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PLANTS UNDER THE RISK DROUGHT AND DESERTIFICATION IN SOUTHEASTERN ANATOLIA (TURKEY)

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ABSTRACT

This study examines the impact of climate change on the semiarid region of Southeastern Anatolia, Turkey, which borders the northern Arabian deserts. The region faces significant risks of desertification due to the expansion of arid zones, affecting precipitation, evaporation, water resources, and vegetation. The loss of biodiversity is already a critical issue, exacerbated by drought conditions. Agricultural productivity is threatened as drought reduces water availability, leading to lower yields and quality of crops. Economic consequences include increased food prices, farmer losses, and potential migration. The study aims to identify at-risk agricultural products and propose measures to combat drought and ensure food security.

KEY WORDS: *Climate change, drought, desertification, soil, evaporation, endangered species*

INTRODUCTION

This semiarid area corresponding to the southeastern corner of Turkey also forms the border with the northern belt of the Arabian deserts (Figure 1). The climate changes that are taking place will deeply affect this region. Especially this semiarid location bordering the desert belt carries the risk of desertification with the expansion of the main arid region to the north. This will affect climate elements such as precipitation and evaporation, then water resources and vegetation. In this case, the vegetation that will not be able to survive will also be in question. Similarly, some agricultural products will no longer grow under natural conditions.



Figure 1: Location Image

Even now, a large part of the area is at very high risk of biodiversity loss. Biodiversity loss will be exacerbated by drought (Figure 2).

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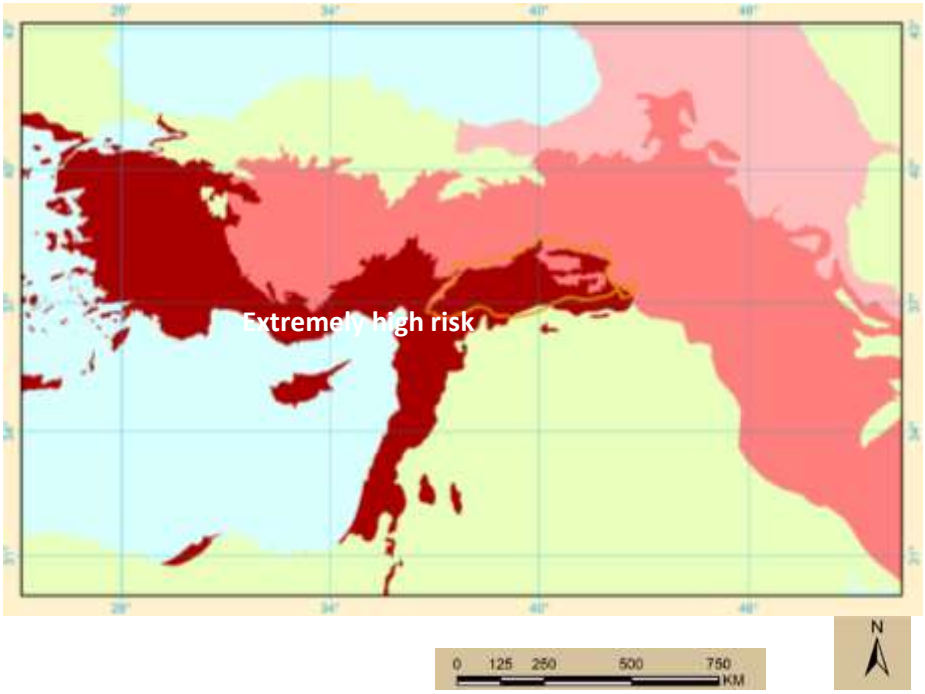


Figure 2: Biodiversity Risk Status in the Study Area and Its Surrounding Area

Depending on the degree of drought, there may be quite negative effects on agricultural products. For example, drought causes the water required for plant growth to decrease. This leads to the plants not being able to get enough nutrition and therefore to a loss of yield. Lack of water can negatively affect the development of plants and cause the quality of the product to decrease. For example, the size of fruits and vegetables may decrease or their taste may change. Drought may cause the cultivation areas to shrink and some products to not be grown at all. This reduces the overall yield. Possible climate changes may cause this (Ekinci, 2024). The decrease in agricultural products may lead to an increase in food prices and the economic losses of farmers and migration. Drought endangers the food supply and puts food security at risk. This situation can lead to serious problems, especially in regions that are not resistant to drought. Species may disappear. It is possible that the amount of salinity, evaporation and transpiration in the soil will increase, water resources will shrink and eventually epidemics and migrations will occur. Apart from this painful picture, the gastronomic culture of the region will also be deeply affected.

Aim

Diet varies from country to country according to culture, climate and conditions. It varies among human communities living in different geographies in the same country and even in the same city. The purpose of the study is to evaluate which agricultural products are at risk as a result of drought that may occur in this area due to the ongoing climate changes. In this respect, it is necessary to evaluate agricultural products that may have problems in production and to implement the necessary precautions. In the face of a possible mass extinction caused by global climate changes (Ekinci, 2024), we must the target research ways to combat drought now and take rapid steps in this direction.

General Climatic Characteristics of the Study Area

The climate conditions in Southeastern Anatolia reflect the characteristics of a continental steppe climate. The fact that the lowest temperatures and precipitation are concentrated in the winter season, while the summer season is very hot and dry, despite some local differences in precipitation, reveals the existence of a Mediterranean-type precipitation regime in the region.

In terms of annual average temperatures, Southeastern Anatolia, together with the Mediterranean and Aegean coasts, undoubtedly constitutes one of the hottest regions in Turkey. The annual average temperature in the Southeastern Anatolia Region varies between 16-22 degrees. In the southern belt, both the proximity to the equator and the altitude values have allowed the temperature to reach 22 degrees. As we go north, both the decrease in the angle of incidence of sunlight and the increase in altitude cause these high values to drop to 16 degrees.

The average temperature values recorded in the region show a gradual increase from north to south and from east to west. For this reason, the temperature values of the provinces in the north are lower. In this respect, Urfa: 18.2 C°, Mardin: 16.0 C', Diyarbakır: 15.7 C° can be given as examples. The highest temperature is seen in July with 31°C, and the lowest in January.

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July is the sunniest month in the Southeastern Anatolia Region with 12 hours a day. December and January have the lowest values in this respect.

In this region of our country that heats up the fastest and most in the summer season, it is known that the average July is around 30.0 C° (Siirt: 30.4 C", Diyarbakır: 31.0 C°, Urfa: 31.7 C°, Gaziantep: 27.1 C°). This issue is related to the high degree of continentality. Because in this region, which heats up very much in the summer months, the winter season is quite cold and the annual temperature difference varies between 25.0 C° and 27.5 C°. These figures show that the annual temperature difference is greater in this region, as in the Northeastern Anatolia region, than in Central Anatolia. The values related to the high temperatures reached in the summer season also support this issue. In fact, the highest absolute temperatures measured in Turkey so far belong to this region: Diyarbakır and Urfa: 46.2 C°. The extreme values recorded in the region reflect the interesting thermal characteristics of a steppe climate in the winter season, as in the summer season. (Erinç, S. 1957).

These extreme values show that the thermometer can often fall below zero in October, November, December, January, February, March and April, and even very low temperatures can be detected in the winter months. The following figures regarding the lowest temperatures show that the annual average temperature difference of around 25.0 C°-27.5 C° can increase approximately two-fold in abnormal winters: Diyarbakır-24.2 C° (January), Mardin-12.0 C° (February), Urfa-12.4 (February), Gaziantep-17.5 (January). The above thermal values undoubtedly affect the distribution of frosty days throughout the year. The months with the highest number of frosty days in the region are December, January, February and March. This frosty period loses its effect in early April and spring season suddenly begins. The number of frost days (regional average: 45 days), which is of great importance in terms of both agriculture and hydrology, is related to the high degree of continentality. In the northern and western parts of the region, frost events show a certain increase depending on thermal conditions (Diyarbakır: 68 days, Siirt: 48 days, Mardin: 37 days, Urfa: 27 days and finally Gaziantep: 58 days). As for the start and end dates of frost events in the region, it can be said that this varies between October 1-15 and April 1-15. Based on 22 years of observations, ERİNÇ records that the minimum number of frost days in Diyarbakır is 40, the maximum is 104 days and the earliest frost date is determined as October 7 and the latest frost date is determined as April 17 (17). The fact that evaporation is very low in this season (Diyarbakır January average: 26.9 mm) and the vapor pressure is low can be put forward as factors that aggravate the frost event. This frosty period is undoubtedly much shorter in the Mesopotamian plains located further south (Erinç, S. 1957). Annual rainfall amounts in Southeastern Anatolia generally decrease gradually from the Southeastern Taurus Mountains towards the Syrian platform (Figure 21). Annual rainfall amounts, which vary between 800-1250 mm on the Southeastern Taurus Mountains arc, are mostly between 450-500 mm in the areas located south of it. This amount decreases even more towards the Syrian border (Ceylanpınar: 271.5 mm) and prepares the conditions for a desert-like steppe. The role of landforms in this regard is clear, for example, while the Diyarbakır basin receives 400-500 mm of precipitation, the Karacadağ volcanic mass on its western edge receives 600-800 mm. The same situation can be observed at the Mardin (elevation: 1150 m) and Nusaybin (elevation: 500 m) meteorological stations. The difference in annual precipitation between these two stations, which are very close to each other, is 230 mm (Mardin: 685.8 mm, Nusaybin, 454.4 mm), (Erinç, S. 1957).

In terms of the number of rainy days, January offers the rainiest days with 10 days, while August has the fewest. The least precipitation falls in August with only 0.0 mm of precipitation. January is the month with the most precipitation.

The month with the most precipitation in Southeastern Anatolia is January (Diyarbakır: 79.2 mm, Siirt: 116.4 mm, Mardin: 133.5 mm, Urfa: 104.2 mm), and the month with the least precipitation is August (Diyarbakır: 0.5 mm, Siirt: 0.5 mm, Mardin: 0.6 mm, Urfa: 0.6 mm). The largest share of the region's annual precipitation falls in the winter season (Diyarbakır: 45%, Siirt: 42%, Mardin: 50%, Urfa: 55%). The share falling in the summer season is very small (1-2%) and in some years no precipitation is even recorded. Since the temperature reaches very high degrees in this season, a severe drought prevails. It is seen that the annual precipitation after the winter season is mostly collected in the spring months (Diyarbakır: Siirt: 37%, Mardin: 34%, Urfa: 30%). With these features, Southeastern Anatolia is located in a deteriorated Mediterranean precipitation regime area (Erol, O. 1992).

The annual average number of rainy days in the Southeastern Anatolia region varies between 70 and 90 days. The distribution of these days is in full compliance with the annual course of precipitation. The months with the least precipitation are July and August (1 day), while the months with the most precipitation are January (12-14 days) and March (14 days). In fact, the months with the highest precipitation values are also concentrated in winter and spring. All these issues testify to the existence of a certain precipitation maximum in the region, extending from winter to spring. January, when the relative humidity is 75% on average, is the most humid month. In July, the relative humidity is at its lowest level.

All these figures reveal the existence of a severe arid-semiarid steppe climate in the region. It can be said that a very hot summer period, intense evaporation and summer drought, a low humidity and cloudiness degree constitute the main characteristics of this climate type.

It is known that Southeastern Anatolia occupies a very important place among our arid regions. The duration of the dry period in the region is about 6-7 months. This period, together with the

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Mediterranean and Southern Aegean coastal zones, constitutes one of the areas with the longest dry period in Turkey. A dry area that occurs locally around Urfa in April gradually covers the whole of Southeastern Anatolia, increases its intensity in July and continues until the end of October. During this long period when high temperatures are recorded, irrigation becomes a necessity for agriculture. (Erinç, S. 1957).

Natural Vegetation of the Study Area

The areas outside the settlement areas in the study area are largely covered with steppe vegetation formed under semiarid climate conditions (Figure 3). In the region where forest cover covers very little space, pastures consisting of steppes and agricultural lands have a widespread surface area.

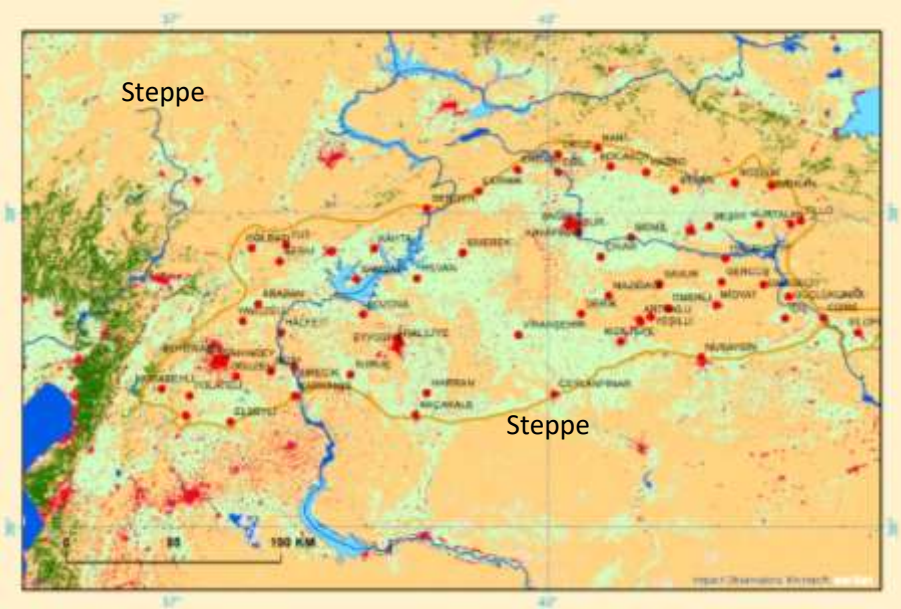


Figure 3: Land Use Characteristics in the Study Area

In Southeastern Anatolia, which is defined by the Taurus Mountains in the north and the Syria-Iraq dry region in the south, there are large steppe areas affected by climate and soil conditions. Steppe plants that bloom in the spring are exposed to extremely unfavorable climatic conditions due to the severe drought that continues from May to November. In this respect, it can be said that the region has a more pronounced steppe character compared to Central and Eastern Anatolia. Towards the Syrian border, in contrast to the high values recorded in temperature, annual precipitation decreases, and thus a desert-like steppe landscape prevails.

Relief and climate conditions also determine the lower limit of the natural forest in the region. These forests, which are seen on the edge of the steppe and generally consist of pure oak communities (Quercetum), have a xeric forest character since a continental climate type approaching the Mediterranean climate prevails in the region (Erinç, 1977).

Among the oak species, the gall oak is particularly notable. These oak communities can reach a very low level of 700 m in Siirt, Garzan and Silvan. Wild fruit trees are seen to be located at lower levels up to 600 m near the Tigris River. Accordingly, it is possible to accept the lower limit of the natural forest in the Siirt region as 700 m. This limit is slightly higher (800 m) in the western part of the Diyarbakır basin and the outer skirts of the Mardin threshold. In the west, the lower limit of the natural forest maintains an altitude of 800 m on the outer edge of the Taurus Mountains, but as we go south, this level decreases to 600 m in Nizip. The same level decrease increases even more from Kilis towards the Mediterranean and decreases to 200 m around Antakya (LOUIS,).

This feature of the natural forest bottom limit indicates the existence of an agreement between the mobile minimums affecting the region. A branch coming from the Gulf of Iskenderun to the Euphrates is divided into two, one in the NE and the other in the SE direction, and the distribution of forest and steppe also develops in accordance with the same natural situation. According to him, the region is completely within the natural forest borders and there are only a few large steppe islands within this area. (Yaltırık, 1984).

The Southeastern Anatolian steppe area forms the northern end of the fertile crescent (eroissant fertile) starting from the Persian Gulf and extending to the foothills of the Taurus Mountains, drawing the Taurus arc and reaching Israel via the Amanos Mountains and Lebanon. The part of the steppe area between Karacadağ, Mardin threshold and the Taurus Mountains corresponds to the Diyarbakır basin.

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The large part of the steppe outside this basin extends from the vicinity of Kilis to the vicinity of Cizre for a distance of 500 km. In the central part where Urfa is located in the middle, the width of the steppe is about 120 km. The Mardin-Viranşehir-Urfa line, which is located to the south of this plateau area where wide plains and low and flat hills follow each other, constitutes the most barren part of the steppe area. The landscape of this desert-like steppe can only be changed by green areas created by abundant and regularly flowing karstic sources, such as in Nusaybin and Ceylanpınar along the Syrian border. In Southeastern Anatolia, the remnants of the Mediterranean flora have taken refuge in valleys where the microclimate is suitable and have survived until today as individual islands in the middle of the steppe. Mediterranean fruit trees such as Pistacia vera, Olea europea, Ficus carica, Punica granatum, and Zyphus vulgaris can be an example of this. The Mediterranean vegetation islands in the region testify to the fact that in the past, Mediterranean vegetation had a wider spreading area in Anatolia that extended to these areas. It should be accepted that major changes have also occurred in the vegetation in parallel with the development of the land and climate. It is possible to attribute the expansion of the steppe against the Mediterranean vegetation to this development.

The steppe plants in the region do not have a flora as rich as the Central and Eastern Anatolian steppes. The reason for this should be sought in the longer drought period compared to the mentioned steppe regions. As we mentioned in the climate section, the dry period in the region is very long (6 or 7 months) and this situation creates disadvantages for plant life.

The steppe plants that bloom with the spring rains turn yellow and dry due to the severe drought that continues from May to November, and the geographical appearance quickly takes on the character of a poor steppe. Among the steppe plants, the ones that are most resistant to drought are the bulbous, rhizome and tuberous plants and the plants with deep roots or hairy leaves. Among these perennial xerophytic plants, camel thorns and mulleins are noteworthy. (Erinç, 1977).

Plants Used in Meals in the Study Area

There are many plants that grow in nature and are traditionally used as food sources in human nutrition. Purslane is a good example in this respect. Today, purslane produced from culture as a vegetable in the market conditions has an important place. Similarly, the acanthus plant is collected from nature and traded directly.

The distribution areas of acanthus, sumac, licorice and thyme plants in the region are gradually shrinking due to new land openings. Plants collected from nature and consumed directly are generally collected from stony, mountainous regions and from places far from settlements. Heavy metal (Cd, Cu, Pb etc.) contents are lower in plants such as acanthus, whose roots are collected from these plants.

Similarly, plants such as terebinth, sumac and nuts can also be evaluated as organic products. Some plants are collected from nature and consumed in traditional eating habits. The increasing interest in these plants, the lack of sustainable production and excessive consumption cause the extinction of many species in nature, especially bulbous species.

The Southeastern Anatolia Region has semi-arid climate characteristics. However, many plants grow in the region's flora. The number of scientific studies on these plants in terms of ethnobotany is quite insufficient. With this study, it was determined that there are 65 taxa of plants from 27 families in the Southeast and its surroundings.

In addition to their use as vegetables, these plants also have therapeutic uses. The plants determined to be collected from nature and consumed in the Southeast are listed below in alphabetical order according to their families.

Amaranthaceae

Amaranthus refloflexus (Photo 1): Young leaves are consumed as a vegetable like spinach. It is sold in Diyarbakır markets under the name “koksor”. It grows around Diyarbakır.



Photo 1: Amaranthus reflexus

Anacardiaceae

Pistacia vera L. (Pistachio) (Photo 2). It is widely cultivated in the provinces of Mardin, Diyarbakır, Şanlıurfa and Siirt in the Southeastern Anatolia Region.



Photo 2: Pistacia vera L.

Pistacia khinjuk Stocks: Bıtım is a natural tree species known as “bıttım”. Its fruits are consumed like pistachios. It is also used in soap making. Again, P. eurycarpa Yalt., which grows wild in the

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region, is used in the same way. It grows widely in the provinces of Mardin, Diyarbakır, Siirt and Adıyaman in the region.

P. terebinthus L.: This species is known as "menengiç", "kızban". Its fruits are eaten raw or roasted. It is also an important commercial product consumed due to its aromatic coffee. It grows in the region around Diyarbakır, Adıyaman, Gaziantep and Siirt. It has a diuretic and expectorant effect medically (Zeybek and Zeybek, 1994).

Rhus coriaria L.: Sumac is a shrubby plant and its ripe fruits are used in meals in the region due to their taste and color. In the past, the leaves of the plant were used in leatherworking and fabric dyeing. It grows widely in the Southeastern Anatolia Region around Mardin, Diyarbakır and Siirt.

Apiaceae (Umbelliferae)

Eryngium campestre L. (Photo 3): It is a perennial herbaceous and thorny plant. Its young shoots are collected in the spring and used as a vegetable. Donkey thorn. Some Eryngium species are also used for this purpose. It grows widely in Mardin, Diyarbakır, Siirt and Adıyaman provinces.

Ferula orientalis: It is a perennial herbaceous plant. The young shoots of the plant are collected and pickled. It is sold as fresh and prepared pickles in the markets in the region. Çakşır. Some Ferula and Prangos species are used in the same ways or. It grows widely in Diyarbakır, Şanlıurfa and Adıyaman provinces.

Echinophora tenuifolia L. subsp. sibthorpiana (Guss.) Tutin: Cheesewort. The young leaves of this subspecies are collected in the spring. It is used especially in the production of herby cheese specific to the Diyarbakır region. It grows widely around Diyarbakır.



Photo 3: Eryngium campestre L.

Apium nodiflorum (L.) Lag. Bendik: It is a perennial herbaceous plant. Young leaves are eaten as salad. It grows naturally around Diyarbakır and Şanlıurfa.

Foeniculum vulgare: Fennel. The plant is 1-2 m tall, has yellow flowers, and is a perennial herbaceous plant with threadlike leaves. It is commonly found on the edges of gardens in the region. Its seeds are dark brown, have a spicy scent and a slightly burning taste. The seeds contain fixed and volatile oils. It generally has stomachic, carminative and milk-increasing effects. The young shoots and leaves of the plant are consumed as fresh vegetables.

Araceae

Arum dioscoridis Sm. Dioscoridis (Photo 4): Arum species are usually 30-50 cm tall and are perennial plants. The leaves are arrow-shaped, long-stalked and dark green. Fresh leaves are harmful to humans and animals. The leaves contain starch, saponin and alkaloids. For this reason, the leaves are boiled and the boiling water is thrown away and used in the preparation of various dishes. It grows around Diyarbakır and Şanlıurfa.



Photo 4: Arum dioscoridis Sm.

Biarum carduchorum (Schoott) Engler; Fresh leaves are poisonous. The leaves are consumed as a vegetable after being boiled and dried. It grows around Diyarbakır and Şanlıurfa.

Asteraceae (Compositae)

Gundelia tournefortii L. (Photo 5): Kenger. The plant's young shoots are taken out of the soil and eaten as a vegetable, as well as regional dishes. Various dishes are made from boiled shoots. In the region, gum is made from the milk obtained by cutting the plant roots. These gums are chewed to strengthen the gums and increase appetite. It is widely sold in markets in the region during the spring months. It grows widely around Diyarbakır, Mardin, Şanlıurfa, Siirt and Adıyaman. In the region, gum is made from the milk obtained by cutting the plant roots.



Photo 5: Gundelia tournefortii L.

Tragopogon longirostris Bisch. Ex Schultz Bip.: Young leaves are used as a vegetable. It grows around Diyarbakır.

Boraginaceae

Anchusa azurea Miller (Photo 6): Young leaves are collected in early spring. The plant sold as "guruz" in regional markets is used as a vegetable. It grows widely around Diyarbakır and Şanlıurfa.

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Photo 6: Anchusa azurea Miller

Brassicaceae (Cruciferae)

Eruca sativa Miller (Photo 7): Arugula. It is a one or two-year herbaceous plant. It is grown as a vegetable. It is eaten as a salad or fresh. The plant contains volatile oil and high amounts of vitamin C. Its leaves are used as a stimulant, tonic and cough suppressant. It grows naturally in the region around Diyarbakır and Şanlıurfa.



Photo 7: Eruca sativa Miller

Sinapis arvensis L.: Mustard. It is a herbaceous, yellow-flowered annual plant. Its leaves are used as salad or vegetable in the young stage. Its seeds are black and brown in color, and give a unique smell when crushed. It contains fixed oil and glycoside (sinigrin) in its composition. It is used as an appetite stimulant among the public. It grows widely around Diyarbakır and Şanlıurfa.

Lepidium sativum L. subsp. spinescens (DC.) Thell.: Cress, "Rişvat". Its leaves are eaten as salad. It is usually collected and consumed in stony areas in the region. It grows naturally around Diyarbakır and Şanlıurfa.

Nasturtium officinale R. Br.: Watercress, "Tuzik". They are herbaceous plants with white flowers that grow in water or near water. Its leaves are eaten as salad. It grows widely around Diyarbakır and Şanlıurfa. It is known as Tuzik. It is a plant consumed locally and specific to the region.

Capparaceae

Capparis ovata Desf. (Photo 8): It is known as "Kember", "Kebere" or caper in the region. The pickle made from the flower buds is valuable. Although it has no significant local consumption, it has recently been collected from the region and traded by merchants. It grows widely in the provinces of Mardin, Diyarbakır, Siirt, Adıyaman, Şanlıurfa and Gaziantep in the Southeastern Anatolia Region.



Photo 8: Capparis ovata Desf.

Caryophyllaceae

Gypsophyla bicolor (Photo 9): Soapwort. The plant is used in making halva and ice cream. After the roots of the plant are thoroughly boiled in water, dresses made of silk and valuable fabrics are soaked in this water and kept for a few hours to clean the fabrics without damaging their color and shine.



Photo 9: Gypsophila Bicolor

Fabaceae (Leguminosae) Glycyrrhiza glabra L.: Licorice. Licorice is obtained from the roots of the plant. The juice obtained from the extraction of the roots of the plant with water is consumed in the region as "licorice sherbet". It is widely believed among the public that this sherbet is good for passing kidney stones. In addition, due to the special aroma of the plant, it is included in the composition of cola-type drinks. It is also consumed as hot tea. It is a plant that grows widely in the provinces of Diyarbakır, Mardin, Şanlıurfa and Siirt.

Trigonella foenum-graecum L.: Fenugreek. This species, which spreads naturally in the region, is consumed by obtaining it from herbalists.

Fagaceae

Quercus brantii Lindl (Photo 10).: Oak. Its sweet and large acorns are cooked and eaten. It is a forest tree that grows widely in the

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provinces of Mardin, Diyarbakır, Siirt, Adıyaman, Şanlıurfa and Gaziantep in the Southeastern Anatolia Region.



Photo 10: Quercus brantii Lindl

Quercus infectoria Olivieri subsp. Boissieri: Gall oak. Its acorns are cooked and eaten. It is a forest tree that grows widely in the provinces of Mardin, Diyarbakır, Siirt, Adıyaman, Şanlıurfa and Gaziantep in the Southeastern Anatolia Region.

Iridaceae

Crocus ssp. (Photo 11): There are species of crocus species that bloom in autumn and spring. The "Deyrulzahferan" Syriac church in Mardin takes its name from this plant and it is known that high-quality saffron was produced in the Viranşehir district of Şanlıurfa in the 17th century (Baytop, 1984). The Crocus pallasi species is called "pivok" and its bulbs are consumed by eating.



Photo 11: Crocus ssp

Lamiaceae

Teucrium polium L. (Photo 12): Known as "Mary Hort". It is a steppe plant that blooms in spring. Its leaves and flowers are brewed and drunk as tea to relieve stomach pains. It is a blood sugar reducer. It grows widely in the Southeastern Anatolia Region in the provinces of Mardin, Diyarbakır, Şanlıurfa, Siirt and Adıyaman.



Photo 12: Teucrium polium L.

Sideritis libanotica Labill.: Mountain tea. Perennial herbaceous plants. Leafy and flowering branches are used as tea. It grows widely around Siirt and Adıyaman.

Cyclotrichum niveum (Boiss.) Manden. Et Sheng.: An endemic species and its tea is used especially against influenza infections in the region. It is an endemic plant growing around Adıyaman.

Ocimum basilicum L.: Basil. It is used as a fresh or dried spice in salads and dishes. It is cultivated around Mardin, Diyarbakır, Şanlıurfa and Siirt. It is an annual herbaceous plant with white or pink flowers, 10-40 cm high. The plant contains volatile oil, and this oil contains astragol, eugenol and cineol components. It is mostly used as a spice among the public and is sold in bunches in the markets. It also has a sedative, stomachic, diuretic and carminative effect. The Ominimum species, another species belonging to the Ocimum genus, is grown in pots for ornamental purposes.

Mentha longifolium L.: The fresh leaves of the plant that grows near water are used in salads and dishes like mint. It is also drunk as tea. It grows naturally in the provinces of Diyarbakır and Şanlıurfa in the region. It is known as Yarpuz or punk.

Satureja hortensis L.: It is called mountain thyme and is known as annual thyme. It is added to the dish made as Hedik.

Thymbra spicata L.: It is called Zahter, "zature" and "cahtiri" and is the most consumed thyme species in the region. It grows widely in the provinces of Mardin, Diyarbakır, Adıyaman and Gaziantep in the Southeastern Anatolia Region. It is widely sold in herbalists. In addition, the following species are also used as thyme.

Thymbra sintenisi Bornm. & Aznav.: It grows around Diyarbakır and Siirt. Origanum vulgare L.: Grows in Diyarbakır, Siirt and Adıyaman provinces. Thymus kotschyanus Boiss. & Hohen: Grows around Diyarbakır, Şanlıurfa and Adıyaman.

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Liliaceae

Allium nemrutdaghense (Photo 13): Its leaves are consumed fresh. It is a wild onion species endemic to Adıyaman Nemrut Mountain. Allium scorodoprasum L.: Known as "Sir" or "sirim" in the region. Its leaves are eaten fresh. It is a wild onion species grown around Diyarbakır.



Photo 13: Allium nemrutdaghense

Colchicum falcifolium Stapf.: Crocus. It is a white or pale pink flowered crocus species that blooms in early spring. The tubers of this species are peeled and eaten fresh. It is a poisonous plant, causing poisoning. It grows widely in the provinces of Mardin, Diyarbakır, Şanlıurfa and Adıyaman in the Southeastern Anatolia Region.

Eremurus spectabilis Bieb.: Çiriş otu. It is a herbaceous plant with yellowish flowers that is approximately 1 m long. Its young leaves are used as a vegetable. It is known as "gülik" in the region and is widely used in markets. It grows around Diyarbakır.

Ornithogalum narbonense L.: It is a perennial bulbous and white flowered herbaceous plant species. Its young leaves are sold in regional markets. It is known as "akbandır" or akbaldır in the region and is used as a vegetable. Other Ornithogalum species grown in the region are also used for the same purpose. It grows widely in Diyarbakır and Şanlıurfa in the region.

Linaceae

Linum usitatissimum (Photo 14): Flax. The plant is called "bızırkıtan" in the region. Its seeds are consumed by roasting. Linseed oil is obtained from its seeds.



Photo 14: Linum usitatissimum

Malvaceae

Malva neglecta Wallr. (Photo 15): Mallow is known as "tolik". It is a plant whose leaves are used as a vegetable and sold in regional markets. It is a plant that grows widely in the Diyarbakır and Şanlıurfa areas.



Photo 15: Malva neglecta Wallr

Orchidaceae

Cephalanthera kotschyana (Photo 16).: Its tubers are used in making salep. It grows around Diyarbakır, Siirt and Gaziantep.



Photo 16: Cephalanthera kotschyana Renz

Cephalanthera kurdica Bornm. Ex Kranzlin: Its tubers are used in making salep. It grows in Diyarbakır, Mardin, Adıyaman and Siirt provinces.

Ophrys mammosa Desf.: Its tubers are used in making salep. It grows around Diyarbakır, Mardin and Siirt. Orchis laxiflora Lam.: Its tubers are used in making salep. It grows widely in Diyarbakır and Şanlıurfa provinces. Although the tubers of many orchid species are used as salep, the species mentioned are the orchid species commonly collected in the region.

Polygonaceae

Rheum ribes L. (Photo 17): Işkın. It is a perennial, large-leaved plant that grows in mountainous areas. The plant's leaf stalks and the stem of the inflorescence are eaten fresh after peeling. It carries tannin and small amounts of anthracene derivatives as

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active ingredients. The plant grows widely around Diyarbakır, Gaziantep, Adıyaman and Siirt.



Photo 17: Rheum ribes L.

Rumex acetosella L.: Sorrel. It is a perennial herbaceous plant. Its young leaves are eaten raw. It grows around Diyarbakır. It is known as "Tırşo" in the region.

Portulacaceae

Portulaca oleraceae L. (Photo 18): It is usually found as a weed in vegetable gardens and cotton fields. The leaves of the plant are consumed as a vegetable. In addition, "pırpar" dishes specific to the region are made, and its fresh leaves are widely consumed as cacık (cold drink made with green grass and yogurt).



Photo 18: Portulaca oleraceae L.

Ranunculaceae

Nigella sativa L (Photo 19):. The black cumin plant is an annual plant that grows 40-50 cm tall, has threadlike leaves, white flowers and forms capsules. Although it is used as a spice in baked goods, it has a diuretic and milk-increasing, appetite-stimulating and menstrual-inducing effect. It grows around Diyarbakır.



Photo 19: Nigella sativa L.

Rosaceae

Cerasus microcarpa (C.A.Meyer) Boiss. subsp. tortuosa (Photo 20) Browicz: It is a naturally growing, bush-like and small-fruited cherry species. Its fruits are eaten by local people. It grows widely in the provinces of Mardin, Diyarbakır, Şanlıurfa, Siirt and Adıyaman in the Southeastern Anatolia Region.



Photo 20: Cerasus macrocarpa

Cerasus mahalep L.: Miller is a type of tree-like wild cherry. Its fruits are bitter and used medicinally. Its seeds are added to muffins due to their taste. It grows widely in the provinces of Mardin, Diyarbakır and Adıyaman in the Southeastern Anatolia Region.

Cratageus aronia (L.) They are small tree-like or semi-shrub plants. Their fruits are sold in local markets. In addition, the fruits of C. orientalis Pallas ex Bieb. var. Orientalis are used for the same purpose. Cratageus monogyna Jacq. subsp. monogyna., which grows in the region and is typical with its red, single-seeded fruits, has medicinal properties. It grows widely in the provinces of Mardin, Diyarbakır, Şanlıurfa, Siirt and Adıyaman in the Southeastern Anatolia Region.

Pyrus syriaca Boiss. var. syriaca: Wild pear grows wild in nature. Its ripe fruits are eaten by local people. It grows in the provinces of Diyarbakır, Şanlıurfa, Siirt and Adıyaman in the region.

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Rosa canina L.: Rosehip is known as “surguler”. It is a bush-like plant. Its fruits are used by the local people in making jam and as tea. It grows widely in the provinces of Mardin, Diyarbakır, Şanlıurfa, Siirt and Adıyaman in the Southeastern Anatolia Region.

Rubus sanctus Schreber: Blackberry is known as “dırik”. This plant is a natural plant that usually grows in the form of a bush near water. Its fruits are eaten by people. Another type of blackberry grown in our region, R. discolor, is used in the same way. It grows widely in the provinces of Mardin, Diyarbakır, Şanlıurfa, Siirt and Adıyaman in the region.
Malus slyvestris Miller: Wild apple. It is a woody natural apple species that grows in the mountainous areas of the region. Its fruits are eaten by the local people. It grows around Diyarbakır.

Ulmaceae
Celtis glabrata Steven ex Planchon and Celtis tournefortii Lam. (Photo 21): Çitlenbik. They are large woody plants. They are known as “dağdağan” or “teyer” in the region. The orange or brown fruits of both species are edible. They grow widely in the provinces of Diyarbakır, Şanlıurfa, Siirt and Gaziantep in the Southeastern Anatolia Region.



Photo 21: Celtis glabrata Steven

Urticaceae
Urtica pilulifera L. (Photo 22): Nettle is known as “adırvaş”. It is an annual herbaceous plant and is sold in markets. Its young leafy branches are eaten. The plant has a stopping effect on stomach and intestinal bleeding. It is also used as herbal tea against diabetes and cancer. It grows around Diyarbakır. (Kızıl, 2004).



Photo 22: Urtica pilulifera L.

RESULT

Climate change can affect the Southeastern Anatolia Region in various ways. The increase in temperatures in the region can negatively affect agricultural and livestock activities. High temperatures increase the water requirement of plants and increase the risk of drought. The decrease in precipitation due to climate change can cause depletion of water resources and decrease in agricultural production. This situation makes it difficult to grow water-dependent products in particular.

Decreased precipitation and increasing temperatures can cause the soil in the region to dry out and increase the risk of desertification. This reduces the productivity of agricultural lands. Climate change can affect the habitats of plant and animal species in the region and cause a decrease in biodiversity. This situation can disrupt the ecosystem balance. The negative impact on agriculture and livestock can threaten the economic activities and livelihoods in the region. This can increase migration movements and lead to social problems.

The widespread presence of endemic or relict species in the region has also caused the nutritional culture to differ or show similarities locally. Although the local plants collected from nature have been largely destroyed today, their examples can still be found in local markets and create local flavor differences. However, the study area is rapidly losing its biodiversity due to both its physical and human characteristics. In this respect, it is among the locations with the highest risk. This situation necessitates urgent actions to be taken, especially in this location that hosts endemic species.

If we talk about the place of edible wild herbs in culinary culture, we can say the following about the way herbs are consumed. These herbs can be classified as those consumed fresh, those roasted and made into meals, and those used in pita and pastries. There are 30 taxa in this category of those that can be consumed fresh. The flowers, seeds and above-ground parts of these plants are consumed. There are 20 taxa in this category of those roasted and made into meals. Examples of those consumed in the form of soup are pirpirim and kenger.

Although the Southeastern Anatolia Region has advantages in terms of landforms and fertile soil, it faces the problem of drought. However, with the GAP, irrigated farming activities are increasing in the region. The lands left fallow due to drought are being rehabilitated. Thus, even products that require water such as rice, corn and cotton can now be produced. In addition to these, red lentils, barley, wheat and millet are also traditionally produced. Products such as peanuts, olives, pomegranates, walnuts, watermelons, melons, chickpeas, sesame and onions are also widely produced. With their increasing effects, climate change will increase drought in the region and cause deforestation. This will narrow the living space of the plants I mentioned and may cause them to disappear over time. Various strategies and adaptation mechanisms should be implemented for

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plants to survive in the face of drought risk.In order to cope with these effects, measures such as water management, growing drought-resistant plant species and adopting sustainable agricultural practices can be taken. Seed depots should be created to prevent these and the existence of these plants should be maintained.

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