Ethnobotanical knowledge of *Daphne gnidium* L. species in Taza (Northeastern Morocco).

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Research

Abstract

Background: Documentation of indigenous knowledge of plant species is the most important factor for their conservation. *Daphne gnidium* L. species is a Mediterranean basin plant belonging to the genus Daphne, which belongs to its family Thymelaeaceae, widely used in this area to treat various ailments. This study aims to evaluate and document the local traditional knowledge about ethnomedicinal uses of the *D. gnidium* plant, possessed by the native population to contribute to its better valorization.

Methods: A total of 112 native informants including laypeople, herbalists and practitioners of traditional healers were interviewed through semi-structured interviews and questionnaires. The data was analyzed and compared by descriptive indicators such as Relative Frequency of Citation, Fidelity level, Jaccard's index, and Multiple Correspondence Analysis.

Results: The highest values of the relative frequency of citation (1 and 0.61) and fidelity level (100% and 62%) were obtained for hair care and skinhead disease respectively. Four categories of use of *Daphne gnidium* L. were identified by the different groups of informants; the cosmetic use category is the most cited (100%) and the medicinal category (64%). The frequent mode of preparation is powder form. New use (bone fracture) was cited and documented for the first time in the current ethnobotanical study about *D. gnidium* species.

Conclusion: Our results contribute to the documentation of local knowledge, for development of conservation strategies, and sustainable use of *Daphne gnidium*, and to encourage further pharmacological research.

Keywords: Ethnobotanical survey, *Daphne gnidium*, Relative Frequency of Citation, Fidelity Level, Multiple Correspondence Analysis.

Background

Medicinal plants are the primary health care used by humans (Hayta et al. 2014). However, herbal treatments involving medicinal plants are the most popular form of traditional medicine (World Health Organization 2013). WHO (2018) has defined traditional medicine as "the sum total of the knowledge, skill, and practices based on the theories, beliefs, and

experiences indigenous to different cultures, whether explicable or not, used in the maintenance of health as well as in the prevention, diagnosis, improvement, or treatment of physical and mental illness".

Traditional medicine in Africa is an old and diversified system of all known therapeutic systems around the world (Mahomoodally 2013). Up to 80% of African countries use some form of traditional medicine (Bodeker & Kronenberg 2002). Morocco is a country situated in the North of Africa, with a border on the Mediterranean Sea in the North and in the West, the Atlantic Ocean. Due to its Mediterranean climate, Morocco has a highly diverse flora, with more than 42000 species of plants, grouped into 150 families and 940 genera (Hmamouchi 2001). Among those species, the *Daphne gnidium* plant belongs to the genus Daphne which belongs to its family Thymelaeaceae (Khouchlaa et al. 2021).

In Morocco, traditional medicinal knowledge is transferred orally from generation to generation (Eddouks et al. 2017). Ethnobotanical studies are necessary to document popular traditional knowledge before it disappears (Magwede et al. 2014). In addition, traditional knowledge allows for the identification, preservation, perpetuation, comparison, and exchange of ancestral knowledge about local medicinal plants.

Daphne gnidium L. species is reported in different ethnobotanical surveys with its application in folk health, each part applied to specific traditional medicinal uses (Khouchlaa et al. 2021). The aerial part is used in Algeria for its anti-inflammatory effect (Boudjelal et al. 2013), and as an odontalgia in Spain (Benítez et al. 2010). In Algeria the leaves are used for hair loss (Benarba et al. 2015), hair care (Chermat & Gharzouli 2015), and rheumatic and muscular pains (Yaici et al. 2020). In Spain, the flowers are used against skin, cutaneous and tissue diseases (Belda et al. 2013), and the roots and branches are used for an insecticide effect (González et al. 2011). In Italy, the entire plant is used as an anti-parasitic (Passalacqua et al. 2006), and the fruits are used against gastrointestinal infection (Bullitta et al. 2007). The leaves and stem bark are used in Morocco against diabetes (Ziyyat et al. 1997), and the leaves are used for hair care (Akdime et al. 2015, Bellakhdar et al. 1991, Bnouham et al. 2002, Hachi et al. 2015, Hseini & Kahouadji 2007, Slimani et al. 2016), hair tonic (Boukhira et al. 2013, Merzouki et al. 2000), hair strengthening (Aziz & Lotfi 2018, El-Hilaly et al. 2003), abortive (Bellakhdar et al. 1991; Bnouham et al. 2002, Rhafouri et al. 2015), dermatological (El-Hilaly et al. 2003, Fatiha et al. 2019), skin disease (Bnouham et al. 2002), liver diseases (Benkhnigue et al. 2023), and remove toxins (Benali et al. 2017).

Little laboratory studies were conducted in Morocco involving the *Daphne gnidium* plant, in comparison with different countries of the Mediterranean Sea (El Mouzazi et al. 2023), and no specific ethnobotanical studies have been conducted about it; consequently, the lack of reliable ethnobotanical information remain the greatest obstacle to its conservation and its sustainability. This investigation, despite its limitation in the space, will contribute to filling gaps in endogenous knowledge, and to the implementation of a strategy of conservation and management of this resource.

This investigation was conducted in the province of Taza, a zone situated between the Middle Atlas and the Rif mountains, which encompasses the National Park of Tazekka. Due to its climatic factors and geographical position, this park is characterized by richness of the flora with 64 endemic taxa (Fougrach et al. 2007). In this regard, this study aims. i) to document the local knowledge of *D. gnidium*; ii) to evaluate the traditional knowledge according to socio-demographical factors (sex, generation, and locality; iii) characterize the use forms, used parts, and use mode in this area; iv) identify the different uses depending on the sampling site.

Materials and Methods

Study area

The current investigation was conducted in Taza province at different areas where *Daphne gnidium* species were found; two urban areas (Taza and Tahla) and five rural areas (Ajdir, Bab Marzouka, Bab Boudir, Bouchfaa, El Gouzate, Galdamane, Maghrawa, Msila, Oulad Zbair, Taineste, Tazarine and Zerarda), were surveyed from September 2022 to April 2023. Taza province is situated in Northeastern Morocco between the Middle Atlas and Rif Mountains. It lies from 34° 13' North latitudes and 4° 01' West longitudes and is surrounded by five different provinces (Figure 1). The climate of this region is Mediterranean, whose winter is cold with average precipitation of approximately 780 mm and a hot summer with temperatures of between 9 and 45 C° (Hakkour et al. 2016).

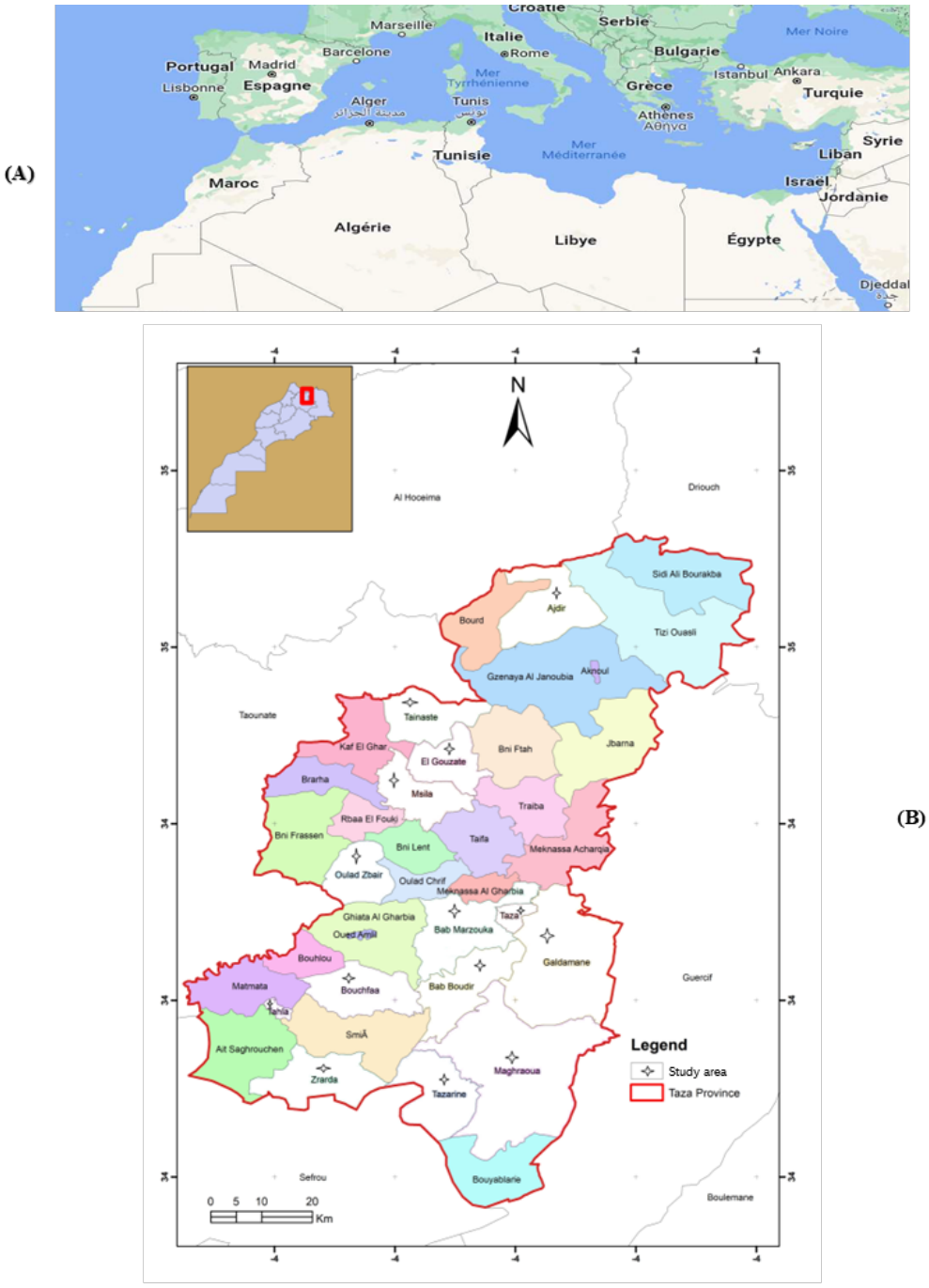

Figure 1. Area study: (A) Mediterranean Sea (source: google Maps), (B) Taza province. (source: created by ArcGIS).

Data collection

Ethnobotanical data were obtained through questionnaires and semi-structured interviews with local herbalists and respondents, with their consent after being informed about the objective of this study. Overall, 112 native informants were randomly selected based on their knowledge of *D. gnidium*. There were 58 males and 54 females. The questionnaire had two sections; the first section included the personal information of informants (gender, education level, age). The second section contained ethnobotanical data (vernacular name, ethnomedicinal uses, mode of use, parts used, mode of administration, toxicity, and price).

Plant identification and collection

The *Daphne gnidium* samples (Figure 2) were harvested from the National Park of Tazekka locality during the flowering season (May 2023); in this area the flowering stage starts in March until October, and the fruits ripe in October until December. The samples were organized as a complete herbarium specimen. The collected samples were pressed, dried, and preserved for future phytochemical analysis. Taxonomic identification and verification were carried out at *Plant, Animal*

Production and Agro-industry Laboratory, Department of Biology Faculty of Sciences at Ibn Tofail University Kenitra, Morocco. A voucher specimen was deposited at the Herbarium under the code 205.

Figure 2. A *Daphne gnidium* L. species plant is on the right and its leaves are on the left.

Data analysis

A number of use reports indicating the individual report of this plant for a certain disease were calculated to evaluate the consensus among the respondents (Weckerle *et al.* 2018). Diseases were classified into fourteen categories following the International Classification of Primary Care (ICPC-2) (WHO 2021), formally recognized by the World Health Organization's Family of International Classification (WHO-FIC). Different quantitative indices were calculated, relative frequency of citation (RFC), fidelity level (FL), and Jaccard's index (JI). Multiple correspondence analysis (MCA) was implemented to observe the relationship between socio-demographic characteristics and all use reports documented. The group age was classified as follows; young people (age < 30 years), adult people (31≤ Age≤ 60), and people beyond 61 years old. Statistical analysis was carried out using Microsoft Office Excel 2023 and IBM SPSS Statistics Version 23.

Relative frequency of citation (RFC)

RFC index counts the frequency of citation (FC) received by all informants who cited the use of the species, and divided by the number of all informants who participated in the study (N) (Tardío & Pardo-de-Santayana 2008) using the following formula:

$$RFC = FC \div N$$

In this study, we calculated this index considering each use category of illness.

The chi-square test was calculated to assess the dependence between the relative frequency of citation (RFC), and the characteristics of socio-demographics such as gender, age, education level and site.

Fidelity level (FL)

This index is used to determine the percentage of respondents who cited the species for each disease (Friedman *et al*. 1986), by the following formula:

$$FL = (N\rho \div N) \times 100$$

Where Np: Number of use-reports mentioned *Daphne gnidium* species for each ailment or use category. N: sum of informants who cited this plant.

Jaccard's index (JI)

Jaccard's index was calculated to compare the similarity between two sets A and B (Jaccard 1912). This index was used to compare the similarity of our result with other studies in different regions of Morocco and neighboring countries (Algeria, Tunisia, Spain, and Italy). The JI is calculated using the following formula:

$$JI(A,B) = \frac{(A \cap B)}{(A \cup B)} = \frac{(A \cap B)}{|A| + |B| - (A \cap B)}$$

Where: **A** is the number of uses in our study, and **B** is the number of uses of another study.
If the value of JI is 1, there is a perfect similarity between the two sets where the union and the intersection are the same size. if the value of JI equals 0, signifying a negative similarity relationship between both sets.

Results and discussion

Socio-demographic data

112 respondents were interviewed, and these included 90 laypeople and 22 key informants (herbalists and practitioners of traditional healers). All respondents (100%) originated from the study areas. Fifty-one percent of the respondents were males (Table 1). Most of the respondents (58%) were aged between 31 and 60 years. Sixty-six percent of Informants belonged to the urban area against (34%) in the rural area. Half of the respondents were illiterate and/or did not complete primary school. Citations of *D. gnidium* plant varies by gender, females cite the plant slightly more than males. This difference can be explained by the male informants were disinterested about the potential therapeutic of the plant; the good knowledge of women as regards medicinal herbs and the high interest by all cosmetic uses; the modern system of health care is dominated to the detriment of the traditional practices. Eighty-three percent of the informants acquired knowledge about *D. gnidium* species through heritage knowledge transferred orally from generation to generation.

Table 1. Socio-demographic characteristics of informants.

Socio-demographic characteristics	**Informants**	
		Percentage (%)
Gender	Males	51%
	Females	49%
Age	≤ 30 years	22%
	31-60	57%
	61-80	21%
	> 80	-
Site	Urban	66%
	Rural	34%
Educational level	Illiterate	31%
	Primary	20%
	Secondary (preparatory and qualifying)	18%
	Academic	32%
Source of knowledge	Heritage (generation to generation)	82%
	Recommended by herbalist	18%
	Reading	-

Traditional medicine knowledge

Vernacular name

Daphne gnidium species is called '*Alzaze'*, in the study area and this is in accordance with previous ethnobotanical studies carried out in Morocco (Bellakhdar *et al*. 1991, El-Assri *et al.* 2021, Fatiha *et al*. 2019), and in Algeria (Boudjelal *et al.* 2013). Other ethnobotanical studies (Bnouham *et al*. 2002, Khouchlaa *et al*. 2021, Redoaun *et al.* 2022, Smaili *et al.* 2023, Ziyyat *et al*. 1997) confirm that *D. gnidium* has two names '*Alzaze*' and '*Metnane*' in Moroccan pharmacopeia. However, herbalists interviewed in the current study, confirmed that '*Metnane*' is the name of another plant in accordance with an ethnobotanical study carried out in the middle atlas and the plan of Saiss, who mentioned that *'Metnane' is Thymelaea hirsute* L. species (El Yaagoubi *et al.* 2023). This contradiction can be explained by the difference in ethnomedicinal

knowledge about classification, nomenclature, and identification of plant species, between neighboring regions in the same countries.

Categories of uses

Respondents mentioned four use categories which are: cosmetic, human medicinal and other (commercial and fishing) (Figure 3). The important uses were related to cosmetic uses (96%), followed by human medicine (64%), commercial categories (18%) and fishing (7%).

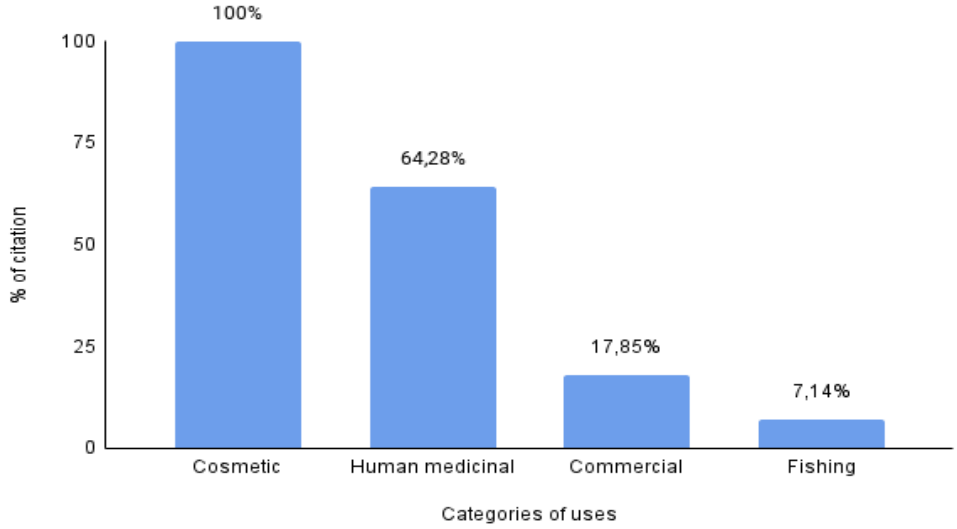

Figure 3. Percentages of responses related to different categories of uses.

The importance of this species in cosmetic uses is justified by the ancestral recommendation and the discovery by personal experience of the users, who confirm that this species shows a high potential to care hair such as dyeing, strengthening and hair loss. These uses are common in Morocco (Abbouyi *et al*. 2014, Akdime *et al.* 2015, Bnouham *et al.* 2002, Eddouks *et al*. 2017, El-Hilaly *et al.* 2003, Rhafouri *et al*. 2015, Slimani *et al.* 2016), and in Algeria (Aziz & Aarab 2018, Benarba *et al*. 2015, Boudjelal *et al.* 2013, Chermat & Gharzout 2015). In the medicinal category, the most ailments treated by *D. gnidium* species recorded in this investigation were, general disorders (100%), skin disease (78%) and musculoskeletal (21%). Results concerning general disorders and skin disease are in accord with recent studies conducted in Morocco (Bnouham *et al.* 2002, Fatiha *et al*. 2019, Tlemcani *et al.* 2023). In an *in vivo* scientific study, involving the *D. gnidium* leaves extract, after the acute primary irritation test, the leaves showed good cutaneous tolerability (Rapisarda *et al*. 1998).

In the other category, some informants (n = 8) indicate that the aerial part (leaves, stems, flowers, and fruits) was used as a fish poison in the valley in the past. We suppose that the use of this plant in fishing was due to its toxicity. The limited citation of this use category is because extinction of this practice and the knowledge of this species about this use category in this area. According to different studies conducted in Italy (Leto *et al.* 2013, Passalacqua *et al.* 2006), the same use was identified.

The Chi-square test explained that the education level and both categories of uses had a significant association (p = 0.000) and (p = 0.028) for therapeutic use and no therapeutic use respectively (Table 2). A significant association between the therapeutic uses and all sociodemographic stratums ($p \leq 0.05$). On the other hand, non-significant relation, p-value higher than 0.05, between non-therapeutic use and gender (p = 0.942), age (p = 0.271), and site (p = 0.884). These differences indicate that the groups surveyed don't give similar importance to the plant with to its different categories of use.

Table 2. Dependence between socio-demographic variables and the use categories. **: ($p \leq 0.05$).

Demographic characteristics	**Therapeutic use**		**Non-therapeutic use**	
	Chi-square	*P* value	Chi-square	*P* value
Gender	11.828	0.001**	0.005	0.942
Age	14.726	0.005**	5.159	0.271
Education level	53.813	0.000**	10.883	0.028**
Site	13.899	0.000**	0.021	0.884

Analysis of sociodemographic characteristics and different uses of respondents by Multiple Correspondence Analysis (MCA)

The graphical representation (Figure 4) carried out by Multiple Correspondence Analysis (MCA) shows different correspondence spaces between sociodemographic variables and different use-reports. A close relationship between the key informants and the use of this species in bone fracture. Illiterate and rural informants indicated the use of this species in fishing. In addition, utilization of *D. gnidium* among adult females was related to hair care and therapeutic uses (Figure 4).

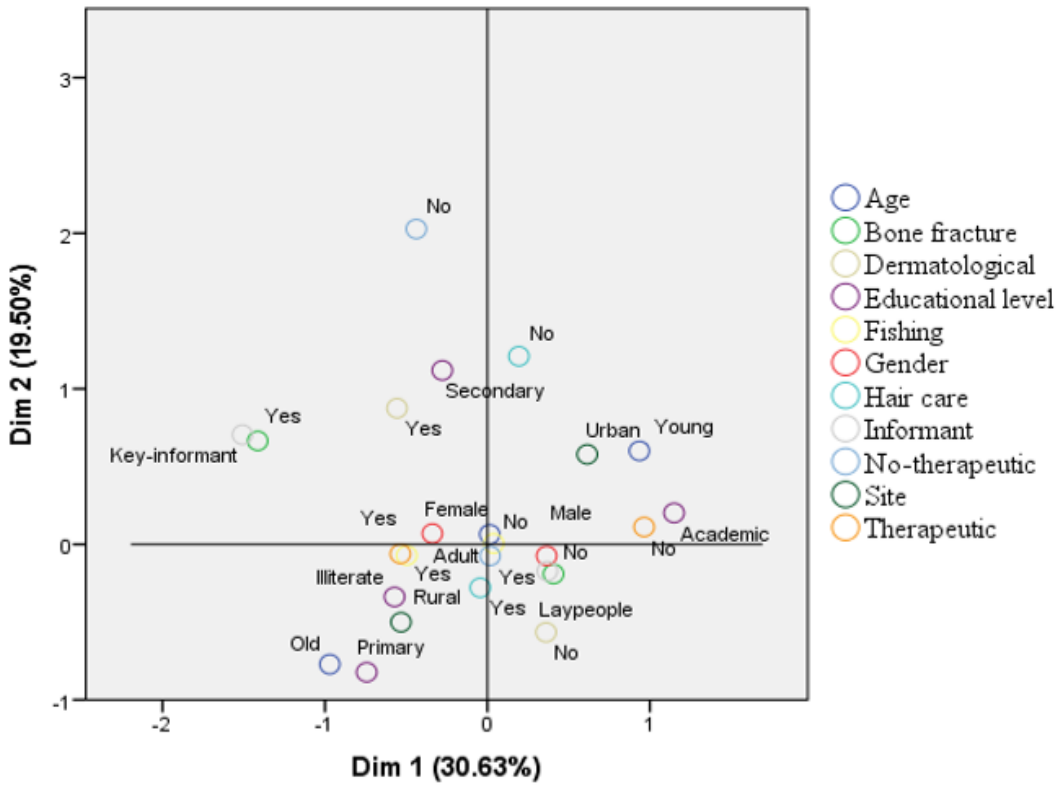

Figure 4. Graphical representation of Multiple Correspondence Analysis (MCA).

Parts used

Leaves were the most used plant part (100%). Previous studies involving the *D. gnidium* plant realized in several regions of Morocco were in accordance with this result (Akdime *et al.* 2015, Bellakhdar *et al*. 1991, El-Hilaly *et al*. 2003, Fatiha *et al.* 2019, Merzouki *et al*. 2000, Slimani *et al.* 2016), also in Algeria (Benarba *et al*. 2015, Boudjelal *et al.* 2013, Yaici *et al.* 2020). On the other hand, in Morocco, other populations use the leaves and other parts such as, whole plant (Eddouks *et al*. 2017) trunk bark (Bnouham *et al*. 2002), fruits (Rhafouri *et al*. 2015), stem bark (Ziyyat *et al*. 1997). In countries of Mediterranean Sea, such as Algeria, aerial parts (Boudjelal *et al*. 2013), seeds (Chermat & Gharzouli 2015), Spain aerial parts (Benítez *et al*. 2010), roots and branches (González *et al*. 2011), flowers (Belda *et al*. 2013), In Italy, entire plant (Passalacqua *et al*. 2006), and fruits in Sardinia (Italy) (Bullitta *et al.* 2007).

All informants were not aware that it's possible to contain different compounds and active compounds with various concentrations at each part of the plant. This refers to the traditional heritage of knowledge, where a high percentage of informants confirm that the origin of their knowledge uses of precise parts (leaves) are from generation to generation rather than a scientific basis. In addition, the leaves are the quick and easily accessible parts of plants to harvest.

Mode of preparation and application

The most common mode of preparation was powder preparation followed by infusion and decoction often in water with a percentage of (43%, 31% and 26%) respectively (Figure 5). The same mode of preparation was mentioned by (Benali *et al.* 2017, Boukhiraa *et al*. 2013, Bnouham *et al*. 2002, Merzouki *et al*. 2000).

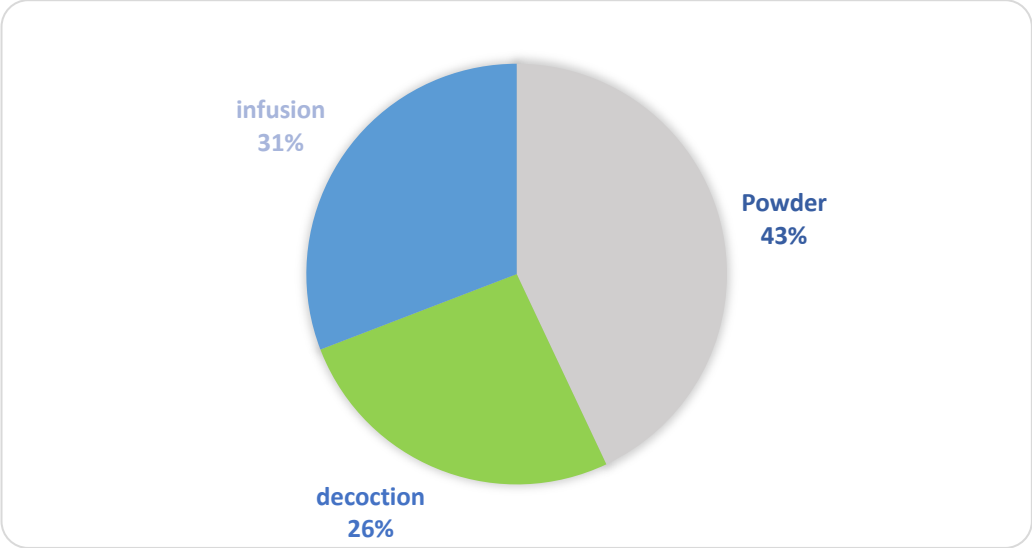

Figure 5. Modes of preparation used by informants.

The informants cited that the plant could be used alone or as a mixture with another plant (*Lawsonia inermis* L. species*)* well-known as '*Henné*', and/or other plants. Key informants cited that the plant could be prepared with other non-plant ingredients like eggs (Figure 6). Despite, the mixture of different plants with other non-plant ingredients such as olive oil, honey, milk, and eggs it is widespread in Moroccan tradition (Eddouks *et al*. 2017). No ethnobotanical studies to date have mentioned the mixture of powder leaves of *D. gnidium* with eggs to treat bone fracture. We suggest, explaining this practice by the heritage knowledge particular to this area, and/or the modern system of health care to replace this traditional practice, the population preferred the use of casts instead of the mixture (powder and eggs) to treat the bone fracture.

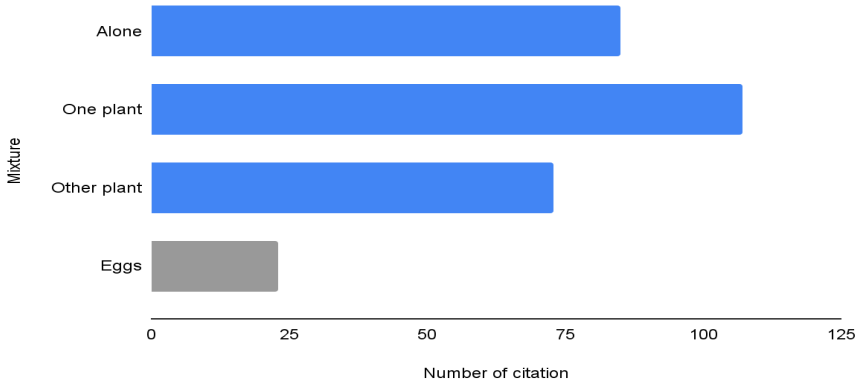

Figure 6. Plants and non-plant ingredients used by informants.

The most common method of use cited in this area is by topical application as cataplasm and bath, especially bath hair. This method of application was cited previously by (El Abbouyi et al. 2014, Rhattas et al. 2016, Slimani et al. 2016).

Relative frequency of citation (RFC) and fidelity level (FL)

RFC values for each disease category ranged from 0.22 to 1. The highest use reports were reported for the beautification of hair and hair care (1), followed by skin disease (dandruff, hair loss and skinhead) (0.78) and bone fracture (0.22) (Table 3). A high RFC value signified an abundant use of this plant species and widespread knowledge in the local community.

The Fidelity level calculated in this study evaluates the importance of *D. gnidium* in treating different diseases, however, this index indicates an agreement between informants mentioned the use for the specific ailment (Friedman *et al*. 1986).

The FL obtained ranged from 22% to 100%. *D. gnidium* is the plant recommended for hair care (100%), same result was obtained in a study carried out by (Eddouks *et al*. 2017) in Southeastern Morocco, and in Northwest Algeria (Benarba *et al.*

2015); to remove dandruff and treat the head skin and hair loss *D. gnidium* is the most cited and preferred (78%); the lowest FL value (22%) found is to treat the bone fracture.

Table 3. Disease categories, RFC, and FL values.

Family and botanical name	Vernacular name	Parts used	Diseases categories	Number of use reports	RFC (%)	FL (%)
Thymelaeaceae *Daphne gnidium* L. species	ألزاز Alezaz	Leaves	Skin: Dandruff, Head skin and hair loss	87	0.78	78%
			Musculoskeletal: Bone fracture	25	0.22	22%
			General disorder: Beautification, care and strengthening of hair.	112	1	100%

Jaccard's similarity index (JI)

Table 4 shows the values of the Jaccard similarity index calculated to observe the similarity degree of several uses between other studies conducted in different regions of Morocco (Oriental, Fez-Meknes, and Daraa-Tafilalet) and neighboring countries (Algeria, Spain, and Italy).

In Morocco, the results revealed that both regions Fez-Meknes (Telemssani *et al.* 2023), and Daraa-Tafilalet (Eddouks *et al.* 2017) were the most similar to Taza province (JI = 0.5), with two similar uses (hair care and dermatological). The Oriental region (Merrouni *et al.* 2021) has the lowest similarity related to the number of uses (JI= 0.12), with one similar use (hair care).

Three neighboring countries (Algeria, Spain, and Italy) were selected to compare Taza province. In Algeria, Djebel Zdimm (Northeast) (Chermat & Gharzouli 2015) has a similarity with our area (JI = 0.4), and two similar uses were cited (dermatological and hair care). The lowest similarity was observed in Bechar and Adrar (Southwest) (Benarba 2016) (JI=0.25) and forest of Tamentout (East) (Karima *et al.* 2020) (JI = 0.16), two uses were observed similar hair care and dermatological respectively.

Also, a similarity was observed between different studies conducted in Spain (Serra de Mariola Natural Park) (JI= 0.2), and Italy, Madonie Regional Park (Palermo) (JI= 0.15), one similar use was detected in each country, dermatological in Spain (Belda *et al.* 2013) and fishing in Italy (Leto *et al.* 2013).

Different reasons can explain these results. Firstly, new uses were reported in our study for the first time in the literature (bone fracture) and in Morocco (fishing), consequently, the value of the Jaccard similarity index decreased. Secondly, the small geographical distance between our area and other regions such as Fez and Oriental, this factor may be impacted by a similarity at the level of climate, geography, and ethnicity group. Thirdly, the socio-cultural factor manifested by unity of religion (Islam), unity of language (Arabe and Amazigh), and the common history, and traditions between Morocco and Algeria. Fourthly, the same use observed between our area and other neighboring countries is characterized by the Mediterranean climate and differences at the level of numerous socio-cultural factors, such as history, language, religions, and tradition. We suggest explaining this similarity through the cross-cultural between Morocco and neighboring countries despite the differences between them.

New use

In comparison with different ethnobotanical investigations carried out in countries of the Mediterranean basin including Morocco, our result revealed for the first time, a new use not documented to date. The leaves powder mixed with egg, are applied topically as a plaster cast to treat the bone fracture, this process is realized by practitioners of traditional healers, called in the local language '*El jbira el baldiya*' meaning 'traditional reparation'. This practice is in extinction and the powder leaves are replaced by white flour in this practice. To date, no ethnobotanical study has cited this use, and no scientific studies existed and explained this practice.

Limitations of this study

Our investigation was conducted only in the province of Taza; we suggest broadening this kind of research in different areas of this country to identify, confirm, compare, and document the indigenous knowledge for better valorization and

conservation of *D. gnidium* species. Henceforward, further research on phytochemicals, toxicity, and biological activities are necessary to confirm all traditional uses documented in Morocco.

Table 4. Jaccard's similarity index between Taza and neighboring regions and countries.

Region selected	Area of Study	Indices	JI	References
Morocco	Oriental	A= 4 B= 5 A∩B= 1	0.12	Merrouni *et al.* 2021
	Fez-Meknes	A= 4 B= 2 A∩B= 2	0.5	Telemssani *et al.* 2023
	Daraa-Tafilalet	A= 4 B= 2 A∩B= 2	0.5	Eddouks *et al.* 2017
Algeria	Djebel Zdimm (Northeast)	A= 4 B= 3 A∩B= 2	0.4	Chermat & Gharzouli 2015
	Adrar and Bechar (Southwest)	A= 4 B= 1 A∩B= 1	0.25	Benarba 2016
	Forest of Tamentout	A= 4 B= 3 A∩B= 1	0.16	Karima *et al.* 2020
Spain	Serra de Mariola Natural Park (Southeast)	A= 4 B= 2 A∩B= 1	0.2	Belda *et al.* 2013
Italy	Madonie Regional Park (Palermo)	A= 4 B= 4 A∩B= 1	0.15	Leto *et al.* 2013

Conclusion

This investigation was carried out in Taza province (Northeastern Morocco) about the knowledge and use of *Daphne gnidium* L. species.

Our result revealed that *D. gnidium* is the most common plant used and cited for the beautification of hair and to treat different skin ailments, this practice is common not only in Morocco but rather in some neighboring countries. All informants in our study use this plant for no-therapeutic use. No-significant relation between it and the sociodemographic variables such as gender, age, and site. The leaves are the most part used in powder form. The principal source of information is heritage information transferred orally from generation to generation. All informants mentioned the toxicity of this plant. Furthermore, a new use was identified and documented in this investigation for the first time. All key informants mentioned that the powder leaves were used by practitioners of traditional healers to treat bone fractures.

It is worth noting that herbalists and practitioners of traditional healers have a low educational level and low scientific knowledge about herbal remedies such as the dose and the parts used. Indeed, we hope to support our findings by phytochemical studies for identification and extraction of the different compounds that seem to be responsible for these findings.

Declarations

List of abbreviations: World Health Organization (WHO), Relative Frequency of Citation (RFC), Fidelity Level (FL), Frequency of Citation (FC), Multiple Correspondence Analysis (MCA).

Ethics approval and consent to participate: Prior informed consent was obtained before conducting interviews with all informants. No further ethics approval was required.

Consent for publication: Not applicable.

Availability of data and materials: Data are available upon request from the first author.

Competing interests: Authors declare no conflict of interest.

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Author contribution: I.E.L: data collection, extraction, and writing. K.E.O.: Conceptualization and investigation. K.F.: Verified the outcomes. S.K.L.: editing. A.B.: supervision.

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