The Journal of Phytopharmacology 2019; 8(3): 135-141
Online at: www.phytopharmajournal.com

Review Article

ISSN 2320-480X
JPHYTO 2019; 8(3): 135-141
May- June
Received: 12-05-2019
Accepted: 01-07-2019

DOI: 10.31254/phyto.2019.8309

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Ethnopharmacological Study of Herbal Medicines used to treat Cancer in Morocco

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ABSTRACT

Since the dawn of time, humans use plants to relieve their ills and diseases; cancer is no exception to this rule. Traditional medicine is an important part of health care but often underestimated. **Aim of the study:** The purpose of this investigation was to determine the prevalence of Medicinal Plants use in oncology, establish the list of plants used to treat cancer and evaluate this practice risks on the health of patients. **Methods:** Cross-sectional study based on a questionnaire on the use of medicinal plants by patients with cancer in unit of oncology of the university teaching hospital IBN Rochd of Casablanca, Morocco. A questionnaire was distributed to 1325 patients in face to face interviews. **Results:** Our study involved 1325 patients. Women made up 75% of the population, compared with 25% of men, with a ratio of 0.33. The found prevalence of plants use in our population of patients was high at 38%. 63 herbal medicine species under 38 families have been identified. The most commonly used species were essentially the *Marrubium vulgare L* followed by the *Aristolochia longa*, the *Berberis vulgaris*. Seeds, leaves and fruits are the most commonly used plant parts of plants to treat cancer. Decoction and infusion were the most commonly used method of preparation. The most common type of cancer treated with traditional medicines was breast cancer followed by uterus, colon and leukaemia. **Conclusion:** This survey provides an updated list of medicinal plants used by the entire Moroccan population. To assess the efficacy and the safety of reported herbs, Clinical and randomized trials are needed hereafter.

Keywords: Ethnopharmacology, Cancer patients, Herbal remedies, Medicinal Plants, Morocco.

INTRODUCTION

Confirmed the impression that the popular use of plants to treat cancer is as widespread now among all peoples of the world as it ever was in the past [1]. Traditional medicine depends on locally available natural resources and authentic knowledge [2]. Traditional medicine is a considerable and often underrated part of healthcare, and the demand for its services is increasing [3], because medicinal plants are accessible and cheap [4]. According to the World Health Organization evaluation, 80% of the world's population used traditional medicine for their healthcare needs, and over 80% of the African population use traditional medicine [5, 6]. In Morocco, natural ecosystems contain 4200 vascular plant species, of these, 382, or 9% of all Moroccan flora, are exploited as medicinal and aromatic plants and are called aromatic and medicinal plants, among which about 600 are described in Moroccan traditional pharmacopoeia [7]. The majority of the pharmacopoeia of scientific medicine are derived from plants [8, 9], many of them have anticancer effects [10, 11].

Cancer is a variety of diseases in which abnormal cells divide without control and can invade nearby tissues. Cancer cells can also spread to other parts of the body through the blood and lymph systems [12].

There were an estimated 18.1 million new cases of cancer and 9.6 million deaths from cancer worldwide in 2018 [13]. Cancer patients often start seeking alternative methods like herbal remedies because of the high death ratio in cancer patients and the dangerous adverse effects of the anticancer treatment. The aim of our investigation was to determine the prevalence of Medicinal Plants use in oncology, establish the list of herbal plants used to treat cancer and evaluate risks of this practice on the health of patients, in the unit of oncology of IBN Rochd University Hospital Centre in Casablanca, Morocco.

MATERIAL AND METHODS

Ethnopharmacological descriptive survey was conducted by direct interview among 1325 cancer patients who were hospitalized, who come for control and also those who come for chemotherapy cures; from April 2018 to August 2018. In unit of oncology of the University Teaching Hospital IBN Rochd in Casablanca

where patients come from various areas of Morocco, the used tool was a close-ended questionnaire which filed-out by three clinical pharmacists.

The questionnaire was structured in 4 sections: - Information on the use of traditional medicine - socio demographic characteristics of the patient - Information on disease - Information on the used herbal medicines.

The identification of the plant was carried out using its vernacular name expressed by the patient. A permission of the director of the oncology unit was taken, and all interviewees formulated their informed consent after being informed about the objectives of the investigation and institutional affiliations of the investigator.

Descriptive statistics of data were analysed through the software SPSS-22.

Informant Consensus Factor (Fic)

Was calculated to explore the homogeneity of informant knowledge, it is used to select disease categories (the type of cancer in our case) where there is consensus on the use of plants among the informants. Low values of Fic close to 0 take place if information is frequently exchanged informants. Fic value is close to 0 if plants are chosen randomly, or if informants do not exchange information randomly, or if informants do not exchange information about their use [14].

$$\mathbf{Fic = nur – nt/ nur – 1}$$

nt is the number of used herbal species and **nur** is a number of use citations in each disease category.

Fidelity Level (FL)

Herbal species which were medicinally important used by the peoples of the locality had high Fidelity Level (FL) than those which were less important. To identify the most important herbal species Fidelity Level (FL) was calculated according to each cancer type.

$$\mathbf{FL = Np/N \times 100}$$

Np is respondents number used medicinal plants for a specific disease and **N** is the number of respondents used same plant for any disease [15].

RESULTS AND DISCUSSION

The study included 1325 cancer patients with a mean age of 45.5 years, 75% women and 25% men with a sex ratio of 0.33. A rate of 67.24% of the population was illiterate, primary schooling (20.38%), secondary schooling (10.42%), and only 1.96% of patients had higher levels of education. About the family situation of the patients, 63.77% were married, 21.35% were single, 13.58% were widowed and 1.28% were divorced. (Table 1) shows socio- demographic characteristics of our patients.

The found prevalence of medicinal plant use in our population of patients was high 38%. Women accounted for 80% of the population which use medicinal plants against 20% of men ($P<0.05$), this funding agrees with those of Jouad *et al*. [16]; Eddouks *et al*. [17]; and Zayneb *et al*. [18] and may be explained by the high rate of illiteracy and the high attachment to traditional medicine among Moroccan women.

Most of patients who use herbal medicines had low revenue and they come from away of the oncology unit.

Overall, a total of 63 medicinal plant species belonging 38 families were documented during this survey (Table 2). This number of herbal remedies species founded is higher in comparison to Fatima Zahra *et al*. [19] who reported 55 herbal remedy species but lower in comparison to another Arabic country such as Jaradat *et al*. [11]. The majority of plants reported as herbal remedies used for treatment of various cancer types in this study were also reported from a similar Moroccan investigation [19].

The most of herbal medicine species are harvested from wild vegetation, cultivated herbal remedies and for both [20]. Our results exhibited that the most popularly used plant parts to treat cancer are seeds, fruits and leaves (Figure 1), this finding quite agrees with that of Jaradat *et al*. [11] Methods of preparation were decoction, infusion, powdering, crushing, fresh juice and natural (Figure 2). Decoction and infusion were the most commonly used methods of preparation. This result was in line with Jaradat *et al*. [11]. Decoction can cause degradation of active constituents in some plants

Data analysis showed that the family of *Lamiaceae* is very used; this is due to the presence of quinones that play a role in oxidation-reduction reactions by inhibiting the proliferation of tumor cells. These quinones may have multiple biochemical effects in the cell that could contribute to their anti-tumor effects [21].

These used plants can be used before, after or during medical treatment which contributes to the occurrence of adverse events that can be harmful. In view of the difficulties in controlling the market of traditional medicine, a system of phytovigilance is needed. This system of information and reporting of adverse events allows a better evaluation of adverse reactions among users of medicinal species [22].

The reasons for this use are very complex; among them are the declining socio-economic level, the very varied cultural context, the psychological and functional state of the patients (anxiety, depression, plus physical symptoms) and sometimes the dissatisfaction with conventional medicine. All these reasons push the population to focus on the use of herbal remedies.

The most shared cancer type treated with traditional medicines was breast cancer, uterus, colon and leukaemia such as illustrated in (Figure 3). The present investigation exhibits that the use of herbal remedies for cancer treatment is a widespread practice in Moroccan population**;** *Marrubium vulgare L; Aristolochia longa***,** *Berberis vulgaris***,** *Euphobia resinifera***,** *Cucuma longa* were the most commonly used herbal remedies to treat cancer.

Anticancer activity has been demonstrated for *Nigella sativa L*. [23], *Zingiber officinale* [24], *Olea europaea* [25], *Trigonella foenum-graecum* [26], *Salvia officinalis L*. [27], *Euphorbia resinifera* [28].

For Aristolochia longa, the results show that the hexane extract and the dichloromethane extract of Aritolochia. longa have a good inhibitory effect on the growth of the three cancer cells with a cytotoxicity index of 50 between 15 µg / ml and 250 µg / ml [29]. These observations are consistent with previous research on the Aristolochiaceae family, in which A longa exhibits strong anticancer activity [30-32].

Although, there are some herbs that are proven to be toxic such as *Euphorbia resinifera* and *Aristolochia longa*, Moroccan cancer patients are in the process of using them randomly. Aristolochic acid nephropathy is a toxic nephropathy characterized by progressive interstitial kidney fibrosis frequently associated with urinary tract cancer [33-36].

- Informant consent factor (ICF) the informant consensus factors have been calculated for each cancer type (Table 3). With the ICF values varied from 0.2 to 0.86 per cancer type. Herbal remedies known by Moroccan community and supposed to be effective in treatment of certain types of cancer will have higher ICF values that indicate how knowledge is shared among population for the treatment of a cancer type. Breast cancer had the highest ICF value of 0.86.

- Fidelity level index (FLI) Fidelity level value in this survey could be close to 100% for some plant species; only FL value higher than 50% were included (Table 4). Herbal remedies which have a high FLI value, have specific uses and are supposed to be more curative, so they can be a subject for further pharmacological analysis [20]. Some species and herbal drugs are used for a range of ailments have a lower FLI value.

In traditional medicine the appropriate doses are not clear [37]; therefore further scientific studies are needed to find out the optimal doses per plant according to the used part and the method of preparation.

Table 1: Sociodemographic characteristics of respondents (n=1325)

Variable	N (%)
THRU	504 (38%)
TNHRU	821 (62%)
Gender	
Male	331 (25%)
Female	994 (75%)
Age (± SD) years	45.4 ±13 years
Education level	
No education	891 (67.24%)
Primary and secondary school	408 (30.8%)
Above	26 (1.96%)

Table 2: HR used for treatment of cancer

Scientific name	Family	Used part	Method of preparation	Cancer type
Allium sativum	Liliaceae	Bulb	Natural	Breast/Uterus/Colon/Lung/Prostate
Jocotnna lamka	Liliaceae	Leaves	Natural	Breast/Uterus/Colon/Stomach
Pimpinella anisum L	Apiaceae	Fruits/seeds	Infusion/powdering	Colon
Annona cherimola	Annonaceae	Fruits/leaves	Natural	Breast
Aristolochia longa	Aristolochiaceae	Roots	Natural	Breast/Uterus/Colon/ORL/Lung/Bone/ Prostate/Ovary/Stomach/Adenocarcinoma
Artemisia atlantica	Asclepiadaceae	Aerial parts	Decoction	Breast/Uterus/Colon/Ovary/Leukaemia
Myrtus communis L.	Myrtaceae	Leaves	Infusion	Colon
Beta vulgaris L	Chenopodiaceae	Roots	Decoction	Leukaemia
Triticum durum	Poaceae	Seeds	Powdering	Breast
Erica arborea	Ericaceae	Leaves	Decoction	Adenocarcinoma
Cinnamomum camphora	Lauraceae	Bark		Breast
Cinnamomum zeylanicum Nees	Lauraceae	Bark	Crushing	Breast/Leukaemia
Daucus carota L	Apiaceae	Roots	Natural	Leukaemia
Ceratonia siliqua	Cesalpiniaceae	Pods /seeds	Natural/powdering	Breast/Uterus
Carum carvi L	Apiaceae	Seeds	Infusion/powdering	Uterus
Apium graveolens L	Apiaceae	Aerial parts/roots	Decoction	Leukaemia
Chelidonium majus	Papaveraceae	Leaves/roots	Decoction	Breast
Citrus limon L	Rutaceae	Fruits	Fresh juice	Stomatology/Rectum
Citrullus colocynthis	Cucurbitaceae	Pulp/seeds	Decoction	Breast
Coriandrum sativum L	Apiaceae	Seeds	Powdering/infusion	Colon/Ovary

Lepidium sativum L.	Cruciferae	Seeds	Decoction	Uterus
Cucuma longa	Zingiberaceae	Rhizomes	Crushing	Breast/Uterus/ORL/Colon/Lung/ Stomach/Stomatology/Bone
Phoenix dactylifera	Palmaceae	Fruits	Natural	Breast/Colon/Uterus/ORL/Stomach
Berberis vulgaris	Asclepiadaceae	Bark /roots	Infusion/Crushing	Breast/Uterus/Colon/Lung/Prostate/ Stomach/Dermis/Bladder/Stomatology/ Ovary/Leukaemia/Adenocarcinoma
Tamarix orientalis	Tamaricaceae	Seeds	Seeds	Stomach
Euphobia *resinifera*	Euphorbiaceae	Resin	Natural	Breast/Colon/Lung/Uterus/ORL/ Leukaemia/Stomatology
Foeniculum vulgare	Ombillifereae	Seeds	Decoction/crushing	Breast/Colon/Leukaemia
Trigonella foenum graecum L	Fabaceae	Seeds	Decoction/crushing	Breast/Uterus/ORL/Colon/Lung/ Leukaemia/Dermis/Stomach
Ficus carica L	Moraceae	Fruits	Natural	Breast/Uterus
Opuntia megacantha salm-dyck	Cactaceae	Fruits	Natural	Bladder
Alpinia officinarum		Rhizomes	Crushing	Colon
Zingiber officinale	Zingiberaceae	Rhizomes	Crushing	Breast/Colon
Senegalia senegal	Fabaceae	Sap exudate	Natural	Breast
Annona muricata	Annonaceae	Fruits/leaves/Bark		Breast/Lung
Peganum harmala L	Zygophylaceae	Seeds	Powdering/infusion	Breast
Lawsonia inermis	Loranthaceae	Leaves	Crushing	Breast/ORL/Prostate
Olea europaea	Ooleaceae	Fruits/leaves	Crushing /Decoction	Breast/Uterus/Lung/Stomach/Lung
Ajuga iva L	Lamiaceae	Aerial parts	Decoction	Breast
Lavandula vera	Lamiaceae	Flowers	Infusion	Breast/Uterus
Lens culinaris med	Fabaceae	Seeds	Decoction	Breast/Colon/Leukaemia/Dermis/Ovary
Linum usitatissimum	Linaceae	Seeds	Crushing	Breast/Colon/Leukaemia/Dermis/Ovary
Raphanus sativus L	Brassicaceae	Roots		Leukaemia
Marrubium vulgare L	Lamiaceae	Leaves	Decoction	Breast/Uterus/Colon/ORL/Bladder/ Leukaemia/Stomach/Stomatology/ Prostate/Liver/Ovary/Dermis/Rectum/ Kidney/Bone
Mentha pulegium	Lamiaceae	Infusion	Infusion	Colon/Breast/Stomach/Prostate
Pennisetum typhoides	Gramineae	Seeds	Decoction	Leukaemia
Nigella sativa	Renonculaceae	Seeds	Infusion/decoction	Breast/Uterus/ORL/Colon/Lung/ Leukaemia/Dermis
Allium cepa L	Liliaceae	Bulb	Natural/infusion	Breast/Uterus/ORL/Colon/Lung/ Bladder/Prostate/Dermis/Ovary

Citrus sinensis	Rutaceae	Fruits	Natural	Breast/ORL
Carica papaya	Caricaceae	Fruits	Natural	Breast
Petroselinum crispum Mill.	Apiaceae	Leaves	Decoction	Prostate
Cicer arietanum	Fabaceae	Seeds	Decoction	Leukaemia
Capsucum annuum	Solanaceae	Fruits	Crushing	ORL
Malus communis DC	Rosaceae	Fruits	Natural	Stomach
Portulaca oleracea L	Portulacaceae	Aerial parts	Decoction	Lung
Rosmarinus officinalis L	Lamiaceae	Leaves	Infusion/decoction	Breast/Uterus/Colon/Stomach/Bladder
Crocus sativus	Iridaceae	Styles/stigmas	Infusion	Breast/Uterus
Eugenia aromatica	Myrtaceae	Flower buds		Colon
Sesamum indicum	Pedaliaceae	Seeds	Natural/crushing	Breast/Uterus/Prostate
Thym sariette du maroc	Lamiaceae	Aerial parts	Decoction	Breast/Uterus/ORL/Colon/Stomach
Vitis vinifera L	Ampelidaceae	Leaves		Breast/Uterus
Salvadora persica L	Salvadoraceae	Roots	Natural/decoction	ORL

Table 3: Factor of informant's consensus (Fic) categorized by cancer types

Cancer types	**Nt**	**Nur**	**Fic**
breast	36	262	0.86
Uterus	22	125	0.83
ORL	12	44	0.74
Colon	22	60	0.64
Lung	11	39	0.73
Leukaemia	16	22	0.28
Bladder	5	10	0.55
Stomach	13	23	0.45
Prostate	9	11	0.20
Dermis	7	9	0.25

Table 4: Fidelity level of herbal medicines mentioned

HR	Cancer type	Np	N	FL,%
Aristolochia longa	Breast	32	57	56.14
Euphobia *resinifera*	Breast	27	52	51.92
Cucuma longa	Breast	22	44	50.00
Citrus sinensis	Breast	6	7	85.71
sesamum indicum	Breast	3	5	60.00
salvadora persica L	ORL	1	1	100.00

peganum harmala L	Breast	3	3	100.00
Zingiber officinale	Colon	2	3	66.66
Alpinia officinarum	Colon	2	2	100.00
lavandula vera	Uterus	4	6	66.66
jocotnna lamka	Breast	3	6	50.50
Citrullus colocynthis	Breast	2	2	100.00
portulaca oleracea L	ORL	1	1	100.00

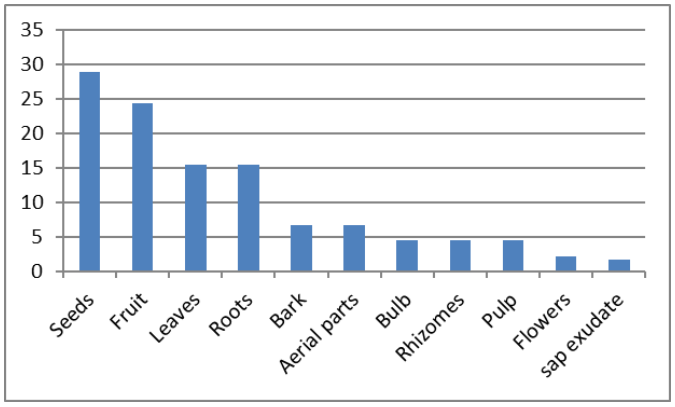

Fig 1: Frequency of the used parts of HR in cancer treatment

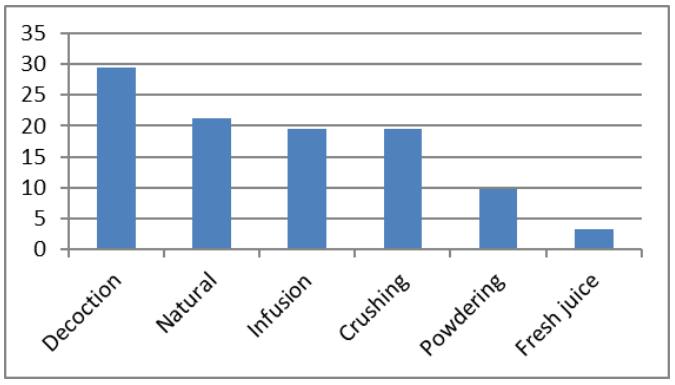

Fig 2: Frequency of methods of preparation from herbals

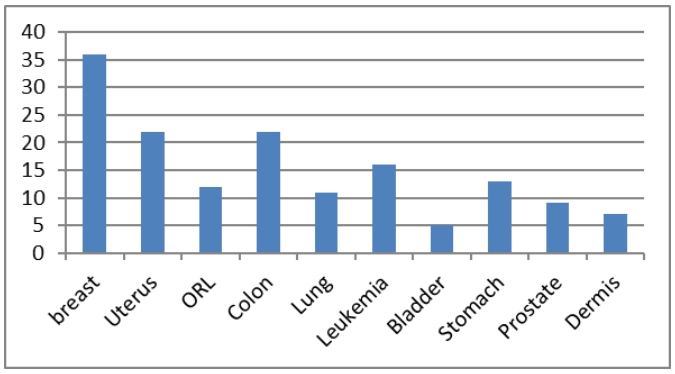

Fig 3: Cancer types treated with HR

Conclusion

We have noticed that the use of medicinal plants by Moroccan patients is an alternative solution. The reasons for this use are very complex; among them are the declining socio-economic level, the very varied cultural context, the psychological and functional state of patients and sometimes the dissatisfaction of conventional medicine.

This survey provides an updated inventory of medicinal plants which are used by all over the Moroccan population. To assess therapeutic effects and side effects of reported herbs, Clinical and randomized trials are needed hereafter.

Acknowledgments

We thank Professor Benider who permitted us to conduct this survey at the oncology unit which directed by him.

Conflicts of interest: Nil.

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HOW TO CITE THIS ARTICLE

Samouh Y, Lemrani A, Mimouni H, Mohamad J, Said AAH. Ethnopharmacological Study of Herbal Medicines used to treat Cancer in Morocco. J Phytopharmacol 2019; 8(3):135-141.