

# The Value of Asteraceae Family Plants in a Mountainous Forest Ecosystem of Central Greece

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**Abstract.** Greece holds a unique position concerning the number of plant species and subspecies compared to other global areas. This depends on the variety of habitats and geological history, climate conditions, and geographical position within the Mediterranean. Mt. Oiti is a mountain with high ecological importance, which, however, belongs to the less explored areas of Greece. In this study, we try to describe the traditional uses, according to literature, of Asteraceae family plants that recorded in the protected Natura 2000 site of Mt. Oiti in central Greece. Plant collections were mainly made in three distinct periods during 2018–2021. All habitat types distributed across the entire elevational range of the study area were systematically plant sampled during all seasons. Subsequently, references, for describing the traditional uses of plants, have been surveyed through the bibliographic search engines ScienceDirect, Scopus and Google Scholar. In this study, 279 plant taxa (species and subspecies) of the Asteraceae were recorded. In total, 44 plant taxa were cited as being useful for medicinal purposes. According to the literature, the family Asteraceae is of great interest. The study highlights important plants from an area, which has not been investigated previously. Several Asteraceae family plants recorded in Mt Oiti have therapeutic applications and have a long history in traditional medicine. It is proven that a diet rich in plants endowed with antioxidant properties, plays a preponderant role in the prevention of several diseases. Also, many plant species of Asteraceae can be included in a regular and healthy diet. It is noteworthy, this study has played an important role in the preservation of traditional knowledge in an ecologically important area, which has not been investigated previously. However, there is a dire need to phytochemically and pharmacologically test the investigated taxa for the validation of traditional knowledge.

**Keywords:** Forest, Asteraceae, traditional use, environment, Natura 2000, Greece.

## 1 Introduction

Mediterranean Basin is the third richest hotspot in the world in terms of plant biodiversity [1,2,3,4]. Species richness and endemism are hosted on the mountains of the Mediterranean Basin, presenting really high plant diversity and are proven ideal for biogeographical and biodiversity studies. Greece, found on the meeting point of three continents, Asia, Africa and Europe is an integral representative of the Mediterranean Basin hotspot and its values. In central Greece, we find Mountain Oiti, which is a mountain of high ecological interest albeit it belongs to the less explored areas of Greece [5,6].

An important issue that is gaining ground recently, is the importance of medicinal plants. The ability of plants to synthesize secondary metabolites, thus causing certain biological activities, has been known through the centuries, even empirically so. Since antiquity, plants have played a vital role in the development of medicine and their properties were known and used. Based on data given by the World Health Organization, over 80% of the population globally still depend on folk medicine which is based on plant remedies. Drugs coming from medicinal plants used in traditional medicine are often cheaper than synthetic drugs, more easily accessible and with fewer side effects than their mainstream alternatives. Many of these medicinal plants have been analyzed with the use of modern methods, leading to the discovery of many promising compounds which can be further used either in complementing existing drugs or in the making of new ones [7,8,9]

Nowadays, the growing need for more natural sources of medicine has driven scientific interest towards the Asteraceae family. This Family is one of the largest families of flowering plants with high ecological and medicinal value in the forest ecosystems. Due to its great concentration of species in various areas from sub-polar to subtropical it is considered as a "cosmopolitan" plant family. It should also be noted that plants of the Asteraceae family produce secondary metabolites such as flavonoids and terpenoids, rendering the whole family especially interesting regarding its herbal-medicinal values [10].

There are two major issues that this study aims to cover: the first one is to present the species richness of the medicinal plants recorded of Mt Oiti in central Greece. Secondly, to underline their use in traditional medicine so as to achieve their conservation and to sensitize the local people to respect their natural habitats of their area.

## 2 Methods

Mt Oiti (Fig.1) is the fifth highest mountain in Sterea Ellada (mainland Greece) after Giona, Vardousia, Parnassos and Tymfristos (Velouchi) mountains. It is characterized by high geological and geomorphological heterogeneity. Moreover, it has abundant water sources, and it is located in the transition zone between Northern and Southern Greece. The elevation ranges from 400 to 2,116 m a.s.l., and its area covers 7,210 ha. The study area (latitude: between 38°56'48"N and 38°41'43"N, longitude: between 22°8'44"E and 22°29'26"E) is important for biodiversity, both at the national and regional levels, as it includes a large variety of natural and semi-natural habitats [11]. Plant collections were mainly made by experts in three distinct periods during 2018–2021. All habitat types distributed across the entire elevational range of the study area were systematically plant sampled during all seasons. Species identification was mainly based on Mountain Flora of Greece [19]. Plant nomenclature and distribution follow Dimopoulos et al. (2016) [6]. Subsequently, this paper reviews the current state of up-to-date literature concerning the value of these plants from the Asteraceae family. For this purpose, references have been surveyed through the bibliographic search engines ScienceDirect, Scopus, and Google Scholar. The preferred literature search was conducted using the keywords “forest” OR “plants”, “traditional use” OR “Natura 2000” and “Asteraceae family” OR “Flora Greece”.

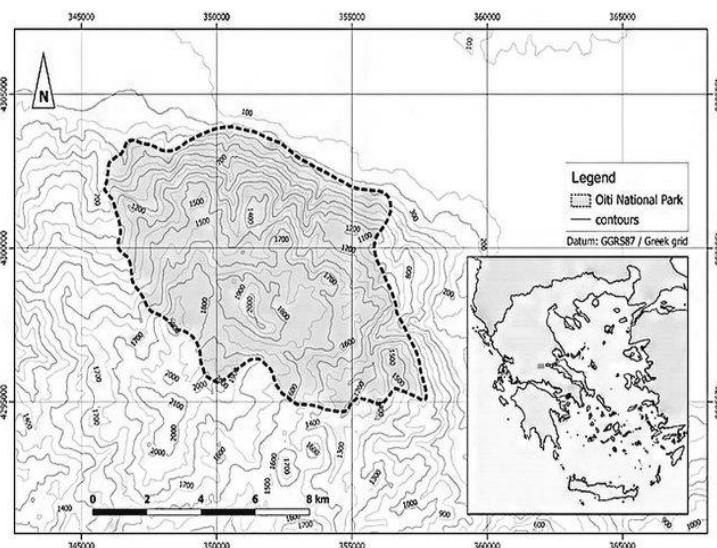


Fig. 1. Topographic map of Mt. Oiti National Park [11].

## 3 Medicinal uses of Asteraceae Family Plants

Asteraceae is an ancient plant family, mostly herbaceous. The oldest fossils found are pollen grain from the Late Cretaceous of Antarctica. It is an economically important family because of the various use of its plants, ranging from cooking oils and sweetening agents, to herbal teas with important medicinal properties. These medicinal properties of Asteraceae plants have been established since antiquity and researchers have been studying and scrutinizing the therapeutic powers of each plant. More than 7.000 compounds have already been known and 5.000 have been often associated with bioactivity [12]. The medicinal and therapeutic properties of this family make a really impressive list, covering a large number of ailments. Some of these properties are antipyretic, analgesic and anti-inflammatory, antibacterial and antiparasitic, antihemorrhagic and wound healing, even antispasmodic and anti-tussing. Ailments such as dyspepsia, leucorrhoea, hypotension are among those that find proper remedies by using the proper medicinal plants of Asteraceae family. Researchers have focused on chemical analyses and there are a lot of papers and *in vitro* studies examining the antimicrobial, antioxidant and anticarcinogenic properties of the plants belonging to this family [13]. Special attention was also given to the use of selective plant-cells coming either from unrefined extracts or from purified compounds and of course there are published reviews presenting the structure-activity relations and the active mechanisms. Although studies concerning the medicinal properties of the Asteraceae family have proved the valuable medicinal properties of these species, there are not enough bioactivity studies and perhaps this field should be more thoroughly examined in the near future [14].

In the present study, 279 plant taxa (species and subspecies) of the family Asteraceae have been recorded. The recorded 44 plant taxa from the above plants have medicinal properties and have been known as herbal-medicinal plants since antiquity. Some of these are described below:

*Achillea ligustica* All.: This plant has the name of the great hero of the Iliad, Achilles. It is said that this plant was used after Aphrodite's advice in order to heal a wound from Paris' s poisoned arrow. Other properties of the plant are: antimicrobial, antispasmodic, antiallergic, anti-inflammatory etc. [15-18].

*Anthemis tinctoria* L.: This herbaceous perennial plant is found mostly around the Mediterranean Basin and is mostly known for its various shades of yellow colour as it was widely used as a dye for fabrics simmered with its dry flowers. Another use of the plant is its herbal tea, having antispasmodic and antiemetic properties [15-18].

*Arctium lappa* L.: This plant is naturalized and can be found almost everywhere. Its root has wide culinary use (especially in Asian cuisine) and nowadays is found as a main ingredient for macrobiotic diet. It makes a low calorie salad rich in fiber, polyphenols, calcium, potassium and amino-acids. Its herbal tea has diuretic and anti-inflammatory properties and when used externally is good for the treatment of minor burns, herpes and acne [15-18].

*Bellis perennis* L.: From its name we can guess the popularity of the plant, as it means "everlasting beauty". But apart from the beauty of the plant, we should also consider that its medicinal properties are numerous: A poultice of its dried leaves and flowers can alleviate and even cure skin conditions such as: boils, open wounds, acne and rashes. The herbal tea of the plant (dried flowers and leaves) is beneficial for: cough-sinusitis, arthritis/gout and anxiety conditions. Although it is a well-known homeopathic remedy combating migraines and severe neuralgia, we should not forget the plant's toxic alkaloids which may affect the liver [15-18].

*Calendula arvensis* (Vaill.) L.: A very well-known medicinal plant, even to those who do not know much about homeopathy. Calendula is the favorite plant of homeopathy, as it is beneficial to a wide range of ailments and having strong detoxifying properties. The herbal tea of the plant is good for gastric ulcers and also menstrual cramps and its oil is used for aromatherapy and massage. Compresses can be used for the treatment of open wounds, burns, acne and insect bites. Calendula dried flowers can be used for foot bath treating chronic foot infections and varicose veins [15-18].

*Carduus nutans* L.: Studying plants of the Asteraceae family, this plant is generally considered to be noxious weeds, native to Eurasia and usually invasive in other regions. Although their reputation is somewhat negative, the plant is far from useless. The flowers are used dried as a herbal tea to purify the blood stream or to combat high fever. The seeds of the plant contain a fixed oil rich in linoleic acid, beneficial in the prevention of atherosclerosis [15-18].

*Carlina corymbosa* L.: Another medicinal plant which has been known to traditional medicine, necessary to every herbal garden of the Middle Ages. Diuretic and good for appetite, it also made a soothing lotion for tired eyes and even used as eye-drops for eye-irritations. Furthermore, its blue herbal tea is anti-coughing, antiseptic and anti-inflammatory and nowadays it is one of the most useful plants of phototherapy [15-18].

*Centaurea cyanus* L.: It is a well-known plant, considered to be an archaeophyte since the Iron Age. Recent studies have found a wealth of flavonoids, anthocyanins, aromatic acids and ascorbic acid, giving *Centaurea cyanus* anti-inflammatory, anti-oxidant and gastro protective properties [15-18].

*Chondrilla juncea* L.: It is a plant native to the Mediterranean Basin and western Europe, having anti-oxidant properties and possibly beneficial to gout and urinal inflammations. *Chondrilla juncea* is highly variable in morphology, thus having various biochemical traits [15-18].

*Cichorium intybus* L.: The plant is used as a tonic but it also has digestive and diuretic properties. Its herbal tea is beneficial to liver ailments/pains, colics, gout pains and rheumatism [15-18].

*Matricaria recutita* L.: This plant is a well-known herbal remedy, suitable for alleviating digestive disorders, nervous tension and its dried flower infusion is a powerful tonic/analgesic suitable even for teething infants. If used externally as a poultice, it is ideal for the treatment of skin problems (herpes-ulcers-acne). Furthermore, it has been a well-known and widely used homeopathic remedy. Special caution is needed because in large quantities, it can cause symptoms similar to those which was supposed to cure [15-18].

*Onopordum acanthium* L.: Its cardi tonic properties make this plant highly respected and among those that treat heart conditions. Its juice is good for external use in case of ulcers and skin inflammations and the decoction of the root is astringent, used to diminish mucus discharges [15-18].

*Pallenis spinosa* (L.) Cass.: This is a medicinal plant of high value whose essential oil has at least 38 ingredients. The terpenoids (sesquiterpenes) are famous for their anti-oxidant and anti-inflammatory properties, not to mention its anti-depressive function, and its treatment for diabetes as it naturally raises the insulin levels. Other equally interesting properties found in the essential oil of the plant are: booster of the immune system, heart tonic and collagen activator [15-18].

*Phagnalon rupestre* subsp. *graecum* (Boiss. & Heldr.) Batt.: The plant is a beautiful little bush native of the Mediterranean Basin. It has an interesting antioxidant activity of the extracts of the plant. These are n-hexane, ethyl acetate, methanol and chlorophorm, rendering the plant as a potential antioxidant especially for food preservation [15-18].

*Ptilostemon chamaepeuce* (L.) Less.: This little shrub belongs to the thistle "tribe" of the Asteraceae family. An infusion from its dried flowerheads is analgesic and is supposed to treat naturally lumbago and headaches [15-18].

*Reichardia picroides* (L.) Roth: Another beautiful shrub found everywhere in the area of the Mediterranean Basin. As a herbal tea (mostly dried leaves) is a stimulant, tonic and has mild analgesic and antioxidant properties [15-18].

*Scolymus hispanicus* L.: Its medicinal and culinary uses have been known, and even today its stalks can be eaten raw in delicious salads or boiled in meat stews. Furthermore, the infusion or decoction of the flowers can treat diarrhea and the herbal tea is against fever and inflammation. Another popular use of *Scolymus hispanicus* is that it is used as a coffee substitute (ground dried roots of the plant) and is considered as a good natural tonic [15-18].

*Sonchus oleraceus* L.: This plant has been known since antiquity, with Theophrastus praising the salad from the boiled leaves of the plant. Apart from its culinary use, its infusion treats menstrual problems and diarrhoea. The stem juice is a powerful cathartic but caution is needed as too much may bring about colics and tansmus. The poultice from its leaves is used to treat infected swellings and boils. Traditional medicine places special value on the water where the leaves were boiled, which can be consumed as a tonic [15-18].

*Sonchus tenerrimus* L.: Its herbal tea is antipyretic, good for liver infections/pains and is beneficial in case of salmonella infection. Poultice of the leaves is good for sore-red eyes [15-18].

*Tussilago farfara* L.: The herbal tea of this plant has diuretic and anti-inflammatory properties and is good for the treatment of bronchitis, asthma and common cold. Externally as a poultice can treat boils-ulcers and rashes. Interestingly enough, throughout Europe the leaves of the plant are mostly used while Chinese medicine uses the stem and the flowers of the plant [15-18].

*Xanthium strumarium* L.: A valuable medicinal plant as it has a lot of properties known to traditional medicine. It is analgesic, anti-inflammatory, antipyretic and diuretic. Its infusion is good for treating kidney problems, rheumatism, coughing, sinusitis, constipation, urinary problems, even tuberculosis. It can also address skin inflammations-rashes [15-18].

## 4 Conclusions

This study has played an important role in the preservation of traditional knowledge in an ecologically important area, which has not been investigated previously. The study has reported a total of 44 medicinal plant taxa. According to the literature, these plants have several medicinal properties; however, the traditional uses of a large number of plants still remain to be validated. This study gives motivation to the scientific community as there is a dire need to phytochemically and pharmacologically test the investigated taxa for the validation of traditional knowledge. Also, the study highlights the need for awareness of the local community to respect the natural habitat of their area. Future studies could fruitfully explore this issue further by collect data through questionnaires from the community members and local herbalists. Finally, it will be important that future research investigate the threats faced to the local flora (e.g. deforestation, heavy grazing, and overexploitation) that are affecting the process of sustainability. Therefore, sound conservation strategies will need to be developed and implemented for the sustainable utilization of medicinal plants and the preservation of traditional knowledge.

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