Aromatic and medicinal plants against cancer in Morocco: Challenges and perspectives

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Abstract:

Background

Cancer is one of the challenging health issues in the world. Both laboratory experimental studies and clinical trials with novel molecules are required for a better understanding of cancer and for better results to cure patients. Although multiple studies report positive results on the capacity of many aromatic and medicinal plants to have cytotoxic and anti-proliferative properties in laboratory models of cancer, many countries still have difficulties carrying out clinical trials on their local aromatic and medicinal plants, because of the challenging regulatory procedures on using natural products or raw material from plant extracts. Limited and hazardous consumption of aromatic and medicinal plants by cancer patients may aggravate their health conditions.

Objective

The present research work is aimed to carry out a bibliographic investigation on some active molecular species and aromatic and medicinal plants that could be used against cancer, in the frame of clinical trials according to good clinical practices.

Methods

Bibliographic research was carried out on aromatic and medicinal plants used in traditional medicine to treat cancer in various sources of scientific publications. Relevant chemicals and natural products that are endowed with anti-cancer properties were searched and their main natural sources were identified. A functional food recipe is proposed in the present study.

Results

In the present paper, I summarize some scientific evidence to support the therapeutic potential of some aromatic and medicinal plants in cancer therapy, and I suggest a functional diet made of several Moroccan food ingredients to treat cancer and help fight some risk factors of cancer. The suggested food recipe includes several natural ingredients that may also be of nutritional interest in many other health conditions.

Conclusion

In the present study, scientific evidence was documented that encourages further clinical investigations on aromatic and medicinal plants in the management of cancer physiopathology.

Key words: Cancer, aromatic and medicinal plants, physiopathology, oxidative stress, clinical trial, Morocco.

1. INTRODUCTION:

Around 100 plant families and 300 genera are described among the aromatic and medicinal plants (AMP) in Morocco [1,2]. All universities in Morocco have scientific teams working on AMP in many fields, such as ethnobotany, chemical composition and pharmacologic properties of their active ingredients. A large literature is available about AMP and their traditional medical use in Moroccan [3-6] and in other countries [7-11]. Many teams in Morocco have published works on the chemical composition of many AMP and their pharmacological properties. In recent years, there have been many scientific events and meetings on AMP that highlighted the economic, social and possible medical use of AMP in

various fields of medicine. Recently, an AMP university institution in the region of Fez (National Institute of Aromatic and Medicinal Plants) has been created [12] as an AMP agency (National Agency of Aromatic and medicinal Plants). Many projects about PAM have been funded in recent years by universities and government agencies. Among the AMP of Morocco, Rosemary, Thyme and Oregano are some of the most studied plants, because they are largely used in traditional medicine and eating habits.

Most of the properties of the medicinal plants studied in Morocco are related to their use in traditional medicine against several illnesses such as digestive disorders, diabetes, skin diseases and cancer. In Morocco, many pharmacological studies have been carried out on medicinal plants in animal or microbiological experimentation to assess their pharmacologic properties, such as antidiabetic, diuretic, anti-inflammatory, antiproliferative, cytotoxic or antimicrobial activity. However, use of the plants in clinical research according to good clinical practice is still a challenging issue in Morocco. This is in part due to the regulatory procedures required for clinical studies, about the physical and chemical character of the active substances to be investigated. Most of plants and plant extracts used in traditional medicine are not securely handled, and as such, they can endanger health status of consumers. The hampering on carrying out clinical studies on AMP is linked to the nature of the product to be studied, as whole plant or its extract. Being so, they don't qualify for clinical studies, because the clinical research procedures in Morocco require a high standard of quality of the pharmaceutical or nutrition items to be investigated in clinical research. Therefore, the transition to clinical research on AMP remains a challenge, as the pharmaceutical formulation or food ingredient formulation should meet the law requirements.

2. METHODS:

Bibliographic research was carried out on aromatic and medicinal plants used in traditional medicine to treat cancer in various sources of scientific publications. Relevant chemicals and natural products that are endowed with anti-cancer properties were searched and their main natural sources were identified. Accordingly, and among food ingredients available in the Moroccan markets, a food recipe is proposed in the present investigation. It is made of several aromatic and medicinal plants (sesame seeds, linseeds, seeds of Nigella Sativa,

cinnamon, cloves, and green anise). Some of the ingredients (almonds, sesame seeds, linseeds, Nigella sees) are roasted over low heat during 10 minutes before their mix to argane oil, olive oil and cloves. All ingredients are then mixed and ground in a blender. The composition of the present food recipe is indicated in Table 1.

3. RESULTS:

In contrast to the many AMP, argan oil makes an exception of having been investigated in several clinical trials. Argan oil is a famous cosmetic and culinary oil obtained from almonds of argan tree fruits. Argan oil is known for its health benefits in Moroccan traditional medicine against many illnesses, like skin, digestive and rheumatologic disorders. Argan oil is a rich source [13-16] of vitamin E (gamma tocopherol), and other active substances (polyphenols, phytosterols, carotenoids, melatonin, essential fatty acids ...). It has antioxidant and lipid-lowering properties that were proved by many studies in animal and in some clinical studies as well [17-19]. Controlled clinical studies were carried out on argan oil consumption in hemodialysis [20,21] patients and knee osteoarthritis patients suffering from metabolic syndrome [22,23], and the data reported on the above research studies indicate that consumption of argan oil led to improving of antioxidant status and blood lipid profiles of patients, as well as a significant lowering of pain scores and walking difficulties in rheumatology patients.

In recent years, there was a boom of food supplements market based on raw material of AMP. Food supplements have less law restrictions to be approved on the market as compared to the pharmaceutical products. Food supplements are marketed for their nutritional and functional property that may be considered of therapeutic significance; however, their consumers may experience toxic events (digestive, cardiac and neurologic issues) which are not assessed or monitored by drug authorities in the same manner as it is the case for a pharmaceutical product. In Morocco, a large amount of AMP is exported for the purpose of international market of food supplement. Moroccan AMP are known for their richness of good "raw material", though, for national development of the food supplement industries in Morocco, more technical and scientific investments are warranted.

3.1 THERAPEUTIC POTENTIALS OF MANY AMP AGAINST CANCER

Several ethnobotanical studies have addressed the subject of medicinal plants used in Morocco in a traditional way in the treatment of several types of pathologies. Several plants have been cited in herbal medicine against cancer in Morocco [3-6], but there are no controlled clinical studies to support the beneficial effect of these plants in a scientific based way. On the other hand, many experimental laboratory work on AMP have reported interesting pharmacological effects, such as anti-inflammatory, antioxidant, antiproliferative and cytotoxic effects that are very relevant to the anti-cancer properties.

Most studies on medicinal plants around the world highlight the importance of certain molecular classes which could be behind the anti-cancer therapeutic properties of plants [3-11]. In Morocco, several food ingredients that are part of the daily eating habits and recipes of the population are classified as AMP. To mention just few of them such as olive oil, argan oil, garlic, turmeric, several types of seeds (sesame, Nigella, flax), ginger, ginseng, cloves and several dried fruits or seasonal fruits very rich in active substances and vitamins such as raisins, plums, grapes and citrus. These food products are known to possess many health benefits, thanks to their various molecular components and their corresponding biological and pharmacologic properties such as anti-inflammatory, antidiabetic, antiproliferative, cytotoxic, antioxidant ..etc. These active substances belong to several molecular classes, like berberine, curcumin, resveratrol, epigallocatechin gallate, phenolic compounds, represented by phenolic alcohols, hydroxytyrosol and tyrosol, and secoiridoids, which include oleocanthal, oleacin, oleuropein.

In olive oil [24-26], three active main classes of phenolic compounds are represented in different proportions: simple phenols (phenolic acids and hydrolyzed secoiridoids such as hydroxytyrosol, tyrosol and elenolic acid), secoiridoids and lignans [27].

Sesame seeds or Sesamum indicum L., which is part of the Pedaliaceae family is made up of such lignans as sesamin, sesamol, sesaminol and sesamolin [28]. These lignans have been extensively studied and are known to possess anti-aging, anti-cancer, anti-diabetic, anti-inflammatory and antioxidant properties [27].

A medicinal plant well known in the world and in Morocco too; Nigella sativa [29,30], used in traditional medicine for centuries. One of its well-known active ingredients is thymoquinone, extracted from its seeds, together with the seed oil of Nigella sativa are described as effective against many diseases including cancer, cardiovascular complications, diabetes, asthma and kidney disease.

Clove (Syzygium aromaticum) [31,32], used for thousands of years in Morocco and Asia. According to the literature, cloves have antiseptic, antibacterial, antifungal and antiviral properties, but their potential anticancer activity remains unknown. Some studies have shown that clove extract may represent a new therapeutic herb for the treatment of colorectal cancer.

Turmeric is also a plant well referenced for its anti-cancer properties [33,34] and it is one of the very used food ingredients in Moroccan and oriental diet and traditional medicine.

Flaxseeds are of great nutritional value in addition to their use in the fabric industry [35]. Their composition in omega 3 fatty acids and lignans make them a very interesting product in herbal medicine.

On a molecular level, the class of phytosterols, found in most plants, have very interesting pharmacological and therapeutic properties [36,37] in cancerology.

Green tea is a plant widely consumed in Morocco as in China and in most Asia. Its composition, especially polyphenols content, makes it a very special product. Hence many clinical trials on its anti-tumor capacities [38] were carried out. Tea is a traditional Moroccan drink consumed on a regular and daily basis by the Moroccan population.

Cinnamon is a spice used in oriental and Moroccan cuisine too. It is known for its composition of active ingredients and its medicinal properties including effects on certain tumor cell factors [39].

Finally, cannabis is a plant well known in Morocco for its recreational properties, but some scientific studies describe this plant as a source of medicinal substances, useful in several therapeutic uses, thanks to its antiepileptic properties. It has promising anti-cancer properties and against pain associated with certain types of cancer [40-43].

3.2 A FUNCTIONAL FOOD RECIPE WORTH INVESTIGATING IN CANCER THERAPY

Many culinary recipes in the daily eating habits of Moroccan people are made of AMP. Some of the most used food ingredients are AMP products like argan oil, almonds, sesame seeds, linseeds, seeds of Nigella Sativa, cinnamon, cloves, and green anise. All these food ingredients contain most of the active substances mentioned above as anti-cancer molecules (polyphenols, phytosterols, carotenoids, vitamin E, melatonin, essential fatty acids, thymoquinone, magnesium, and many vitamins). Some of the above AMP mixed with honey are used in Morocco to make different culinary recipes, such as "SELLOU", "AMLOU" and other sweet pastry recipes. For the purpose of investigating possible therapeutic properties of such natural food recipes, a food mixture made of several Moroccan AMP is proposed in the present study (Table 1). It is elaborated from the abovementioned natural food ingredient among the many Moroccan AMP. 100 grams of the present proposed recipe is the recommended daily serving for a rational consumption. In addition, one of the major components of the proposed food recipes for the present study, argan oil, has shown therapeutic effects [18–23] in several clinical trials in hemodialysis and rheumatology patients (ameliorating blood lipid, antioxidant and metabolic syndrome components, and lowering knee pain). Moreover, among the above ingredients, olive oil is known for many health benefits in cardiovascular, neurodegenerative diseases and cancer [44], thanks to its chemical composition (oleic acid, polyphenols). Hence, the proposed food recipe of our investigation should be worth investigating in cancer therapy in relation to the large number of anti-cancer substances that it contains.

4. CONCLUSION :

Many aromatic and medicinal plants are used in traditional medicine in Morocco; however, their consumption could be a risk factor for patients in case of poor knowledge of the properties of a plant. On the other hand, many local AMP in Morocco are used in daily cuisine and nutritional habits. These AMP and some of the food recipes that contain many of these AMP should be investigated in the frame of clinical trials, on scientific based evidence, so that they can be promoted as natural remedies for many diseases and health conditions such as cancer.

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