



Anticancer Potential of *Retama monosperma* (L) Boiss in the Beni Mellal Khenifra Region

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Abstract

Background: Moroccan cancer patients use traditional herbal medicine. The prevalence of the use of medicinal plants is 31% in this country. No ethnobotanical study has targeted these patients in the Beni Mellal Khenifra region, a region known for the extensive use of medicinal plants.

Objective: Enumerate the plants used against cancer in the Beni Mellal-Khenifra region, to highlight the use of a botanical species, not yet described in previous studies in Morocco, and to describe its ethnobotanical characteristics, its frequency of use and its possible effects on cancer.

Methods: An ethnobotanical survey was conducted at the level of the regional oncology center of Beni Mellal between June 2020 and April 2021. A structured interview with 410 cancer patients contacted according to a sampling by quotas made it possible to collect socio-demographic, clinical and ethnobotany data.

Results: The prevalence of herbal medicine use was 38% (n = 156). 34 plant species used belong to 19 botanical families. *Retama monosperma* (L) Boiss (11%) took second place after *Marrubium vulgare* L. (16%), it was followed by other plants depending on the frequency: *Juniperus oxycedrus* L., *Allium cepa* L., *Allium Sativum* L., *Nigella sativa* L., *Artemisia herba-alba* Asso and *Trigonella foenum-graecum* L.

Conclusion: *R. monosperma* is a plant that has never been included in the list of plants used by cancer patients in Morocco. Further research is needed to evaluate the pharmacological and toxicological aspects of this plant and its interest for cancer.

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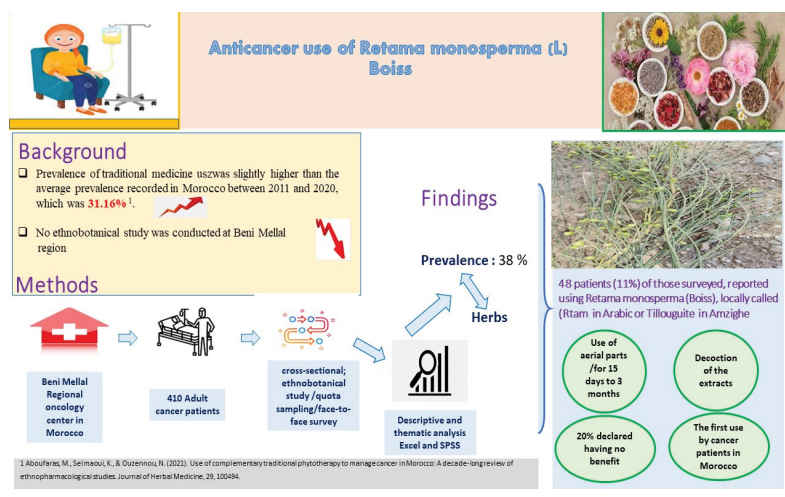
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Introduction

The use of traditional medicine has grown remarkably over the last three decades, with an increase in prevalence from 33.8% in 1990 to 42.1% in 1997 [1]. A recent systematic review have found that the prevalence of phytotherapy use by cancer patients worldwide is 22%, The prevalence was higher in Africa (40%) compared to other regions of the world [2].

Cancer patients use herbal medicine to treat the disease [3] or to reduce the side effects of chemotherapy [4]. In Morocco, cancer patients frequently use these plants. Thus, among 230 patients interviewed in the medical oncology department of Rabat, 35% used medicinal plants [5]. At the University Hospital of Fez, 46% of patients in the medical oncology department were identified as users of complementary medicines. Of these users, 24% have used plants [6]. The plants used by cancer patients inventoried so far in Morocco belong to many families, including Lamiaceae, Fabaceae, Liliaceae, Apiaceae, Asteraceae, Aristolochiaceae[6,5, 7,8,9,10,11]. However, no study has focused on the inventory of medicinal plants used against cancer in the region of Beni Mellal-Khenifra.

The objective of this study is to enumerate the plants used against cancer in the Beni Mellal-Khenifra region, to highlight the use of a botanical species, not yet described in previous studies in Morocco, and to describe its ethnobotanical characteristics, its frequency of use and its possible effects on cancer.

Materials and Methods

Study region and location

This study is conducted as part of a research project on the use of medicinal plants against cancer in Morocco. It is a cross-sectional ethnobotanical survey conducted in the region of Beni Mellal khenifra. The region of Beni Mellal khenifra is a Moroccan region. Located in the center of the country and inserted between the Middle Atlas and the Tadla plain, it is bounded by the regions of Marrakech-Safi in the southwest, Drâa-Tafilalet in the southeast, Rabat-Salé-Kénitra in the north, Casablanca-Settat in the northeast and Fès-Meknès in the northwest. It is a region where half of its inhabitants lives in rural areas (51%). this region is rich and diversified with the presence of plains and mountains (Eastern High Atlas and Central Middle Atlas) and several natural sites and natural resources This richness and diversity in climate and natural resources gives this region a forestry potential. This biodiversity could be a reason for an important use of spontaneous plants in this region [12].

Ethnobotanical Survey

During ten months, ethnobotanical information was collected from 410 cancer patients at the regional oncology

center of Beni Mellal, which is the only oncology facility in this region. The participants included are adult cancer patients who are able to reply the questions and have consented to take part within the overview after clarifying its reason.

The target populace was 2240 patients taken after at the begin of 2021. We used quotas sampling by sex and type of cancer, the estimate sample was calculated based on the formula:

$$Sample\ size(n) = \frac{z^2 \times p(1-p) / e^2}{1 + \left(\frac{z^2 \times p(1-p)}{e^2 N} \right)}$$

n = Sample size =

N = population size = 2240

z = z-score = 1,96

e = error = 5%

p = standard deviation = 0,5

The data collection instrument was a structured interview that allowed us to collect sociodemographic, socioeconomic, health data and data on the use of medicinal plants against cancer. The data collected were processed in a descriptive manner, thus measuring the prevalence of use and the relative frequency of use of each herb. Note-taking was conducted during the interview Qualitative data on plant names, place of harvest or purchase, and patterns of use were collected by a local Ph.D. researcher trained in health and non-violent communication who also worked as a trainer at a health sciences training institute. The researcher was not part of the research site; he did not know about the investigations.

After identifying a species that was not used in other areas, we conducted a snowball survey of herbalists in the areas where the plant was consumed, namely Khenifra, Bejaad (Khouribga province), and Bin loudane (Azilal province). After the collection of the plant used by the patients, *R. monosperma* was identified by a botanist in the laboratory of plant-based productions at Ibn Tofail University.

Ethical statement

Approval for this study was obtained from the Oujda Biomedical Research Ethics Committee (CERBO) of the Faculty of Medicine and Pharmacy, Mohamed Premier University under number 29/2020. Prior to data collection, we obtained written consent. Informants were also informed of the objectives and confidentiality of the study. The patients were informed about the nature of the study, anonymity, the confidentiality of the study, as well as the free choice to participate.

Statistical analysis

The data collected was processed descriptively using Microsoft Excel and IBM SPSS. We conducted a univariate analysis to measure the prevalence and relative frequency of use of each plant.

Qualitative data on use patterns were analyzed thematically before coding and transcribed manually.

Results

Characteristics of the participants

Among the 410 patients interviewed, 53% were from rural and peri-urban areas and 74.3% were women. The average age was 54.24 years. The activity rate was 25%. The illiteracy rate was 71.8% with a large gender difference, 75% of illiterate women versus 60% of men. In terms of clinical data, breast cancer was the most frequent type (44%), followed by colorectal cancer (14%) and cervical cancer (11%) (table 1).

Prevalence and patterns of herbal medicine use

The prevalence of patients who used herbal medicines in this study was 38% (n=156). Cancer patients sometimes used more than one herb simultaneously or sequentially with conventional medical treatment with a duration of use ranging from one week to three months. Two-thirds of the participants took these plants daily, with the infusion mode being the most commonly used to prepare the plant extract. The plants used are in order of importance *Marrubium vulgare* L., *Retama monosperma* (L.) Boiss, *Juniperus oxycedrus* L., *Allium cepa* L., *Allium Sativum* L., *Nigella sativa* L., *Artemisia herba-alba* Asso, *Trigonella foenum-graecum* L.

Table 1: Characteristics of participants.

Characteristics	n (%)	Characteristics	n(%)
Gender		Cancer Type	
Female	307(74,9)	Breast	171(41,7)
Male	103(25,1)	Cervix	55(13,4)
Age		Lung	27(6,6)
18 – 40	70(17,1)	Prostate	20(4,9)
40_60	202(49,3)	Colorectal	48(11,7)
> 60	138(33,7)	Other	89(21,7)
Ethnicity		Monthly family income (in DH)	
Amazigh	95(23,2)	Less than 2000	283(69)
Arab	307(74,9)	> 2000	127(31)
Mixed	8(2,0)	Residence	
Education level		Urban peri-urban	236 (57,6)
Illiterate	298(72,7)	Rural	174(57,6)
Primary	56(13,7)		
Secondary	43(10,5)		
High	13(3,2)		

All the plants have been used traditionally. The infusion mode was predominant, followed by the natural mode and the decoction. The majority were administered orally.

Participants used these plants to permanently treat cancer, to strengthen immunity, to decrease cancer symptoms or the effects of conventional therapy. Almost 90% of users did not communicate their use with health professionals.

Use of *Retama monosperma* (L.) Boiss

48 patients (11%) of those surveyed, reported using *Retama monosperma* (Boiss), locally called (Rtam in the local Arabic dialect of the region, or Tillouguite in Amzigh of the region) (figure 1). This plant, never listed among the plants used by cancer patients in Morocco, belongs to the Fabaceae family. Our survey of herbalists and the local population made it possible to identify the location of the plant, as several patient users named this plant (Aalanda) in confusion with *R. monosperma*. Because the herbalists were selling this plant under the name Alanda.



Retama monosperma (L.) Boiss: photo taken by Aboufaras mohamed in khenifra province in April 2022. (32.633952, -5.935408)

Most of the users in our study obtained this plant from the herbalist, while seven participants reported harvesting the plant in the areas of Bejaad (a town in the province of Khouribga), and near of khenifra. Their sources of information were other cancer patients they met in the regional oncology center in Beni Mellal; or in Casablanca. Only one patient stated that he got the information by chance from the herbalist.

Patients with breast cancer represented more than half of the users of this plant (n=28), followed by colorectal cancer (n=08) and other cancers.

The majority of cancer patients in our study used the aerial parts of this plant (stem and twigs) in the form of decoction, except for one patient who used it by infusion.

The patients prepared the decoction of the extracts of this plant with a large amount of water in different ways. 250g of dry extract of the aerial parts of the plant in 7 liters, 350g of the extract per 7 liters for 20 minutes, 500g of the extract in 10 liters or 350g of the extract per 2 liters of water. Another patient stated that he makes a decoction of a handful of the stems in one liter of water. Only one patient used infusion of an unknown amount of the plant in a large glass overnight.

This difference was also manifested in the dosage ranging from one glass per day to two liters per day before meals, especially in the morning, only three patients drank a glass twice a day morning and evening. The duration of use varied from 15 days to 3 months.

Concerning the results of this use, only one patient with breast cancer declared having had a disappearance of the tumor by associating this plant with chemotherapy. The others were satisfied without details, 20% declared having no benefit.

Discussion

The prevalence of patients having used medicinal plants in the region of Beni Mellal Khenifra was 38% with disparities according to the provinces of origin of the patients. In fact, the rate of use of medicinal plants normally changes according to the place of residence and ethnology [21]. This frequency of use found in Beni Mellal Khenifra region is close to those found in other regions of Morocco such as Rabat (between 35% and 39%) and Casablanca (38%) [5,7,8]. The same results were found outside Morocco in Trinidad and Tobago (39.1%) [13], Jordan (35.5%)[14]. Nevertheless, a lower frequency was found in the UK (between 3.1 and 21.8%) [15]. While a very high frequency was observed in other countries such as Palestine (68.0%) [3], South and Central America(75% in Peru and 80% in Jamaica) [16,17] and Iran (84.1%) [18]. Our results showed for the first time the use of *R. monosperma* by cancer patients and with a proportion of 11% of the interviewed patients. We point out that no study for Moroccan cancer patients has cited this plant [5,6,7,8,9,10,11]. *R. monosperma* is a Fabaceae family spontaneous plant. Retama is a genus of plants that grows in desert areas and across Morocco's Middle Atlas. It comes from the Mediterranean region[19,20]. This species is named in the Moroccan dialect rtam "R'tam." or 'Tillouguitte' in Amazighe .it comprises 3 species Retama monosperma Boiss. Retama sphaerocarpa (L.) Boiss. and Retama raetam(Forsk.) Webb [21]. ces espèces are perennial and unarmed shrubs. The leaves are simple and deciduous. Small flowers appear in summer [20]. this type of plant has been widely used in traditional mediterranean medicine (León-González et al., 2018) . This plant has been used in traditional moroccan medicine as vomiting, healing, antiseptic, deworming and abortive [21]. This traditional usage has been corroborated by some experimental studies. This plant has demonstrated anti-cancer properties, particularly against leukemia. Human Jurkat cells were cytotoxic to the hexane extract of Retama monosperma. The inhibitory effect of this extract was dose-dependent (IC50 = 34.44 3.88 g/ml). This activity was mainly due to the ability of this extract to induce cell cycle arrest and apoptosis by DNA destruction. Phytochemical analysis showed that linolenic acid, campesterol, stigmasterol, and

sitosterol were the bioactive components responsible for this effect [19]. The methanolic extract exerted an anticancer action on the SiHa and HeLa cells of cervical cancer with an inhibitory concentration (IC50) of 99 and 112 g/ml, respectively [22]. This study based on patients' statements is limited by the absence of pharmacological study on this plant which we propose to conduct to evaluate its possible anticancer effects.

Conclusion

The increasing use of traditional extracts of *R. monosperma* by cancer patients opens up a promoting ways of preclinical and clinical research with the aim of testing its efficacy and evaluating its toxicity.

Author contributions

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Availability of data statement

The data that support the findings of this study are available from the corresponding author, [M A], upon reasonable request.

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