Ethnobotanical study of *Anacyclus pyrethrum* L. beside the population of Timahdite town (Moroccan Middle Atlas)

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**ABSTRACT**

The fieldwork has been carried out whose the objective consists to conduct an ethnobotanical survey on *Anacyclus pyrethrum* Link (Asteraceae), commonly called «Tigendaste» in the region of Timahdite, located in the Moroccan Middle Atlas. The Ethnobotanical study realised in June-July 2012 beside 82 different respondents allowed coherency to the different uses of the medicinal plant by the local population, and to create a synergy of activity with active chemical compounds used in conventional medicine, as well as their impact on the degradation of the vegetable biodiversity. The data Analysis showed that the overall level of schooling of the town was low (64% of the illiterate). The results of the study also showed that the root was the most used part. The majority of remedies is prepared powdered (77%). In fact, the survey revealed that the medicinal specie was mainly used against toothache (43%), as well as for other multiple activities as anesthesia, respiratory and genital diseases, and like a pesticide. Moreover, the opening of a market more or less organized of the plants, the predominance of informal sector, the lack of organization of the production, distribution and marketing circuits in the region, may enhance the pressure on these medicinal resources that could lead to the disappearance of the most vulnerable species such as pyrethrum.

**INTRODUCTION**

Since millenia, the Man draws from his environment the necessary knowledge for his survival and its better being. Before even having the use of the language, it could transmit the experiment of the medicine and any type of natural remedies for finally developed what we call today «traditional medicine» [26].

Traditional knowledge of medicinal plants and their use by indigenous healers and drug development in the present are not only useful for conservation of cultural tradition and biodiversity but also for community health care and drug development in the local people [29]. The indigenous knowledge on medicinal plants appears when humans started and learned how to use the traditional knowledge on medicinal plants [29] and were often the source of high-level scientific researches. In most cases, these researches lead to the discovery of original substances of considerable therapeutic interest [35].

The uses of medicinal plants are important sources of therapeutic drugs and play an important role in the survival of the tribal and ethnic communities. Traditional medicinal plants have several advantages; they are affordable, easily accessible, and there is no evidence of resistance to whole-plant extracts. Morocco is known for its rich vegetation and plant biodiversity, due to its geographical and climatic conditions. It is one of the Mediterranean countries with a long tradition in the field of phytotherapy. The local traditional pharmacopoeia continues to be an important source of remedies for primary healthcare in the country [1,35]; the rural town of Timahdite is a concrete example. Among the scientific disciplines which are interested in traditional phytotherapy, the ethnobotany, it is considered as a science of translating the popular know-how knowledge to scientific knowledge. In fact, various studies have been published in recent decades on the Moroccan ethnobotanic knowledge among which we mention: Kahouadji, [23]; Bellakhdar [6]; Benchaabane and Abbad [7]; Hseini et al., [18]; Mehdioui, [27]; etc
We will note also the great desire to return to nature and the plants [21] despite of the important development of chemistry, biochemistry and the organic analysis in the therapeutic and medical field. Unfortunately, the Moroccan system of exploitation and valorization of these natural resources remains very limited and very artisanal.

Within a framework of the contribution to a valorization of our Moroccan natural heritage, that this study is registered. Selected Anacyclus pyrethrum L. (Link) (photo.1) is a species that belongs to the Asteraceae family [8], it is endemic of Morocco, Algeria and India [16], named locally “Aud el-attas”, “Akkar Karha” and “Agargarha” [5]. The pyrethrum root is the drug used in traditional medicine [15], very present in the middle-Atlas and particularly in Timahdite area [32]. The chemical analysis of the roots shows that they contain the pellitorin, the anacylvin, hydrocarolin, inulin, seasamin and traces of essential oil [19]. The roots of the plant are considered as tonic for the nervous system, anti-inflammatory, immunostimulant, anabolic, insecticide [36] and aphrodisiac [39].

Our research concerns a preliminary ethnobotanic study to target an unspecified biological activity, and directs towards a later chemical study. So we will try by this contribution to elucidate the mysteries of the therapeutic traditions confirmed in a long use very responded by the users and the healers. Thus, we take part in a better knowledge and natural resources management for a future interest as well as ethnobotanic, pharmaceutical and phytotherapeutic.

**MATERIALS AND METHODS**

**Presentation of the studied area :**

The municipality of Timahdite (33° 14' 13" North 5° 03' 36" West) is placed under the administrative authority of Ifran province (Fig. 1). It is located at 1800 m of altitude in full heart of the Middle Atlas 35km to the South of Azrou [2], and extends over an area of 63375 ha with a population estimated at 6790 inhabitants, and a density of 14 inhabitants/km² under to the census1994 [38].

This region is characterized by a semi-arid climate [34], a cold winter and a hot summer with a dry season during the period from May until early October, and a season cold from December to March [17]. The region is favoured by important and a diverse forest vegetation [3] sometimes of vast arylvatic pastures [11] which is a ideal traverses the farms mainly 'race Timahdite' which dominates, and is the main economic resource of the rural population [12].

Timahdite is located on a Liassic calcairo-dolomitic substrate [11], and generally above this training a basaltic layer resulting from volcanic activity of quaternary [2].

**Fig. 1: Map situation of the Timahdite town.**

**Working method of the ethnobotany study:**

To know the uses of A. pyrethrum in traditional medicine, the tours were conducted in the town of Timahdite and were spread over a duration more than one month and started during June 2012. Information was obtained through the ethnobotany interviews with people born and/or who have lived long in the town. During the first phase, we proceeded to an exploratory survey without a questionnaire preset in order to become familiar with the terrain and the local vocabulary mixed Arabic and Berber. During the meetings with the inhabitants, we have tried to obtain general information on our plant. The second phase is based on an ethnobotany survey sheet (Annex. 1) submitted to the respondents in individual interviews. During this work, 82 interviews were performed with many different people, the survey was also conducted near the sellers of the medicinal species in the weekly local market “souk”. 
The data collected were analyzed using the Microsoft Office Excel 2007 for best viewing of the obtained results.

**Photo.1: Anacyclus pyrèthrum** of Timahdite region (Photo: H. Elazzouzi)

**RESULTS AND DISCUSSION**

The registered data on sheets of raw data were transferred in a database, treated and analyzed to get a data indexed and standardized bearing on the following aspects:
- frequency of use of the medicinal plant in the area according in particular to the kind, the age, academic level, family situation, and income;
- therapeutic uses attributed to the plant species;
- modes of preparation and administrations most commonly mentioned;
- marketing of the plant.

*frequency of use of the medicinal plant according to the profile of respondents Distribution by sex:*

In this region, there is still an involvement of local communities in the conservation of popular know-how in traditional phytotherapy. However, the men have more knowledge about the medicinal species compared to women (70% versus 30%) (Fig. 2). These results confirm other ethnobotanical researches carried out at the national scale [24,13]. Dissimilar findings were also reported in other works [22,27,25,9,1]. However, the intensive use of this species in generation activities of income push people specially men to collect the plant in the town and its exploitation for the marketing.

*Distribution according to the age groups:*

The data processing allowed to obtain the graph in figure 3 which shows that in the rural town of Timahdite, the persons that age belonging to the slices [30-40] years and [40-50] years, have the same frequency of plant use estimated toward 26%. Followed by the age groups [20-30], [50-60], [>60] and that less than 20 years with frequencies 23%, 18%, 5% and 2% respectively. The results obtained show effectively like other works already performed locally that people who belong to the class-age from 30 to 50 years have more knowledge of medicinal plants than the other age classes [22,9,10]. Knowledge of the properties and uses of medicinal plants are generally acquired following a long accumulated and transmitted experience from generation to another. The transmission of this knowledge is in danger now because it is not always assured, so traditional medicine affects the quality and sustainability of the natural environments [4,1].

*Distribution according to the level of schooling:*

Interestingly, the frequency of use of medicinal plant was inversely related to the level of education of the interviewed population. The most users of the plant are illiterate with a percentage of 64% (Fig. 4). This result is similar to national data and show that the use of medicinal plants is the prerogative of the poor [14], in other work the illiterate are the least [40]. However, persons, with a primary school level, have a percentage of use about 24%, while the use of pyrethrum was very little with a secondary (secondary 7%) or university education level (university 5%). These results accord those realized by Rachida Mehdoui and Azzedine Kahouadi in the rural town of Imi n’Tlit, (2007); Lahsissene et al., [25]; Benkhnigue et al., [9]; and Abouri et al., [1] The data analysis shows that the low schooling level of medicinal plants users may hinder the local development and promotes the degradation of the natural resources of the region. It’s certainly related to poverty of families, geographical enclosure and to weakness of means of transport and of infrastructures.
Distribution according to the family situation:
Pyrethrum plant is more used by married persons (68%) than singles (21%), widowers (6%) and divorced (5%) to avoid or minimize the financial loads required by the doctor and the pharmacist (Fig. 5) [25].

Distribution according to the income:
Agriculture and livestock are the main socio-economic activities of population in the town [17]. Thus, The increase of poverty has pushed the population to seek additional incomes for a daily life [28], and they are obliged to resort to traditional phytotherapy and to use abusively medicinal plants. Our results obtained from our ethnobotanical surveys actually show that the income less than 1500dh/month of the most of respondents (70%) (Fig. 6). Indeed, the persons earning less than 1500dh/month become attached more and more to traditional medicine.

Fig. 2: Distribution of use frequency of the medicinal species by sex in the rural town of Timahdite.

Fig. 3: Distribution of use frequency of the medicinal species by age-classes in the rural town of Timahdite.

Fig. 4: Distribution of use frequency of the medicinal species according to the level of study in the rural town of Timahdite.
The results obtained are different in other works performed by Lahsissene et al., [25], Mirdellami et al., [31], Saric-Kundalic et al., Benkhnigue et al., [9], Khabbach et al., [24], Abouri et al., [1], and Chabi China et al. [10], which the maceration, infusion and decoction preparations are the most used.

Track of administration:

The mode of prepared remedies administration is in relation to the symptoms of the treated disease. The Graph (Fig. 8) shows that remedies by external usage predominate the other modes with a percentage reached 77%. Dissimilar findings were also reported in other works [20,29,10].

Therapeutic indication:

Taking account of the respondents number submitted to the ethnobotany survey, we estimated that a use is mentioned with a frequency of at least three, might have a presumption to be considered as major use of the plant and deserves special attention. Anacyclus pyrethrum is an excellent medicinal plant, this is proven by the obtained results. It is used primarily against toothache (43%) (Fig. 9), as an anesthetic (17%), against diseases of the respiratory system and like astringent agent in equal percentage of 12%, following by genital diseases (10%), also as a pesticide (4%) and is included in the treatment of urinary diseases represented by less than 2%. The traditional use of the plant roots for the toothache, as aphrodisiac and insecticide, is very current and is agreed with our results [41,36,37].
Fig. 7: Distribution of the different preparation mode of the medicinal plant in the rural town of Timahdite.

Fig. 8: Distribution the track of administration of the medicinal plant in the rural town of Timahdite.

Fig. 9: Distribution the different uses of the medicinal plant in the rural town of Timahdite.

Commercial distribution of the medicinal plant:

According to the selling price:

The marketing of the specie plays an important role for the rural economy by improving the income of the population, the production sites and exploitation. In fact, more than 50 t/year of pyrethrum is destiny for marketing during three seasons 2005, 2006 and 2007 according to the censuses of the United Nations Program for development [32]. Thus, the survey shows that the producers sell the dried plant on the field at a price higher than 50 dh/kg and few people sell it fresh at a price higher than 20 dh/kg (Fig. 10).

According to the circuit of sales:

Generally, all of the production in the aromatic and medicinal plants (PAM) field is intended for export. Indeed, the structure of trade and plant distribution networks remain traditional, archaic and informal. Thus, the survey revealed that the most frequently modes used for the pyrethrum marketing is the direct sale (on foot, edge of field, souk, or nearest market).

Sale circuits reflect a diversity of buyers types and market places. According to the case, the producers take the initiative to dry the plant and sell their products to an intermediary such the individual traders, domestic or foreign wholesalers, cooperatives, or to the final consumer. Indeed, sales of pyrethrum can stand in a local market (71%), national (26%) or international to a percentage of about 3% (Fig. 11).
Fig. 10: Distribution of the plant depending on its sale price.

Fig. 11: Distribution of the plant depending on market.


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Ethnobotany survey sheet of Anacyclus pyrethrum realized beside the population of the Timahdite region

Area of study: Zone or site:
Date of survey:

The demographic characteristics of the informant
2. Location of birth / current residence: /
3. Are you from the region? □Yes □No
4. Family status: □Married □Single □Widowed □Divorced
5. Academic level: □Illiterate □Primary □Secondary □University
6. Profession: □
7. Income/month □Unemployed □250-1500 □1500-5000 □5000-10000 □>10000
8. Number of children: □
9. Know you plant? □Yes □No
10. How do you name it?
11. Do you know other names for this plant?
12. Do you use it? □Yes □No
13. It is used fresh or dry? Can we store it?
14. Uses you plant with precise doses? □Yes □No
15. If yes, do you find it efficient? □Yes □No

Ethnobotanical and ethnopharmacological plant characteristics
1. Type of plant? (Spontaneous, cultured, introduced)
2. Which part of the plant does use it? (Leaf, flower, bud, fruit, twigs, bark, stem, root, whole plant, etc.)
3. How do you prepare? (Infusion, decoction, maceration, Inhalation, Powder, Miscellaneous)
4. Track of administration? (Oral, external application, other)
5. What is therapeutic use? (circulatory, digestive, respiratory, urinary tract, genital tract, hearing, Visual system, nervous system, skeleton, skin)
6. What can it serve else? (Culinary uses, domestic, symbolic, Decorative etc.)

Exploitation/Marketing
1. Part removed: □Leaf □Flower □Fruit □twigs □rod □root □whole plant
2. Quantity removed (yields kg/day):
3. Site of levy: □forest □collective lands □private lands
4. Collection period: □Summer □Fall □winter □Spring □All the year
5. Collection mode: □manual □tool □Other
6. Which are the people who work in the collection? □nomad □Shepherd □farmer □herbalist □Other
7. There are treatment and pretreatment of the plant before the sale?
8. Which are the points of sale or place of marketing? □Local market □National □International □Other
9. Price per the kilogram of plant in the field (Dh/Kg): □Fresh □<10 □[11-20] □[21-30] □[31-40] □[41-50] □>51
   □Dry □<10 □[11-20] □[21-30] □[31-40] □[41-50] □>51
Conclusion:
The ethnomedical study of A. pyrethrum conducted in Timahdite region, has led to bring out the important place of traditional phytotherapy and confirmed the reduction of various species that were once abundant. The collection, synthesis and comparison of the data allowed to identify and verify the divergences in information and thus to bring out the confusion in the plant identity, in their use mode and the practice of traditional medicine. The PAM sector suffers to predominance of informal sector, the lack of organization of production, distribution and marketing circuits which defend the sustainability and profitability of the sector.

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REFERENCES


