

Ethnobotanical uses of genus *Pinus* L. (Pinaceae) in Turkey

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Pinus brutia Ten., *Pinus halepensis* Mill., *Pinus nigra* Arnold, *Pinus pinea* L. and *Pinus sylvestris* L. forests cover approximately 10.91 million hectares area in Turkey. Since there are a lot of settlements inside or near these wide *Pinus* forest lands, the usages of *Pinus* species are very common among local people. Within this paper, 130 ethnobotanical and traditional medicinal studies published up to 2011 which were dealt different areas of Turkey are examined and the usages of *Pinus* species are compiled from 54 of them. It has 269 records that are to be proof of the wide range of ethnobotanical usages of pines. Due *P. halepensis* has a narrow distribution, the records about ethnobotanical usage of it does not exist in the investigated literature.

Particularly medicinal use of pines is the most prominent way of their utilization. It is stated in the literature that the uppermost medicinal usage of *Pinus* species is for respiratory system diseases. They are also used as food, veterinary medicine, dye, firewood, handicrafts, etc.

P. brutia and *P. nigra* have the widest distribution area in Turkey and ethnobotanical usages of them are found more than other species according to indexes obtained with Shannon-Wiener index system.

Keywords: *Pinus*, Ethnobotany, Comparative analyses, Turkey

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Turkey is one of the richest countries in the world in terms of plant diversity. The Turkish flora is estimated to contain more than 10.000 species of vascular plants of which approximately 34 % are endemic^{1, 2, 3, 4, 5, 6}. As is the case with elsewhere in the world, Turkish people have utilized plants for a long time as medicinal, food, firewood and dye, as well as for ornamentation, agricultural tools, furniture and construction materials⁷. Woody species of Turkish flora are pointed out with their ethnobotanical usages. Especially *Pinus* species are the primary of them because of their wide distribution area.

Genus *Pinus* is important and very often a dominant component of the vegetation over large parts of the northern hemisphere. They play important ecological roles and they have enormous economic value⁸. The total distribution area of forests is approximately 21.19 million ha in Turkey. *Pinus* forests cover an area of 10.91 million ha that accounts to roughly half of total forest area⁹. There are 5 *Pinus* species naturally grown in Turkey. They are represented with 15 taxa and 4 of them are endemic¹⁰. *Pinus* taxa distributed naturally in Turkey are:

1. *Pinus brutia* Ten. (Turkish red pine, Calabrian pine), var. *brutia*, var. *pyramidalis* Selik, var. *agrophotii* Papaj, var. *pendulifolia* Frankis, var. *densifolia* Yalt.&Boydak
2. *Pinus halepensis* Mill. (Aleppo pine)
3. *Pinus nigra* Arnold (Black pine), subsp. *pallasiana* (Lamb.) Holmboe, var. *pallasiana* (Anatolian black pine), *var. *fastigiata* Businsky (Ehrami black pine), *var. *seneriana* (Saatçioğlu) Yaltırık (Ebe black pine), *var. *columnaris-pendula* Boydak, *var. *yaltirikiana* Alptekin (Big cone black pine)
4. *Pinus pinea* L. (Stone pine, Umbrella pine)
5. *Pinus sylvestris* L. (Scots pine), var. *sylvestris*, var. *compacta* (Tosun) Ü.Akkemik, var. *hamata* Steven

*: Endemic

Gymnosperms have developed a more resistant structure against the conditions of their habitat than Angiosperms. Therefore, a species may spread over an area with only very small morphological changes¹⁰. In this regard, *Pinus* species have very rich genetic diversity in terms of variety number in Turkey.

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P. brutia has the widest natural distribution area (5.4 million ha) in Turkey. *P. brutia* forms extensive forests, especially in regions where the Mediterranean climate prevails. Distribution area of *P. brutia* includes Mediterranean, Aegean, Marmara and Black Sea Regions^{9, 10, 11}. Distribution area of *P. nigra* includes Black Sea, Marmara, Aegean, Taurus Mountain and Inner Anatolia Regions in a total distribution of about 4.2 million ha. *P. sylvestris* forms pure and mixed stand along all Black Sea mountains. Total distribution area of *P. sylvestris* is 1.2 million ha. *P. pinea* has natural distribution in Artvin, Trabzon, Bartın, Bursa, İzmir, Aydın, Muğla, Antalya and Kahramanmaraş provinces with total distribution of smaller than 0.1 million ha. *P. halepensis* has local distributions between Adana-Kadirli, Milas-Bodrum, İzmir-Urla, Aydın-Selçuk and around Çeşme, with a total distribution of smaller than 0.01 million ha^{9, 10, 12}.

Human have harvested pines and their products for thousands of years⁸. In Turkey, since there are a lot of settlements inside or near *Pinus* forests, the usages of pines are very common among local people. Especially wood is used to build house, cellar, etc. Wood and cones are collected for firewood. Various products are obtained from *Pinus* species. Resin, turpentine, pine oil, tar and resin, etc. are produced especially from *P. brutia*. Pine seeds are produced from *P. pinea* plantations. *P. nigra* and *P. sylvestris* are extremely important especially in terms of wood production¹⁰. Besides pine wood has very different uses, because of this it has first-order importance in trade.

Drugs obtained from *Pinus* species have various ethnomedicinal usages in Turkey. They are used as antiseptic, tonic, expectorant, especially in respiratory and urinary system disorders and externally against rheumatic pain and skin diseases. Also they have usages in dye, paper and leather industries⁷. Additionally *P. sylvestris*, *P. pinea*, *P. nigra* and *P. brutia* have antimicrobial activities^{13, 14, 15, 16, 17}. There are some working about turpentine of *Pinus* species in Turkey^{18, 19, 20} that are mainly used on improving the yield of turpentine production²¹.

Pine honey is produced from the sap of pine trees and it is a favored Turkish product owing to its high mineral content^{22, 23}. Therefore, pine honey is classified as high quality honey. Turkey and Greece are the major pine honey producing countries in the world²².

In circumstances under threat of complex effects such as global warming, over human population and environmental pollution, the plant species diversity is

endangered both to be disappearance and shrinkage of the area. Since urbanization persistently causes to leakage of inheritance of knowledge to the next generation, in recent years the attention on recovering the illnesses by traditional methods increased. Within this study both the literature related to ethnobotanical plant usages of pines and their comperative relations are investigated to highlight actual status of public knowledge and plant species based concern.

The aim of our study is to show the richness of ethnobotanical usages of *Pinus* species in Turkey by making comparisions among species. Thus, it is try to find answers to these questions with the results of comparisions; 1- What is the diversity on ethnobotanical usages of each species' parts? 2- What is the difference of usages between species?

Methodology

In this study, accessible 130 ethnobotanical and traditional medicinal articles published up to 2011 which were made related to different areas in Turkey are surveyed and the usages of *Pinus* species are compiled from 54 of them¹.

The informations given in these publications are checked by being compared with natural distributions of each species. When there were plantation areas out of species' natural distribution in some publications, these kind of records were checked from Turkish Ministry of Forestry and Waterworks records.

Although 15 *Pinus* taxa are present in Turkey, the organization of classification is usually made on species base in the investigated literature, because the systematically determination of genus *Pinus* is considerably easy in species terms. Also the species based assessment of usages provides ease of determination. As well, some authors expressed the systematical nomination with only "sp." shortage, the related citations were remained like the original expression in our study. However we determined that there were only the same records of usage for all *Pinus* species in some publications. This situation made us to think that, the usage of one *Pinus* species is handled for all other species which were present in the study area. Publications with problematic records like these were not incorporated in our study.

¹ (24; 25; 26; 27; 28; 29; 30; 31; 32; 33; 34; 35; 36; 37; 38; 39; 40; 41; 42; 43; 44; 45; 46; 47; 48; 49; 50; 51; 52; 53; 54; 55; 56; 57; 58; 59; 60; 61; 62; 63; 64; 65; 66; 67; 68; 69; 70; 71; 72; 73; 74; 75; 76; 77)

A literature survey was performed to collect data on the use of specific *Pinus* species' parts as indicated in the respective articles. Subsequently, these data was assigned as "a record number". In this study, we have 269 records to show the ethnobotanical usages of pines in Turkey.

The usage purposes of plants could be summarized under 6 titles such as;

1. Food (E: Eaten, T: Tea, G: Gum)
2. Medicinal (for human and animal)
3. Dye
4. Firewood
5. Handy crafts (woodworks like container, spoon, basket, staff, toy, pipe, musical instrument, etc.)
6. Other usages (boat care, cosmetic, insecticide, timber, preserving of fruits, barrel, water bottle, agricultural tools, etc.)

Because the expression of plant parts reveal variances, the attributions to plant parts were reduced to most common ones to unify the quality of compiled data like; root, stem (stem and stem-branch), phloem, bark, branch, resin (resin, terebinthe and gum), tar, leaf (leaf, bud, shoot and leaves-shoot), pollen, cone (cone and fruit), seed and non indicated for the ones that were not explicitly implied.

Medicinal utilization of pines differs in terms of purposes such as illnesses (asthma, flu, tuberculosis, psoriasis, hemorrhoids, etc.), complaints (abdominal pain, cough, stomachache, etc.) and therapeutic effects (analgesic, antimicrobial, antiseptic, aphrodisiac, sedative, etc.). So the evaluation of expression of uses was re-organized as listed below in 9 groups:

1. Human treatment: Non detailed data
2. Panacea: Mentioned as "cure-all"
3. Skin diseases: Abscess, abdominal ptosis, burn, chapped foot and hand, contusion, callus, cut, dermatitis, erysipelas, fungal infections, lesions, psoriasis, wart, wound
4. Respiratory system diseases: Asthma, bronchitis, common cold, cough, expectorant, flu, lung diseases, pneumonia, tuberculosis
5. Digestive system diseases: Carminative, colitis, diarrhoea, gastritis, hemorrhoids, indigestion, laxative, liver disease, stomach diseases, ulcer
6. Urinary system diseases
7. Analgesic: Abdominal pain, anodyne, rheumatic pain, stomachache, toothache, waist pain
8. Endocrin system diseases: Diabetes, goiter
9. Others: Antimicrobial, antiseptic, aphrodisiac, anthelmintic, fatigue, fracture, hygienic for

teeth, inflammatory diseases, internal diseases, lactagogue, paraproxia, sedative, snake bites.

Furthermore, if the medicinal uses exceeded more than 10 records, the applications of the species were given in detail. Also the details about the multiterbal remedies with *Pinus* species were explained elaborately.

The Shannon-Wiener diversity index is used in the definition of part-usages diversity of *Pinus* species⁷⁸. When preparing data sets, the usage and parts of *Pinus* species were matched and the record numbers which correspond to these usages were found. Ethnobotanical and ethnomedicinal-part usages diversity index was prepared. The data were determined in "Species Diversity and Richness 4.1.2 Program".

Results and discussion

Ethnobotanical usages of *Pinus* species

Totally 269 items revealed the ethnobotanical usages of the species *P. brutia*, *P. nigra*, *P. pinea*, *P. sylvestris* and *Pinus* sp. which were recorded in 54 investigated publications where *P. halepensis* was missing. *P. nigra* was the foremost preferred and used species of which record number is 108, where the rest of the species were at numbers 67, 63, 27 and 4 for *P. brutia*, *P. sylvestris*, *P. pinea* and *Pinus* sp., respectively. The most usage aim of pine species was to cure human illnesses with 216 records. Using number of *P. nigra* for human illness curing is 89.

The usage of species as a nutrition is commonly in the way of gum and tea, but as an exception *P. pinea* nuts are directly eaten or used in stuffed vegetables or *halva*^{44, 63, 66}. So, the seeds of *P. pinea* are subjected to be trade goods^{71, 79}.

Although the wide distribution of the pine forests (10.91 million ha) breed the expectation of many firewood usages but contrary to expectations there is only 10 records at 7 investigated publications^{36, 40, 54, 61, 70, 71, 73}. Likely the item "timber" could be seen at only 4 publications^{32, 36, 61, 68}. The minority of the "firewood" and "timber" usage of pines evokes the insufficient attention that should be paid for them. It is known that the requisite firewood is provided to the native villagers by the provincial organization of Turkish Ministry of Forestry and Waterworks^{80, 81}.

Ethnobotanical usages purposes of *Pinus* species' parts

Used parts and record numbers of *Pinus* species in ethnobotanical usages are respectively determined as; resin (77 records), cone (45 records), tar (30 records), leaf (27 records), stem (20 records), phloem (19

records), undefined part (17 records), bark (11 records), branch (8 records), seed (7 records) and root (4 records). Resin, cone, tar and leaf are prominent parts of *Pinus* species for ethnobotanical usages.

The record numbers of the usage aims and the parts of *Pinus* species were classified and given (Fig. 1). Only *P. nigra* was detected for the usage of root for curing. Usage of stem as firewood, handicrafts and other usages were common for all species. The phloem (the leakage obtained after peeling the bark of stem is called phloem or “*çam soymuğu*” in Turkish³¹) of *P. nigra* (10 records) and *P. sylvestris* (9 records) is used only for treatment of human illnesses. The medicinal usage of bark of all species is regularly present and additionally the bark of *P. brutia* was utilized for dye extraction. Branches of *P. brutia*, *P. nigra* and *P. sylvestris* are used for treatment of human illnesses. Resin is the uppermost utilization of stem of *Pinus* species that particularly 77 records were encountered. Tar is produced by slow ignition of branches and stem parts in furnaces⁷. We recognized usage of branch and stem parts for tar production at *P. brutia*, *P. nigra* and *P. sylvestris* whereas their medicinal usage is also ubiquitous.

However Turkey is one of the major pine honey producing country in the world, we found the usage of Pines as “honey plant” only in one investigated publication⁸². Also pollen usage is not recorded in investigated publications, however Baytop⁷ mentioned internally poverty effect of pollens obtained from *P. brutia*. Cones were used in multipurpose deal except animal curing. All plant parts of *P. nigra* were utilized which has the highest usage (Fig. 1).

Fig. 1 - Record numbers of ■ *P. brutia*, ■ *P. nigra*, ■ *P. sylvestris*, □ *P. pinea* parts for ethnobotanical usages

Ethnomedicinal usages (for human) of *Pinus* species' parts

P. brutia, *P. nigra*, *P. pinea* and *P. sylvestris* were mostly used for treatment of human illnesses. Totally 216 items were recorded by being mentioned the name of the species and left anonymously at numbers 213 and 3 (for *Pinus* sp.). The usage of plant parts and relevant purposes are presented (Fig. 2). In some publications, that are totally 12, medicinal usage is stated solely as “human treatment” or “panacea”.

Usage of root is seen only at *P. nigra* for skin and respiratory system diseases. The uppermost medicinal usage is for respiratory system diseases with 73 records. *P. sylvestris* ranked in the first order for this purpose which is stated in 28 records. 41 records of *Pinus* species were detected for curing skin diseases

where resin and tar are primarily used parts. *P. nigra* is in the first rank with 23 records. 25 records were determined for curing digestive system diseases. Any record of root and stem usage do not exist. *P. nigra* (11 records) and *P. brutia* (10 records) are determined as mostly used species for digestive system diseases. Only limited items were recorded for curing urinary system diseases that were only resin and cone of *P. nigra*. 21 records were detected for analgesic usages. *P. brutia* and *P. nigra* have priority of usage for this purpose. Only to 4 records could be reached describing curing endocrinal system diseases by using leaf and cone. The usages as antimicrobial, antiseptic, aphrodisiac, anthelmintic, fatigue, fracture, hygienic for teeth, inflammatory diseases, internal disease, lactagogue, paraproxia, sedative, snake bites mentioned in the investigated publications were classified under the group of “other usages” and 21 items belonged to four species (*P. brutia*, *P. nigra*, *P. pinea* and *P. sylvestris*) were recorded (Fig. 2).

As a result of our research, medicinal utilizations of *P. nigra* were determined in all 9 groups for medicinal assessment. Also it has more usage records (87 records) than other species. Especially resin (70 records), cone (35 records), tar (25 records) and phloem (24 records) are preferred for ethnomedicinal usages of *Pinus* species.

Fig. 2 - Record numbers of ■ *P. brutia*, ■ *P. nigra*, ■ *P. sylvestris*, □ *P. pinea* parts for ethnomedicinal (for human) usages (Hu.Tre.: Human treatment, Pan: Panacea, Skin: Skin diseases, Res: Respiratory system diseases, Dig: Digestive diseases, Uri: Urinary system diseases, Ana: Analgesic, End: Endocrin system diseases)

It is stated in the literature that *Pinus* species have 55 different medicinal utilization to cure illnesses, complaints and therapeutic effects. The ethnomedicinal usage of *Pinus* species are determined mostly as asthma, wound, bronchitis, common cold and cough (Table 1). The detailed usages of *Pinus* species for these purposes are given below:

Treatment of wound

There are records for treatment of wound in 15 articles. The usage of *P. sylvestris* for wound treatment is seen in most records and the external usage of resin is common for all species.

Treatment of asthma

There are records for treatment of asthma in 12 articles. The usage of *P. brutia* for asthma treatment is seen in most records.

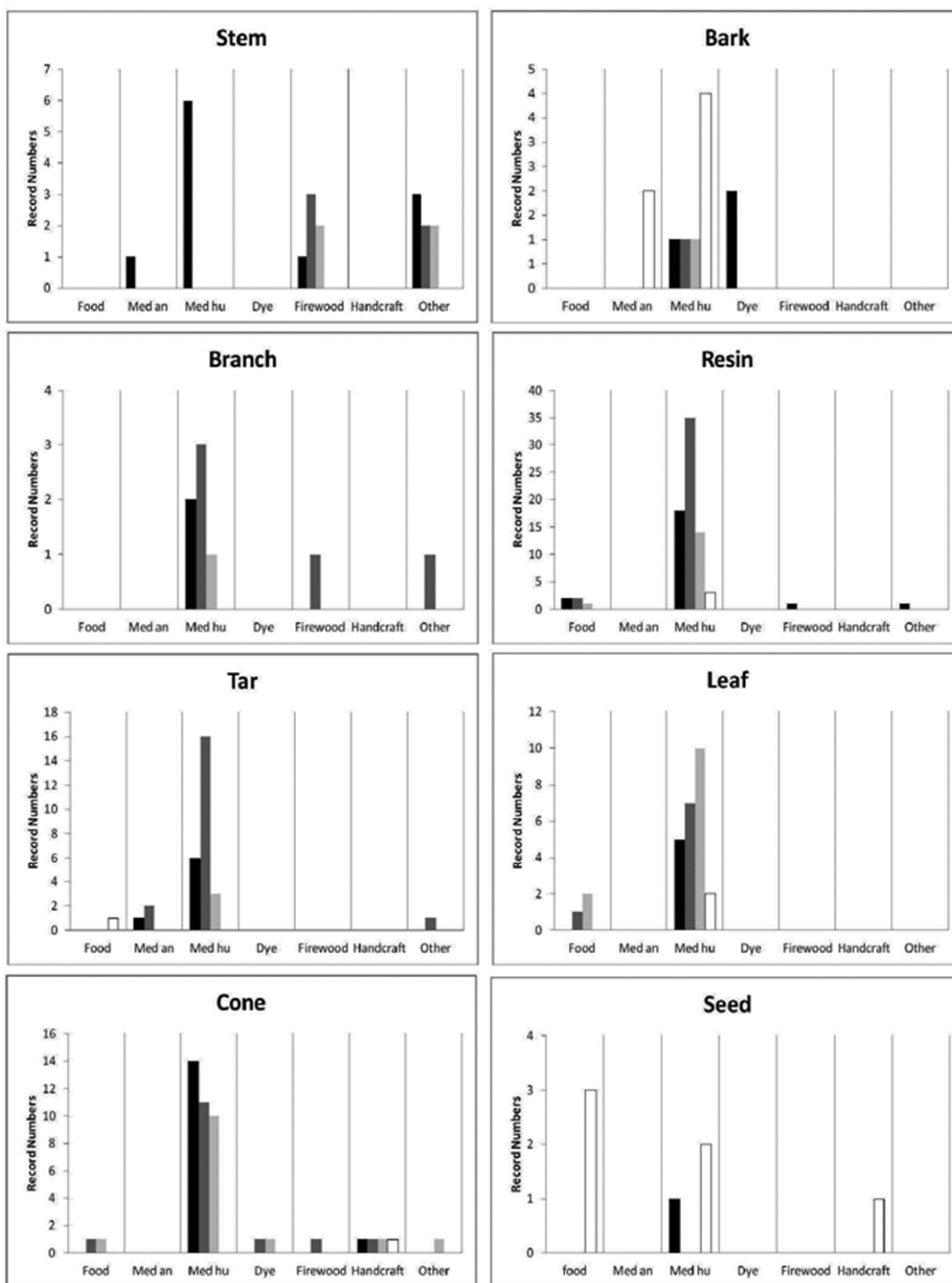


Fig. 1—Record numbers of *P. brutia*, *P. nigra*, *P. sylvestris*, *P. pinea* parts for ethnobotanical usages

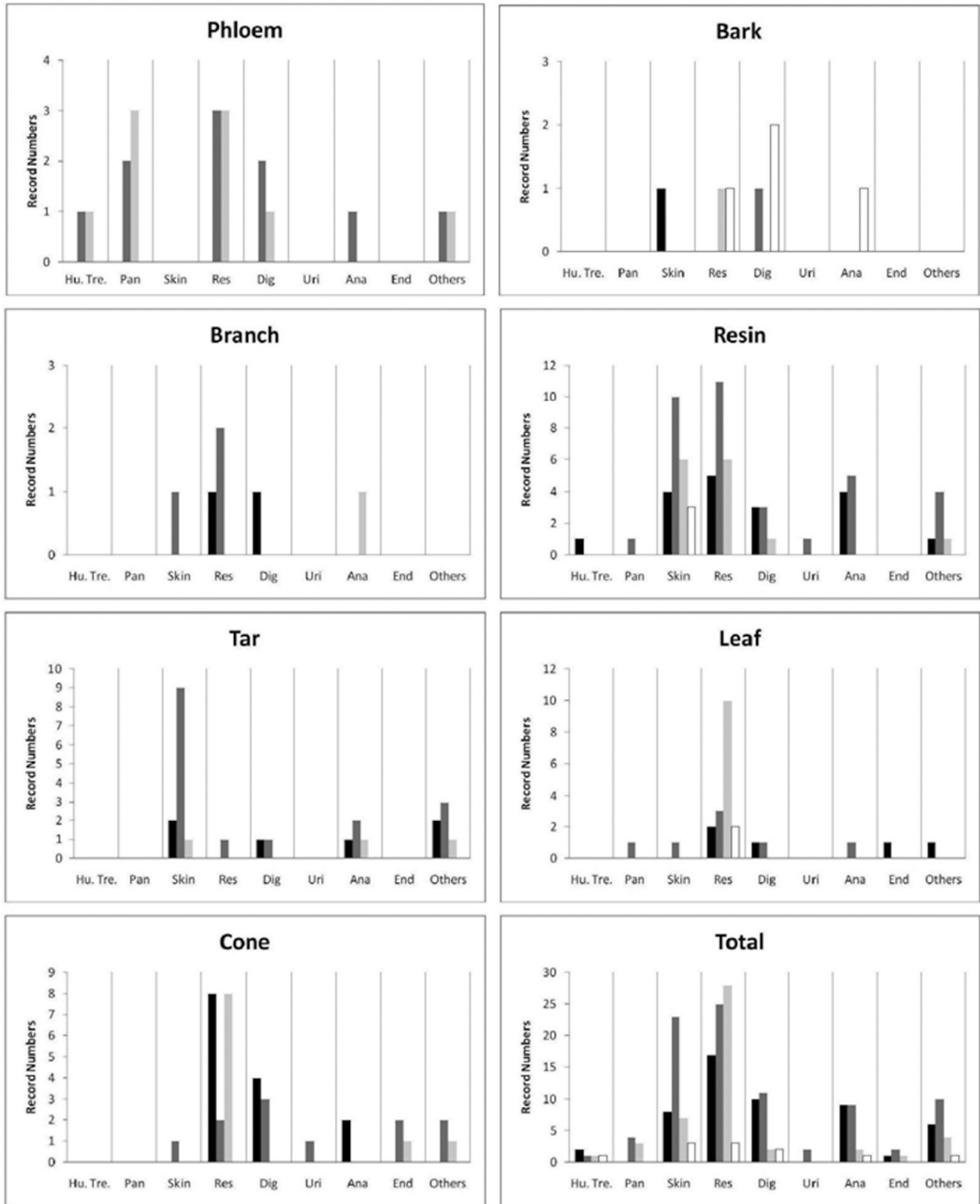


Fig. 2—Record numbers of *P. brutia*, *P. nigra*, *P. sylvestris*, *P. pinea* parts for ethnomedicinal (for human) usages (Hu.Tre.: Human treatment, Pan: Panacea, Skin: Skin diseases, Res: Respiratory system diseases, Dig: Digestive diseases, Uri: Urinary system diseases, Ana: Analgesic, End: Endocrin system diseases)

Table 1—The ethnomedicinal usages of *Pinus* species for asthma, wound, bronchitis, common cold and cough treatment

Species	Ailment treatment	Used parts	Administration/preparations*	References
<i>P. pinea</i>	Wound	Resin	Dec. ext.	64, 69, 77
	Asthma	Shoot	Dec.	39
	Bronchitis	Shoot	Dec.	39
		Bark	Crushed bark ext.	35
	Wound	Resin	Ext. with or without crushed root of <i>Asphodelus aestivus</i> Brot.	60
		Resin	Int.	33
		Leaf	Dec.	69
	Asthma	Fresh cone	1-2 pieces of the fresh cones are eaten	70
		Cone	Dec.	33, 57, 66
	<i>P. brutia</i>		Resin	Chewed
Cough		Resin	Int. with honey	28
		Fresh cone	Dec.	33
Bronchitis		Resin	Powdered, mixed with honey and eaten	33
		Gren cone	Inf.	33
Common cold		Resin	Int. with honey	28
		-	-	50
		Root	Ext.	29
Wound		Resin	Ext.	29; 65
		Tar	Ext.	28
		-	-	60
		Root and shoot	Dec.	41
Asthma		Fresh cone	Eaten	70
		-	-	60
		Resin	Int. with honey	28
		Resin	Eaten (Sieved and mixed with honey)	26
Cough		Resin	Eaten with honey	65
		Resin	Used as pills	29
		Root	Dec.	26
		Root	After peeling off the bark, cut into small pieces and cooked, cooled overnight and drunk	26
		Phloem	Eaten	26
Bronchitis		Resin	Eaten (Sieved and mixed with honey)	26
		Resin	Int. mixed with <i>Styrax</i> sp.	29
		Fresh cone	Dec.	65
		Branch, resin and leaf	Inf. as inhalation	74
Common cold		Resin	Used as pills	29
		Resin	Eaten with honey or boiled with milk and applied on dorsal part	28
		Tar	Applied on dorsal part as plaster	28
Wound		Resin	Applied directly to the affected area or if the wound is dry, it is prepared mixed with tail fat or beeswax or butter before application	26, 30, 48, 55, 76
		Tar	Ext. with butter	31
		Fresh bud	Eaten	56
Asthma		Fresh bud	Dec.	72
	Bark	Dec. ext.	56	
	Shoot and leaf	Dec.	55	

(Contd. ...)

Table 1—The ethnomedicinal usages of *Pinus* species for asthma, wound, bronchitis, common cold and cough treatment

Species	Ailment treatment	Used parts	Administration/preparations*	References
<i>P. sylvestris</i>	Cough	Young shoot and green cone	Dec.	76
		Young shoot and fresh cone	Dec.	76
	Bronchitis	Fresh cone	Dec.	34, 48
		Resin	Chewed	30
		Fresh shoot	Eaten	34
		Fresh cone	Dec.	34
	Common cold	Resin	Boiled with milk, cooled overnight and taken on empty stomach	26
		Fresh cone	Eaten	26
Fresh cone		Dec.	34	
<i>Pinus</i> sp.	Wound	Fresh shoot	Eaten	34
		-	-	53

* Dec.: Decoction, Ext.: External, Inf.: Infusion, Int.: Internal

Table 2—Multiherbal remedies with *Pinus* species

Species	Used part	Ailment treatment	Administration/Preparations	References
<i>P. brutia</i>	Resin	Chapped (foot and hand)	Ext. / Dec. (with wax, olive oil)	60
<i>Cistus creticus</i> L.	Leaf			
<i>Asphodelus aestivus</i> Brot.	Root			
<i>Alkanna tinctoria</i> Tausch subsp. <i>tinctoria</i>	Root	Chapped (foot and hand)	Ext. / Crushed and put into olive oil	60
<i>P. brutia</i>	Resin			
<i>Hypericum perforatum</i> L.	Flowering branch	Wound	Ext. / Crushed with wax	60
<i>P. brutia</i>	Stem	Toothache	Ext. / Crushed	60
<i>Asphodelus aestivus</i> Brot.	Root			
<i>P. brutia</i>	Wood	Laxative	Dec.	38
<i>Cupressus sempervirens</i> L. var. <i>sempervirens</i>	Cone			
<i>P. brutia</i>	Branch (young)	Abdominal ptosis	Ext. / Poultice with milk	37
<i>Juniperus oxycedrus</i> L. subsp. <i>oxycedrus</i> L.	Branch (young)			
<i>P. nigra</i>	Resin	Bronchitis	Int.	29
<i>Astragalus</i> sp.	Root	Rheumatic pain	Ext. / Bathing in this extract	26
<i>P. nigra</i>	Resin			
<i>Styrax</i> sp.	-			
<i>P. sylvestris</i>	Young bud / shoot			
<i>Juniperus</i> sp.	Tar			
<i>Sambucus ebulus</i> L.	Leaf			

Treatment of cough

There are records for treatment of cough in 9 articles. The usage of *P. nigra* for cough treatment is seen in most records. Parts of species as root, resin, shoot and cone are only used internally.

Treatment of bronchitis

There are records for treatment of bronchitis in 7 articles. The usage of *P. nigra* with parts as root, phloem, resin and fresh cone for bronchitis treatment is seen in most records.

Treatment of common cold

There are records for treatment of common cold in 6 articles. The usage of *P. nigra* for common cold

treatment is seen in most records. The usage of *P. pinea* is not recorded.

Table 1-The ethnomedicinal usages of *Pinus* species for asthma, wound, bronchitis, common cold and cough treatment

Ethnobotanical and ethnomedicinal-part usages diversity index

The Shannon-Wiener index is used in diversity of parts of *Pinus* species according to ethnobotanical and ethnomedicinal usages. Obtained diversity indexes are found as; *P. brutia* - 2.281, *P. nigra* - 2.259, *P. sylvestris* - 2.209 and *P. pinea* - 2.087. Variances are

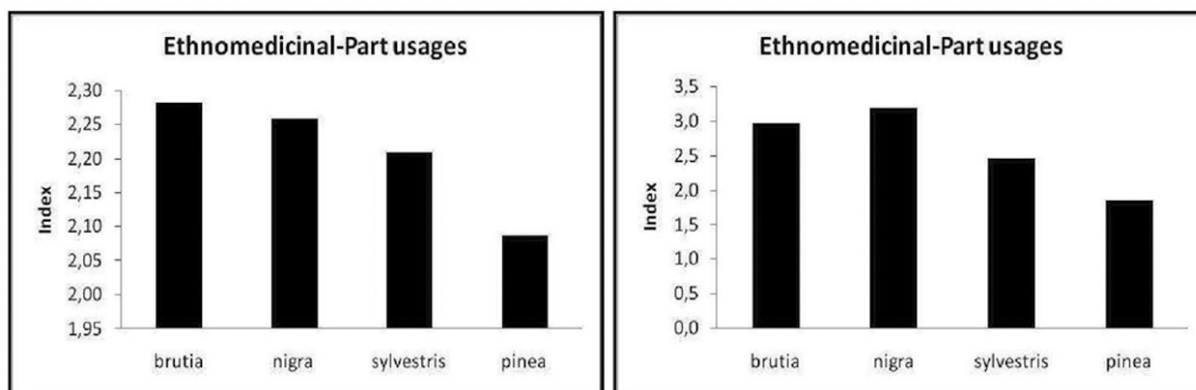


Fig. 3—Ethnobotanical and Ethnomedicinal-part usages diversity indexes of *Pinus* species

found as respectively 0.01685, 0.01327, 0.01567 and 0.0217. Used parts-ethnobotanical usages diversity is found the most for *P. brutia* and the least for *P. pinea*.

Obtained indexes are found by using Shannon Wiener for determining “parts-ethnomedicinal usages” diversity as; *P. brutia* - 2.972, *P. nigra* - 3.176, *P. sylvestris* - 2.46 ve *P. pinea* - 1.846. Variances are found as respectively 0.01393, 0.01063, 0.02007 and 0.04293. Used parts-ethnomedicinal usages diversity is found the most for *P. nigra* and the least for *P. pinea* (Fig. 3).

Used parts-usages indexes are arranged in descending order as; *P. brutia*, *P. nigra*, *P. sylvestris* and *P. pinea* but used parts-medicinal usages indexes are arranged in descending order as; *P. nigra*, *P. brutia*, *P. sylvestris* and *P. pinea*. So, ethnobotanical usages of *P. brutia* and *P. nigra* which have the widest distribution area in Turkey are found more than other species. This result indicates the correlation between distribution area of a species and its usage. *P. pinea* has narrower distribution than other species in Turkey so it has the least usage ratio (Fig. 3).

Fig. 3-Ethnobotanical and Ethnomedicinal-part usages diversity indexes of *Pinus* species

There are some multiherbal remedies of *P. brutia*, *P. nigra* and *P. sylvestris* for the treatment of chapped foot and hand, wound, toothache, laxative, abdominal ptosis, bronchitis and rheumatic pain in 5 articles according to our investigated literature. *P. brutia* is the most frequently used species in multiherbal recipes (Table 2).

Table 2-Multiherbal remedies with *Pinus* species

These results show that a wide range of ethnobotanically use of *Pinus* parts is present in Turkey. Particularly medicinal usage is at the first place. The distribution areas and used species reveal

similarity. But chiefly ethnobotanical usage of *P. sylvestris* at its non-native distribution areas, indicate the ethnobotanical diversifying effect of inland immigrations. Ethnobotanical usage becomes widespread by immigration. Because ethnobotanical knowledge and practices are dynamic and they change as they are transferred and appropriated by people who are adapting to new surroundings and changing environments⁸³. Consequently, the general properties of the source person and the location from where the knowledge is gathered should be recorded in detail.

When the distribution areas of *Pinus* species are considered, the ethnobotanical usage of *P. brutia* is supposed to be more than others because of its widest distribution area. But the presence of *P. brutia* in Mediterranean Region of Turkey where the richness of medicinal and aromatic plants is numerous, was caused reducing in its usage purposes. Because there is a positive correlation between species richness and number of ethnobotanically useful plants⁸⁴. In brief, increasing number of plants were caused reducing in ethnobotanical usages of *P. brutia*. However, *P. nigra* has a natural distribution in mountainside of Mediterranean region and it has the most frequently usage records for ethnomedicinal purposes in Turkey. The richness of medicinal and aromatic plants was decreasing with increasing altitude⁸⁴. Depending on this, the usage of widespread species can increase. This can be the reason of explaining the most frequently ethnomedicinal usage of *P. nigra* in Turkey.

The ethnobotanical usages of pines don't cause a threat for *Pinus* species. Especially cutting firewood and collecting non-wood products from forests are kept under control by the provincial organization of Turkish Ministry of Forestry and Waterworks. Such processes are done according to the forest

management plans⁸⁵. In addition to conservation areas like national park, protection forest etc. determination of gene conservation areas and protection studies are continued since 1993 until today⁸⁶. As a result, the widely distributed *Pinus* species are protected. In addition, no indications have been found in ethnobotanical articles that the use of this species have a negative impact on the species itself or its genetic diversity.

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