ORIGINAL ARTICLE

Ethnopharmacological Survey of Plants Used as Folk Remedy in Gerze (Sinop, Türkiye)

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ABSTRACT

Objectives: Folk medicines used in the Gerze district of Sinop have not been previously studied in detail. This study aimed to record and compile the folk medicines used in Gerze (Sinop, Türkiye).

Materials and Methods: In this ethnobotanical inventory study, scientific trips were organized to 18 villages in the Gerze district between May and August in 2009, and folk medicine information was obtained using open and semi-structured questionnaires. The obtained data were analysed by calculating use value", informant consensus factor, and relative frequency of citation.

Results: As a result, 63 plant species from 41 families were determined to be used as folk medicine. Plants from the *Rosaceae* and *Asteraceae* families are preferred in preparing folk medicines. *Sempervivum brevipilum* Muirhead and *Serapias vomeracea* (Burm.f.) Briq. were recorded for the first time as folk medicine in this research. In Gerze, folk medicines were mostly used in the respiratory tract (86 citations), and dermatological system diseases (86 citations). However, when informant consensus factor values are considered, dermatological system disorders are ranked first (0.7529) and, followed by musculoskeletal (0.7049), respiratory (0.6941), and cardiovascular system disorders (0.5882). The most cited plants were *Olea europaea* L. (27 citations) and *Sambucus ebulus* L. (23 citations). The highest use value was calculated for *O. europaea* subsp. *europaea* (0.293), and *S. ebulus* (0.260). At the same time, *S. ebulus* took first place with an relative frequency of citation value of 0.239, *O. europaea* subsp. *europaea* (0.184) fell in second place.

Conclusion: The use of 63 different plant species in folk medicine in Gerze has been recorded to eliminate a deficiency in the Turkish folk medicine inventory and be a source for future scientific studies. However, as in other regions of Türkiye, it has emerged that the folk medicine knowledge was being lost in Gerze District, and that ethnobotanical inventory studies should be carried out rapidly throughout the country.

Keywords: Ethnobotany, folk medicine, Gerze, medicinal plant, Sinop

INTRODUCTION

Archaeological findings show that plants have been used for different purposes besides nutrition (e.g., tool making, religious ceremonies) since Neanderthals.[1] Although this situation is not different today, the tendency to use plants, under the influence of ideas such as adopting a natural lifestyle and avoiding the side effects of synthetic drugs, is increasing, especially in the field of medicine. In this context, ethnobotanical knowledge/folk medicines, considered effective and reliable since they have been used for many years, are very valuable resources for new drug discovery. Compounds artemisinin, digoxin, and aspirin are some examples of drugs developed from ethnobotanical records and available on the market today.[2] It is thought that the number of such examples will gradually increase as a

result of phytochemical and bioactivity studies on plants with ethnobotanical uses.

Anatolia is a center of attraction for ethnobotanical studies due to its cultural richness provided by being one of the important settlement centers since ancient times, rich flora due to geographical diversity, and being under the influence of three phytogeographical regions.[3] Ethnobotanical studies started in Türkiye in the mid-1980s and continue with acceleration today. One thousand two hundred eighty plants, about 11% of Turkish flora, were identified as being used in folk medicine, but it is estimated that this number has increased more with new studies.[4] In addition, considering that about 7% of plants are used as traditional medicine worldwide, the rate in Türkiye is quite high.[5] However, this valuable cultural heritage is being lost day by daydue to modernization, migration to big cities, easier access to health institutions and medicines, loss of knowledgeable people about folk medicine, difficulty in accessing plants used as folk medicine with urbanization, and young people's indifference to the subject.[6] Therefore, quickly recording this valuable heritage before it is completely lost is extremely important.[7]

When the folk medicinal studies conducted in Türkiye were examined, it was seen that no studies had yet been carried out on some regions. To the best of our knowledge, no comprehensive folk medicinal research has been conducted in the Gerze district of Sinop. In a study investigating the ethnobotanical characteristics of the central and western Black Sea regions of Türkiye using a sampling method, five localities from the city center, Dikmen, Boyabat, and Durağan districts of Sinop were visited. In this research, 25 plant species belonging to 24 genera from 21 families and two animal species were determined to be used as folk medicine.[8] However, Gerze was not visited in this study. Indeed, the data obtained from 5 localities only are sufficient to understand the folk medicinal richness of the region. Therefore, this study aimed to record the folk medicines used in the region by conducting comprehensive research in the Gerze district of Sinop. In addition, the study aimed to find new folk medicines or different usages of previously identified folk medicines by comparing the results with the data obtained from previous studies in different regions of Türkiye. In addition, to increase the reliability of the results, and the data obtained was analysed using various statistical methods.

MATERIALS AND METHODS

Study area

Gerze, the district of Sinop, has been chosen as a settlement and shelter by societies since ancient times. It was founded as a small village by the Kaskians in 1400 B.C.. It came under the domination of the Hittites, Phrygians, Persians, Alexander the Great, Romans, Byzantines, Seljuks, and Ottoman Empire. Gerze, which was made a township of Sinop City in 1896, became a district in 1920 in the Republic of Türkiye.[9]

The Gerze district is located in A5 square (41° 48′ 6″ N, 35° 11′ 48″ E) according to Davis' grid system[10] and is surrounded by the Black Sea in the north; Boyabat district

in the south; Dikmen district in the east and Sinop center in the west (Figure 1). The district is 39 km from the city centre, encompassing a total area of 594 km², and its altitude is 50 m.

Elma, Köse, Dede, and Hasan Mountains are significant elevations of the region. The main streams of the district are Sarımsak, Çakıroğlu, and Sarıyer Streams.[11] lthough it is not possible to define the climate of the region with precise boundaries, it can be said that in addition to the oceanic climate, which constitutes the main climate type of the Black Sea region, the region is also under the influence of the Mediterranean climate, which has become more dominant occasionally in some areas.[12]

The district has a rich forest structure due to the abundant precipitation characteristic of the Black Sea climate. Trees such as pine, beech, oak, fir, hornbeam, and ash that extend from the coast to the mountains form this rich forest texture. Various orchards and olive groves in the valleys constitute a separate aspect of the vegetation.[9] In the few floristic studies conducted in the region, plants from three phytogeographic regions (Euro-Siberian, Mediterranean, and Irano-Turanian) were recorded, and Asteraceae, Fabaceae, and Poaceae were found to be the most common families.[12]

Agriculture, textiles, aquaculture, and tourism are the important sources of income in the district. It supplies approximately 11.8% of Sinop's agricultural area with 109,370 decare. In the district, legumes, grains, tobacco, vegetables such as tomato, cucumber, zucchini, leek, and fruits such as figs, mulberries, and cherries are widely cultivated in the region.[11]
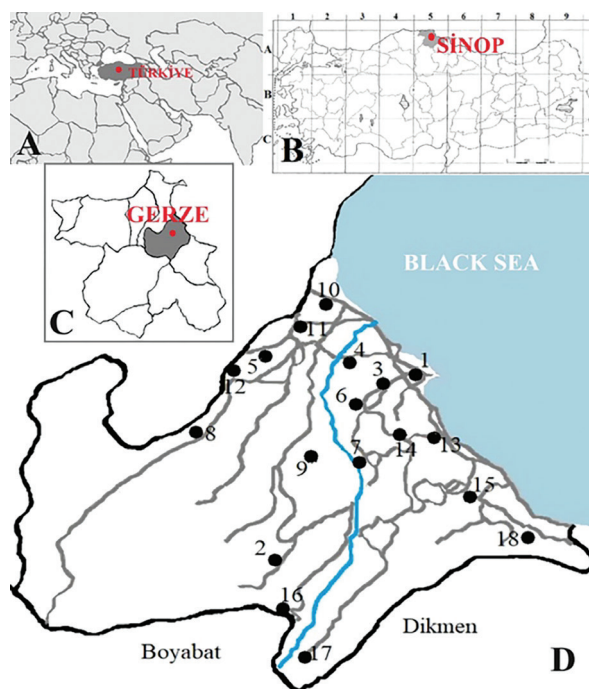

Figure 1. A) Türkiye's position in the world; B) the position of Sinop in Davis's grid system;[10] C) position of Gerze in Sinop; D) map of Gerze and visited locations (1) Gerze Centre; (2) Kiren Çukuru; (3) Abdaloğlu; (4) Belören; (5) Karlı; (6) Acısu, (7) Sazak; (8) Kuzsökü; (9) Dere (Gürsökü); (10) Yaykıl; (11) Çırnık; (12) Kabanlar; (13) Hızarçayı; (14) Çakallı; (15) Çeçe (Yenikent); (16) Tatlıcak; (17) Tilkilik (Çağlayan); (18) Hacıselli

Selection of visited locations

Instead of visiting all the villages in the region, it was preferred to collect information from 18 villages situated in various locales to reveal the general situation. Criteria such as distance to city centers, accessibility to health services, population, altitude, and transportation facilities were taken into account in the selection of fieldwork regions. The visits to the selected villages were organized between May and August in 2009. The locations visited and folk medicine information obtained are given in Figure 1.

Interviews, botanical investigations,

Folk medicinal information was collected through face-to-face interviews using the methodology described by Sezik et al.[6] and the modified open and semi-structured questionnaire of Thring and Weitz.[13,14] During these face-to-face interviews, direct questions were avoided as much as possible to prevent influencing the participants. Since folk remedies are based on ancestral knowledge, only well-established information was taken into account, and information suspected to be contaminated from sources such as television, the internet, and books was excluded.[15,16]

Information about the local name, used parts, usage, and detailed preparation methods of folk remedies was recorded using the questionnaire during the interviews. After the interviews, the plants used as folk medicine were recognized and collected in situ under the guidance of informants.[16] Collected plant specimens were identified by Prof. Dr. Ekrem SEZİK consulting Flora of Türkiye and the East Aegean Islands[10,17-19] and by comparison with previously registered herbarium specimens. After identification, prepared herbarium specimens were deposited in GUE (Gazi University Faculty of Pharmacy Herbarium). The taxonomical hierarchy of identified plants was updated according to World Flora Online.[20]

Statistical analysis

To assess the reliability of results, folk medicinal data were analyzed through three quantitative indices: informant consensus factor (FIC), use value (UV), and relative frequency of citation (RFC). FIC indicated the consistency of knowledge on the usage of folk medicines among the informants for a specific illness. Folk medicines were evaluated under 12 illness categories based on their usage (Table 1), and FIC was calculated for each category by using the following formula:

$$FIC = (Ŋur - Ŋt) / (Ŋur - 1).$$

$Ŋur$ is the number of citations used in each illness category, and $Ŋt$ stands for the number of taxa used to treat disorders in this illness category. The FIC value will be close to 1 if there is agreement among informants about the use of folk medicine in specific situations, while low values (close to 0) indicate disagreement about taxa, or the selection was random.[21-24]

The other quantitative parameter for data evaluation was UV, which revealed the relative cultural importance of the uses of each folk medicine. This index, suggested by Prance et al.[25] was calculated as follows:

$$UV = \Sigma \, U/n$$

U refers to the number of citations recorded for a specific plant species, while n is the total number of informants involved in the study. If folk medicine is important for a community, it will be highly cited; therefore, its UV index will be high (close to 1). Contrarily, UV will be near 0 when there are few citations.[24,26]

Similarly, the RFC was calculated using the following formula to assess the local importance of folk medicines:

$$RFC = FC/N$$

FC is the number of informants who reported a specific folk medicine, and N is the total number of informants who took part in the survey.[27] Similar to the UV index, obtaining result values close to 1 indicates the importance of folk medicine in the studied area.

Table 1. Distribution of herbal folk medicines with respect to pharmacological categories and FIC values					
Pharmacological categories	Species	All species (%)	Use citation	All use citation (%)	FIC value
Dermatological system disorders	22	34.92	86	20.77	0.7529
Musculoskeletal system disorders	19	30.15	62	14.97	0.7049
Respiratory system disorders	27	42.85	86	20.77	0.6941
Cardiovascular disorders	8	12.69	18	4.34	0.5882
Metabolic disorders	14	22.22	31	7.48	0.5666
Gastrointestinal system disorders	29	46.03	59	14.25	0.5172
Central nervous system disorders	9	14.28	17	4.10	0.5000
Genitourinary system disorders	16	25.39	28	6.76	0.4444
Eye-ear disorders	5	7.93	7	1.69	0.3333
Immunity disorders	8	12.69	11	2.65	0.3000
Mouth and tooth disorders	1	1.58	1	0.24	0
Others	4	6.34	4	0.97	0

FIC: Informant Consensus Factor

RESULTS

During the field survey carried out in 18 different villages, 92 people [31 women (33.7%); 61 men (66.3%)] who have knowledge about folk medicine were interviewed, and an inventory of folk medicine of the region was attempted to be prepared. Demographic statistics of the informants are given in Table 2. As can be seen in Table 2, the average age of informants is 59.4, and about 80% of them are older than 46 years. Younger than 25-year-olds made up a relatively small portion of informants (3.3%). Nearly half of the informants (48.9%) were primary school graduates, 3% were unschooled, and 13% were only literate. More than half of the informants were farmers, and almost half of the female informants were housewives. Most informants were native-born (93.5%) and had lived in Gerze since birth (81.5%). When asked about their ethnic origins during the interviews, all informants except for two (one was Georgian, and one of them was Circassian) declared that they were of Turkish origin.

As a result of these interviews, 63 plant species from 41 families have been determined to be used as folk medicine in the Gerze district. All the plants used as folk medicine in the region are presented in Supplementary Table 1 in alphabetical order. In this table, their local names, phytogeographical regions to which the plants belong, threat categories, parts used as folk medicine, purposes of use, preparation methods, locations where they were detected, citations, statistical results (UV, RFC), and previously identified uses are included.

The distribution of plants according to phytogeographical regions is as follows: 13 Euro-Siberian (21%) species, 9 Mediterranean (14%) species, and 3 Irano-Turanian (5%) species. Of the recorded folk medicines, 14 (22%) plants were cultivated, and two plants are exotic. The remaining 26 species (41%) were cosmopolitan and multi-regional. In Figure 2, the distribution according to families of plants used as folk medicine in the region is shown. As can be seen in this graphic, the Rosaceae family is the most preferred family in the preparation of folk remedies, with 7 species. Asteraceae (4 species), Malvaceae (3 species), and Solanaceae (3 species) are the other widely cited families in Gerze. As mentioned before, in floristic studies, Asteraceae has been determined as the family that represents the highest number of species in the region, as in all of Türkiye.[12,28,29] Therefore, it is not surprising that Asteraceae and Rosaceae, which are widespread and large families, appear as two of the most used families in the preparation of folk medicine. Similarly, in the previous folk medicine research in the Black Sea region, where Gerze (Sinop) is also located, Asteraceae and Rosaceae were the most frequently referred families.[15,30-32]

| Table 2. Demographic data of the informants					
Characteristic (n=92)	Count	%	Characteristic (n=92)	Count	%
Gender			Marital status		
Female	31	33.7	Single	5	5.4
Male	61	66.3	Married	87	94.6
Age			Employment		
≤25	3	3.3	Self-employed	5	5.4
26-35	9	9.8	Worker/public servant	20	21.8
36-45	7	7.6	Housewife	15	16.3
46-55	14	15.2	Farmer	47	51.1
56-65	29	31.5	Retired	5	5.4
66-75	15	16.3	Ethnicity		
76-85	11	12.0	Turkish	90	97.8
>85	4	4.3	Circassian	1	1.1
Education			Georgian	1	1.1
Illiterate	3	3.3	Duration of residence		
Literate	12	13.1	Less than 10 years	4	4.4
Primary school	45	48.9	More than 10 years	13	14.1
Middle school	13	14.1	Since birth	75	81.5
High school	11	11.9	Birthplace		
College	8	8.7	Native-born	86	93.5
			Incomer	6	6.5
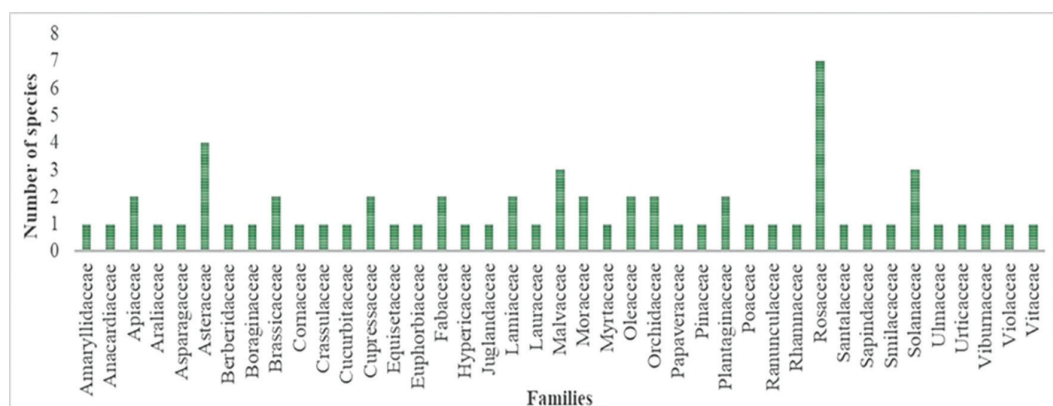
Figure 2. Distribution of folk medicines according to families

In Gerze, the most cited plant species was *Olea europaea* L. subsp. *europaea* (27 citations), followed by *Sambucus ebulus* L. (23 citations), *Brassica oleracea* L. (21 citations), *Urtica dioica* L. (20 citations), *Pinus nigra* J.F. Arnold subsp. *nigra* (18 citations) and *Nicotiana tabacum* L. (18 citations). The same order is observed when considering the UV values: the highest UV value was calculated for *O. europaea* subsp. *europaea* (0.293), while *S. ebulus*, *B. oleracea*, *U. dioica*, *P. nigra* subsp. *nigra*, and *N. tabacum* had subsequent UV values of 0.260, 0.228, 0.217, 0.195, and 0.195, respectively. Although not very common, there are olive groves in Sinop. Olive is an important product currently produced in large quantities in Türkiye, and its oil and fruit are widely consumed. The olive tree and the products obtained from it also have historical and mythological importance. Therefore, coming across olives as the most cited folk medicine is not surprising. *B. oleracea* and *N. tabacum* are widely cultivated in the Black Sea region. *P. nigra* and *U. dioica* are the plants that grow in forest areas and almost every garden in the study area, as well as in many regions of Türkiye. It is expected that these easily accessible plants are frequently used as folk remedies. However, this order slightly varies when considering the RFC values. At the same time, *S. ebulus* took first place with an RFC value of 0.239, *O. europaea* subsp. *europaea* (0.184) fell in second place. *N. tabacum* and *U. dioica*, with RFC values of 0.173 and 0.163, respectively, ranked third and fourth.

In Gerze, folk medicines are generally used after being subjected to processes like boiling, infusion preparation, decoction, and poultice; only 26% are used directly. Those for internal use are primarily used in tea formulations, primarily in the form of decoction and infusion (40%). For external usages, different preparation techniques, such as withering and making poultices, are used. The rate of internally used folk medicines is slightly higher (55%) than that of externally used folk medicines (Figure 3). Leaves (44%) and fruits (21%) were the most preferred plant parts in the preparation of folk remedies; they are followed by aerial parts (11%) and flowers (7%). Plant parts such as essential oil and tubers were also used, albeit in small amounts (Figure 4).

As mentioned before, folk medicines are evaluated under 12 illness categories according to the diseases for which they are used, as shown in Table 1. As this table shows, in our study area, folk medicines are mostly used in for respiratory diseases, with 27 species cited 86 times, and dermatological diseases, with 22 species cited 86 times. Musculoskeletal (19 species, 62 citations) and gastrointestinal system diseases (29 species, 59 citations) are the other categories in which folk remedies are most frequently used. However, when FIC values are considered, dermatological system disorders are ranked first (FIC: 0.7529) and, followed by musculoskeletal (FIC: 0.7049), respiratory (FIC: 0.6941), and cardiovascular system disorders (FIC: 0.5882). The difference between sorting by FIC and citation was thought to be due to disagreements and the utilization of the same plant for diverse purposes.

Threat categories of plants were determined according to the Red Data Book of Turkish Plants and the International Union for Conservation of Nature. One of the plants used as folk medicine in the region, *Sempervivum brevipilum* Muirhead (Figure 5), is endemic, and its IUCN category is Least Concern (LC). *Platycladus orientalis* (L.) Franco is categorized as near threatened, while the 28 folk medicines identified in the research area are categorized as LC.[33]
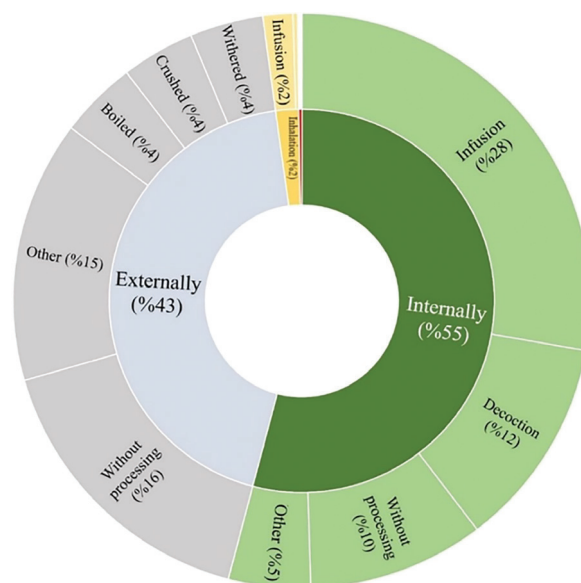

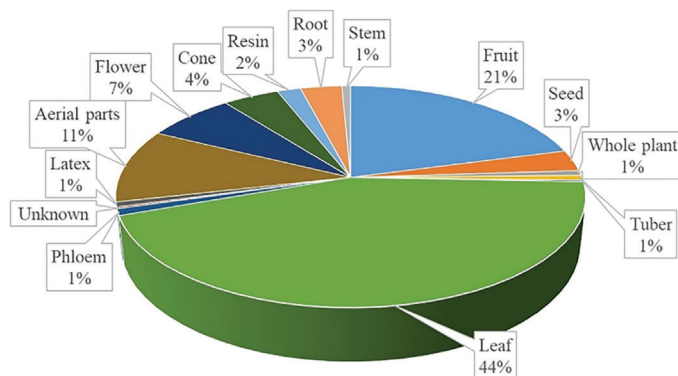**Figure 3.** Application and preparation methods of folk medicines

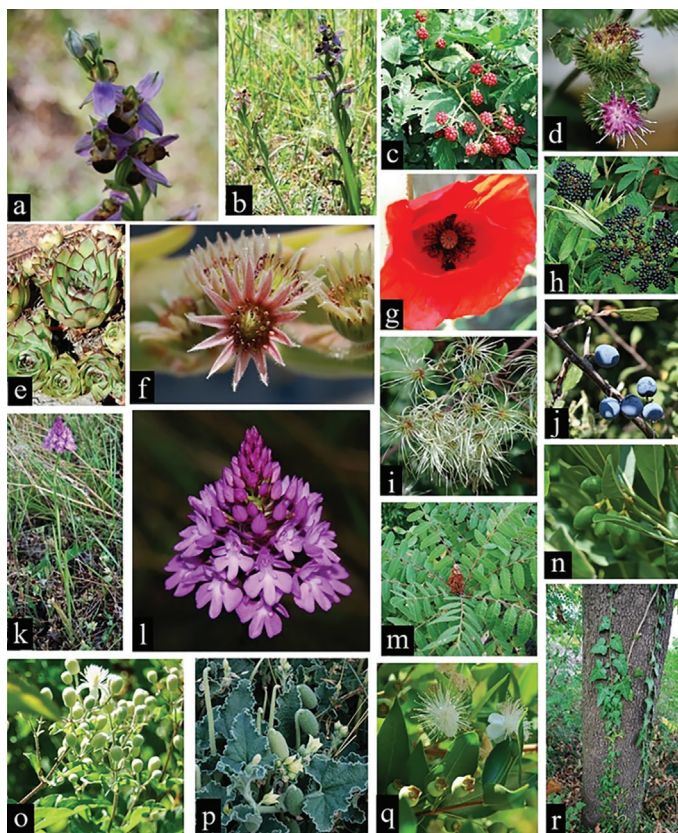**Figure 4.** Distribution of plants according to the parts used as folk medicine

Figure 5. Examples of some interesting folk medicines

a, b: Serapias vomeracea; c: Rubus sanctus; d: Arctium minus; e, f: Sempervivum brevipilum; g: Papaver rhoeas; h: Sambucus ebulus; i: Clematis vitalba; j: Berberis crataegina, k, l: Anacamptis pyramidalis; m: Rhus coriaria; n: Laurus nobilis; o: Smilax excelsa; p: Ecballium elaterium; q: Myrtus communis subsp. communis; r: Hedera helix

DISCUSSION

The results of this investigation are expected to essentially contribute to the ethnobotanical inventory of Türkiye. To the best of our knowledge, *S. brevipilum* and *Serapias vomeracea* (Burm.f.) Briq. were recorded as folk medicine for the first time with this research. In addition, 33 new usages for 25 species previously reported as folk medicine have been identified. In the Supplementary Table 1, the new usage records identified in this study regarding the previously identified folk remedies are underlined. For instance, this study is the first to document the traditional use of *Anacamptis pyramidalis* (L.) Rich as an antitussive remedy in folk medicine. Similarly, *Datura stramonium* L. and *F. carica* have been documented here for their ethnobotanical use in the treatment of jaundice. Notably, the use of *Xanthium spinosum* L. for managing malaria is also recorded for the first time in this research. These findings suggest that future investigations could focus on evaluating the antimalarial activity of *X. spinosum* and isolating the bioactive compounds responsible for its effects. Additionally, the traditional use of *Rubus sanctus* Schreb. in the treatment of gonorrhea represents a novel finding. Microbiological and clinical studies may facilitate the identification of potential therapeutic compounds from this species, contributing to the development of alternative treatments for gonorrhea, a disease that continues to impact a significant global population.

No previous ethnobotanical study has been conducted in the Gerze district. However, it appears that a study covering the central and western Black Sea regions of Türkiye, including 5 localities from Sinop's districts other than Gerze, was conducted. In this research, 25 plant species belonging to 24 genera from 21 families were identified as being used as folk medicine in Sinop historically. When the findings of this study were compared with our results, it was observed that there are many similarities to folk remedies in the neighboring districts of Gerze, such as Boyabat and Dikmen. For instance, *Cornus mas* L.; used against diarrhoea, *Juniperus oxycedrus* L.; is used against haemorrhoid, *Cydonia oblonga* Mill.; used against cough, *Tilia rubra* (Weston) DC.; is used against common cold and cough, and *U. dioica*; used to reduce blood sugar levels, are used for the same conditions in both districts.[8] The similarities in the local names given to the same species were also noted: *S. ebulus* (yüyün, yetün, yiğtün), *Arctium minus* (Hill) Bernh. (kabalak, kabalayık), *Euphorbia stricta* L. (sütliğen), and *Plantago major* L. (siğil yaprağı, siyil yaprağı) were found to have the same or very similar local names in the present study, and Fujita et al.[8] research conducted in different districts of Sinop. In addition, similarities were observed with folk medicines in different cities of Türkiye as well as in neighboring, nearby districts. For example, *C. mas* is utilized for diarrhea in different parts of Türkiye (e.g., Düzce, Manisa, Erzurum), including Gerze.[16,34-36] *Ecballium elaterium* (L.) A. Rich. is used in the treatment of sinusitis in Gerze, as in many regions of Türkiye.[16,34-41] Latex of *F. carica* is used to remove warts in Düzce, Gaziantep, and Denizli, just as it is in Gerze.[16,40]

Likewise, *S. ebulus* leaf is used against pain in Düzce, Kocaeli, Sakarya, Zonguldak, Hatay, Kahraman Maraş, as in Gerze.[16,42,43] As in many regions of Türkiye, the use of *Plantago* species for wound healing and maturation of abscess and the use of *Urtica* species in joint diseases, such as rheumatism, is common in Gerze as well.[16,31,34-36,40] Furthermore, *C. oblonga*, *Laurus nobilis* L., *Mespilus germanica* L., *Morus alba* L., *N. tabacum*, *P. nigra* subsp. *nigra*, *Smilax excelsa* L., and *Sorbus domestica* L. were used in different provinces in a similar manner to determine in

our study area.[16,31,34-36,38] Because of the similar flora and ease of information exchange, encountering similarities in neighboring or close regions is expected. The reasons for identifying the same folk remedies in remote areas are considered to include internal migration and information reaching remote areas due to improvements in communication facilities. In addition, obtaining similar folk medicinal usages for a plant in different regions supports the accuracy of the information obtained.

Different species of one genus have also been observed to be used for similar purposes in Gerze and other parts of Türkiye. One example of this situation is the *Malva* species. In Düzce and Erzurum, *Malva neglecta* Wallr. and *Malva nicaeensis* All. are used against stomach ailments like stomach ache, gastric ulcers,[16,34] similarly, *Malva sylvestris* L. is also used for stomach ache in Gerze. Another example is *Equisetum* species; *Equisetum hyemale* L. is used against stomach disorders in Gerze, another *Equisetum* species, *Equisetum ramosissimum* Desf. is also determined to be used for stomach aches in Manisa.[35] *Euphorbia coniosperma* Boiss. & Buhse is used in the treatment of warts, similar to the documented uses of *E. stricta* in Gerze.[37] The reason for this may be that local people consider different species of the same genus as the same plant, which are morphologically similar and can only be differentiated by expert botanists, leading to their use for the same purposes. In other words, local people may have learned the folk remedies used in different regions, prepared them with similar plants grown in their own region and tried them. Consequently, they may have continued to use that folk medicine after seeing a beneficial effect. It can be argued that immigrants use other plants similar to those grown in the places they come from, and these new folk medicines may have been included in the folk medicine knowledge of that region over time.

In contrast to these similarities, the same plant species is used for quite different purposes when compared to nearby regions. For example, *Vicia faba* L. is used for memory impairment and for reducing symptoms of dementia in Gerze, but in Fujita et al.[8] research, it is used for the maturation of abscesses in Dikmen (Sinop), one of the neighboring districts. *Berberis crataegina* DC., used against anal fistula in Boyabat (Sinop), is also used in eye diseases in Gerze. Another example of this situation is *A. minus*. It is used for sunstroke in the Durağan and Boyabat districts of Sinop, while in Gerze, it is used for knee and abdominal pain.[8] During the search for treatments for diseases observed in themselves or their relatives, people may have tried medicines prepared from easily accessible plants, and thus, quite different uses for the same plant may have been derived.

In accordance with the definition of folk medicine, the folk remedies used in Gerze are usually mono-component and prepared by simple methods such as infusion and decoction. However, there are also folk medicines in which multi-component, more complex preparation techniques are applied. For example, in the treatment of hernia, *Ficus carica* L. fruits are mixed with fava beans and lemon juice, and this mixture is cooked to obtain a poultice, which is then applied. Another example of this situation is the use of *P. nigra* subsp. *nigra*

resin for treating wounds and abscesses. An ointment used for wound healing is obtained by mixing its resin with soap and heating. Likewise, its resin and soap are placed in hollowed onion, heated and used against abscesses.

In many regions of Türkiye, plants that are considered useful for many diseases have been evaluated as a "panacea" among the people. *Anthemis cotula* L., *Hypericum perforatum* L., *Matricaria chamomilla* L. var. *recutita* (L.) Grierson, and *Papaver rhoeas* L. are reported to be used as a panacea in Gerze as well.

The use of *B. crataegina* in the region provides an example of issues that highlight the importance of folk medicinal studies from another perspective. *B. crataegina* fruit is used to reduce blood sugar levels in Gerze. The α-amylase and α-glucosidase inhibitory effect of three different extracts [ethanol (0.1% trifluoroacetic acid), ethanol:water (70:30, 0.1% trifluoroacetic acid) and water (0.1% trifluoroacetic acid)] prepared from *B. crataegina* fruit has been studied *in vitro*. In this study, the aforementioned *B. crataegina* extracts were determined to inhibit the α-glucosidase and α-amylase by 23% and 76%.[44] These data suggest that *B. crataegina* may also exhibit antidiabetic activity in a bioactivity study to be carried out.

Interestingly, the use of an intoxicating plant was also determined while researching folk medicines in the region. The seeds of *D. stramonium* are placed in cigarettes and smoked as a hallucinogen.

As can be seen in the Supplementary Table 1, macerate of *P. rhoeas* flowers is used against cough. Although phytochemical studies have shown no or very low levels of codeine in *P. rhoeas*, different alkaloids with a structure similar to codeine in the plant are thought to be responsible for this effect.

As in different parts of Türkiye, *S. ebulus* is used against pains or for musculoskeletal system diseases such as sprains and bruises in most of the visited locations.[16,42,45-48] Different extracts prepared from *S. ebulus* and the isolated compounds have been shown to have antinociceptive activity in bioactivity studies.[49-50] The consistency of the folk medicine records obtained in the region with bioactivity studies supports the reliability and value of our findings.

Study limitations

This study was geographically limited to the Gerze district. A significant limitation was the declining population in rural villages, primarily due to migration to urban centers or larger cities such as Ankara and İstanbul. Additionally, the younger generation's diminishing interest in folk medicine further restricted the availability of ethnobotanical knowledge. The inability to access some knowledgeable elderly individuals during the study period posed another challenge, further limiting the scope of the investigation.

CONCLUSION

As far as we know, this is the first study recording folk medicines in the Gerze District. It is thought that this research has made an essential contribution to the ethnobotanical inventory of Türkiye. In addition, 33 new usages for 25 previously reported

folk medicines, *S. brevipilum*, and *S. vomeracea* were recorded as folk medicines for the first time with this research. Besides their cultural importance, folk remedies are important sources for new drug discovery. However, this study has shown once again that folk medicine knowledge is rapidly disappearing due to decreasing village populations, increased educational status, and ease of reaching orthodox medicine and drugs. The loss of knowledgeable elders and the lack of interest among younger generations further contribute to the erosion of traditional knowledge. Although awareness of this issue has been increasing in recent years, and ethnobotanical inventory studies have gained momentum across Türkiye, many regions remain unexplored in an ethnobotanical context. It is therefore essential to document this valuable cultural heritage before it disappears entirely.

Ethics

Ethics Committee Approval: Not required.

Informed Consent: Not required.

Footnotes

Authorship Contributions

Concept: E.S., İ.G., Design: E.S., İ.G., Data Collection or Processing: T.G., O.K., Analysis or Interpretation: T.G., O.K., E.S., İ.G., Literature Search: T.G., O.K., Writing: T.G., O.K., E.S., İ.G.

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Click the link to access Supplementary Table 1: https://d2v96fxpocvxx.cloudfront.net/a426c3a3-a110-40af-a6dd-1b2b563ce9ac/content-images/31d38b12-a104-41e4-8e75-088b1515b253.pdf