Review Article

Hacettepe University Journal of the Faculty of Pharmacy
Volume 44 / Number 4 / December 2024 / pp. 390-400

Toxic Effects of Ethnobotanically Used Plants in Muğla

Dila ÇANA[1]*
ORCID: 0009-0004-1356-7396
Aslı DOĞRU KOCA[2]
ORCID: 0000-0001-7477-0225

[1]Hacettepe University, Faculty of Science, Department of Biology (Botany), Laboratory of Plant Conservation & Phylogeny (PCoPh), Ankara, Türkiye

[2]Hacettepe University, Faculty of Science, Department of Biology (Botany), Laboratory of Plant Conservation & Phylogeny (PCoPh), Ankara, Türkiye

Corresponding author:
Dila ÇANA
Hacettepe University, Faculty of Science, Department of Biology (Botany), Laboratory of Plant Conservation & Phylogeny (PCoPh), Ankara, Türkiye
E-mail: dilaa.canaa@gmail.com

Received date : 09.10.2024
Accepted date : 21.11.2024

DOI: 10.52794/hujpharm.1564274

ABSTRACT

According to various ethnobotanical studies, the local people in Muğla use 315 plant species for a wide range of purposes, including medicinal, culinary, and other traditional uses. These plants are integral to local customs, often being used as home remedies for ailments, in food preparation, or in various cultural practices. At the same time, it has been seen in different phytochemical studies that these same species recorded in ethnobotanical studies also contain compounds that have a toxic and harmful effects on humans. Compounds found in these plants, though beneficial in certain contexts can have adverse effects depending on how they are prepared, consumed or dosed. Under certain conditions as considering the one's age, weight, gender, allergies and various diseases, addictions and pregnancy status, these plant species may have toxic effects. The purpose of this review is to underline that, as a result of evaluating both of these researched information together, plants that are used quite commonly and unconsciously can have sudden poisoning effects or long-term harmful impacts on people.

Keywords: Ethnobotany, Poisonous Plants, Traditional medicine, Muğla, Türkiye

1. Introduction

Since their existence on earth, humans have used plants for a wide variety of purposes, primarily for food, medicinal, cosmetic, aesthetic, goods, fuel, belief and witchcraft. Ethnobotany is an interdisciplinary field that explains, gives meaning and records the various uses of plants among the humans. Ethnobotany, which refers to plant-human relationships, is a field that contributes significantly to the scientific evaluation of plants with its contents reflecting very valuable information acquired through trial and error and passed down from generation to generation over a long period of time [1]. However, although people have been in close contact with nature since ancient times and have a very good command of nature, with the age of technology, people no longer include plants in their lives as much as they used to [2]. Due to both the indifference of the new generation and the advantages provided by developing technology, valuable information is forgotten without being used or is lost in older generations before it can be passed on to the next generation [3].

Nevertheless, nowadays alternative treatment methods with plants and herbal treatment are popular again due to many factors such as medical and economic problems that can occur with synthetic systems and serious side effects, ecological approaches, chronic diseases that cannot yet be cured, and tendency to return to what is pure, harmless and natural [4]. With this new trend, people started to use various plants for different purposes even in their own homes without any knowledge about how plants may have an effect on them. The fact that plants may contain various phytochemical compounds raises concerns because they pose a potential risk to human health [4, 5]. Since, plants found in nature have a wide variety of uses, their incorrect or excessive use can cause many different ailments depending on the user's age, weight, gender, chronic diseases and allergic disorders. These effects can even result in quite disastrous situations such as paralysis, stroke and even death.

Additionally, plants produce compounds called phytochemicals or secondary metabolites for reproduction, growth and organ repair, as well as to protect themselves from various external stimuli such as herbivore defense, stress, pollution, UV exposure, infections/diseases and alteration of climatic conditions [6, 7, 8]. Even though it is difficult to group these compounds since there are many phytochemicals in the structure of plants, phytochemicals may classified into six main categories depending upon their chemical structure and function. These classes are carbohydrates, phenolics, lipids, alkaloids, terpenoids and other nitrogen-containing compounds [6]. Also, some phytochemicals are known as phytotoxins that are toxic to animals, including humans and these phytotoxins include anticholinergic, severe gastrointestinal irritants, cardiac glycosides, central nervous system stimulants/hallucinogens, and cyanogens [9]. Although the effects of these compounds vary from person to person, their unconscious use can pose a real danger to a person's life.

At the same time, considering the similarities between plants species, wild plants found in nature should be approached with great caution unless they are identified and recommended by experts in their field. As, plant species can be separated from each other by very small morphological differences and can sometimes have overlapping distributions and they can even have intertwined populations [10, 11]. For that reason, it should be recognized that even though many plants have benefits, they should be used with great caution to prevent poisoning.

The review aims to underline how plants that have been used for ethnobotanical purposes in the region for generations and are known to be beneficial may pose a danger to humans. The plants previously recorded as ethnobotanically used in the region and their toxic effects on humans are documented on the table at the results and discussion part of this review. In this table, the parts of the plants used among the locals and their beneficial effects, as well as their chemical compounds, poisonous parts and toxic effects on humans are shown.

2. Materials and Methods

2.1. Investigation Area

This review was carried out in Muğla province, which is located at the intersection of the Aegean and Mediterranean regions of Türkiye and is known to have significant floristic diversity [12-15]. Muğla, located in the C1 and C2 square [16], boasts a rich floral diversity due to its abundant water resources and varied topography [12-15]. According to Emberger method, Muğla is located in the cool winter type of the rainy lower Mediterranean climate layer

ISSN: 2458 - 8806

[12]. Mediterranean Climate is recorded in areas up to an altitude of 800 meters while the Mediterranean Mountain Climate is recorded in higher areas of Muğla [17]. This bioclimatic layer is characterized by the upper Mediterranean and less mountainous Mediterranean vegetation series and contains species such as *Quercus cerris* L. and *Pinus brutia* Ten. [18]. In addition to the coastal slopes where Mediterranean maquis such as olive (*Olea* sp.), sweetgum (*Liquidambar*sp.), sandalwood (*Arbutus* sp.) and stone pine (*Pinus pinea* L.) prevails, plane (*Platanus* sp.), willow (*Salix* sp.) and cypress trees (*Cupressus* sp.) are widespread in forests and wetlands of Muğla [19]. Considering this diversity, it is possible to observe a versatile and extensive ethnobotanical uses in the region. This richness of ethnobotanical use has been proven by scientific studies carried out in many districts, villages and towns of Muğla province.

2.2. Ethnobotanical Studies Conducted in Muğla Province

It was seen that there were eight separate ethnobotanical studies carried out in Muğla [20-27]. These studies were conducted in Bodrum, Datça, Köyceğiz, Marmaris, Ortaca and Ula districts. Lists of the plants mentioned in these eight studies that are used for various purposes by the locals were compiled, and the plant names in this list were confirmed from the Plants of World Online (POWO) data base [28] and Turkish name of the plants also checked and confirmed from Türkiye Bitkileri Listesi (Damarlı Bitkiler) [29]. As a result, a total of 315 plant species were recorded as used for ethnobotanical purposes in these eight studies.

2.3. Poisonous Plants with Ethnobotanical Use in Muğla Province

Firstly, the data were collected from online databases using various keywords related to poisonous plants (poisonous plants, poisonous herbs, plant toxicology, plants with toxic effects and etc.). After the research, a total of 25 local and foreign published sources were accessed regarding plants known to have toxic effects on humans. As a result of researching and organizing the information obtained from 25 sources within the scope of this study, it was understood that 116 of 315 plant species used for ethnobotanical purposes in Muğla province were poisonous [30-54]. Among the 116 plants used for various purposes by the local people and found to be poisonous, 48% (56) were documented in the table detailing their toxic effects on humans. Table 1 provides information on the chemical components of these 56 plant species, the parts that contain poison and how they can poison people are documented in the together with the ethnobotanical uses.

3. Results and Discussion

In Muğla's these six districts, in addition to being used as food and fuel, these plants are also used for medicinal, cosmetic, handicraft and religious purposes [20-27]. In addition, it has been determined that the main used parts of the plants are the leaves, flowers, seeds, fruits and finally the different types of roots. These plants are applied in various ways, such as boiling, crushing, oil extraction or direct consumption, as well as through inhalation, topical application, or drops into the ears, nose and eyes. In addition to all these, it is also known that these plants exist in nature in different forms, including herbaceous, creeping, climber, shrub and semi-shrub and as trees.

Medical plants are generally used to treat diseases such as respiratory diseases, cold, flu, headache and dizziness, stomach and intestinal disorders, kidney stones, rheumatism and skin disorders [20-27]. Additionally, these plants are also consumed as spices, snacks, tea, coffee and main dishes. Another common use is for cosmetic purposes, and it has been seen that plants are used for a wide variety of functions such as major skin problems (acne, scars, and color equalizer), hair dye, and blush.

The 56 plant species on the poisonous plants list belong to 31 plant families, and it was observed that the families with the highest number of poisonous plant species are Asteraceae, Amaryllidaceae, Brassicaceae, Fabaceae, Rosaceae and Solanaceae [Table 1]. At the same time, these plant species contain a wide variety of components in their different organs, generally in the aboveground parts. The main components of these plants commonly include alkaloids, flavonoids, saponins and oxalates. It has been observed that the toxic effects of these 56 plant species, which are known to be used ethnobotanically, include severe effects such as dermatitis, eczema, skin itching, rash and sores, dizziness, vomiting, diarrhea, kidney disorders, abnormal heart function, respiratory acceleration, and blood pressure [Table 1]. It has even

been determined that it may result in stroke, paralysis, coma and death, depending on the person's age, weight, gender and various diseases.

Even though these 56 plants used in ethnobotanical terms have many side effects, local people use them frequently in their daily lives. Among the results, there are many plants that are known to have toxic effects which people mainly include in their diet such as *Daucus carota* L. (yabani havuç), *Solanum tuberosum* L. (patates), *Petroselinum crispum* (Mill.) Fuss (maydanoz), *Brassica nigra* (L.) W.D.J.Koch (karahardal), *Allium cepa* (soğan), *Allium sativum* L. (sarımsak), *Capsella bursa-pastoris* (L.) Medik. (çobançantası), *Rumex acetosella* L. (kuzukulağı), *Amaranthus* L. species and many more [Table 1]. According to these studies, the use of *Daucus carota* can result in hypertension, sweating, seizures, respiratory failure, coma, paralysis and even death. On the other hand, the green, undeveloped parts of *Solanum tuberosum*, causes very severe effects such as vomiting, confusion, tachycardia, hallucination, coma and death just like *Daucus carota.* Also, *Petroselinum crispum* has been used as an abortion option from ancient times to the present day, so it is recommended that pregnant women use it with caution and under the supervision of a doctor. Moreover, *Brassica nigra*, which is known to give a pleasant aroma to food and tea, has irritant and burning side effects on people. Also, *Allium cepa* and *Allium sativum*, which can also be consumed raw, have dermatitis effects on humans. While the leaves of *Capsella bursa-pastoris* are consumed as salad, the entire herbaceous part actually causes serious kidney damage. It is seen that the herbaceous parts of *Amaranthus* species are consumed as food, but again, the results of the review show that this plant has destructive effects on the humans' nervous system. Similarly, while the herbaceous parts of *Rumex acetosella* are used as stuffing and salad, they also cause kidney damage. Furthermore, plants used for both in diet and medicinal purposes such as *Hedera helix* L. (duvarsarmaşığı), *Asparagus acutifolius* L. (tilkişen), *Chrysanthemum segetum* L. (kasımçiçeği), *Alnus glutinosa* (L.) Gaertner (kızılağaç), *Cupressus sempervirens* L. (servi), *Juglans regia* L. (ceviz), *Laurus nobilis* L. (defne), *Ficus carica* L. (incir), *Anemone coronaria* L. (Manisalalesi) and *Capsicum annuum* L. (biber) have been recorded to have dermatitis in people among with various other health disorders.

In addition to using these plants as food, locals also frequently use them for medicinal purposes. For instance, while the bulbs of *Narcissus tazetta* L. (nergis) are used by locals against skin diseases, the toxic compounds that cause dermatitis have also been detected in their bulbs [Table 1]. Similarly, the herbaceous parts of *Euphorbia amygdaloides* L. (zerana), are used for skin problems, while at the same time it also have an irritant and dermatitis effects on skin. Moreover, although the roots of *Carlina gummifera* (L.) Less. (sakız keyganası) and *Centaurea solstitialis* L. (çakırdikeni) species are used for both medicinal and food purposes, their roots also have a lethal effect on humans. It is also reported that the herbaceous parts of *Hypericum perforatum* L. (kantaron), which is widely used for medicinal purposes among the public, cause liver damage.

Furthermore the research indicates that some plants can cause severe condition such as paralysis, coma and even death. For example, *Nerium oleander* L. (zakkum), which is mainly used for medicinal purposes by the local people, is one of the most poisonous plants among the list. Its main toxic effects are known to include dermatitis, dizziness, vomiting, diarrhea, respiratory failure, abnormal heart function, coma and death [Table 1]. In a reported case of the *Nerium oleander* poisoning in Türkiye, an 18-year-old woman consumed oleander tea for weight loss and 8 presented to the emergency room hours later with symptoms of nausea, vomiting, lightheadedness, and abdominal pain [55]. After receiving treatment with digoxin specific Fab antibody fragments, the symptoms of poisoning disappeared within 72 hours.

In another case, *Xanthium strumarium* L. (koca pıtrak), which is used as rheumatism, yeast and kidney ailments in Muğla, is poisonous due to the xanthostrumarine component in its seeds [Table 1]. As stated in this case, the seeds of this plant, which is very common in the region, are very similar to sunflowers. For that reason it is high probable that they may have been mistaken for sunflower seeds by children and, thus caused poisoning [56]. Although it is stated in the output of this study that no mortality occurred in any of the patients, it is mentioned that there was one of the patients had to undergo liver transplantation due to *Xanthium strumarium* poisoning. Moreover, it was also stated that potato-related poisonings were observed as cyanide poisoning occurred due to eating *Solanum tuberosum* sprouts [56].

In the light of these studies, it is seen that there is a tendency among the public to benefit from other

ISSN: 2458 - 8806

organs of a plant that is frequently consumed, with the thought that it will not be harmful. However, this may lead to misleading results, as the accumulation of phytochemicals they contain will vary from organ to organ [57, 58]. For example, the leaves and seeds of the fruit of the *Malus sylvestris* Mill. (yaban elması), which is frequently consumed by people, can lead to death [Table 1]. Similarly, the leaves and seeds of the *Armeniaca vulgaris* Lam. (kayısı) should be avoided when eating its fruits, as they cause many illnesses and even death.

4. Conclusion

In this study, the results of ethnobotanical studies conducted in Muğla province were compared with the results of toxic phytochemical studies. The use of plants as both food and medicine is an indispensable part of human life. However, the effects of plants that people used to determine whether they were harmful by trial and error in ancient times could vary from person to person, and the effect process could be different or may be slow on different human beings. On the other hand, while people used to live more in touch with nature in the past, today the human-nature relationship has weakened. This makes it difficult to transfer ethnobotanical knowledge to future generations and increases the possibility of errors in transmission from generation to generation. While it is possible for a plant that is collected incorrectly without knowledge and used as medicine can show immediate toxic effects or the possibility of causing serious harm to day by day should not be ignored. The side effects of these plants, which people use in daily life and are known to have many ethnobotanical benefits, are proof of how dangerous the careless use of plants can be.

Financial Source: During this study, no financial and/or moral support was received from any pharmaceutical company, a company that provides and/or produces medical devices, equipment and materials, or any commercial company that has a direct connection with the research topic, which could negatively affect the decision to be made regarding the study during the evaluation process of the study.

Conflict of Interest

The authors have no conflicts of interest, financial or otherwise, to declare.

Statement of Contribution of Researchers

Design – ADK, DÇ; Literature Search, Data Processing, Writing, Interpretation – DÇ; Critical reviews – ADK.

Table 1. Poisonous plants with ethnobotanical use in Muğla province

Scientific Name	Used Parts	Ethnobotanical Use	Toxic Parts	Toxic Effects	Toxic Compounds
Amaranthaceae Amaranthus chlorostachys Willd.	All Parts	Food [22]	Leaf, Stem	Nervous system destruction [41]	Oxalate
Amaranthaceae Amaranthus retroflexus L.	All Parts	Diabetes, food [22,27]	All Parts	Nervous system destruction, hypocalcaemia, kidney lesions [42, 51]	Saponin, Flavonoid, Oxalate
Amaryllidaceae Allium cepa L.	Stem, Leaf, Bulb	Cancer, cold, inflammation, headache, boil, sprain, food [25,27]	All Parts (Esp. Bulb, Flower)	Dermatitis [44, 45]	N-Propyl Sulfide, Methyl Disulfide, Allyl Disulfide
Amaryllidaceae Allium sativum L.	Stem, Leaf, Bulb	Antiseptic, dewormer, ringworm, burn, blood pressure, food [25, 26, 27]	All Parts (Esp. Bulb, Flower)	Dermatitis [45]	N-Propyl Sulfide, Methyl Disulfide, Allyl Bisulfide

Scientific Name	Used Parts	Ethnobotanical Use	Toxic Parts	Toxic Effects	Toxic Compounds
Amaryllidaceae Narcissus tazetta L.	Bulb	Cancer, tumor, sore throat, skin diseases, wounds [20, 23]	Bulb, Leaf, Fruit	Nausea, cramps, diarrhea, dermatitis, tremor, CNS depression, cardiac abnormalities, death [33, 40, 43, 45]	Lycorine, Phenanthridine Alkaloids, Narcissin, Galanthamin, Scillotoxin
Anacardiaceae Cotinus coggygria Scop.	Leaf	Antiseptic, antipyretic [26]	Leaf	Itching, skin inflammation [35, 42, 43, 53, 54]	Tannin, Flavonoid derivatives
Apiaceae Daucus carota L.	Radix, Flower	Food, medical [21, 27]	All Parts (Esp. Radix, Fruit, Seed)	Hypertension, sweating, seizures, respiratory failure, coma, paralysis, death [37, 45]	Coniine, Nicotine-Like Alkaloids, Methyl Isoeugenol, Elemicin, Beta Asarone
Apiaceae Petroselinum crispum (Mill.) Fuss	Leaf, Caulis	Diuretic, kidney stone, cold, food [25, 27]	All Parts (Esp. Fruit)	Abortion [37]	Psoralen, Bergaten 8-Methoxypsoralen, Phenylpropanoid
Apocynaceae Nerium oleander L.	Leaf, Flower, Stem, Latex	Cancer, eczema, scorpion sting [21, 23, 27]	All Parts	Dermatitis, dizziness, vomiting, diarrhea, respiratory failure, abnormal heart function, coma, death [31-54]	Oleandrin, Neriine, Oleandroside, Cardiotoxics, Digitoxine, Saponin, Oleandrigenin, Rosagenin, Neriandrin
Araliaceae Hedera helix L.	Flower, Leaf	Dewormer, laxative [26]	All Parts	Dermatitis, nausea, vomiting, diarrhea, respiratory failure, coma [33, 37, 39, 41, 42, 43, 44, 46, 50, 54]	Flavonoid, Quercetin, Kaempferol, Glycosides, Hederin, Saponin, Pectin, Tannin
Asparagaceae Asparagus acutifolius L.	Young Shoots, Rhizome	Diuretic, kidney leisons, eye tonic cough suppressant, food [20, 21, 22, 23, 25, 26, 27]	Fruit	Dermatitis, allergies, dyspnea, dysphagia [31, 37, 41, 43, 45, 48]	Steroidal Saponins, Sapogenins
Asparagaceae Urginea maritima (L.) Baker	Corm, Leaf	Rheumatism, pain, boils, respiratory disorders [20, 21, 24, 27]	Corm	Cardioactive steroid poisoning, sinus bradycardia, premature ventricular contractions [31, 33, 34, 45,48]	Scillaren A, Glyco Scillaren A
Asteraceae Artemisia absinthium L.	Leaf, Flower	Antipyretic, dewormer, stomach discomfort [26]	All Parts	Abnormal breathing, kidney failure, gastrointestinal irritation, involuntary excretion, vomiting [31,33,40,43,47,50]	Thujone, Absintic Acid, Camphor, Thuyol, Terpenoids, Artabsin, Absintin, Flavones, Coumarin
Asteraceae Carlina gummifera (L.) Less	Radix	Medicinal [21]	Radix	Fatal [34, 37]	Diterpenic Heterosides, Atractilosides, Parquine,Carboxiparquine, Wedeloside
Asteraceae Centaurea solstitialis L.	All Parts, Radix	Food [22]	All Parts	Coordination disorder, staggering, death [52, 53, 54]	Santaurin, Cyanine, Cycorine, Pelargonin
Asteraceae Centaurea urvillei DC.	All Parts	Food [22]	All Parts	Paralyzed [42]	Flavonoids, Sesquiterpene, Triterpenoid, Phenylpropanoid
Asteraceae Chrysanthemum segetum L.	All Parts	Food [22]	Flower	Dermatitis, hypersensitivity [44]	Arteglasin A, Sesquiterpene Lactones

ISSN: 2458 - 8806

Scientific Name	Used Parts	Ethnobotanical Use	Toxic Parts	Toxic Effects	Toxic Compounds
Asteraceae Cynara cardunculus L.	Flower, Fruit	Food [21, 22]	-	Dermatitis [35, 37]	-
Asteraceae Helianthus annuus L.	Seed	Prostate, blood sugar [21, 27]	Cilia	Eczema, erythema, dermatitis [40]	Sesquiterpene Lactones
Betulaceae Alnus glutinosa (L.) Gaertner	Leaf	Bone fracture, antipyretic [27]	Stem, Leaf, Sap	Dermatitis [35]	-
Boraginaceae Echium plantagineum L.	Flower	Stomach discomfort [23]	All Parts	Hepatitis, budd-chiari syndrome, hypertension, paralysis [33,45,52]	Cynoglosine, Consolidin
Brassicaceae Brassica nigra (L.) W.D.J.Koch	All Parts	Food [22]	Flower, Fruit, Leaf, Seed	Irritant, burning effect [33, 37, 39, 41, 43, 54]	Sinigrin Glycoside, Sulfur Glycosides, Glucosinolates
Brassicaceae Brassica oleracea L.	Leaf	Cholesterol, stomachache, sprain, food [25, 27]	All Parts (Esp. Leaf, Flower)	Goiter [40]	S-Methyl-L Cysteine Sulfoxide, Glucosinolate Erucic Acid, Sulfur Glycosides
Brassicaceae Capsella bursa–pastoris (L.) Medik.	Leaf	Homeostatic, food [20, 22]	All Parts	Kidney disorders [30, 37, 42, 50, 51]	Oxalates, Choline, Acetylcholine, Apple and Lemon Acids, Rhein, Hyoscine, Saponins, Brucine, Sulphur
Cucurbitaceae Ecballium elaterium (L.) A.Rich	Fruit	Medicinal [21]	All Parts	Skin irritant [33, 37, 41, 42, 43, 47, 48]	Ecballin, Cucurbitacin, Saponin
Cucurbitaceae Momordica charantia L.	Fruit	Stomach discomfort, ulcer, burn [23]	All Parts	Nausea, vomiting, diarrhea [36, 45]	Momordin, Ricin, Momordicoside, Momordicine
Cupressaceae Cupressus sempervirens L.	Cone	Appetizer, cough suppressant, diuretic, diarrhea, blood pressure [23, 25, 27]	Cone	Dermatitis [37, 41]	Resinous Compounds
Cupressaceae Juniperus foetidissima Willd.	Seed, Bark	Diuretic, cough suppressant, asthma, bronchitis [26, 27]	-	Irritation, vomiting, intestines bleeding [31, 33]	Sabinol Derivatives
Dioscoreaceae Tamus communis L.	All Parts	Food [22]	Leaf, Stem	Irritation of the mucous membrane, respiratory distress [31, 33, 50]	Campesterol, Stigmasterol, ß Systrol, Acrid Juice
Euphorbiaceae Euphorbia amygdaloides L.	All Parts, Latex	Wart, insect bite [25, 27]	All Parts	Irritant, diarrhea, vomiting gastrointestinal symptoms, keratoconjunctivitis [33,41,45,47,50,53]	Euphorbin, Complex Diterpene Esters, Resin, Euphoron
Fabaceae Anagyris foetida L.	Flower, Seed	Gastrointestinal disease, dewormer, laxative [21, 23, 26]	All Parts	Tachycardia, hypertension, vomiting, diarrhea [32, 33, 34, 37, 42, 47, 50, 53]	Anagyrin, Consolidin, Cynoglossine, Andrine, Quinolizidine Alkaloids

Scientific Name	Used Parts	Ethnobotanical Use	Toxic Parts	Toxic Effects	Toxic Compounds
Fabaceae Medicago sativa L.	All Parts	Food [25]	All Parts	Irritation of mucous membranes, suffocation, vomiting, central nervous system destruction [37, 41]	Stachydrine, Homostachydrine, Trigonelline, Saponin
Fabaceae Phaseolus vulgaris L.	Seed	Food [25]	Seed, Fruit	Diarrhea, vomiting, effect on cell metabolism [37, 40]	Phytohaemagglutinin, Lectin, Linamarin
Fabaceae Vicia faba L.	Fruit, Leaf	Food [21, 25]	Seed, Fruit	Anemia, bloody urine [31, 33, 41, 42, 47]	Vicin, Convicin, Cyanogenic Glycosides
Hypericaceae Hypericum perforatum L.	Inflorescence	Diabetes, stomach discomfort, wounds, burns, yeast [20, 25, 26, 27]	All Parts	Liver disorders, skin lesions, sores [33, 37, 39, 41, 45, 47]	Hypericin, Dianthrone Derivatives, Furcoumarine, Tannin, Flavone
Juglandaceae Juglans regia L.	Leaf, Seed	Headache, bronchitis, anti-inflammatory, rheumatism [22-27]	Leaf, Fruit	Reducing protein and carbohydrate intake, dermatitis [37, 41, 42, 45, 54]	Tannin, Juglandin, Naphthoquinones, Oxyaphthochion
Lamiaceae Vitex agnus-castus L.	All Parts (Without Radix)	Diuretic, cold, bronchitis, diarrhea, scorpion sting, menstrual cycle [21, 23, 26, 27]	All Parts	Liver toxicity [37]	Monoterpene Etheroxide, Bicyclic Monoterpenes, Sabinene, 1,8-Cineole
Lauraceae Laurus nobilis L.	Leaf, Fruit, Seed	Stomach disorders, cold, rheumatism, muscle fatigue, blood pressure, toothache, insect bites [20-26]	Leaf, Fruit	Dermatitis [35, 37, 43, 50, 54]	Daphnetin, Define, Coumarin, Prussic Acid, Methyl Eugenol, Cineole
Linaceae Linum usitatissimum L.	Seed	Indigestion, gut trainer, cholesterol, fatigue [25, 27]	Seed	Cyanide poisoning, death [33, 37, 41]	Cyanogenic Glycosides, Diglucosides Linostatin, Neolinostatin, Lignan
Lythraceae Punica granatum L.	Fruit, Leaf, Flower	Diarrhea, indigestion, diabetes, cholesterol, burns [23, 25, 27]	Fruit Cortices, Radix, Bark	Vomiting, diarrhea [35, 37, 42, 43, 50]	Tannin, Pelletierine, Iso-Pelletierine, Tropane Alkaloids, Pseudopelletierine
Moraceae Ficus carica L.	Fruit, Bark	Cold, bronchitis, stomachache, flatulence, constipation, wart, bee sting [23, 25, 27]	All Parts	Dermatitis, 1st degree burn [35,37,45,54]	Furocoumarins, Ficin, Sesquiterpenoid Glycosides, Psoralen, Bergapten
Papaveraceae Papaver rhoeas L.	All Parts	Heart diseases, cough, sleep regulator, sadative, food [20, 21, 23, 26, 27]	Flower, Leaf, Fruit	Nervous system destruction, drowsiness, balance loss [30,44,50,52,53]	Isoquiroline, Rhoeadin, Rhoesin, Tebain, Morphine, Papaverine
Polygonaceae Rumex acetosella L.	All Parts	Food [25]	All Parts	Kidney damage [42, 47, 53, 54]	Calcium Oxalate Crystals, Coumarin, Anthocyanin, Hydrocarbon
Ranunculaceae Anemone coronaria L.	Flower	Rheumatism [23]	All Parts	Ulceration, profuse salivation, abdominal cramps, bloody vomiting, diarrhea, seizures, dermatitis [42, 46, 48]	Saponin, Porotoanemonine, Ranunculine, Anemonine

ISSN: 2458 - 8806

Scientific Name	Used Parts	Ethnobotanical Use	Toxic Parts	Toxic Effects	Toxic Compounds
Rosaceae Amygdalus communis L.	Seed	Diabetes, food [23, 25]	Seed	Central nervous system destruction, dyspnea, vomiting, coma, death [31, 33, 37,41,42,43,45,46]	Cyanhydric Acid, Prunasin, Amygdalin, Dhurrin, Linamarin, Sombunigin
Rosaceae Armeniaca vulgaris Lam.	Fruit, Fruit Caulis	Constipation, cancer treatment, food [25]	Leaf, Seed, Branch	Shortness of breath, staggering, sensory loss, dilated pupils, death [33, 40, 41, 50, 54]	Cyanide, Prunasin, Amygdalin
Rosaceae Malus sylvestris Mill.	Fruit	Sprain treatment, Fruit [25, 27]	Leaf, Seed	Fatal [43,45,53,54]	Amygdalin
Rosaceae Potentilla reptans L.	All Parts	Restorative [26]	All Parts	Liver disfunction [37]	Tannin
Santalaceae Viscum album L.	All Parts	Tumor, blood pressure, diabetes, rheumatism, bronchitis, migraine [20, 27]	All Parts	Nausea, vomiting, abdominal cramps, diarrhea, dehydration [31-54]	Guipsine, Viscotoxins (I, II, III), Glycoproteins
Solanaceae Capsicum annuum L.	Fruit	Pain relieving, constipation, food [25, 27]	Fruit, Seed	Burning or stinging of oral mucous membranes, chemical conjunctivitis, dermatitis [45]	Capsaicin
Solanaceae Datura innoxia Mill.	Flower	Medicinal [21]	All Parts	Headache, dizziness, skin rash, drooling, dilation of the pupils, delirium, increased pulse, coma, death [33, 41, 43, 44]	Atropine, Hyoscyamine, Scopolamine, Tropan
Solanaceae Hyoscyamus albus L.	Flower	Food [22]	Leaf, Seed, Radix	Headache, dizziness, drooling, difficulty swallowing, dilation of pupils, delirium, increased pulse, coma, death [33,37]	Atropine, Hyocyamine, Scopolamine
Solanaceae Solanum nigrum L.	Fruit	Boils, tonsils [25, 27]	All Parts	Vomiting, mental confusion, tachycardia, hallucination, coma, death [31-54]	Solanine, Solanidine, Glycoalkaloid
Solanaceae Solanum tuberosum L.	Tuber	Antipyretic, headache [25, 27]	All Parts	Vomiting, confusion, tachycardia, hallucination, coma, death [32-54]	Solanine, Solanidine, Glycoalkaloid
Theaceae Camellia sinensis L.Kuntze	Leaf	Diarrhea [25, 27]	Leaf	Hepatotoxicity [37]	Caffeine, Theophylline, Catechins, Epigallocatechin Gallate
Urticaceae Urtica dioica L.	All Parts	Cancer, diuretic, food [20, 25, 27]	Leaf, Flower, Stem	Itching, short-term blisters [42, 44, 50]	Organic Acid, Choline, Formic Acid

References

1. Kendir G, Güvenç A. Etnobotanik ve Türkiye'de yapılmış etnobotanik çalışmalara genel bir bakış. HUJPHRAM. 2010; 30(1):49-80.
2. Koyu Belikci E. Türkiye'nin Etnobotanik Veritabanı. [Doctoral Thesis]. İzmir: Ege Üniversitesi, 2020. 362 p.
3. Sadıkoğlu N. Cumhuriyet Dönemi Türk etnobotanik araştırmaları arşivi. [Master's Thesis] İstanbul: İstanbul Üniversitesi; 1998. 80 p.
4. Şarışen Ö, Çalışkan D. Fitoterapi: Bitkilerle tedaviye dikkat. STED. 2005; 14(8):184-187.
5. Luo L, Wang B, Jiang J, Fitzgerald M et al. Heavy metal contaminations in all parts medicines: determination, comprehensive risk assessments, and solutions. Front. Pharmacol. 2021; 11:1-14. https://doi.org/10.3389/fphar.2020.595335
6. Behl T, Kumar K, Brisc C, Rus M, Nistor-Cseppento DC, Bustea C et al. Exploring the multifocal role of phytochemicals as immunomodulators. Biomed. Pharmacother. 2021; 113:1-18. https://doi.org/10.1016/j.biopha.2020.110959
7. Tyagi S, Singh G, Sharma A, Aggarwal G. Phytochemicals as candidate therapeutics: an overview. IJPSRR. 2010; 3(1):53-55.
8. Saxena M, Saxena J, Nema R, Singh D, Gupta A. Phytochemistry of Medical plants. J Pharmacogn Phytochem. 2013; 1(6):168-182.
9. Huang Y, Bu Q. Adverse effects of phytochemicals. In Zhang L. (eds). Nutritional Toxicology. 2022: 355-384. https://doi.org/10.1007/978-981-19-0872-9_13
10. Davis PH, Cullen J. Flora of Turkey and the East Aegean Islands. Edinburgh: Edinburgh University Press; 1972. 673 p.
11. Davis PH, Cullen J. Flora of Turkey and the East Aegean Islands. Edinburgh: Edinburgh University Press; 1982. 964 p.
12. Kaya E. Muğla (Merkez) Florası. [Master's Thesis]. Muğla: Muğla Sıtkı Koçman University; 2004. 142 p.
13. Ceylan O, Görk G. Flora of Kavaklıdere Muğla/Türkiye. BioDiCon. 2017; 10(2):167-182.
14. Ceylan O. Muğla Üniversitesi Yerleşke Florası. [Master's Thesis]. Muğla: Muğla Üniversitesi. 2007. 82 p.
15. Varol Ö, Doğru A, Kaya E. Flora of Yılanlı Mountain (Muğla). Ekoloji. 2004; 13:23-36.
16. Davis PH, Cullen J. Flora of Turkey and the East Aegean Islands. Edinburgh: Edinburgh University Press; 1965. 573 p.
17. Özsalmanlı AY. Muğla kenti ve Muğla Büyükşehir Belediyesi Yönetimi. Adnan Menderes Üniversitesi Sosyal Bilimler Enstitüsü Dergisi. 2014; 1(5):136-159. https://doi.org/10.30803/adusobed.188833
18. Akman Y. İklim ve Biyoiklim. Ankara: Palme Yayınları; 1990.
19. Atalay İ. Türkiye vejetasyon coğrafyası. İzmir: Ege Üniversitesi Basımevi; 1994. 352 p.
20. Akan H, Öz A, Pekmez H. Some of the plants species used among the local people in Ortaca (Muğla). TURJAF. 2018; 6(9):1168-1174. doi.org/10.24925/turjaf.v6i9.1168-1174.1981
21. Akbulut S, Yılmaz D. Ethnobotanical knowledge on the plants used by people on the Datça Peninsula (Muğla/Turkey). Appl Ecol Env Res. 2022; 20(2):1887-1910. doi.org/10.15666/aeer/2002_18871910
22. Ertuğ F. Wild edible plants of the Bodrum area (Muğla, Turkey). Turk J Bot. 2004; 28(1):161-174.
23. Gürdal B, Kültür Ş. An ethnobotanical study of medicinal plants in Marmaris (Muğla, Turkey). J Ethnopharmacol. 2012; 146(1):113-126. doi.org/10.1016/j.jep.2012.12.012
24. Honda G, Yeşilada E, Tabata M, Sezik E, Fujita T, Takeda Y, Takaishi Y, Tanaka T. Traditional medicine in Turkey. VI. Folk medicine in West Anatolia: Afyon, Kütahya, Denizli, Muğla, Aydın provinces. J Ethnopharmacol. 1996; 53(2):75-87. doi.org/10.1016/S0378-8741(96)01426-2
25. Kıncal S, Ceylan O. Ula (Muğla) ilçesinin etnobotanik özellikleri. BioDiCon. 2021; 14(1):69-81. doi.org/10.46309/biodicon.2021.768665
26. Sayar A, Öztürk M, Güvensen A, Özdemir F. Muğla (Turkey) ilindeki bazı türlerin etnobotanik özellikleri. Ot Sistematik Botanik Dergisi. 1995; 2(1):151-160.
27. Uysal G. Köyceğiz (Muğla) ilçesinin etnobotaniği. [Master's Thesis]. Muğla University Institute of Natural Sciences. 2008. 244 p.
28. POWO. Plants of the Worlds Online. Kew: Facilitated by the Royal Botanic Gardens. 2024; [2024]. Available from https://powo.science.kew.org/
29. Güner A, Aslan S, Ekim T, Vural M et al. Türkiye Bitkileri Listesi (Damarlı Bitkiler). İstanbul. Nezahat Gökyiğit Botanik Bahçesi ve Flora Araştırmaları Derneği Yayını. 2012. 1290 p.
30. Başbağ M, Davies W, Cannon N et al. Some wild plants in the Cirencester natural Flora. ANAJAS. 2014; 29(2):126-135 doi.org/10.7161/anajas.2014.29.2.126-135
31. Başer KHC. Current knowledge on the wild food and non-food plants of Turkey. Cahiers Options Méditerranéennes. 1997; 23:129-159.
32. Baytop T, Baytop A, Mat A, Sun S. Türkiye'de zehirli bitkiler, bitki zehirlenmeleri ve tedavi yöntemleri. İstanbul. İstanbul Üniversitesi Yayınları. 1988. 999 p.
33. Baytop T. Türkiye'nin tıbbi ve zehirli bitkileri. İstanbul. İstanbul Üniversitesi Yayınları. 1963. 502 p.
34. Bnouham M, Merhfour FZ, Elachoui M, Ziyyat A, Abdelkhaleq L, Mekhfi H, Lamnaouer D. Toxic effects of some medici-

ISSN: 2458 - 8806

nal plants used in Morroccan traditional medicine. Morrocan Journal of Biology. 2006; 2(3):21-30.

35. Çelik BH, Zencirkıran M. A research on toxicological properties of Bursa City Parks' design plants. BAROFD. 2021; 23(2):446-464. https://doi.org/10.24011/barofd.942374
36. Diaz JH. Poisoning by herbs and plants: rapid toxidromic classification and diagnosis. Wild Environ Med. 2016; 27(1):136-152. https://doi.org/10.1016/j.wem.2015.11.006
37. European Food Safety Authority. Compendium of botanicals reported to contain naturally occurring substances of possible concern for human health when used in food and food supplements. EFSA Journal. 2012; 10(5):26-63. https://doi.org/10.2903/j.efsa.2012.2663
38. Gökkür S, Eldoğan S. Ülkemizde bulunan zararlı bitkiler. Apelasyon. 2018; 53(1).
39. Gül V, Topcu E. Salıpazarı (Samsun) ilçesinde yayılış gösteren zehirli bitkiler üzerine bir araştırma. TURKJANS. 2017; 4(2):162-168.
40. Khan RU, Mehmood S, Khan SU. Toxic effect of common poisonous plants of district Bannu. Pak J Pharm Sci. 2018; 31(1):57-67.
41. Kılıç Ö, Aktaş İ, Bilgiç S. Ön Lisans Toksikoloji Kitabı. 1st Ed. İbrahim Aktaş. Ankara. Institution of Economic Development and Social Researches Publications. 2020. 166 p.
42. Kocabaş YZ. Türkoğlu (Kahramanmaraş) ilçe florasında bulunan zehirli bitkiler. TFSD. 2020; 1(1):42-51.
43. Muca B, Yıldırım B, Özçelik Ş, Koca A. Isparta's (Turkey) poisonous plants of public access places. BioDiCon. 2012; 5(1):23-30.
44. Mulligan GA, Munro DB. Plantes Toxiques du Canada. Ottawa/Canada. 1990.
45. Nelson LW, Shih RD, Balick MJ. Handbook of Poisonous and Injurious Plants 2nd Edition. Springer Nation. 2007. 340 p.
46. Özgen Y. Peyzaj düzenlemelerinde kullanılan insan sağlığına zararlı bitkiler. Review of the Faculty of Forestry, University of İstanbul. 1997; 37(1):90-99. doi.org/10.17099/jffiu.49649
47. Öztürk M, Uysal I, Gücel S et al. Ethnoecology of poisonous plants of Turkey and Northern Cyprus. Pak J Bot. 2008; 40(4):1359-1386.
48. Republic of Türkiye Ministry of Agriculture and Forestry. Zehirli ve zararlı oldukları için gıda amaçlı kullanımlarıda yasaklanması gereken bitkiler. 2020. 4 p.
49. Serrano R. Toxic Plants: Knowledge, Medicinal Uses and Potential Human Health Risks. Environment and Ecology Research. 2008; 6(5):487-492. doi.org/10.13189/eer.2018.060509
50. Smith AB. Poisonous Plants of All Countries. 2nd ed. London, Baillière, Tindall & Cox London/Britain. 1923. 112 p. doi.org/10.5962/bhl.title.21499
51. Sokat Y. Ege Bölgesi yaprağı yenen sebze üretim alanlarındaki zehirli yabancı ot türleri. Journal of Bahri Dagdas Crop Research. 2021; 20(1):91-101.
52. Töngel MÖ, Ayan İ. Samsun ili çayır ve meralarında yetişen bazı zararlı bitkiler ve hayvanlar üzerindeki etkileri. J. of Fac. of Agric. OMU. 2004; 20(1):84-93.
53. Tuttu G, Abay G. Çankırı ve çevresi zehirli bitkileri. 3rd International Non-wood Forest Products Symposium. Kahramanmaraş. 2014. 931-943.
54. Yılmaz H, Akpınar E, Yılmaz H. Peyzaj mimarlığı çalışmalarında kullanılan bazı süs bitkilerinin toksikolojik özellikleri. Süleyman Demirel Üniversitesi Orman Fakültesi Dergisi. 2006; 7(1):82-95.
55. Tatlısu MA, Çekirdekçi E. İ, Akyüz Ş, Nurkalem Z. A case of Mobitz type II atrioventricular block due to Nerium oleander poisoning successfully managed with digoxin-specific Fab antibody fragments. Turk Kardiyol Dern Ars. 2015;43(7):648–650. https://doi.org/10.5543/tkda.2015.65848
56. Almış H, Karabiber H, Yakıncı C. Plant Related Poisonings in Children: An Evaluation of 23 Cases. Journal of Turgut Ozal Med Cent. 2014; 21(2):126-9.
57. Van Tassel, DL, Roberts N, Lewy A, O'Neill SD. Melatonin in plant organs. J Pineal Res. 2001; 31:8-15. https://doi.org/10.1034/j.1600-079X.2001.310102.x
58. Vukić M, Vukovic N, Obradović A, Galovicáova L, Čmiková N, Kacaniova M, Matic mm. Chemical composition and biological activity of Tanacetum balsamita essential oils obtained from different plant organs. Plants. 2022; 11(24): 1-22. https://doi.org/10.3390/plants11243474