



Tirsik: Turning Poison into an Alternative Medicine

* Önder YAYLA ^a 

^a Osmaniye Korkut Ata University, Kadirli Faculty of Applied Sciences, Department of Gastronomy and Culinary Arts, Osmaniye/Turkey

Article History

Received: 06.08.2021

Accepted: 01.09.2021

Keywords

Tirsik

Arum maculatum L.

Fermented food

Alternative medicine

Abstract

Arum maculatum L., a poisonous plant that should not be directly consumed by humans, is the primary ingredient in Tirsik, the Kahramanmaraş province's most well-known culinary dish. Tirsik is a registered dish with the Turkish Trademark and Patent Office and has a geographical indication. However, this ethnic dish is not widely known, even within the country, and is seldom consumed outside of the region. The aim of this research is to demonstrate how fermentation may transform a common toxic plant into an alternative source of healing. The study is significant in terms of promoting the awareness and consumption of such healthy ethnic foods by the society. In the study, the author gathered the literature about the Tirsik dish and demonstrated all the dish's preparation processes. As the dish is believed to be beneficial for human health, the Tirsik dish is called as 'Andirin's doctor' among the people. Tirsik made by fermenting this plant's leaves with water, (sour) yogurt, chickpeas, and cracked wheat is an exceedingly difficult dish to prepare because Tirsik is prepared over approximately twenty-four hours, and its structure and texture are similar to soup. As a consequence, it can be said that *A. maculatum*, a poisonous plant, becomes the Tirsik dish, which is believed to be a source of healing in the hands of local people through fermentation. Toxic substances in the plant's content give way to substances potentially beneficial to human health. Tirsik is not only a functional dish, but it is also a significant dish that has shaped local people's identity. Therefore, such ethnic foods should be protected, and their consumption by future generations should be ensured.

Article Type

Conceptual Article

* Corresponding Author

E-mail: onder.yayla@gmail.com (Ö. Yayla)

DOI:10.21325/jotags.2021.853

INTRODUCTION

Plants that have been used for therapeutic purposes since ancient times are still being used by people for these purposes today (Kültür, 2007, s. 341). It is possible to predict that the use of plants for healing will continue in the future as long as there is a high level of trust (Erbil vd., 2018, s. 8709) in traditional medicine, including herbal medicines, particularly in developing countries. According to locals, the majority of plants have functional properties in terms of human health. Therefore, the seeds, oils, leaves, fruits, and flowers of certain plants have been used for medicinal purposes by local people since ancient times (Dayısoylu, 2010, s. 6596). Plants thought to be beneficial to human health differ from society to society, and even from region to region within a society. The main reason these differences exist from region to region is due to the prevalence of different endemic plants in each one. Turkey is an important floristic center in the world, with a high potential for endemic plant diversity, and is home to over 10,000 natural plant species (Çolak vd., 2009, s. 13; Hudson vd., 2000, s. 171). Some endemic plants, which are used to support people's health, are generally the main ingredients of most ethnic dishes in the region to which they belong. The Covid-19 pandemic has reminded people all over the world about the importance of eating healthily. However, as healthy eating can be expensive these days, functional foods are the most accessible foods for those who want to eat healthily (Akdeniz Oktay & Özbaş, 2020, s. 1222). Fermented foods are considered to be among the most popular functional foods because they are relatively inexpensive and easily accessible, and they also have extended shelf-life. Turkish cuisine is one of the most fermented-product-heavy cuisines in the world (Kabak & Dobson, 2011). The main foods among them are tarhana, pickles, sausage, pastrami, kefir, boza, and particularly yogurt, which are traditionally prepared and/or consumed in most homes (Karaçıl & Acar Tek, 2013). The functional benefits of such fermented foods are highly appreciated by the public. Another of these foods is Tirsik, a dish made from the *Arum maculatum* L. plant. This study aims to show how an ordinary poisonous plant turns into a source of healing by fermentation. It is also aimed to show how important plants that seem to be ordinary can actually be for local culture. The study is important in terms of promoting the awareness and consumption of such healthy ethnic foods by the society. In addition, the study is important so that this ethnic dish, which has certain rituals from its preparation to consumption, can be passed on to future generations. In the study, the literature on the Tirsik dish was compiled, and all the production processes of it were demonstrated by the author himself.

***Arum maculatum* L. as an Ordinary Plant**

Arum maculatum L. (see Figure 1) is a plant of the *Arum* genus from the Araceae family (Erbil vd., 2018, s. 8709; Uçan Türkmen vd., 2019, s. 102). The *Arum* genus, with thirty species from Europe to Central Asia, has perennial, herbaceous, tuberous, and poisonous plants known for their triangular leaves, long stems, colorful spathes, and cylindrical fruits, which consist of red pods (Kandemir, 2008, s. 37). The *Arum* species grow naturally in Europe, North Africa, the Caucasus, and the Middle East in general (Kandemir, 2008, s. 37). Turkey has twenty naturally growing species of *Arum*. One of these species, *Arum maculatum* L., has a distribution area in Turkey that includes the provinces of Kahramanmaraş, Adana, Osmaniye, as well as the Eastern Mediterranean, South-Western Anatolia, and Cyprus (Şimşek, 2013, s. 67).



Figure 1. *Arum maculatum* L. plant

Known to people for generations, this species is also known as snake head, Adam-and-Eve, adder's root, cuckoo pint, cuckoopint, friar's cowl, lords-and-ladies, Portland arrowroot, and wake-robin around the world (Quattrocchi, 2012, s. 428). In Turkey, this plant is known by various names such as tirşik, Andirin's doctor (Andırın doktoru), beet (pancar) (Demirci & Özhatay, 2012), snake pillow (yılan yastığı), nivic grass (nivik otu), livik grass (livik otu), bear's ear (ayı kulağı), kabargan (Şimşek Yurt vd., 2019), snake tongue (yılan dili), snake grass (yılan otu), and infidel grass (gavur macarı) (Yılmaz & Akman, 2018, s. 860). In Turkey, harvesting and exporting onions or tubers of the *Arum* species is prohibited (Atalay & Yıldız, 2020, s. 127).

It, a perennial herbaceous plant, grows in moist forested areas and under rocks. The leaves of the plant are shaped like a pointed arrow, and the roots are in the shape of a tuber. The roots of the plant are extremely large, as they are rich in starch (Şimşek Yurt vd., 2019, ss. 796–797). The plant's above-ground parts die in the winter, but tuber of the plant survives underground and grow back the following spring (Çolak vd., 2009, s. 13). It is a poisonous species due to the alkaloids and saponins it contains (Demirci & Özhatay, 2012; Kızıllarslan, 2008). While synthesizing primary metabolic products, such as protein, fat, and carbohydrates, to maintain its basic vital activities, the plant also produces secondary metabolites like glycosides, alkaloids, and tannins that can be toxic to other living creatures. Secondary metabolites found in the plant that may have serious side effects are the following: aristolochic acid, oxalates, pyrrolizidine alkaloids, safrole, salicylates, cyanogenetic glycosides, tannins, tuilon, atropine, beta-asarone, berberine, cardiac glycosides, iodine, and lectin (Kocabaş, 2020, s. 43; Kocabas vd., 2017, s. 118). The plant has pro-inflammatory activity and induces neutrophil migration in two ways. One is independent of resident cells, whereas the other is dependent on the presence of macrophages (Alencar vd., 2005, s. 1812). All parts of the plant have a strong irritating effect on mucous membranes. However, if the plant is boiled or dried for an extended period of time, this renders it less harmful (Şimşek Yurt vd., 2019, ss. 796–797).

The poison in the plant can cause a variety of health problems in humans and animals. In general, the poison causes burning in the oral mucosa, bulging, swelling of the tongue, difficulty swallowing, and nausea in humans. Consuming the plant completely raw or in large quantities has also been observed to cause gastrointestinal

discomfort, severe upper tract obstruction, cardiovascular collapse, central nervous system depression, and, in rare cases, death. There is no specific antidote for the treatment of the poison (Şimşek Yurt vd., 2019, s. 798). The consumption of *Arum maculatum* L. has been reported to cause death in children but causes no problem in certain animals, such as pigs and birds (Sowter, 1949). In Jordan, this plant, called Arun, has been found to cause skin irritation and heart problems in humans (Al-Qura'n, 2005). The presence of toxic substances in many plant species is, in fact, not significant in terms of their toxicity. This is because such plants can only be harmful if consumed in excess. Although this effect is dependent on people's metabolic response levels, the preparation methods used on the plant affect the plant's poison level, minimizing and sometimes even eliminating the damage it can cause (Kocabaş, 2020, s. 43).

Several poisonous plants which are an important part of biodiversity and play a role in the ecological cycle, have medicinal benefits. Despite their toxic effect, they have been used for nutritional and medicinal purposes since ancient times (Espíndola vd., 2010). Saponins are a type of secondary metabolite found in many plant species including *Arum maculatum* L. Saponins are steroid and triterpene glycosides named for their soap-like properties. Terpenes or terpenoids are effective against bacteria, fungi, viruses, and protozoa (Çolak vd., 2009, s. 13). The plant has long been used as a traditional medicine to treat diseases such as rheumatoid arthritis, abscesses, convulsions, plague wounds, gout, and fever, and many therapeutic effects on human health have been identified (Dayısoylu, 2010, s. 6595). In Turkey, it is believed that the extract obtained by crushing the seeds of this plant cures earache, and that water boiled with the plant's leaves is effective against all types of cancer –in a way local people know that it is a totally superstition– (Şimşek, 2013, s. 67). It is also believed that the plant can help against bronchitis, asthma, shortness of breath, expectoration, intestinal laziness, urinary tract diseases, malaria, mumps, erysipelas, bladder problems, hemorrhoids, and boil type skin infections (Baytop, 2021).

On the other hand, there have been studies conducted in various parts of the world on the functional benefits of this plant. For instance, the leaves of this plant, used as food by local people in Jordan, are also used as a contraceptive in folkloric medicine (Nabeel vd., 2008, s. 383). In Iran, this plant is used as a widely-accessible source of natural bioactive compounds with antioxidant and antibacterial properties that can be used in place of synthetic antioxidants and antimicrobials in a variety of food products (Farahmandfar vd., 2019, s. 473). The roots of the *Arum maculatum* are commonly-used for therapeutic purposes such as diaphoresis, expectorants, and vermifuges around the world (Çolak vd., 2009, s. 13). It is also thought that *Arum maculatum*, which is known to reduce intestinal worms in traditional medicine, can be used in parasite control strategies (Atalay & Yıldız, 2020, s. 132). On the other hand, *Arum maculatum* is a plant with antioxidant activity (Pınar vd., 2012, s. 153). As the extract obtained from *Arum maculatum* leaves has significant antibacterial activity, it is believed that it could be used as an antimicrobial agent in new drug therapy (Çolak vd., 2009, s. 16). It has also been found to have high antimicrobial activity against test micro-organisms, moderate antioxidant activity, antimutagenic activity in some doses, and different biochemical content (Erbil vd., 2018, s. 8713). Table 1 depicts the nutritional and functional properties of the plant leaves, which is the subject of this review. It is a food item consumed by the public for its functional properties rather than its nutritional properties.

Table 1. Nutritional properties of the *Arum maculatum* L. leaves

Antioxidant (U/mg prt)	
Catalase (CAT)	19.7
Superoxide dismutase (SOD)	20.6
Dry Substance (%)	12.2
Protein (%)	2.85 23.32 (in dry substance)
Ash (%)	1.22 10.07 (in dry substance)
pH	6.35

Source: (Dayısoylu, K., 2017, s. 10)

A Dish Turned from a Poisonous Substance into an Alternative Medicine: Tirsik

Arum maculatum is a poisonous plant and should not be directly consumed by humans. It, on the other hand, appears to be a plant that is widely-sold in street markets in the Andirin district of Kahramanmaraş (Kocabaş & Gedik, 2016, s. 46). The reason for this is that it is the primary ingredient in Tirsik, the province's most famous culinary dish. Tirsik, an ethnic dish made from the leaves of it and locally called beetroot, is widely-consumed in this region (Şimşek, 2013, s. 67). Kahramanmaraş is a province located in the Mediterranean Region of Turkey. The region has an extremely rich flora, approximately 2,500 taxa, and many endemic species (20%). The main reasons for this richness are the Iranian-Turanian and Mediterranean plant geography regions located in the transition zone to the south of the Anatolian Cross, which is one of Turkey's remarkable floristic features, as well as their geomorphological features, microclimate, and habitat diversity (Demirci & Özhatay, 2012, s. 76). Andirin is the westernmost district of Kahramanmaraş (see Figure 2). With a population of just over 32,000, the district is one of the low-population districts of both the province and the country (TUIK, 2021).



Figure 2. Andirin's location (created on google maps by the author)

Tirsik, a dish unique to this region, is a registered dish with the Turkish Trademark and Patent Office and has a geographical indication. This ethnic dish, however, is not widely known, even within the country, and is seldom consumed outside of the region. As the dish, which is famous in the region, is believed to be beneficial for human health, the Tirsik dish made from *Arum maculatum* L. is called 'Andirin's doctor' among the people. However, sales

of this plant in street markets are steadily declining, because the use of this plant as a food source is not widely-known (especially by new generations) (Altay & Çelik, 2011). Because it is well-known among the general population that improper use results in poisoning, those who do not know how to use the plant avoid it (Altay vd., 2015, s. 86; Altay & Karahan, 2012, s. 26). Although it is not known exactly when and how the Tirsik dish, which is a part of the traditional culture of Andirin, emerged, it is thought to be as old as the history of Andirin. The tirsik dish appears frequently in old local poems and songs (Taşkaya, 2015, s. 600).

Festivals are also held for the Tirsik dish in Kahramanmaraş, Osmaniye and Andirin. However, even these festivals fall short of national recognition of the dish. The main reason for this is that the dish is made from an endemic and poisonous plant. Since the plant is not used as a food in other regions, this dish does not take enough attention. Another factor is its strong aroma, which is due to it being a fermented product. Local people try to consume this dish frequently during the winter months, since it is believed that it is supposedly good for health. As the Tirsik dish is considered healthy by locals, it is eaten seven times a year. This is because local people believe that if the dish is eaten seven times a year, they will not get sick that year. It is even believed in the region that eating the foam that forms on the top of the Tirsik dish while it is being cooked prevents cancer (Ceylan & Akar Şahingöz, 2019, s. 2214).

Tirsik is an exceedingly difficult dish to prepare. One of the reasons for this is that the Tirsik dish is prepared over approximately twenty-four hours. The second is that the beet must be collected from certain regions of Andirin, because beets grown outside certain areas cannot give the desired aroma to the dish. Due to the geographical characteristics of the place where the plant grows, the aroma of the dish varies. For this reason, the geographical area (terroir) of the plant that should be used in the dish are determined by the Turkish Patent and Trademark Office. Therefore, the plant exhibits distinct characteristics in each region. Tirsik is a dish made by fermenting *Arum maculatum* plant's leaves with water, (sour) yogurt, chickpeas, and cracked wheat. The structure and texture of the dish are similar to soup. The dish is often described as a kind of cold soup because it is eaten cold. However, it is widely regarded as a main course rather than a soup by the public. Andirin is in a very suitable location for Tirsik beet production due to its climate and landforms because it requires Mediterranean climate and humid places. As the plant grows between November and March, the dish is often consumed in the winter season. The fact that it is regarded as a source of healing by local people naturally adds to the dish's significance (Kocabas vd., 2017, s. 118). The dish that is cooked mainly in winter can be stored in jars using a canning method and consumed in all seasons of the year. In addition, the plant is stored in (deep) freezers so that local people can make Tirsik at different times of the year. General information about Tirsik can be seen in Table 2.

Table 2. Brief Information About Tirsik ¹

Geographical origin of Tirsik	Where Tirsik is generally consumed in Turkey	Main Ingredients of Tirsik	Price of <i>Arum Maculatum</i> L. plant (leaves)	Price of Tirsik in local markets
Andirin, Kahramanmaraş, Turkey	Kahramanmaraş, Osmaniye, Adana, Hatay	1 kg <i>Arum maculatum</i> L. plant (leaves) 4 liters of water 250 g yogurt 175 g flour 10 g cracked wheat 10 g chickpeas 1 teaspoon of salt	The plant leaves are collected and chopped by the local people in the region and sold in the market for an average of 1 USD dollar per kilo.	1 kg of Tirsik is sold for an average of 10 USD dollars. While it used to be sold only in public markets in the region, it is now also sold online.

¹ The table was created from the author's personal observations.

Tirsik is made with finely chopped *Arum maculatum* L. leaves, sour yogurt, chickpeas, split ends, water, and salt. After these ingredients are mixed, the surface of the mixture is covered with flour to cut off contact with air and provide an anaerobic environment. It is then fermented by keeping it at 27-30 °C for at least ten hours. The swelling level of the mixture indicates whether the fermentation has been successful. If it has swollen, it means that fermentation has taken place. This fermentation is a synergy fermentation in which lactic acid bacteria from the yogurt and fermentative yeasts from the flour work together. As a result of this fermentation, the mixture acquires a pleasant acidic and sour flavor, and some metabolites (lactic acid, and suchlike) are formed, which aid digestion. These metabolites have certain functional properties in terms of human health and nutrition. Aside from its beneficial fibrous structure, a number of vitamins and minerals in this beet's composition are extremely important for human metabolism and nutrition. The second main ingredient of this dish after beets is yogurt. Depending on the animal protein in the composition of yogurt, the biological value of this dish also increases. In the case of adding cracked wheat to the meal, because of this fermentation, the B group vitamin content increases, and the antinutritional factors decrease. All of these factors contribute to the dish's functionality (Dayısoylu, 2010, s. 6596).

It is critical to note that the yogurt used in the dish is sour. The predominance of a sour taste in the Tirsik dish made with sour yogurt is an important feature desired by people. There are different practices among people for the souring of the Tirsik dish. As people associate a sour taste with quarrelsomeness, the clothes of the most quarrelsome person in the family are put on the cooking vessel during the fermentation process. In addition, the dish is prepared by dedicating it to the quarrelsome person, orally. In local culture, leavening is defined as an improvement of the dish. To improve the dish, theatrical fights are also held in folk rituals during the preparation of the dish. It is also thought that the more violent the fight, the sourer the dish will be. In Turkish, the condition of not having good interpersonal relationships is defined by the word 'limoni' (lemon-like). As the word limoni derives from the word 'lemon', it is also associated with sourness. Thereby, the limoni (unsettling) atmosphere created while making Tirsik suggests that the dish will be sourer. For this reason, an unsettling atmosphere is created around the dish. Creating such an unsettling atmosphere requires the presence of several people. This demonstrates that Tirsik is a dish prepared in a ritual with a group of people (Uğureli, 2020). The flour on the fermented mixture is separated from the mixture and stirred continuously until it boils over a wood fire.

After boiling, the intensity of the fire is reduced, and the dish, which is mixed at ten-minute intervals, is cooked on a wood fire for approximately four hours. It is thought that as the plant is boiled for a long time in preparation of the dish, the toxic effect of the saponin in the leaves disappears, and its toxic feature disappears (Kizilarıslan & Özhataı, 2012; Şimşek, 2013, s. 67). The way to tell if a Tirsik dish is cooked is the fact that the dish should not 'tickle the tongue', as the saying goes. Therefore, the cooking process continues until the dish does not leave a tickling sensation in the mouth. The dish is then allowed to cool before being served with grated garlic. Tirsik is commonly eaten with bulgur pilaf and phyllo bread by locals. Tirsik is a dish that is shared with neighbors rather than a dish that is prepared for the family in the region (Yılmaz Akçaözođlu & Koday, 2019, s. 543–544). The dish is a symbol of communal sharing among local people. All preparation stages of the dish are shown in Figure 3.



Preparation process of tirsik: a) *Arum maculatum* L. leaves, b) Chopped leaves, c) Covered surface of the mixture with flour, d) Boiling over a wood fire, e) Tirsik after four hours cooked, f) Canned tirsik, g) Tirsik with bulgur pilaf and onion salad, and h) Eating ritual with neighbors

Figure 3. Preparation process of Tirsik

The nutritional facts of the dish are given in Table 3. The dish appears to be healthy food in terms of the nutrients it contains. Tirsik is average in calories. Also, it is low in fat being a kind of soup. Total carbs are 35.8 g and Fiber 6.9 g that makes it just 28.9 g net carbs for one portion of Tirsik (240 g). Furthermore, it contains cholesterol (3.4 mg), calcium (51.2 mg), potassium (421.3 mg), sodium (163.6 mg), iron (2.4 mg), vitamins A, B and C.

Table 3. Nutritional Facts of Tirsik dish per one portion (240 g)

Carbohydrate	35.8 g
Protein	10 g
Fat	7.2 g
Polyunsaturated Fatty Acid	2.7 g
Fiber	6.9 g
Energy	202.4 kcal

Source: (Saydam, 2017, ss. 42–43)

Conclusion

Arum maculatum L., a poisonous plant, becomes the Tirsik dish, which is an alternative medicine, in the hands of local people through fermentation and boiling. Toxic substances in the plant's content turn into substances that does not harm human health. Tirsik is not only a functional dish, but it is also an important dish that has shaped local people's identity. Although it is registered with a geographical indication and festivals are organized in its name, the dish is not well-known, even within the boundaries of the country. It is important to increase public awareness of dishes made with such functional foods. Furthermore, the preparation stages of such ethnic dishes must be documented so that they are not forgotten and can be passed down to future generations. The frequency of use of local foods in daily life is also crucial for the preservation of local culture. The use of local foods also contributes to

the cuisine's long-term viability. For this purpose, such local dishes should be included in the menus of food and beverage businesses.

As stated by different researchers in the literature (Ceylan & Akar Şahingöz, 2019, s. 2219; Kocabaş & Gedik, 2016, s. 48; Polat, 2020, s. 190; Uğureli, 2020, s. 198).:

- The scope of Tirsik festival should be expanded and the story and history of the dish should be emphasized in the events.
- Medical studies should be carried out on Tirsik and similar ethnic dishes. These studies will contribute to revealing Turkey's regional gastronomic richness in terms of health.
- Such local dishes included in the menus will contribute to the image of the destination. This image will affect individuals' travel motivations and decision-making.

REFERENCES

- Akdeniz Oktay, B., & Özbaş, Z. Y. (2020). The effects of fermented foods on human health. *The Journal of Food*, 45(6), 1215–1226. <https://doi.org/10.15237/gida.gd20105>
- Al-Qura'n, S. (2005). Ethnobotanical survey of folk toxic plants in southern part of Jordan. *Toxicon*, 46(2), 119–129. <https://doi.org/10.1016/j.toxicon.2005.04.010>
- Alencar, V. B. M., Alencar, N. M. N., Assreuy, A. M. S., Mota, M. L., Brito, G. A. C., Aragão, K. S., Bittencourt, F. S., Pinto, V. P. T., Debray, H., Ribeiro, R. A., & Cavada, B. S. (2005). Pro-inflammatory effect of arum maculatum lectin and role of resident cells. İçinde *The International Journal of Biochemistry and Cell Biology* (C. 37, Sayı 9, ss. 1805–1814). <https://doi.org/10.1016/j.biocel.2005.02.027>
- Altay, V., & Çelik, O. (2011). Investigation of some natural plants at the neighborhood markets of Antakya in terms of Ethnobotanic. *BİBAD*, 4(2), 137–139.
- Altay, V., & Karahan, F. (2012). An ethnobotanical study about plants in Tayfur Ata Sokmen Campus (Antakya-Hatay) and its environs. *The Black Sea Journal of Sciences*, 2(7), 13–28. <http://kfbd.giresun.edu.tr>
- Altay, V., Karahan, F., Sarcan, Y. B., & İlçim, A. (2015). An ethnobotanical research on wild plants sold in Kırıkhan district Hatay/Turkey herbalists and local markets. *Biological Diversity and Conservation*, 8(2), 81–91.
- Atalay, T., & Yıldız, K. (2020). Arum maculatum (cuckoo-pint) and its antiparasitic characteristics. *Bulletin of Veterinary Pharmacology and Toxicology Association*, 11(3), 126–133. <https://doi.org/10.38137/vetfarmatoksbulen.753991>
- Baytop, T. (2021). *Türkiye'e bitkiler ile tedavi*. Nobel Medical Publishing.
- Ceylan, F., & Akar Şahingöz, S. (2019). Edible herbs habitual consumption: Düziçi example. *Journal of Tourism and Gastronomy Studies*, 7(3), 2204–2225. <https://doi.org/10.21325/jotags.2019.468>
- Çolak, F., Savaroğlu, F., & İlhan, S. (2009). Antibacterial and antifungal activities of arum maculatum L. Leaves extracts. *Journal of Applied Biological Sciences*, 3(3), 13–16.

- Dayısoylu, K., S. (2017). Andırın'da fonksiyonel bir besin TİRŞİK. *tirşik*, 96.
- Dayısoylu, K. S. (2010). Changes of antioxidant activity in different forms and meal of arum maculatum in Kahramanmaraş province from Turkey. *Asian Journal of Chemistry*, 22(8), 6595–6599.
- Demirci, S., & Özhatay, N. (2012). An ethnobotanical study in Kahramanmaraş (Turkey); Wild plants used for medicinal purpose in Andırın, Kahramanmaraş. *Turkish Journal of Pharmaceutical Sciences*, 9(1), 75–92.
- Erbil, N., Arslan, M., & Murathan, Z. T. (2018). Antioxidant, antimicrobial, and antimutagenic effects and biochemical contents of arum maculatum L. That is a medical plant from Turkish flora. *Fresenius Environmental Bulletin*, 27(12/A), 8709–8714.
- Espíndola, A., Buerki, S., Bedalov, M., Küpfer, P., & Alvarez, N. (2010). New insights into the phylogenetics and biogeography of Arum (Araceae): Unravelling its evolutionary history. *Botanical Journal of the Linnean Society*, 163, 14–32. <https://doi.org/10.1111/j.1095-8339.2010.01049.x>
- Farahmandfar, R., Esmailzadeh Kenari, R., Asnaashari, M., Shahrapour, D., & Bakhshandeh, T. (2019). Bioactive compounds, antioxidant and antimicrobial activities of arum maculatum leaves extracts as affected by various solvents and extraction methods. *Food Science and Nutrition*, 7(2), 465–475. <https://doi.org/10.1002/fsn3.815>
- Hudson, J. B., Lee, M. K., Sener, B., & Erdemoglu, N. (2000). Antiviral activities in extracts of Turkish medicinal plants. *Pharmaceutical Biology*, 38(3), 171–175. [https://doi.org/10.1076/1388-0209\(200007\)3831-SFT171](https://doi.org/10.1076/1388-0209(200007)3831-SFT171)
- Kabak, B., & Dobson, A. D. W. (2011). An introduction to the traditional fermented foods and beverages of Turkey. *Critical Reviews in Food Science and Nutrition* ISSN:, 51(3), 248–260. <https://doi.org/10.1080/10408390903569640>
- Kandemir, N. (2008). Morphological and anatomical investigations on some species of Genus Arum L. (Araceae) distributed in the vicinity of Ordu. *Research Journal of Biology Sciences*, 1(2), 37–43.
- Karaçıl, M. Ş., & Acar Tek, N. (2013). Fermented products produced in the world: Historical process and relationships with health. *Journal of Agricultural Faculty of Uludag University*, 27(2), 163–173.
- Kızıllarslan, Ç., & Özhatay, N. (2012). An ethnobotanical study of the useful and edible plants of İzmit. *Marmara Pharmaceutical Journal*, 16(3), 194–200. <https://doi.org/10.12991/201216398>
- Kızıllarslan, Ç. (2008). *An ethnobotanical survey in the south part of İzmit Gulf*. İstanbul University.
- Kocabaş, Y. Z. (2020). Toxics plants in flora of Turkoglu district (Kahramanmaraş). *Turkish Journal Of Science and Health*, 1(1), 42–51.
- Kocabas, Y. Z., Erol, A., & Aktolun, O. (2017). Medicinal plants of flora of KSU Avsar Campus (Kahramanmaraş) and surrounding areas. *Aksaray University Journal of Science and Engineering*, 1(2), 110–120. <https://doi.org/10.29002/asujse.306972>
- Kocabaş, Y. Z., & Gedik, O. (2016). An Ethnobotanical Study of wild plants sold in district bazaar in Kahramanmaraş. *Iğdır University Journal of the Institute of Science and Technology*, 6(4), 41–50. <https://doi.org/10.21597/jist.2016624154>
- Kültür, Ş. (2007). Medicinal plants used in Kırklareli Province (Turkey). *Journal of Ethnopharmacology*, 111(2), 1545

341–364. <https://doi.org/10.1016/j.jep.2006.11.035>

- Nabeel, M., Abderrahman, S., & Papini, A. (2008). Cytogenetic effect of arum maculatum extract on the bone marrow cells of mice. *Caryologia*, 61(4), 383–387. <https://doi.org/10.1080/00087114.2008.10589650>
- Pınar, F., Çavlan, L., Samancı, Ö., Dursun, İ., Tepebaş, K., Vural, N., Biçil, M., & Akdeniz, F. (2012). Tırşik otundan (arum dioskoridis Sm) elde edilen ekstraktların fenolik medde içeriğinin ve antioksidan aktivitelerinin tayini. VI. *Ulusal Analitik Kimya Kongresi*, 195. <http://www.kimyakongreleri.org/6UAAK/6UAAK-0195.pdf>
- Polat, M. (2020). Yöresel yemek imajının destinasyon tercihinin etkisi: Kahramanmaraş örneği. *Doğu Coğrafya Dergisi*, 25(43), 183–194. <https://doi.org/10.17295/ataunidcd.712430>
- Quattrocchi, U. (2012). *CRC World Dictionary of Medicinal and Poisonous Plants - Common Names, Scientific Names, Eponyms, Synonyms, and Etymology*. CRC Press.
- Saydam, İ. B. (2017). Bölgemizde tıbbi aromatik bitkiler ve narenciye. *DOĞAKA Bülten*, 62.
- Şimşek, M. (2013). Arum dioscoridis ekstrelerinin çeşitli patojen mikroorganizmalara karşı antimikrobiyal etkisi. *Turkish Journal of Clinics and Laboratory*, 4(1), 66–70.
- Şimşek Yurt, N., Türe, E., & Çubukçu, M. (2019). Nivic grass poisoning: Arum maculatum - a case report. *Ankara Medical Journal*, 19(4), 796–799. <https://doi.org/10.17098/amj.652024>
- Sowter, F. A. (1949). Arum maculatum L. *Journal of Ecology*, 37(1), 207–219.
- Taşkaya, S. M. (2015). Kadirli in the poems of Asik (Ashik) Feymani. *Route Educational and Social Science Journal*, 2(2), 592–605.
- TUIK. (2021). *Population by province*. Retrieved from: <https://data.tuik.gov.tr/Kategori/GetKategori?p=Nufus-ve-Demografi-109>
- Uçan Türkmen, F., Mercimek Takcı, H. A., Sarıgüllü Önalın, F. E., & Sağlam, H. (2019). Antioxidant and antibacterial activities with total phenolic and flavonoid contents of Arum dioscoridis extracts. *Harran University Journal of Engineering*, 4(1), 102–108.
- Uğureli, A. (2020). Tırşik at up Çukurova's folklore. *Uluslararası Türkçe Edebiyat Kültür Eğitim Dergisi (TEKE)*, 9(1), 180–204. <https://doi.org/10.7884/teke.4653>
- Yılmaz Akçaözoğlu, E., & Koday, S. (2019). Culinary culture of Osmaniye province from cultural geography. *Ataturk University Journal of Graduate School of Social Sciences*, 23(2), 537–552.
- Yılmaz, G., & Akman, S. (2018). Edremit gulf regional cuisine in sustainable within the framework of gastronomy. *Journal of Tourism and Gastronomy Studies*, 6(4), 852–872. <https://doi.org/10.21325/jotags.2018.337>