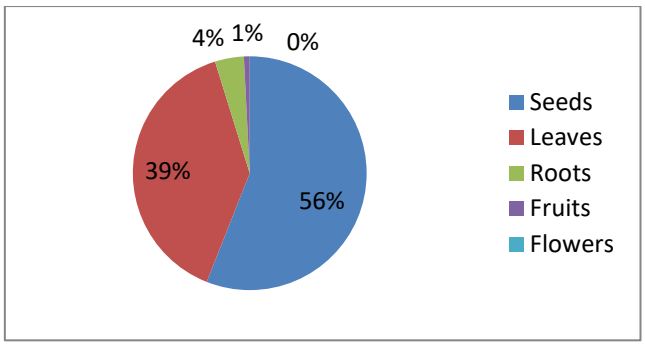


Figure 9. *The use of the plant according to its parts*

2. Use of the plant according to preparation method:

The parts of the plant are used in different forms, infusion followed by decoction and steam cooking are the most used with a percentage of 31%, 19% and 16% respectively .

This result is similar to that reported in the studies on medicinal plants in Algeria on the method of infusion and decoction of seeds and leaves of *P.harmala*, which are the preferred methods of preparation in Algeria (Sarri and al, 2014; Sarri and al, 2015).

According to Olajuyigbe and Afolayan (2012), decoction and infusion are highly valued and often preferred by local healers in Africa. However, our population uses a new method (steam cooking), which is very little known and has not been found in previous surveys.

In our stady, the informants (women) used steam-cooked, a recipe of the grandmother, the seeds are steamed and taken orally. They explain that this method of preparation reduces the toxicity of the seeds without any risk of poisoning.

This method of preparation is generally used by pregnant women, breastfeeding women and women with hot flushes in the five communes of Sidi-Bel-Abbes. We believe that this may be due to the evaporation of some of the alkaloids contained in the essential oils of *P. harmala* seeds, which reduces the toxicity and makes the seeds safer to use.

Our informants claim to use a very small spoonful of raw seeds, but once the seeds have been steamed, the dose can be safely increased.

To the best of our knowledge, and based on the research that has been carried out, there is no research on reducing the toxicity of medicinal plants using the steaming method, so it is very important to study this by measuring the bioactive compounds before and after steaming, particularly the essential oils and fixed oils containing alkaloids (the potentially toxic fraction), as well as the antioxidant and anti-inflammatory compounds present in the different parts of the plant (seeds, leaves, ...), which will enable us to adjust the exact doses.

The use of fixed oils (12%) by our population comes from herbalists and pharmacists.

On the other hand, the use of cataplasm, fumigation and raw seeds is not negligible with the rate of (11%), (7%) and (4%) respectively (Figure 10).

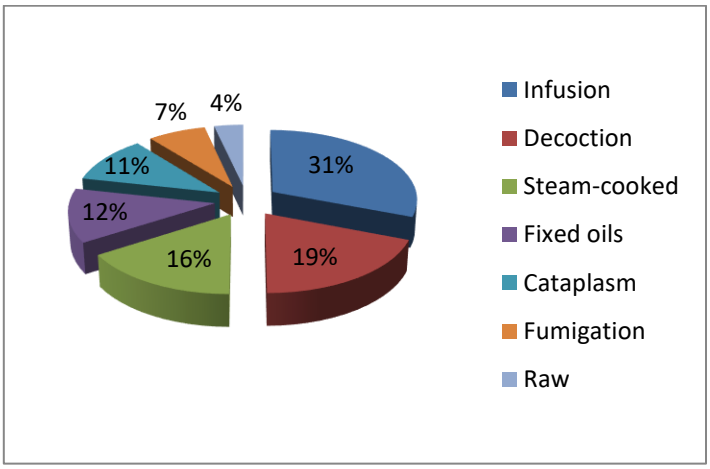


Figure 10. *The use of the plant according to preparation method*

3. Use of the plant according to therapeutic indications:

The ethnobotanical survey revealed that this medicinal species is mainly used for digestive disorders (stomach pain, diarrhea, colic and others) (23%), *P. harmala* was used in the north-west of Morocco as a spasmolytic and antihelminthic (Merzouki et al, 2000). Powdered seeds of *P. harmala* have been used to treat colic in humans and animals for its antispasmodic effect (Akhtar and al., 2000), These results may be due to various factors such as a diet in the study area, essentially rich in starches (pasta) and tobacco consumption, which could be the cause of digestive (Souilah and al, 2018). Followed by urinary tract infections (18%), 80% of urinary tract infections are caused by E. coli (predominant uropathogen), followed by Staphylococcus, Klebsiella, Enterobacter and Enterococcus species (Hooton et al., 1996); while the use of the plant for genital diseases is (15%).

Traditional medicine in Central Sahara reveals that this plant is used in just married sexual weakness and as an emmenagogue (Hammiche and Maiza, 2006), this therapeutic effect is attributed to some alkaloids and flavonoid derivatives (Talib and Mahasneh, 2010).

This study was carried out to demonstrate that, despite the restrictions imposed on pregnant and breastfeeding women, some informants claim to have used this plant for urogenital infections, to increase breast milk and to reduce hot flushes in menopausal women, but in safe doses with using a special preparation method inherited from their great-grandmothers (steam cooking), confirming that this practice does not pose any risk of toxicity.

Oxidative stress is the main cause of menopause and medicinal plants usually restore estrogen levels and attenuating hot flushes (Behrman and al., 2001 and Freedman, 1998).

The main reasons why women use complementary medicine products are to protect themselves and their children from the adverse effects of drugs, to facilitate normal physiological processes during pregnancy, childbirth and breastfeeding, and to prevent negative consequences of pregnancy such as abortion, birth defects and poor health during pregnancy (Barnes and al., 2018).

This is followed by osteoarticular disorders (rheumatism, arthrosis, sciatica) (14%), the same results are found in the Pharmacopoeia of Tassili N'ajjer by Hammiche and Maiza, (2006), our informants state that the treatment consists of mixing the fixed oil of the seeds with camel fat and then applying it to the affected area.

Research suggests that the presence of alkaloids and flavonoids in *P. harmala* extracts may potentially enhance its antioxidant and anti-arthritic properties (Singhai and Patil, 2021).

Then the metabolic disorders (diabetes) with a rate of (9%). Similar results were found by Boudjelal and al. (2013) in a survey of herbalists in northern Algeria. Komeili and al. (2016) results confirmed that *P. harmala* seed extract significantly reduced glucose, cholesterol and triglycerides levels in vitro.

Other diseases are treated such as respiratory pain (influenza, asthma) (7%), according to Souilah and al (2018) it can be due to the very cold climate in winter. Informants stated that *P. harmala* was one of the plants used during the Covid 19 pandemic to relieve respiratory difficulties and as an air purifier, this improvement was noted after infusion and ingestion of teaspoons of raw seeds, usually used in combination with other ingredients such as honey, olive oil, sesame seeds, black seeds, lemon and juice, or by fumigating the sufferer's room (Mansour and al., 2021). It has a bronchodilator effect by improving oxygen saturation as measured by an oximeter at home or in hospital.

According to Mahmoudian et al (2002), the vasicine (peganine) and vasicinone are active alkaloids used as bronchodilators in asthma.

The least commonly treated ailments are nervous disorders (insomnia), which account for 5% of cases, although research by Damirov et al (1983) also shows that *P. harmala* can be used to treat insomnia and depressive disorders. The plant treats break down and Anxiety (Hammiche and Maiza, 2006), Skin and hair problems account for 4% of cases and it is possible to attribute skin

diseases to allergies that arise from interaction with plants and pollen emissions (Souilah and al. 2018). Extracts from plants have been used for a very long time to treat wounds and have a great effect on wound healing (Thakur and al., 2011). Khadhr (2016) shows that cream made from *P. harmala* seed oil has interesting anti-inflammatory activity. It is used against lice and to maintain the vitality and beauty of the hair (Mouchane and al., 2024).

Cardiovascular disease (blood pressure) (3%) (Jouad and al., 2001).Boudjelal's research revealed the use of *P. harmala* by herbalists in Msila in northern Algeria as an anti-hypertensive agent (Boudjelal et al, 2013).

Spiritual practice (2%). Burned *P. harmala* seeds are traditionally used for rituals and magic (Merzouki et al, 2000), luck and protection against the "evil eye" (Ümit-Sayin, 2017). (Figure 11).

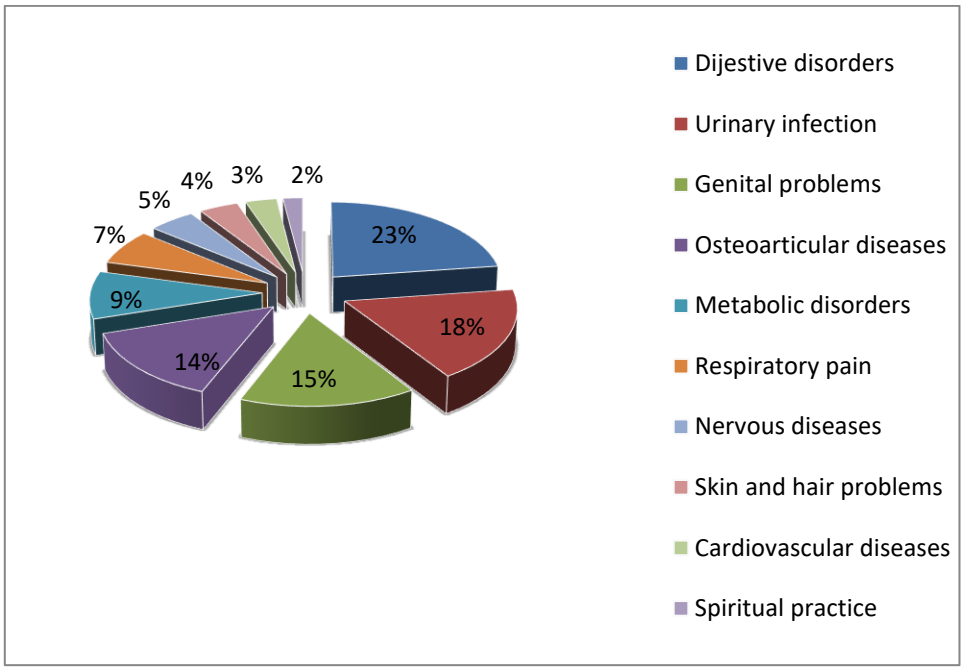


Figure 11.*The use of the plant according to therapeutic indications*

4. Use of the plant according to knowledge of toxicity:

According to our informants, the majorities of them (84%) have recognized the existence of risks of this plant and respect the doses, the others don't know (16%), and they also follow the recommendations of connoisseurs and the recipes of healers and elders.

In this respect, we found no toxicity in our survey (Figure 12). These results indicate that the local population has extensive traditional knowledge about medicinal plants and their harmful effects. The first study on ethnotoxic knowledge of plants, carried out in north-eastern Morocco to assess

the local population's knowledge of the toxicity of medicinal plants, including *P. harmala*, confirms what we have said about potentially toxic plants used for culinary purposes and the treatment of acute illnesses. In this case, the dose is a key factor in determining whether the effect is therapeutic or toxic, and the author points out that it is essential to exercise caution when using medicinal plants (Kharchoufa and al ,2021).

However, it should be noted that the misuse and illegal prescription of this plant can also lead to a series of complications and toxicities for the consumer (Moshiri and al., 2013).

5. Use of the plant according to route of administration and dosage:

The majority of remedies are taken orally (62%), the most common preparation being infusion, especially raw seeds and dried leaves (1 teaspoon per cup of boiling water), decoction(A handful of seeds or dried leaves is boiled in 2 liters of water for 15 minutes until reduced to one liter, then a cup is taken orally).This finding is similar to those reported in studies of Algerian medicinal plants found in the Haddada region of Souk Ahras, Algeria (Boutabia and al, 2020), the city of M'sila in the central part of northern Algeria (Sarri and al, 2014), and the southeastern region of the capital Hodna (Sarri and al, 2015).

Steam cooking involves steaming the seeds several times, 5 to 10 times (Depending on the disease and condition of the patient). The seeds are cooled between each steaming, then dried with paper towels and stored in an airtight jar for future use (swallow a teaspoon of seeds with water or drink a glass of herbal tea).

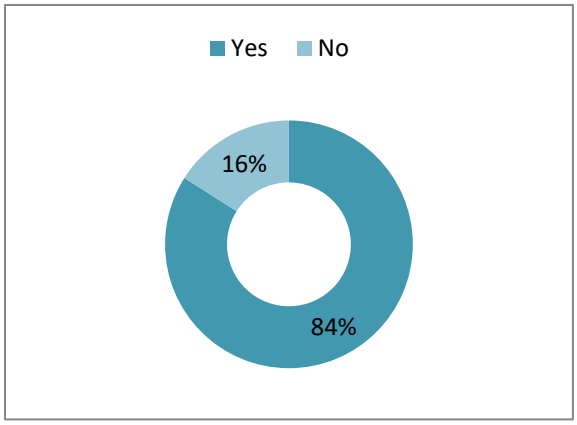
The plant is also used externally (22%), a study carried out in the Algerian arid zone in Biskra shows the use of the cataplasm (compress) method (Behaz and al, 2024), in our survey the local population use this method by spreading the leaves (pasty preparation) between two cloths and applying to the skin to relieve inflammation (bronchitis, back pain, haemorrhoids, insect bites, etc.).

Fixed oils used with a massage on the sick part and arthrisis, generally mixed with olive oil or fat of camel and others, Contrary to the ethnobotanical study carried out by Behaz and al, (2024), which suggests using essential oils.

Followed by the inhalation (10%) of the vapors of seeds or leaves boiled in water, this practice was often used during the Covid 19 pandemic in the home of people suffering from respiratory diseases in order to minimize the transmission of the disease to others. A study in the Algerian steppe shows its use for asthma (Miara and al, 2019).

The burnt seeds were used alone or mixed with other herbs for disinfection and spiritual practices (evil eye and exorcism) using the fumigation method, especially by healers or on the advice of a herbalist. The same result was found for folk medicine in the Ksar Lakbir district of Rif, in north-west Morocco (Merzouki et al, 2000).

The other way of administration (6%), according to the informants, is to put the seeds in a bag or under the pillow for people and children who have the evil eye and have problems sleeping at night. (Figure 13).



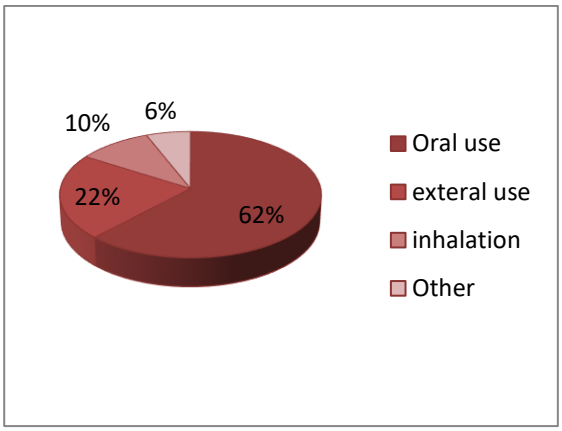


Figure 12. *Knowledge of toxicity*

Figure 13. *Route of administration*

Conclusion and prospects:

Phytomedicine is an ancient therapy used by people all over the world to cure themselves and alleviate their suffering since before the advent of pharmaceuticals. This first contribution to the ethnobotany of this region carried out in the five communes of Sidi Bel Abbes has enabled us to highlight the importance of traditional phytomedicine and the frequent use of *Peganum harmala L.*

The results of this survey confirm that the most respondent users use this plant for the treatment of digestive, urogenital, osteo-articular, and other conditions. The seeds, raw or steamed, and the dried leaves are the most commonly used parts, especially by infusion, decoction, and steaming.

The information obtained from the questionnaires carried out in the field shows that the informants use this plant with great caution, especially by vulnerable people such as the chronically ill, pregnant women and children; they know very well the dose not to exceed that is why we have not come across any cases of intoxication during our research.

According to our informants, the steaming method helps to reduce toxicity and is a grandmother's recipe used by women, especially pregnant and breastfeeding women.

Despite the widespread and popular use of herbal remedies during pregnancy, there are very few studies on these treatments, particularly *P harmala*, and there are no clinical indications for the use of this plant in pregnant women.

Our objective in preparing this paper was to valorize this medicinal plant of the Algerian flora and to demonstrate the traditional use and previously reported pharmacological properties of *P. harmala* as one of the most well-known medicinal plants in Algeria, in order to find new bioactive natural products and highlight its traditional applications for the development of novel pharmacological and clinical applications based on related studies that have been conducted recently.

This has also enabled us to envisage a future experimental research project on the oestrogenic effect of this plant, given its use by women for the treatment of genital diseases mentioned in our study. We also plan to study the toxicity by comparing the chemical screening and LD 50 of the raw and steamed extracts, in order to confirm or refute what the informants said about the reduced toxicity of parts of the plant (particularly alkaloids of seeds) when steamed.

Therefore, this review provides evidence that will enable future researchers to introduce *P. harmala* as a safe and effective therapeutic source; it is also possible that β-carboline alkaloids may be useful in the development of new drugs to treat various diseases.

Finally, we hope that this ethnobotanical study of this plant, accompanied by its use by the population of this region, will serve on the one hand to complete the work already done and help future research to discover the multiple benefits of this plant, with the recipes used to reduce the toxicity of plants in general, for a safer use to take advantage of its various virtues reported in numerous studies on the curative effects of *P. harmala.*

Data Availability

All the data are provided in the manuscript.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

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Annex 1: Questionnaire Card

Algerian Democratic and Popular Republic

Ministry of Higher Education and Scientific Research

University Djillali Liabes, Sidi Bel Abbes

Faculty of Natural Sciences and Life, Department of Biology

Laboratory of Biotoxicology

Questionnaire Card No…….....

The informant's profile (Check the correct answer : **X**)

First and Last name:……

Age : > 65 years (40-65) years (25-40) years < 25 years

Sexe : Man Women

Locality : Sidi-Bel-Abbes Sidi-Brahim Sidi-Lahcen Tenira Telagh

Family situation: Married Single Widow Divorcee

Level of education: illiterate primary level secondary level university level

Socio-professional category: Employee Retired Unemployed Liberal profession

Pharmacist Herbalist Healers Farmer Other

Part used (drogue) : Seeds Leaves Roots Fruits Flowers

Method of preparation: Infusion Decoction Cataplasm Fumigation

Steam-cooked Raw Fixed oils

Therapeutic uses : Digestive Respiratory Metabolic Cardiovascular Urinary

Genital Osteoarticular Nervous Skin and hair Spiritual

Route of administration: Oral use External use Inhalation Other

The survey card modified and translated in English by Professor BENABDERRAHMANE Mokhtar (Boutabia and al, 2020).