

RESEARCH ARTICLE

Ethnobotanical Usages of the Turkish *Rumex* Taxa

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Abstract

Objective: The genus *Rumex* is represented by 183 taxa across the world, with 48 taxa in Turkey. The most common species are *R. acetosella* L., *R. acetosa* L., *R. alpinus* L., *R. crispus* L., *R. nepalensis* Spreng., *R. patientia* L., *R. pulcher* L., *R. tuberosus* L. and they are known by local names such as Kuzukulağı, Şortah, Taşturşusu, Ekşikulak, Labada, Dibikızıl, Efelek, Ekşilik, Kuzuoğlağı, Kuzukırdağı, Ak labada, Ekşi yemiş. In this study, those *Rumex* species used for medical and food purposes by people in Turkey were compiled. The aim of this study is to provide a basis for chemical, physiological, molecular or agricultural studies and to support them in easily accessing the bibliography without wasting time.

Materials and Methods: Approximately 250 ethnobotanical articles were examined from Turkey and other countries around the world about the local usages of the genus *Rumex*. The data were listed as a table and according to the data compiled from these articles, the Use-Value (UV) index among species was calculated.

Results: In the ethnobotanical studies compiled, it was determined that the species most used by people were *R. crispus*, *R. acetocella* and *R. acetosa*. 174 ethnobotanical usages in Turkey, 152 ethnobotanical usages from different countries for 27 Turkish *Rumex* taxa have been recorded. When the parts used were compared, it was seen that the leaves and roots are mostly used. Considering the usage purposes of the *Rumex* genus, it was revealed that there are many different uses, however, the most common uses are for food purposes. In the compiled study, the species with the highest UV values were calculated as *R. crispus*, *R. acetosella*, *R. acetosa*, *R. patientia*, and *R. scutatus*.

Conclusion: *Rumex* taxa are used widely by people for reasons such as having a wide distribution area, growth around agricultural areas and being in areas where people can easily reach them. Also, they do not need special conditions for germination and growth. However, since they have a sourish flavour, consuming them raw as a salad can trigger some health problems. Although there are studies reporting that levels of oxalic acid, which is the source of this sour taste, decrease in cooking, there are also clinical studies that show that it can accumulate in the body and have some long-term toxic effects.

Keywords: *Rumex*, Kuzukulağı, Labada, Ethnobotany, Turkey

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Received: 30.04.2021

Revision Requested: 03.05.2021

Last Revision Received: 21.05.2021

Accepted: 24.05.2021

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Citation: Sari, F., & Kocyiğit, M. (2021). Ethnobotanical Usages of the Turkish *Rumex* Taxa. *Turkish Journal of Bioscience and Collections*, 5(2), 123-140.
<https://doi.org/10.26650/tjbc.2021930272>

Introduction

Resources from plants found in local environments play an important role in providing food and medical care for people in many parts of the world. The most important factor in people's interest in wild plants is their use as food in times of famine or food shortages. Also, eating

wild products has become fashionable in modern society (Vasas, *et al.*, 2015). The genus *Rumex* L., which is in the family Polygonaceae, is frequently encountered in meadow pasture areas and is consumed as food and used for treatment purposes among the people in Turkey (Turan, *et al.*, 2003; Töngel & Ayan, 2005; Tanker, *et al.*, 1993). There are 183 taxa of the genus *Rumex* in the world

(ThePlantlist 2021). In Turkey, 48 species, 8 of which are endemic, grow widely (Güner, *et al.*, 2012).

The genus *Rumex* is used in Greek 'lápató' Turkish sources to mean 'a vegetable whose leaves are used as a salad' from the word 'lebeta/lebeta'. Another view is that the name *Rumex* derives from the Latin word *dart*, referring to the shape of the leaves (Saleh, *et al.*, 1993).

In Turkey, Kuzukulağı, Şortah, Taşturşusu, Ekşikulak, Labada, Dibikızıl, Efelek, Ekşilik, Kuzuoğlağı, Kuzukıkırdağı, Aklabada, Ekşiyemiş are used as local names. It is known that the use of herbs for both nutrition and folk medicine in our country has a rich history. Especially in the Aegean and Black Sea regions, we should mention that there is a widespread "Herb Culture" with the contribution of natural floristic wealth (Faydaoğlu & Sürücüoğlu, 2011; Tuzlacı, 2016).

In this study, those *Rumex* species used for medical and food by the people in Turkey were compiled. The aim of this study is to provide a basis for chemical, physiological, molecular or agricultural studies and to support them in easily accessing the bibliography without wasting time.

Material and Methods

In the compilation of data to determine the ethnobotanical use of *Rumex* species both among the people of Turkey and worldwide, 250 scientific articles were reviewed. According to the data compiled from these articles, significance comparison (UV) values between species were calculated according to the formula $UV = U / N$. U type refers to the number of times it has been used, and N represents the number of articles it appears in. The parts of *Rumex* species used in ethnobotanical studies, the preparation method and the details of the purpose of use are also listed in Table 1.

Results and Discussions

In Turkey, 48 taxa and 38 species grow naturally, however, within the scope of this research, according to the results of the literature review on *Rumex* species grown in our country, the ethnobotanical use of 26 *Rumex* taxa was obtained. In the world 152 different usages are recorded, while in Turkey this figure is 174. Most records of usage were collected from the following provinces respectively Izmir, Hakkari, Van and Mersin in Turkey. The species which had the highest UV values were *R. crispus*, *R. acetosella*, *R. acetosa*, *R. patienta* and *R. scutatus*. Ethnobotanical data was not found for some taxa such as *R.*

amanus Rech.f. (Çimen turşusu), *R. angustifolius* Campd (Taş turşusu), *R. × autranianus* Freyn & Sint.ex Dinsm. (At kulağı), *R. palustris* Sm. (Tosbağakulağı), *R. olympicus* Boiss. (Uluefelek), *R. bithynicus* Rech.f. (Yılkı kulak), *R. × subtrilobus* Boiss. (Şeytan Kulağı), *R. × subtrianianus* Freyn & Sint (Kedi Kuzulası), *R. × gemlikensis* Rech.f. (Gemlik labadası), *R. tmoleus* Boiss. (Özge Labada), *R. × prusianus* Rech.f. (Ilemondoru), *R. × muelleri* Meisn. (Eşek Kuzulası) and *R. bucephalophorus* L. (Çipir), they are known only by their Turkish names (Güner, *et al.*, 2012). Leaves of some *Rumex* species (*R. acetosa*, *R. acetosella*, *R. abyssinicus*, *R. crispus*, *R. sanguineus*, *R. tuberosus* ve *R. thyrsiflorus*, *R. vesicarius*) are used in the preparation of salads (Pardo-de-Santayana, *et al.*, 2007; Çakılcıoğlu & Türkoğlu, 2010).

The roots of many species belonging to the *Rumex* genus have been used in traditional medicine since ancient times due to their mild laxative effect. *R. acetosa* is officially listed as one of the main food ingredients in the Korean Food Code (Korean Food and Drug Administration). It has been used in folk medicine both as a mild laxative and for the treatment of cutaneous diseases (inflammation of skin vessels) (Lee, *et al.*, 2005). Some species such as *R. acetosa* and *R. vesicarius* are cultivated (Bélanger, *et al.*, 2010). In addition, there are invasive species such as *R. obtusifolius* and *R. crispus* that grow widely in agricultural areas within this genus (Watanabe, *et al.*, 2011).

Worldwide, the countries with the highest rate of use of *Rumex* species are Ireland, England, Iran, North America, and India, respectively.

Some *Rumex* species have been used in Traditional Chinese Medicine (TCM) to treat different ailments. Fresh young leaves of *R. nepalensis* have been shown to be of benefit when applied to the affected areas after injuries from nettles (Gautam, *et al.*, 2010).

The dried roots of *R. crispus* find usage in our country against constipation and as a blood cleanser. It has been used in other parts of the world against skin diseases, jaundice and gastrointestinal system ailments. The fruits of the plant are used against dysentery, and the leaves are eaten as vegetables (Shiwani, *et al.*, 2012). In some parts of India, almost all parts of *R. crispus* are used either as food or medicine. Very young leaves of the plant are added to salads and soups, the stems are peeled and the inside is eaten, and finally the seeds are ground and powdered and used as flour for pancakes. Roasted seeds have been used as coffee (Pareek & Kumar, 2014).

R. conglomeratus has been used as a blood cleanser to relieve bathing rashes and sunburn. It has also been used

Table 1. Ethnobotanical Usages and Use-Values of the Turkish Rumex

Plant species	UV	Local Name	Country / City	Plant Part	Dosage, application	Traditional uses	References
<i>R. acetosa</i> L.	0.9	Sour dock, red sorrel, Kışlek	Turkey, Edirne	Leaf	Salad or fresh	Foodstuff	Güneş (2017)
				Stem			
			Kore	Leaf	-	Jaundice treatment	Vasas, et al. (2015), Bello, et al. (2019)
					-	Mild purgative	
					-	Cutaneous diseases	
					-	Throat diseases	
					-	Warts	
			Switzerland	Aerial part	-	Diarrhea treatment	Vasas, et al. (2015), Bello, et al. (2019)
			Britain, Ireland	Leaf	Decoction	Diarrhea treatment	
					-	Dysentery	
				-	Gonorrhea		
				-	Fever		
				-	Ulcer		
				-	Scabies problem		
				-	Skin diseases		
				-	Kidney diseases		
			Czech Republic	Leaf	Decoction	Lumps	Bello, et al. (2019)
			North America	Leaf	Extract	Diarrhea treatment	
			Yemen	Whole	-	Gastrointestinal disorders	
			Pakistan	Aerial part	-	Acne	Korpelainen & Pietiläinen (2020)
Pakistan	Aerial part	-	Lowering high blood pressure	Korpelainen & Pietiläinen (2020)			
Yemen	Whole	-	Dermatological infections	Bello, et al. (2019)			
Hungary	Leaf	-	Fever	Vasas, et al. (2015)			
South Africa	Leaf	-	Abscesses	Watt and Breyer, Brandwijk (1932)			
-	Bulgaria	Leaf	Salad or fresh	Foodstuff	Nedelcheva (2013)		
-	India	Leaf	Decoction	Diarrhea treatment	Allen & Hatfield (2004)		
Sheep sorrel	North America	Leaf	Decoction	Diarrhea treatment	Bello, et al. (2019)		

Table 1. Continue

Plant species	UV	Local Name	Country / City	Plant Part	Dosage, application	Traditional uses	References
<i>R. acetosella</i> L.	1.14	Field sorrel, red sorrel, sour dock, juhsóska	Malatya	Leaf	Salad or fresh	Foodstuff	Yeşil & Akalın (2011)
			North America	Leaf	Poultice	Warts	Moerman, (2003); Vasas, et al. (2015)
			Romania	Leaf	Poultice	Warts	
			North America	Seed	Chewed	Diarrhea treatment	
			Hungary	Aerial part	Chewed	Diarrhea treatment	
			North America	Seed	Chewed	Stomach problems	
			Hungary	Aerial part	Chewed	Stomach problems	
			Iran	Aerial part	Decoction	Jaundice treatment	Amiri, et al. (2014)
			Iran	Aerial part	Decoction	Fever	Amiri, et al. (2014)
			Turkey, Balıkesir	Leaf	-	Nausea treatment	Çelik, et al. (2008)
			Turkey, Balıkesir	Leaf	-	Pituitary extractor	Çelik, et al. (2008)
		Sheep sorrel	Turkey, Manisa	Leaf	-	Diarrhea treatment	Güler, et al. (2015)
			Turkey	Leaf	Decoction	Diabetes	Çakılcıoğlu, et al. (2011)
			Turkey, Bilecik	Root	Decoction	Diuretic	Güler, et al. (2015)
			Turkey, Bilecik	Leaf	Decoction	Diuretic	Güler, et al. (2015)
			Turkey, Ordu	Leaf	-	Diabetes	Zengin Kurt, et al. (2018)
			Turkey, Ordu	Leaf	-	Foodstuff	Zengin Kurt, et al. (2018)
			Turkey, Ordu	Leaf	-	Blood pressure-lowering	Zengin Kurt, et al. (2018)
			Turkey	Leaf	-	Blood pressure-lowering	Polat, et al. (2013)
			Turkey	Leaf	-	Diuretic	Polat, et al. (2013)
			Turkey	Leaf	Decoction	Heart diseases	Kılıç & Bağcı(2013)
			Turkey, Erzincan	Leaf	-	Diabetes	Korkmaz & Karakuş (2015)
			Turkey	Leaf	Decoction	Analgesic	Çakılcıoğlu & Türkoğlu (2010)
Turkey	Leaf	Infusion	Constipation	Fakir, et al. (2009)			
Turkey, Manisa	Leaf	-	Gallstone	Fakir, et al. (2009); Sargin, et al. (2013); Sargin, et al. (2015)			
Turkey, Manisa	Leaf	-	Kidney diseases	Fakir, et al 2009; Sargin, et al (2013); Sargin, et al. (2015)			

Table 1. Continue

Plant species	UV	Local Name	Country / City	Plant Part	Dosage, application	Traditional uses	References
<i>R. acetosella</i> L.	1.14		Turkey, Manisa	Leaf	-	-	Fakir, et al. (2009); Sargin, et al. (2013); Sargin, et al. (2015)
			Turkey	Leaf	Infusion	Human intestinal parasites	Fakir, et al. (2009)
			Turkey	Leaf	Infusion	Gallstone	Fakir, et al. (2009)
			Turkey	Leaf	Decoction	Diuretic	Çakılcoğlu & Türkoğlu (2010)
			Turkey, Ankara	Leaf	-	Gallstone	Baytop (1999)
			Turkey, Ankara	Leaf	-	Antipyretic	Baytop (1999)
			Turkey, Kırklareli	Leaf	Cooked	Asthma	Kültür (2008)
			Mersin, Turkey	Leaf	-	Foodstuff	Elçi & Erik (2006)
		Sheep sorrel	Turkey	Leaf	-	Foodstuff	Dogan, et al. (2004); Dogan (2012); Ari, et al. (2015)
			Kosovo	Leaf	-	Foodstuff	Keskin, et.al. (2012)
			Turkey	Leaf	Poultice	Fistula	Akbulut & Bayramoğlu (2013)
			Turkey	Leaf	Pounded/ External	Acne	Altundag & Öztürk (2011)
			Turkey	Leaf	External	Acne	Altundag & Öztürk (2011)
			Turkey, Manisa	Leaf	Eaten	Acne	Güler, et al. (2015)
			Turkey	Aerial part	Eaten	Stomach problems	Altundag & Öztürk (2011)
Turkey, Kastamonu	Leaf	Eaten	Foodstuff	Tuttu, et al. (2019)			
Turkey, Mersin	Leaf	Decoction	Diabetes	Bağcı (2013)			
<i>R. alpestris</i> Jacq.	0.024	Kırturşusu	Armenia	Leaf	-	Foodstuff	Hovsepyan, et al. (2016)
<i>R. alpinus</i> L.	0.36	Şortah	Armenia	Leaf	-	Foodstuff	Hovsepyan, et al. (2016)
			Turkey, Balıkesir	Leaf	Eaten	Foodstuff	Kaval, et al. (2014)
		Turkey	Leaf	Decoction	Laxative	Mishra, et al. (2018)	
					Constipation		
					Diarrhea treatment		
					Jaundice treatment		
					Laxative		
Root	Leaf	Decoction	Constipation				
			Diarrhea treatment				
			Jaundice treatment				
Şortah	Leaf	-	Antibacterial				
Dırşo, silkok	Turkey, Erzurum	Leaf	Cooked	Foodstuff	Karakaya, et al. (2019); Özgen, et al. (2012)		
<i>R. caucasicus</i> Rech.f.	0.121	Trişov	Turkey, Van	Leaf	-	Teeth Treatment	Baytop (1999); Öztürk & Öztürk (2007) Aksakal & Kaya (2008); Erarslan, et al. (2018)
						Constipation	
						Diuretic	
						Diuretic	
						Foodstuff	

Table 1. Continue

Plant species	UV	Local Name	Country / City	Plant Part	Dosage, application	Traditional uses	References
<i>R. chalepensis</i> Mill.	0.07	Ekşiot	Pakistan	Root	-	Cutaneous diseases	Shinwari & Khan (2000)
			Turkey	Root	-	Laxative	Öztürk, et al.(2013)
<i>R. conglomeratus</i> Murray.	0.22	Ekşikulak	Turkey, Balıkesir	Aerial part	-	Foodstuff	
			Turkey	Stem	-	Blood purifier	Ahmedi, et al. (2016)
		Turkey	Root	Maceration	Laxative	Öztürk, et al. (2013)	
			Root	-	Eczema		
<i>R. crispus</i> L.	1.58	Labada, Curled dock, sour dock, row dock, yellow dock, curled dock, sour dock, fodros lórom	Turkey, Edirne	Leaf	-	Haemorrhoid	Ugulu (2011)
			Turkey, Edirne	Leaf	Crushed	Rheumatism	
			Turkey, Denizli	Leaf	Crushed	Headache	Bulut ,et al. (2017)
			Turkey, Denizli	Leaf	Decoction	Diabetes	
			Turkey, Edirne	Leaf	Eaten	Foodstuff	Güneş (2017)
			Turkey, Edirne	Stem	Eaten	Foodstuff	Güneş (2017)
			Turkey, Kars	Aerial part	-	Foodstuff	Güneş & Özhatay (2011)
			Turkey, Afyonkarahisar	Whole	-	Foodstuff	Kargioğlu, et al. (2008), Arı, et al. (2015), Dogan (2012), Dogan, et al. (2004)
			Turkey, Erzincan	Leaf	Cooked	Anticancer	Korkmaz & Karakuş (2015)
			Turkey, Erzincan	Seed	-	Eczema	
			Turkey, Erzincan	Leaf	-	Diabetes	Kargioğlu, et al. (2008)
			Turkey	Aerial part	-	Foodstuff	
			Iran	Fruit	-	Cholesterol-lowering	Ahmedi, et al. (2016)
			Turkey, Ordu	Leaf	-	For scabies	Zengin Kurt, et al. (2018)
			Turkey, Ordu	Leaf	-	Foodstuff	Ahmedi, et al. (2016)
			Iran	Leaf	-	Blood pressure-lowering	
			Turkey, Ankara	Seed	-	Diarrhea treatment	Sarper, et al. (2009)
			India	Aerial part	-	Homeopath	Pareek & Kumar (2014)
			Turkey	Leaf	-	Antipyretic	Özgökçe & Özçelik (2004)
			Turkey	Leaf	-	Haemorrhoid	

Table 1. Continue

Plant species	UV	Local Name	Country / City	Plant Part	Dosage, application	Traditional uses	References
<i>R. crispus</i> L.	1.58	Labada, Curled dock, sour dock, row dock, yellow dock, curled dock, sour dock, fodros lórom	Turkey, Niğde	Leaf	-	For worm	Paksoy, et al. (2016)
			Iran	Root	-	Antipyretic	Rajaei & Mohamadi (2012)
			Iran	Root	-	Laxative	
			Iran	Rhizome	-	Antipyretic	
			Iran	Rhizome	-	Laxative	
			Iran	Rhizome	-	Diarrhea treatment	
			Turkey, İzmir	Leaf	-	For the biliary system	Ugulu, et al. (2009)
			Turkey, İzmir	Leaf	-	Diuretic	
			Turkey, İzmir	Leaf	-	Rheumatism	
			Turkey, Manisa	Leaf	-	Rheumatism	Uğurlu (2011)
			Turkey, Manisa	Leaf	-	Haemorrhoid	Ugulu, et al. (2009)
			Iran	Root	-	Diarrhea treatment	Rajaei & Mohamadi (2012)
			Turkey, Malatya	Leaf	-	Heart diseases	Tetik, et al. (2013)
			Turkey, Ankara	Seed	-	Diarrhea treatment	Akaydın, et al. (2009)
			Turkey	Leaf	-	Antiphlogistic	Özgökçe & Özçelik (2004); Altundag & Öztürk (2011)
			Pakistan	Leaf	-	Infections	Shuaib, et al. (2014)
			Pakistan	Fruit	-	Infections	
			Turkey, Uşak	Fruit	-	Urinary system	Bulut, et al. (2017)
			Turkey, Uşak	Fruit	Decoction	Diuretic	
			Turkey	Root	Decoction	Laxative	Öztürk, et al. (2013)
			Turkey, Kırklareli	Leaf	-	Foodstuff	Kültür (2007)
			Turkey	Leaf	-	Cold	Altundag & Öztürk (2011); Genç & Özhatay (2006); Doğru Koca, & Yıldırım (2010)
			Turkey	Leaf	Decoction	Cough	
			Turkey	Leaf	Decoction	Asthma	
			Turkey	Leaf	Decoction	Haemorrhoid	Doğru Koca, & Yıldırım (2010)
			Turkey	Leaf	Decoction	Gynecologically diseases	
			Turkey, Kırklareli	Leaf	Decoction	Inflamed wounds	Kültür (2007)
			Turkey	Fruit	Eaten	Goiter	Altundag & Öztürk (2011)
			Turkey	Leaf	Decoction	Rheumatism	Altundag & Öztürk (2011); Bulut, et al. (2017)
			Turkey	Root	Decoction	Eczema	Öztürk, et al. (2013); Erarslan, et al. (2018)
			Britain	Root	-	Laxative	Vasas, et al (2015)
			North America	Root	-	Laxative	Öztürk, et al (2013); Vasas, et al (2015)
			South Africa	-	Eaten	Purgative	Watt & Breyer-Brandwijk (1932)
North America	-	-	Dysentery	Moerman (2003)			
Taiwan	Leaf	Infusion	Infections	Shiwani, et al. (2012)			
Taiwan	Fruit	-	Dysentery				
Turkey, Kırklareli	Leaf	-	Foodstuff	Karakaya, et al. (2019); Özgen, et al. (2004)			
Switzerland	Root	Cooked	Diabetes	Sandra, et al. (2021)			

Table 1. Continue

Plant species	UV	Local Name	Country / City	Plant Part	Dosage, application	Traditional uses	References
<i>R. crispus</i> L.	1.58	Labada, Curled dock, sour dock, row dock, yellow dock, curled dock, sour dock, fódros lórom	Pakistan	-	-	Skin diseases	Ahmad, et al. (2009); Eraslan, et al. (2018)
			Turkey, Kastamonu	Leaf	-	Foodstuff	Tuttu, et al. (2019)
			Italy	Leaf	Infusion	For obesity	Pierroni & Cattero (2019)
			Iran	Fruit	Boiled	Reduction in blood fat	Baharvand, et al. (2015)
<i>R. cristatus</i> DC.	0.1	Lapuşa	Turkey	Flower	-	Laxative	Öztürk, et al. (2013)
				Root	-	Laxative	
				Flower	-	Eczema	
				Root	-	Eczema	Öztürk, et al. (2013), Eraslan, et al. (2018)
<i>R. dentatus</i> L.	0.2	Kıvırtak	Turkey, Antakya	Leaf	-	Foodstuff	Altay, et al. (2012)
			Turkey	Leaf	-	Anticancer	Mishra, et al. (2018)
			India	Root	-	Astringent	Khare (2007)
			China	Root	-	Infections	Zhu, et al. (2010); Zhang, et al. (2012)
			Iran	Leaf	-	Child food	Rajaei & Mohamadi (2012)
<i>R. gracilescens</i> Rech.f.	0.024	Güreyik	Turkey, Ankara	Leaf	-	Laxative	Elçi & Erik (2006)
<i>R. hydrolapathum</i> Huds.	0.32	Water dock	Britain, Ireland	Root	-	Astringent Scurvy Laxative Eczema, Foodstuff Blood purifier	Allen & Hatfield (2004)
<i>R. maritimus</i> L.	0.121	Kum eveleği	Bangladesh	Seed	-	Aphorizes Tonic Analgesic	Uddin & Mahbubur Rahman (2014)
				Root	-	Skin diseases	Mahbubur Rahman (2013)
			India	Seed	-	Tonic	Rouf, et al. (2003); Khare (2007)
<i>R. nepalensis</i> Spreng.	0.41	Dibikızııl	Turkey	Seed	-	Constipation	Mishra, et al. (2018)
					-	infectious	
					-	Tumour	
					-	Analgesic	
			Ethiopia	Root	-	Pain	Giday, et al. (2009)
			China	Root	-	Stomach problems	
			South Africa	Root	-	Purgative	
Leaf	Infusion	Bilharziasis					
North India, Afghanistan, India	Leaf	-	Colic treatment	Khare(2007); Gautam, et al. (2010)			

Table 1. Continue

Plant species	UV	Local Name	Country / City	Plant Part	Dosage, application	Traditional uses	References			
<i>R. nepalensis</i> Spreng.	0.41	-	India	Aerial part	Decoction	Stomach problems	Jain & Parkhe (2018)			
		-	India	Leaf	Infusion	Dysmenorrhoea				
		-	India	Leaf	Infusion	Antiallergic				
		-	Ethiopia	Leaf	Crushed	Abortifacient activities	Dabe, et al. (2020)			
		Dibikızıl	India	Leaf	Extract	Colic treatment	Rana & Datt (1997)			
<i>R. obtusifolius</i> L.	0.31	Blunt leaf	Ireland	-	-	Laxative	Allen & Hatfield (2004)			
						Tonic				
						Anticancer				
						Tumour				
						Burn				
						Astringent				
						Skin diseases				
		North America	Root	-	-	-		Skin diseases		
								Ireland	Root	Skin diseases
								Ireland	Seed	Cough
Britain	Root	-	-	-	Skin diseases					
					Britain	Seed	Cough			
Hungary	Aerial part	-	-	-	Constipation	Haraszti (1985)				
					Kökükızıl	Turkey	Leaf	-	Foodstuff	Dogan, et al. (2004); Dogan (2012)
<i>R. obtusifolius</i> L. subsp. <i>subalpinus</i> Schur.	0.05	Kökükızıl	Turkey, Trabzon	Leaf	Cooked	Animal nutrition	Sağiroğlu, et al. (2012)			
<i>R. patienta</i> L.	0.8	Efelek, Tırşıka karan lórom	Turkey, Denizli	Leaf	-	Wound healing	Bulut, et al. (2017)			
			Turkey	Leaf	-	Foodstuff	Baytop (1999), Dogan, et al. (2004); Dogan (2012); Kocabaş & Gedik (2016)			
			Turkey, Malatya	Leaf	Cooked	Foodstuff	Yeşil & Akalın (2011); Arı, et al. (2015)			
			Turkey, Mersin	Root	-	-	-	Eaten	Internal medicine	Altundag & Özturk (2011)
								-	Haemorrhoid	Altundag & Özturk (2011)
			Turkey, Kars	Root	-	-	-	Cold	Güneş & Özhatay (2011)	
			Turkey, Mersin	Root	Eaten, Cooked	Asthma	Altundag & Özturk (2011)			
			Turkey, Mersin Turkey, Balıkesir	Root	-	-	-	Kidney diseases	Altundag & Özturk (2011)	
								-	Diarrhea treatment	Uysal (2010)
			Turkey, Mersin	Root	-	-	-	Eczema	Baytop (1999); Kocabaş & Gedik (2016); Erarslan, et al. (2018)	
			Bulgaria	Root	-	-	-	Dysentery	Uysal, et al. (2006); Dogan & Nedelcheva (2015)	
			Turkey	Root	-	-	-	Cytotoxic	Mishra, et al. (2018)	
			Turkey	Root	-	-	-	Antiphlogistic	Mishra, et al. (2018) Baytop (1999); Kocabaş & Gedik (2016)	
Antipyretic										
Turkey	Root	-	-	-	Blood pressure-lowering					

Table 1. Continue

Plant species	UV	Local Name	Country / City	Plant Part	Dosage, application	Traditional uses	References
<i>R. patienta</i> L.	0.8	Efelek, Tırşika karan lórom	Hungary, Afghanistan, North India, North America	Root Leaf	-	Constipation Dysentery	Haraszti (1985); Moerman (2003)
			Hungary, Afghanistan, North India, North America		Infusion	Constipation Dysentery	Haraszti (1985); Moerman (2003); Eraslan, et al. (2018)
					Infusion		
					-	Skin diseases	
			Hungary	Crushed	Wound healing	Dénes, et al. (2013)	
			Serbia	Leaf	Infusion	Anaemia	Zlatković, et al. (2014)
			Afghanistan	Leaf	Infusion	Fever	Moerman (2003); Gairola, et al. (2014)
		Turkey	Leaf	-	Internal medicine	Altundag & Özturk (2011)	
		At eveliği	Turkey	Leaf	Infusion	Haemorrhoid	Altundag & Özturk (2011)
			Turkey	Leaf	Infusion	Kidney diseases	Altundag & Özturk (2011)
			Turkey	Leaf	Infusion	Laxative	Baytop (1999); Silig, et al. (2004); Suleyman, et al. (2004); Dogan & Ugulu (2013)
			Dock Patience dock	India	Leaf	-	Goiter
		-	Turkey, Mersin Turkey, İzmir	Root	-	Laxative	Dogan & Ugulu (2013)
Efelek	Hakkari, Turkey	Aerial part	-	Goiter	Oguz & Tepe (2017)		
<i>R. ponticus</i> E.H.L.Krause	0.024	Boçu	Turkey, İzmir	Fruit	-	Cough	Kızırlarlan & Özhataş (2012)
<i>R. pulcher</i> L.	0.24	Ekşilik Efelik, Labada, Lapaza, Mancar,	Turkey, İzmir Turkey, Kırklareli	Fruit Leaf	Decoction	Cold	Kızırlarlan & Özhataş (2012)
					Decoction	Haemorrhoid	Kızırlarlan & Özhataş (2012)
					Decoction	Foodstuff	Kültür (2008)
			Turkey, İzmit	Leaf	-	Foodstuff	Kızırlarlan & Özhataş (2012)
		Çarşaf, Efelek,	Turkey, Yalova	Aerial part	Eaten	Foodstuff	Koçyiğit & Özhataş (2008)
		Dibikizil	Iran	Aerial part	Eaten	Diarrhea treatment	Anbari, et al. (2019)
		Torshak	Iran	stem	-	Foodstuff	Ghanadi, et al. (2019)
		Torshak	Iran	Leaf	-	Foodstuff	Ghanadi, et al. (2019)
		Torshak	Turkey, Muğla	Leaf	-	Foodstuff	Gürdal & Kültür (2014)
Ekşilik	Bangladesh	Seed	Externally	The pain of lumber region	Rahman & Khatun (2020)		
<i>R. sangiuneus</i> L.	0.05	Kuzuoğlağı	Ethiopia	Leaf	Salad or fresh	Foodstuff	Nigussie (2020)
		Bon Palong	Turkey	Leaf	-	Vitamin needs	Ari, et al. (2011)

Table 1. Continue

Plant species	UV	Local Name	Country / City	Plant Part	Dosage, application	Traditional uses	References
<i>R. scutatus</i> L.	0.46	Kuşkulağı, oğlak kulağı, şeker otu Tırşoktırş French sorrel, Ekşimen Taş turşusu	Turkey, Elazığ	Leaf	Eaten	Diabetes	Hayta, et al. (2014)
			Turkey, Niğde	Aerial part	Eaten	Diabetes	Özdemir & Alpınar (2015)
			Turkey	Leaf		Appetizing	Altundag & Özturk (2011)
			Turkey	Root	-	Diuretic	Altundag & Özturk (2011)
			Turkey, Malatya	Leaf	-	Foodstuff	Yeşil & Akalın 2011
			Turkey	Root	-	Antipyretic	Kargioğlu, et al. (2008)
			Turkey	Aerial part	-	Foodstuff	
			Turkey, Van	Leaf	-	Foodstuff	Mükemre, et al. (2016)
			Turkey, Afyonkarahisar	Leaf	Eaten	Foodstuff	Kargioğlu, et al. (2013)
			Turkey, Hakkari	Aerial part	Cooked	Blood pressure-lowering	Bulut, et al. (2016)
			India	-	-	Antipyretic	Khare (2007)
			India	Leaf	-	Refrigerant	
			Turkey, Malatya	Leaf	Juice	Blood pressure-lowering	Tetik, et al. (2013)
			Turkey	Leaf	-	Orexigenic	Altundag & Özturk (2011)
			Turkey	Root	Eaten	Antipyretic	Altundag & Özturk (2011)
Turkey	Root	Eaten	Diuretic	Altundag & Özturk (2011)			
Turkey	Aerial part	Eaten	Foodstuff	Akaydın, et al. (2013)			
Turkey	Leaf	Cooked	Blood pressure-lowering	Uysal, et al. (2010)			
<i>R. tuberosus</i> L.	0.12	Kuzu Kıkırdağı	Turkey, Balıkesir	Leaf	-	Kidney diseases	Uysal, et al. (2010)
			Turkey, Isparta	Leaf	Cooked	Foodstuff	Akaydın, et al. (2013)
			Turkey, Muğla	Leaf	-	Foodstuff	Gürdal & Kültür (2014)
<i>R. tuberosus</i> L. subsp. <i>creticus</i> (Boiss.) Rech.	0.024	Kuzukulağı	Turkey, Elazığ	Aerial part	Cooked	Constipation	Çakılcıoğlu, et al. (2010); Altundag & Özturk (2011)
<i>R. tuberosus</i> subsp. <i>tuberosus</i> L.	0.073	Kuzu Kıkırdağı	Turkey, Ankara	Leaf	Infusion	Blood pressure-lowering	Akyol & Altan (2013); Özturk, et al. (2013)
			Turkey, Ankara	Leaf	Infusion	Antipyretic, Kidney diseases	Özturk, et al. (2013), Akyol & Altan (2013)
			Turkey	Root	Infusion	Diuretic	Özturk, et al. (2013)
<i>R. tuberosus</i> subsp. <i>horizontalis</i> (Koch) Rech.f	0.34	Kuzu Kıkırdağı, Tırşo, Tırşika mariyan	Turkey	Seed	-	Diuretic	Özturk, et al. (2013) Kaval, et al. (2014)
			Turkey	Seed	Infusion	Antipyretic	
			Turkey	Root	Infusion	Antipyretic	
			Turkey	Root		Kidney diseases	
			Turkey	Seed	-	Kidney diseases	
Turkey, Hakkari	Leaf	-	Wound healing				

Table 1. Continue

Plant species	UV	Local Name	Country / City	Plant Part	Dosage, application	Traditional uses	References
<i>R. tuberosus</i> subsp. <i>horizontalis</i> (Koch) Rech.f	0.34	Kuzu Kırdağı, Tırşo, Tırşika mariyan	Turkey, Hakkari	Leaf	Maceration	Diabetes	Kaval, et al. (2014) Yeşil & Akalın (2011)
			Turkey, Malatya	Leaf	Maceration Infusion	Blood pressure-lowering Diuretic Antipyretic Constipation	
			Turkey, Van	Leaf	Maceration -	Foodstuff Foodstuff	Mükemre, et al. (2016)

in cancer treatment (Allen & Hatfield, 2004). In the Alpine regions, fresh leaves of *R. alpinus* are used as an alternative to sauerkraut or spinach, the stems are peeled and eaten, and added to cakes, biscuits and puddings (Stastna, et al., 2010). *Rumex* species are also used to make wraps, a traditional Middle Eastern and South-eastern dish (Dogan, et al., 2015).

Rumex species are mostly used as food, as well as their use as diarrhoea treatment, laxative and antipyretic, respectively. According to the literature review, it was determined that the leaf, root, above ground and fruit parts of *Rumex* species were mostly used. The ethnobotanical information of the Turkish *Rumex* species is presented in detail in table. Plants have been important natural resources for humans, both therapeutic and protective, since ancient times (Giday, et al., 2016).

According to the estimates of the World Health Organization, the populations of 80 developing countries rely more on plants than modern health resources to cure various diseases (WHO 2010). Compilation of traditional uses of medicinal herbs sheds light on pharmacological phytochemical studies. It increases the possibilities to identify new molecules instead of randomly scanning (Akalın, et al., 2020).

In the ethnobotanical studies compiled, it was determined that the most used species among people worldwide were *R. crispus*, *R. acetocella* and *R. acetosa* (Figure 1). When the parts used are compared, it is seen that leaves and roots are mostly used (Figure 2). Considering the usage purposes of the *Rumex* genus, it has been revealed that there are many different uses, however, the most common uses are as food (Figure 3).

Rumex species contain high levels of oxalic acid, this is the substance that gives the leaves of many species of the genus an acid-lemon flavor. Leaves should not be consumed fresh in large quantities, as oxalic acid can bind other nutrients in foods, especially calcium, causing mineral deficiencies.

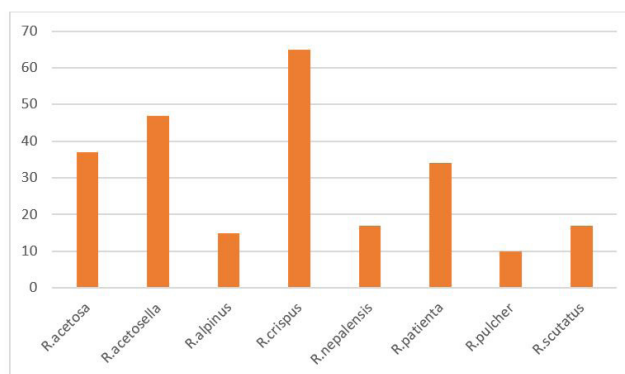


Figure 1. The most commonly used Turkish *Rumex* species in the world.

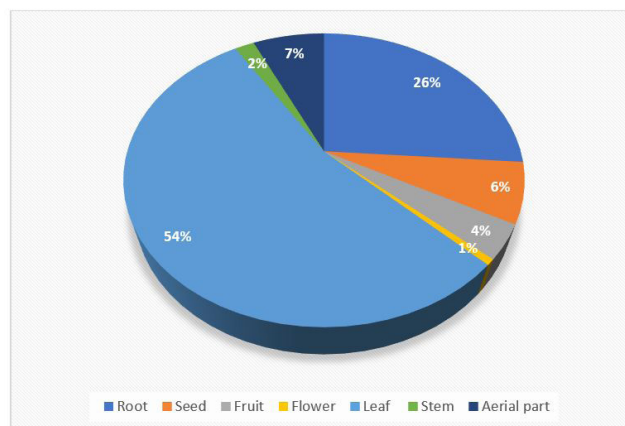


Figure 2. The usage rates of the most used parts of Turkish *Rumex* species

If the plant is cooked, its oxalic acid content may decrease. People with a tendency to rheumatism, arthritis, gout, kidney stones or hyperactivity should be very careful when including this herb in their diet as it may worsen their condition (Bown, 1995).

The *Rumex* species, which are widely used in Ireland, England, Iran and India (Figure 4).

The *Rumex* species, which are widely used in Mersin, Ankara, Van and Manisa in our country (Figure 5).

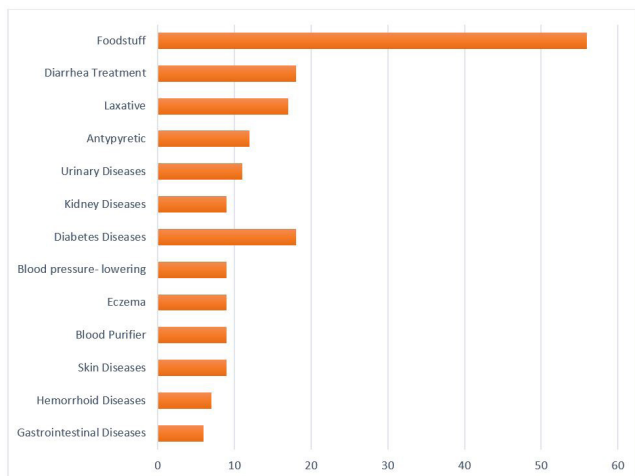


Figure 3. Intended use of *Rumex* taxa

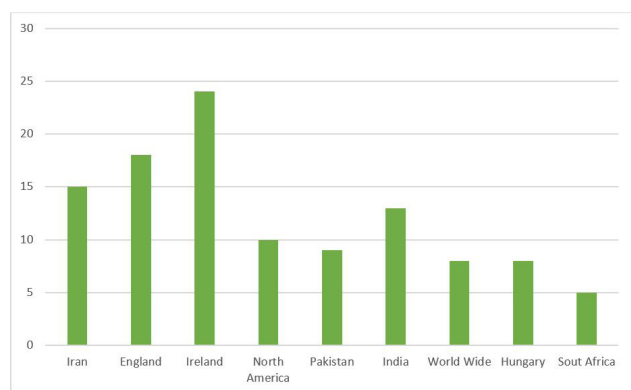


Figure 4. The countries of the world where *Rumex* species are used most ethnobotanically

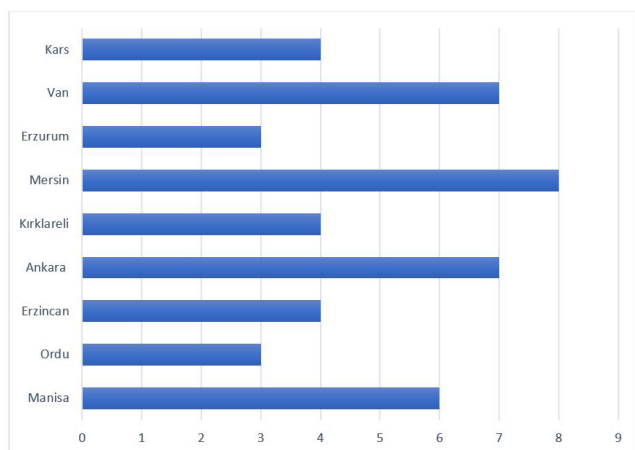


Figure 5. The provinces with the highest ethnobotanical usages of the genus *Rumex* in Turkey

The most important disadvantage of *Rumex* species in food use is that they contain oxalic acid. It is reported that they contain 6.6 to 11.1% oxalic acid on a dry weight basis. This is a very high rate, it has been shown to cause oxalate toxicosis in sheep when consumed as food (Panciera, *et al.*, 1990). The lethal dose in humans is 15-30 g and it has

been reported that cooking does not make the plant edible (Silberhorn, 2005). However, it is mostly consumed by people after cooking. (Figure 6).

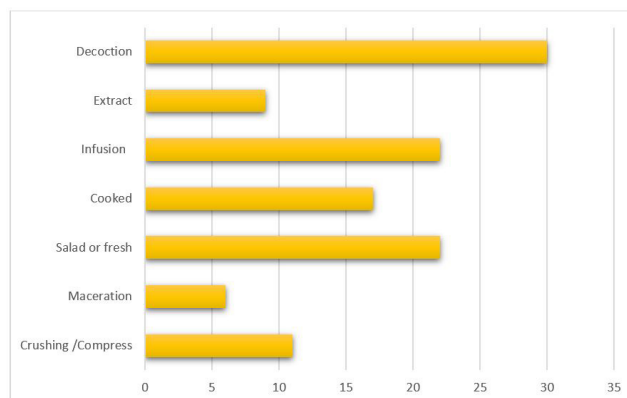


Figure 6. The preparation methods of *Rumex* taxa in ethnobotanical usages

The Use-Value (UV) is an ethnobotanical index commonly used to measure the relative importance of useful plants. In particular, it has been widely used in recent years to base ethnobotanical data on a measurable method (Yeşil & İnal 2019; Yeşil, *et al.*, 2019). In the compiled study, the species with the highest UV values were calculated as *R. crispus*, *R. acetosella*, *R. acetosa*, *R. patienta*, *R. scutatus*. *Rumex* taxa are widely used by people for reasons such as having a wide distribution area, growth around agricultural areas and being in areas where people can easily reach them, and they do not need special conditions for germination and growth. However, since they have a sourish flavor, consuming them raw as a salad can trigger some health problems. Although there are studies reporting that levels of oxalic acid, which is the source of this sour taste, decrease in cooking, there are also clinical studies that show that it can accumulate in the body and have some long-term toxic effects.

Peer-review: Externally peer-reviewed.

Conflict of Interest: The authors declare that they have no conflicts of interest.

Financial Disclosure: Financial support was given by Dept of Research Projects, Istanbul University (Project no: TYL-2020-34138).

Author Contributions: Conception/Design of study: F.S.; Data Analysis/ Interpretation: F.S.; Data Acquisition: F.S.; Drafting Manuscript: F.S.; Critical Revision of Manuscript: M.K.; Final Approval and Accountability: M.K.

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