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*Full Length Research Paper*

# Wild medicinal plants and their usage in traditional human therapy (Southern Bosnia and Herzegovina, W. Balkan)

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**Both Mediterranean and sub-Mediterranean regions of Bosnia and Herzegovina are known for very prominent traditional usage of wild medicinal and aromatic plants for the treatment of various diseases. Ethno botanical interview method was used to collect information from the sample population comprised of 55 adults, of different religious background (Catholics, Muslims, and Orthodox), with an average age of 63. This resulted in the collection of 96 wild plants from 46 different plant families. These plants are used in preparation of up to 200 different ethno pharmaceuticals and used for 430 different treatments, mainly of chronic diseases: respiratory system (63 species), stomach and intestinal system (55 species), liver and gall bladder (60 species), urinary system (33 species), genital system (42 species), nervous system (30 species), cardiovascular system (27 species), skin conditions (56 species). 60 species are being used for the treatment of some other health disorders. In ecological sense, 40% of these species are constituents of meadow and rock debris communities, 34% of termophilous forest and shrub communities, while 20% of species are constituents of abandoned places.**

**Key words:** Biodiversity, botanical medicine, ethno therapy, ethno biology, ethno pharmacology, herbal anthropology, pharmaceutical ethno botany, preparations of traditional medicines.

## INTRODUCTION

Traditional herbal medicine has played an important role in the life of the Bosnian and Herzegovinian population. This is especially true for Herzegovinian population (Redzic, 2007), whose geographical area is generally very rich in medicinal plants (Redzic, 2009). Medicinal plants of this area have been used in treatment of various diseases since ancient times (Gluck, 1892; Sadikovic, 1928). Etnobotanical research in Herzegovina is an important link to similar researches in the other parts of the world, including both, third world countries (Girach et al., 1998; Lev and Amar, 2002; Fernandez et al., 2003; Giday et al., 2003; Hattarai et al, 2006) and the developed ones (Kenny, 2002; Applequist, 2004; Stobart, 2005; Pieroni et al., 2005a). Men have always used natural resources of healing substances in a search for a cure for a many pathological human condition. Effort to heal the sicknesses by means of traditional phyto-therapy has been made in all parts of the world (Heinrich, 2003; 2005; Abella et al., 2000; Bodeker et al., 2005). At present, ethno botanical and ethno pharmacological experiences of certain nation are used in the treatment of wide range of diseases (Matavelle and Habib, 2000; Sheng-Ji, 2001; Vivienne et al., 2005; Muthu et al., 2006; Uniyal et al., 2006) including treatments for the difficult to cure diseases such as cancer, AIDS, Alzheimer's disease, alcoholism, etc. (Perry et al., 1999; Carai et al., 2000; Bedoya et al., 2001; Donaldson and Rex, 2004; Bailly et al., 2005; Heinrich and Bremner, 2006; Sajem and Gosai, 2006). Today, a major breakthrough in a fight against stress is reached with the phytotherapy that is based on traditional ethno botanical knowledge gained through experiences of almost all nations of the world (van-Wyk, 2002; Nigro et al., 2004; Norscia and Borgognini-Tarli, 2006).

Each geographical area is characterized by its unique biodiversity, people, culture, specific history and its living

needs. This results in many different forms of interaction between a man and environment, through the nourishment needs (Redzic, 2006a, b), and basic medicinal healing treatments (Redzic et al., 1991; 1998).

Isolation of some geographical regions over longer periods of time, due to the relief dynamism or a presence of large rivers, has led to the development of trends in usage of wild plants in medicinal treatment and supplementary nourishment (Leporatti and Corradi, 2001; Leporatti and Ivancheva, 2003; Bonet and Vales, 2003; Leduc et al., 2006). An area of Mediterranean and sub Mediterranean part of Bosnia and Herzegovina (BiH) named Herzegovina, extremely dynamic in its biodiversity, relief, climate, anthropogenesis and other factors, developed unique culture and tradition with specific ethno botanical and ethno pharmacological way of practice.

Even though Herzegovina has been inhabited since the ancient times and is known to possess a long tradition in ethno botany, there are scarce records on respective experiences concerning medicinal or edible wild plants. This paper points out certain aspects of traditional medicinal plants practice in phytotherapy by human community in the Mediterranean and sub-Mediterranean region of BiH.

The main aim of this paper is to make an inventory and to record medicinal and aromatic plants practices in human therapy in Mediterranean and sub- Mediterranean region of BiH. This paper also includes data gathering on preparatory procedures for some herbal drugs.

## Study area

The area of interest is located between N 43° - 44° and E 17° - 19° (Figure 1). It includes Mediterranean and sub Mediterranean zone belt, as well as one part of Southern Herzegovinian high Mediterranean region. Mediterranean belt includes 30 km of Adriatic coastline. Sub Mediterranean belt extends to north towards Mostar city including area around Ljubuski in the west, and Stolac in the east. Altitude of the investigated area spans from 0 - 1,800 m above the sea level with an average altitude of around 300 m.

Natural vegetation of this area comprises of remnants of woods and shrubs with evergreen oak *Quercus ilex, deciduous oak forests with Quercus pubescens*, *Carpinus orientalis*, *Fraxinus ornus* and *Quercus frainetto.* In the colder habitats, vegetation includes shrubs of *Ostrya carpinifolia* and *Fagus moesiaca*. Characteristic of sub Mediterranean region is an occurrence of shrubs composed of endemic Balkan species *Petteria ramentacea* (Redzic, 1999; 2000). Secondary vegetation types include shrubs, xeric grasslands and meadows. Significant number of medicinal plants quite commonly grows in the habitats of the abandoned places (around roads and arable land). Moving towards the high mountain region, wood communities including the endemic pine *Pinus heldreichii* can be found. This area is characterized by an enormous heterogeneity and the high level of habitat's diversity, as well as biodiversity in general. It also posses richness of endemic and relict plants. 60% of 450 endemic plants of BiH are found in the territory of Herzegovina (Redzic et al., 2003).

## Population

The territory of Herzegovina, around Neretva River, was inhabited by humans during a Neolithic Era (Fukarek, 1954) and their settlements were mainly located around a river beds. Some evidences prove existence of a pill dwelling. All investigated sites in the area of interest have (spanning from Adriatic Sea to Mostar city) revealed remains of the Roman culture and civilization. Later in history, these attractive areas were visited by many individuals arriving from the North, South, West, and East. The culture and tradition of the region were heavily influenced by the Austro-Hungarian monarchy and the Ottoman Empire. The area has been inhabited by Catholics and Muslims and later by Orthodox too. Similar population structure is maintained nowadays. This is confirmed by an existence of many sacral places, that are known beyond borders of BiH - Medjugorje (Sveta Gospa, Catholic), Manastir Žitomislici (Orthodox), and Tekija on Buna river (Islamic). Since the early days of civilization, the population was orientated to agriculture-(growing vegetables and Mediterranean fruits), and at higher altitudes - cattle breeding, especially goats. Since ancients, vine and tobacco were also grown here (Begovic, 1960). Over the last twenty years tangerine, kiwi, tomato, sweet pepper, watermelon, peach, and apricot have been planted as well.

## MATERIALS AND METHODS

The intensive ethno botanical research has been conducted continuously from a year 2000 to the year 2005. Significant amount of data was gathered during the long-termed ethno botanical and floristic investigations in this part of BiH, which was carried out by the author during the last 15 - 20 years. They include all important transects (Figure 1): from the Adriatic Sea coast to Hutovo blato (17 informants), surrounding of Stolac (9 informants), surrounding of Ljubuski, villages Vitina and Klobuk (12 informants), surrounding of Čapljina (6 informants) and surrounding of Mostar, Podveležje and Buna (11 informants).

Ethno botanical interview has been used as a basic method for data gathering. All informants have given their consent to participate in the research. The ethno botanical interview form contained: name and age of informants, area/village, time the interview took place, local name of medicinal herbs, herbal part being used, preparation procedure, purpose of usage, habitat type and estimation of conservation status.

The survey included interviews of over 55 informants. Average age of informants is 63 (ranging from 48 - 83). They had to be involved in collection and application of medicinal plants with the therapeutic purpose in any way. Informants were identified through the local community authorities. Local community's representatives provided data on persons which could have certain experience in


**Figure 1.** Investigated area.

human therapy. The author made an oral interview with each of the above mentioned persons, explaining the research's objective and making a preliminary testing of their knowledge in the field of traditional therapy. Only after they gave their consent, they were interviewed by the author. Printed forms containing following information: common or the most frequently used plant name, plant's part being used, usage modes and the purpose of usage were distributed to all informants. Thereafter, the author collected indicated plants and confirmed their true identity with informants. In some cases, the informants were able to provide only dried plant's materials and the author himself had to conduct further botanical identification. Knowledge on medicinal herbs and traditional use thereof in therapy and ethnology, was transferred from generation to generation. In the Mediterranean area people use wild plants for healing purposes more often than in any other region. Some informants stated to practice traditional healing modes with herbs based on ethno botanical and ethno pharmacological experiences gained by earlier herbalists. Many of them are very famous and respected, even today and their work has also been acknowledged by pharmacological scientists too, such as St. Grga Martić and Sadik Sadiković.

The informants are the members of different ethnical groups. Approximately 55% of them are Catholics, 35% are Muslims and 10% are Orthodox. Gender ratio is: approx. 65% female and 35% of male. In many occasions, the author presented the collected herbal material the locals, and for the each specimen that was recognized as the one that is being used in the therapy, relevant data was collected (including photos and prepared plant material).

Communication with the locals went on smoothly due to the fact that the entire population of the investigated area uses the same local language. Moreover, all interviewed persons, with the few exceptions, readily agreed to participate in ethno botanical dialog. In the dialogs, the author expressed the deepest respect to each interviewed person, especially to the respective ethno botanical skills and knowledge. High level of co-operation was also achieved thanks to the fact that the author is well known to the locals for his numerous TV presentations about nature and medicinal herbs.

The entire plant material collected in the course of research is placed and stored in the Herbaria of medicinal plants of the Center of Ecology and Natural Resources at the Faculty of Science, University of Sarajevo (CEPRES HERB!) and in the Herbaria of the National Museum of BiH (SARA!). Each determined specimen is assigned with own herbarium number (voucher of specimen).

Herbal material was identified by the author. Some questionable taxa were determined by comparing them with the referring specimens from SARA and CEPRES HERB. The plant nomenclature complies with Flora Europea (Tutin et al., 1980). It is important to point out that in some cases several modes of usage and preparation procedures for certain herbs were recorded. As a consequence of this, spectrum of occurring species concerns only the most frequent ones, whereby less frequent species were named in Table 1. Forms of usage of medicinal herbs used for the treatments have been created in consultation with the experienced local herbalists taking into account human organ systems. Here, like in other areas, some species, or even genera are highly variable and complex for precise taxonomic determination, especially in the sense of a modern taxonomic investigation (EURO-MED Plant Base, 2006). Therefore, some species are aggregates that contain some micro-species whose origin are found within these aggregates. Example of these are *Achillea millefolium* agg., *Thymus serpyllum* agg., *Taraxacum officinale* agg., *Rosa canina* agg., *Rubus heteromorphus* agg.

## RESULTS

During the course of investigations 96 vascular plants have been recorded belonging to the wild flora and playing a key role in the phytotherapy of Mediterranean and Sub- Mediterranean region of BiH. An overview of

**Table 1.** Wild medicinal flora of Mediterranean and Sub-Mediterranean region of Bosnia and Herzegovina use in ethno therapy.

| Habitat/belonging to plant community* | Scientific name of plant, plant family and voucher herbarium specimens | Local name | English name | Part (s) used | Frequency of citation |
|---|---|---|---|---|---|
| Arr./T.-H. | *Achillea millefolium* L.. *Asteraceae* (210101H) | Kkkkkkkkk Kunica , sporiš | Yarrow | Aerial part | 26 |
| Ph. | *Acrus calamus* L. *Araceae* (220504H) | Idjirot | Sweet flag | Rhizome | 5 |
| Ad. | *Adiantum capillus-veneris* L. *Adiantaceae (*310101H) | Vilina vlas | Maidenhair fern | Aerial part | 2 |
| T.-H. | *Althaea officinalis* L. Malvaceae (210601H) | Bijeli sljez | Marsh mallow | Leaf, Root | 12 |
| B.e. | *Anthyllis vulneraria* L. Fabaceae(210901H) | Ranjenik | Kidney vetch | Aerial part | 4 |
| Q.i. | *Arbutus unedo L.* Ericaceae (210580H) | Planika | Strawberry tree | Leaf, fruit | 10 |
| O. | *Arctium lappa* L. Asteraceae (210103H) | Čičak, repuh | Great burdock | Root, leaf, fruit | 13 |
| O. | *Artemisia absinthium* L. *Asteraceae* (210104H) | Pelin, pelim | Wormwood | Aerial part | 21 |
| O. | *Artemisia vulgaris* L. Asteraceae (210105H) | Komonjika | Mugwort | Young shoots | 7 |
| O.-C.o. | *Asparagus officinalis* L. *Asparagaceae* (220605H) | Viline metle | Asparagus | Young shoots | 7 |
| Q.p. | *Calamintha officinalis* Moench *Lamiaceae* (210503H) | Marulja | Calamint | Aerial part | 5 |

**Table 1.** Contd.

| | | | | | |
|---|---|---|---|---|---|
| Ch. | *Capsella bursa-pastoris* (L.)Med. *Brassicaceae* (210151H) | Rusomača | Shepherd's purse | Aerial part | 11 |
| B.e. | *Carlina acaulis* L. *Asteraceae* (210108H) | Kravljak, sikavac | Stem less carline thistle | Root | 7 |
| C-B.r. | *Centaurium maritimum* (L.) Fritsch *Gentianaceae* (210590H) | Kantarija, kitica | Centaury | Aerial part | 10 |
| Amp. | Ceterach officinarum DC. *Aspleniaceae* (310102H) | Zlatna paprat | Scale fern | Leaf | 7 |
| Ch. | *Chelidonium majus* L. *Papveraceae* (210190H) | Rosopas | Greater celandine | Aerial part | 16 |
| Sis. | *Cichorium intybus* L. *Asteraceae* (210110H) | Vodopija, ženetrga | Chicory | Root | 14 |
| Sis. | *Cnicus benedictus* L. *Asteraceae* (210111H) | Blaženi čkalj | Blessed Thistle | Leaf | 6 |
| O.-C.o. | *Cotinus coggygria* Scop. *Anacardiaceae* (210220H) | Ruj | Smoke tree | Leaf | 5 |
| O.-C.o./ P.s. | *Crataegus monogyna* Jacq. *Rosaceae* (210403H) | Jednosjemeni glog | Hawthorn | Flower, leaf | 31 |
| Sis. | *Cynoglossum officinale* L. *Boraginaceae* (210240H) | Mišinac, mali gavez | Hound's tongue | Aerial part, leaf, root | 7 |
| Q.p. | *Dictamnus albus L.* *Rutaceae* (210471H) | Jasenak | Burning bush | Aerial part, root | 2 |
| P.m. | *Equisetum arvense L.* *Equisetaceae* (310201H) | Preslica | Field horsetail | Aerial part | 7 |

**Table 1.** Contd.

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|---|---|---|---|---|---|
| B.e. | *Eryngium ametystinum* L.<br>*Apiaceae* (210705H) | Kotrljan | Blue eryngo | Root | 10 |
| B.e. | *Filipendula vulgaris* Moench<br>*Rosaceae* (210407H) | Kraljica polja | Dropwort | Aerial part | 3 |
| Sis. | *Foeniculum vulgare* Mill.<br>*Apiaceae* (210706H) | Komorač | Fennel | Aerial part | 17 |
| P.s. | *Fragaria vesca* L.<br>*Rosaceae* (210406H) | Jagoda šumska | Wild strawberry | Leaf, rhizome, fruit | 15 |
| O.-C.o. | *Fraxinus ornus* L.<br>*Oleaceae* (210341H) | Crni jasen | Manna ash | Leaf | 5 |
| Ch. | *Fumaria officinalis* L.<br>*Papaveraceae* (210200H) | Dimnjača | Fumitory | Aerial part | 3 |
| A.f. | *Geranium macrorrhizum* L.<br>*Geraniaceae* (210350H) | Zdravac planinski | Big root geranium | Rhizome | 3 |
| T.-H.. | *Glechoma hederacea* L.<br>*Lamiaceae* (210504H) | Dobričica | Ground Ivy | Aerial part | 6 |
| T.-H. | *Glycyrrhiza glabra* L.<br>*Fabaceae* (210903H) | Sladić | Liquorices | Root | 7 |
| Q.p. | *Hedera helix* L.<br>*Araliaceae* (210360H) | Bršljan | Ivy | Leaf | 7 |
| S.-Ch. | *Helichrysum italicum* (Roth.) G.Don<br>*Asteraceae* (210112H) | Smilje | Curry plant | Flower | 10 |
| S.-Ch. | *Herniaria hirsuta* L.<br>*Caryophyllaceae* (210370H) | Sitnica, kilavica | Hairy rupture wort | Aerial part | 9 |

**Table 1.** Contd.

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|---|---|---|---|---|---|
| B.e. | *Hieracium pilosella* L. *Asteraceae* (210113H) | Runjika, zečija loboda | Mouse-Ear hawkweed | Aerial part, root | 7 |
| B.e. | *Hypericum perforatum* L. Clusiaceae (210390H) | Bogorodična trava | St. John's Wort | Aerial part | 27 |
| S.-Ch. | *Hyssopus officinalis* L. *Lamiaceae* (210505H) | Miloduh, isop | Hyssop | Aerial part | 12 |
| Q.p./P.a. | *Juglans regia* L. Juglandaceae (210400H) | Orah | Walnut | Leaf, immature fruits | 9 |
| Jun. | *Juniperus oxycedrus* L. Cupressaceae (110302H) | Crvena kleka | Prickly Juniper | Fruit | 5 |
| S.-Ch/Ch | *Lavandula vera DC. Lamiaceae (*250531H*)* | Despik | Lavender | Aerial part | 11 |
| Q.p. | *Lilium cattaniae* (Vis.)Vis. Liliaceae (220503H) | Zlatan | Balkan Lily | Bulb | 2 |
| Ch. | *Malva neglecta* Wallr. Malvaceae (211231H) | Mali sljez | Dwarf Mallow | Aerial part | 7 |
| S.-Ch. | *Marrubium incanum* Dsr. Lamiaceae (210507H) | Matočina, očajnica | SIVI Horehound | Aerial part | 7 |
| Q.p. | Melittis melissophyllum L.. Lamiaceae (250528H) | Medunika | Bastard Balm | Aerial part | 4 |
| T.-H. | *Mentha pulegium* L. Lamiaceae (210511H) | Verem trava | Pennyroyal | Aerial part | 15 |
| S.-Ch./ Amph. | *Micromeria thymifolia* (Scop.) Fritsch. Lamiaceae (210512H) | Timjanoliki vrisić | Thyme Savory | Aerial part | 3 |

**Table 1.** Contd.

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|---|---|---|---|---|---|
| O. | *Nepeta cataria* L. Lamiaceae (210513H) | Mačija metvica | Catmint | Aerial part | 17 |
| Ch | *Nigella damascena* L. Ranunculaceae (210205H) | Čurekot, mačkov brk | Love-In-A-Mist | Seed | 2 |
| B.e. | *Orchis morio* L. *Orchidaceae* (220502H) | Salep, kaćun | Green-Winged Orchid | Tuber | 17 |
| O.-C.o. | *Origanum heracleoticum L. Lamiaceae* (250530H) | Mravinac | Oregano | Aerial part | 10 |
| Pal./ O.-C.o. | *Paliurus spina-christi* Mill. Rhamnaceae (210294H) | Drača | Christ's thorn | Fruit | 2 |
| B.e. | *Pimpinella saxifraga* L. Apiaceae (210708H) | Bedrenika | Burnet Saxifrage | Root | 6 |
| P.h.-n. | *Pinus heldreichii* H. Christ Pinaceae (110103H) | Munika | | Resin | 2 |
| P.h.-n. | *Pinus nigra J.F.* Arnold Pinaceae (110105H) | Crni bor | Austrian pine | Resin | 10 |
| Q.i. | Pistacia lentiscus L. Anacardiaceae (210145H) | Tršlja | Mastic tree | Leaf, bark | 3 |
| B.e. | *Plantago media* L. Plantaginaceae (210461H) | Srednja bokvica | Hoary plantain | Leaf | 10 |
| Q.p. | *Polygonatum odoratum* (Mill.) Druce Convallariaceae (220604H) | Pokosnica | Solomon's seal | Rhizome | 5 |
| P.m. | *Polygonum aviculare* L. Polygonaceae (210321H) | Troskot | Knotweed | Aerial part | 12 |

**Table 1.** Contd.

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|---|---|---|---|---|---|
| Amph. | *Polypodium vulgare L.* *Polypodiaceae (*310103H*)* | Slatka paprat | Polypody | Rhizome | 4 |
| T.-H. | *Potentilla anserine L.* *Rosaceae* (210416H) | Guščija trava | Polypody | Leaves | 3 |
| B.e. | Prunella laciniata (L.) L. Lamiaceae (250531H | Bijela celinčica | Self-Heal | Aerial part | 4 |
| C.-B.r. | *Psoralea bituminosa* L. Fabaceae (210904H) | Djetelinjak | Silver leaf | Aerial part | 2 |
| O.-C.o. | *Punica granatum* L. Punicaceae (210300H) | Nar | Pomegranate | Bark | 5 |
| Q.p. | *Quercus pubescens* Willd. Fagaceae (210273H) | Hrast medunac | Downy Oak | Bark, fruit | 7 |
| O.-C.o. | *Rhamnus cathartica* L. Rhamnaceae (210290H) | Pasdrijen | Common buckthorn | Bark | 6 |
| P.s. | *Rosa canina* L. Rosaceae (210410H) | Šipurak | Dog rose | Fruit | 12 |
| Q.i. | *Rubia peregrina* L. Rubiaceae (210112H) | Broćac | Wild madder | Aerial part | 3 |
| O.-C.o. /P.s. | *Rubus heteromorphus* Ripart ex Genev. Rosaceae (210415H) | Dalm.kupina | Dalmatic blackberry | Leaf, fruit | 9 |
| O.-C.o. | *Ruscus aculeatus* L. Liiaceae (220605H) | Veprina | Butcher's broom | Rhizome | 3 |
| S.-Ch. | *Ruta chalepensis* L. Rutaceae (210470H) | Ruta, sedef | Egyptian rue | Aerial part | 9 |

**Table 1.** Contd.

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|---|---|---|---|---|---|
| P.a. | *Salix alba* L.<br>Salicaceae (210332H) | Bijela vrba | White willow | Bark | 6 |
| B.e. | *Salvia bertoloni* Vis.<br>Lamiaceae (210529H) | Kadulja livadska | Grassland sage | Leaf | 8 |
| S.-Ch. | *Salvia officinalis* L.<br>Lamiaceae (210528x) | Kadulja | Sage | Leaf | 31 |
| O. | *Sambucus ebulus* L.<br>*Caprifoliaceae* (210480H) | Apta, burjan | Dwarf Elder | Leaf, root, fruit | 5 |
| B.e. | *Sanguisorba minor* Scop.<br>Rosaceae (210417H) | Dinjica | Salad Burnet | Fresh leaf | 9 |
| S.-Ch. | *Satureia montana* L.<br>Lamiaceae (210516H) | Vrijesak bijeli | Winter Savory | Aerial part | 12 |
| S.-Ch. | *Satureia subspicata* Bartl.<br>ex Vis. Lamiaceae (210517H) | Vrijesak crveni | Red Savory | Aerial part | 12 |
| S.-Ch. | *Sedum acre* L.<br>Crassulaceae (210490H) | Žuti žednjak | Common Stonecrop | Aerial part | 11 |
| Amph. | *Sedum maximum* ( L.)<br>Suter *Crassulaceae (*210491H*)* | Debelo more | Orpine | Fresh leaf | 15 |
| S.-Ch. | *Sedum sexangulare* L.<br>Crassulaceae (210492H) | Bradajuščak | Small Stonecrop | Fresh leaf | 5 |
| T.-H. | *Symphytum officinale* L.<br>Boraginaceae (210243H) | Gavez | Comfrey | Root, leaf, fresh juice | 21 |
| Arr./O. | T*araxacum officinale* Weber<br>Asteraceae (210120H) | Maslačak, žučanik | Dandelion | Root, leaf, flower | 31 |

**Table 1.** Contd.

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|---|---|---|---|---|---|
| A.f. | *Teucrium arduini* L. Lamiaceae (210519H) | Velika iva | Arduin's Germander | Aerial part | 2 |
| S.-Ch. | *Teucrium montanum* L. Lamiaceae (210521H) | Iva trava | Common Germander | Aerial part | 21 |
| C.-B.r. | *Teucrium polium* L. Lamiaceae (210522H) | Iva mediteranska | Mediterranean Germander | Aerial part | 2 |
| B.e. | *Thymus serpyllum* L. Lamiaceae (210524H) | Čubra, majkina dušica | Wild Thyme | Aerial part | 32 |
| S.-Ch. | *Thymus* pulegioides L. Lamiaceae (210525H) | Timijan, majkina dušica | Broad-Leaved Thyme | Aerial part | 23 |
| Q.p. | *Tilia cordata* Miller Tiliaceae (210500H) | Sitnolisna lipa | Small Leaved Lime | Flower | 31 |
| O. | *Tussilago farfara* L. Asteraceae (210122H) | Podbjel | Coltsfoot | Leaf, flower | 23 |
| O. | *Urtica dioica* L. Urticaceae (210510H) | Kopriva, žara | Stinging Nettle | Leaf, root, seeds | 31 |
| O. | *Verbascum thapsus* L. Scrophulariaceae (210256H) | Divizma, vučiji rep | Great Mullein | Leaf, Flower | 5 |
| O-C.o. | *Viola alba* L. Violaceae (210552H) | Ljubičica bijela | White Violet | Flower, leaf | 10 |
| O.-C.o. | *Viola odorata* L. Violaceae (210551H) | Ljubica mirisna | Sweet Violet | Flower, leaf | 12 |
| Q.p. | *Viscum album* L. Violaceae (210560H) | Imela bijela | Mistletoe | Aerial part | 10 |

**Table 1.** Contd.

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|---|---|---|---|---|---|
| S.p. | *Vitex agnus-castus L.* *Verbenaceae (*210570H*)* | Fratarski biber | Agnus Castus | Aerial part, seed | 4 |

*Q.i. - *Quercetalia ilicis Q.p.- Quercetalia pubescentis* O.-C.o.- *Ostryo-Carpinetalia orientalis* P.s. -*Prunetalia spinosae* .Jun. - *Juniperetalia* Pal. - *Paliuretalia aculeatae* P.h.-n.- *Pinetalia heldreichii-nigrae* P.a. - *Populetalia albae* S.p. - *Salicetalia purpureae* Arr. - *Arrhenatheretalia,* T.-H. *Trifolio-Hordetalia* B.e. - *Brometalia erecti* S.-Ch. - *Scorzonero-Chrysopogonetalia* C.-B.r. - *Cymbopogo-Brachypodietalia* Ph. - *Phragmitetalia* Ad. - *Adiantetalia* M.p. -*Moltkaeetalia petraeae* (incl. Amph. - *Amphoricarpetalia*) D.j. - *Drypeetalia jacquinianae (Incl.* A.f. - *Arabidetalia flavescentis)* Ch. - *Chenopodietalia* O. - *Onopordetalia* Sis. - *Sisymbrietalia* P.m. *Plantaginetalia majoris*
** E.r.–Edibility rating ***M.r.–Medicinal rating

**Table 1.** Contd.

| **Use in human therapy** | **Preparation and or/ Administration process** |
|---|---|
| Wound, leucorrhea, chapped breast nipple, stomach, liver, hear palpitation, liver inflammation, gall disorder, purify of blood, strengthen of spleen and pancreas, hard diabetes | Fresh juice, infusion, oil |
| Fever, strengthen of nervous system, stomach, for better digestion, heart palpitation, cough, disagreeable felling, hepatitis | Infusion, powder |
| Plug, kidney, menstruation problem | Infusion |
| Cough, skin, tonic, voice improvement, fever, coldness, strengthen of liver, gall, inflammation of pancreas, hard hemorrhoids, | Maceration, light infusion |
| Wound, contusion, cough, skin disorders | Infusion |
| Kidney, urinary disorder, skin diseases, constipation | Decoction, fresh fruit |
| Skin, regeneration root of hair, with vine eliminate of tapeworm, melting of kidney stone, effective urination Diabetes, when to bite of fury dog, at stomach intoxication, venereal diseases, inflammation of facial nervous | Decoction, wine and “lozovaca” tincture |
| Asthma, Appetite, leucorrhea, heart disorders (arrhythmia), liver, gall, hepatitis | Infusion, tincture, powder |
| Leucorrhea, digestive disorders, water disease, psychotic disorders | Infusion, “lozovaca” Tincture |
| Urinary infection, prostate inflammation | Infusion |
| Sedative, tonic, cough, liver disorders | Infusion, tincture |
| Leucorrhea, Internal bleeding, skin disorders, Menstrual blooding | Fresh juice, infusion |
| Catalyze of urination, strengthen of kidney, nervous system, at water disease, hepatitis, furuncle and skin diseases | Infusion, fresh juice, infusion in vinegar |
| Stomach disorders, recovery, genital disorder, leucorrhea | Infusion, tincture, infusion with honey |
| Urinary infections, skin diseases, cough | Infusion |
| Cough, asthma, constipation, Wart on skin, cancer of lung, hepatitis, against to uterus convulsions, melting of gall stone | Fresh juice, infusion, tincture |
| Water disease, anemia, inflammation of uterus, strengthen of liver and spleen | Infusion, tincture in lozovaca |
| Cancer of stomach, strengthen of liver and spleen | Infusion, tincture |
| Skin diseases, fever, hair regeneration | Infusion |
| Heart disease, sedative, relaxation | Infusion, tincture |

**Table 1.** Contd.

| | |
|---|---|
| Burn, bone fracture external, skin disorders | Maceration, decoction in milk |
| Sedative, stomach disorder, cough | Infusion |
| Furuncles, sin diseases, cough, melting of kidney stones, skin disorders, urinary infections, face pimples, inflammation of urinary bladder | Infusion |
| Water disease, hepatitis | Infusion |
| Rheumatism, circulation, fever, cough | Infusion, fresh juice |
| Cough, Stomach and respiratory disorders | Tincture, infusion, fresh juice |
| Recovery, diarrhea, strengthen of heart, melting of kidney stone and gallstone, ayes inflammation | Infusion, decoction |
| Constipation, fever, cough | Infusion, fresh fruit |
| Blood recovery, tonic | Infusion, fresh juice |
| Stomach disorder, menstruation disorders | Infusion, decoction |
| Respiratory system, hysteria, stone and sand kidney, hepatitis, infected stomach | Infusion, extract in oil olive |
| Asthma, Stomach disease, liver, skin disorders | Infusion, powder |
| Hepatitis, hard lung diseases, for better urination gall, skin disease | Infusion, extract in cooked wine |
| Liver, gall, cough, stomach and liver disorders | Infusion |
| Urinary system, kidney, prostate inflammation | Infusion |
| Urinary system, prostate gland inflammation | Infusion |
| Lung diseases, Stomach, skin disease, neurosis, kidney inflammation, venereal diseases, inflammation of spleen | Infusion, oil |
| Lung disease, tonsillitis, strengthen of potency | Infusion |
| Leucorrhea, liver disease, skin, strengthen, throat inflammation, strengthen of muscles, fore better breast , strengthen of male sex organs | Decoction, infusion |
| Asthma, skin disease, urinary infection, tuberculosis, rheumatism, gall stone melting, nervous disorders | Decoction, macerate, infusion, tincture in lozovaca |
| Asthma, uterus pains and inflammation, vaginal infections, rheumatism | Infusion, extract in olive oil |
| Wound, gall disorder, circulation | Extract in olive oil, infusion |
| Cough, skin disorder, catalyze of digestion, mouth diseases | Maceration, infusion |
| Anemia, heart disease, stomach disease | Infusion, tincture |
| Cough, stomach, sedative | Infusion |
| Vaginal infections, neural disease, headache | Infusion |
| Stomach and lung diseases, liver and gall disorders, against to hysteria, relaxation | Infusion, tincture |
| Hysteria, for barren woman, vaginal chronic infections | Infusion |
| Excretion of urine, prostate gland inflammation | Infusion, powder |
| Cough, sex power, constipation | Decoction |
| Cough, improvement potency, stomach, liver disorders | Infusion, tincture in lozovaca |
| Diarrhea, recovery, strengthen of stomach, skin disorders | Powder, decoction |

**Table 1.** Contd.

| | |
|---|---|
| Chronic vaginal infection, cough, stomach hardship purify of blood, strengthen of nervous system, regulate of menstruation, eliminate gas in stomach | Infusion, maceration |
| Contusion, wound, asthma, heart disorders | Resin, traditional balm |
| Wounds, rheumatism | Resin, traditional balm |
| Psoriasis, skin disorders | Decoction in wine |
| Hemorrhoids, blooding from trachea, Cough, wound, liver disorders, uterus disorders, leucorrhea | Fresh juice, infusion |
| Bone fracture, skin diseases | Decoction, infusion |
| Vaginal infections, prostate gland, urinary infection, kidney inflammation, spleen, ulcer, hard cough, blooding of lung | Infusion |
| Cough, skin disorder | Decoction, infusion |
| Asthma, diarrhea, liver, strengthen of heart | Decoction, infusion |
| Cough, liver, gall, hard skin disorder | Infusion |
| Constipation, skin disorder | Infusion |
| Diarrhea, stomach warm | Decoction, infusion |
| Vaginal chronic infections, recovery, skin disease, tonsillitis, fistulae and hemorrhoids | Decoction, maceration, powder |
| Chronic constipation, skin diseases, liver and Spleen disorders, hemorrhoids | Infusion, decoction |
| Diarrhea, roundworm, recovery, fever, cough | Infusion, maceration, decoction |
| Kidney disease, hepatitis | Decoction, infusion |
| Cough, diarrhea, against uterus blooding, skin disorders, balance of body temperature | Decoction, juice |
| Hemorrhoids, blood vessels | Decoction, infusion |
| Heart disorder, against to hysteria and epilepsy | Fresh juice, infusion |
| Heart disorder, skin diseases, “swam fever” (malaria), corn at foot | Decoction, extract in wine |
| Skin disease, cough, liver and gall disorders | Infusion |
| Respiratory and skin disease, strengthen of nervous system, clean of liver, strengthen of kidneys, heard, inflammation of mouth mucous membrane, toothache, recovery and strengthen of organism | Infusion, extract in wine, tincture in lozovaca |
| Eliminate of toxic liquids by urine, clean of kidneys, water diseases, inflammation of urinary bladder, Cough, Rheumatism, stomach disorder | Infusion, potion |
| To bite of poisonous snakes, Diabetes, melting of kidney stone, skin disorders, diabetes | Fresh juice, infusion |
| Blood – leukemia, lung diseases, live, spleen, skin diseases, potency improvement | Infusion, powder, tincture in lozovaca |
| Blood disease, plug disease, potency, cough, liver and gall disorders, skin cleaning | Infusion, powder, tincture in lozovaca |
| Plug serious disease, skin wart, liver regeneration | Fresh juice |
| Liver, skin, wounds | Fresh leaves, mixture with honey |
| Chronic vaginal infections | Powder |
| Bone fracture, lung inflammation, asthma, bronchitis, kidney mucous elimination, baldness, hard fever | Decoction with milk, fresh juice |
| Anemia, Liver, diabetes, kidney stone melting, hemorrhoids, recovery, hepatitis | Infusion, decoction with milk |

**Table 1.** Contd.

| | |
|---|---|
| Stomach disease, liver and gall stone | Infusion, tincture in lozovaca |
| Liver, stomach disease, gall disorders | Infusion, tincture in lozovaca |
| Stomach disease, liver and gall disorders | Infusion, tincture in lozovaca |
| Neurosis, cough, stomach disease, irregular menstruation, strengthen of heart, stomach, anemia, hands tremor, paralysis of legs and hands | Infusion, powder, tincture in lozovaca, extract in olive oil |
| Neurosis, cough, stomach disease | Infusion, powder |
| Cough, fever, lean of blood, recovery of nervous, epilepsy, hysteria | Infusion |
| Cough, serious lung disease, skin disorders | Infusion, maceration in honey |
| Anemia, kidney and skin, cough, gall and liver disorders, better urinate, hepatitis, fever | Fresh juice, infusion, decoction |
| Hemorrhoids, lung tuberculosis and serious wounds, cough, nose irrigation | Decoction in milk Infusion, powder Hemorrhoids Infusion, extract in olive oil |
| Cough, skin disorder, liver disorders | Infusion, tincture |
| Cough at children, skin disease, gas in stomach elimination, scarlet fever | Infusion, decoction, tincture |
| Epilepsy, heart hardship, nematode elimination at children, blooding in uterus and lung | Maceration, infusion, tincture |
| Menstrual disorders, against high potency, for nervous balance, hysteria. | Infusion, decoction, powder |

these plants along with their main features is given in Table 1. All recorded species belong to vascular plants. The most frequently used plants in the whole region are: *Thymus serpyllum* (32 times), *Crataegus monogyna* (31 times), *Salvia officinalis* (31 times), *Tilia cordata* (31 times), *Urtica dioica* (31 times), Taraxacum officinale (31), *Hypericum perforatum* (27 times) *Achillea millefiolium* (26 times), *Thymus pulegioides* (23 times), *Artemisia absinthium* (21 times), *Teucrium montanum* (21 times), *Nepeta catharia* (17 times), *Orchis morio* (17 times) and others (Table 1). For the first time in BiH, the following species are recorded as ones used by ordinary people as medicinal herbs: *Dictamnus albus*, *Origanum heracleoticum*, *Pinus heldreichii*, *Psoralea bituminosa*, *Rubia peregrina, Teucrium polium* and *Vitex agnus-castus*. For the first time use of *Sedum sexangulare*, *Lilium cattaniae* and *Micromeria thymifolia* in Mediterranean area is recorded. Preparations made of detected medicinal plants are used for the treatment of wide spectrum of human diseases. The majority of species (63 of them) are used for the treatment of different respiratory disorders (cough, inflammation of throat, various infections, malicious kind of illnesses etc.). Significant share of plants (75 species) is used for the treatment of chronic illnesses of urinary and genital system, most commonly inflammation of urinary paths, inflammatory processes in the kidneys, formation of stone in the kidneys and the urinary bladder, then fungal or bacterial infections and as a preventive measure against the sterility, especially in females, as well as for treatment and rising of male potency. About 55 of analyzed species are primary used for treatment of gastrointestinal illnesses (ulcers of stomach and duodenum, digestion disorders, regulation of stomach acidity, bettering of appetite etc.). Significant number of species is traditionally used for treatment of heart malfunctions, especially rhythm disorders, myocardial ischemia and circulation disorders, as well as for the treatment of skin conditions, wounds, diseases of nervous system (youth madness, depression, and fear), liver and gall diseases and metabolic disorders (Figure 2).

Shoot system (stem and leaves) is the most frequently used in medicinal purposes (Table 2), where usage of dried floral parts (34%) and dried leaves (around 21%) is predominant. Share of use of root system (rhizome, root, bulb and tuber) is approximately around 17% (Table 2).

The most frequent preparations for medicinal treatments from plants are usually very simple where infusion comprise around 44%, then diversity of decocts (around 19%), fresh juices (around 8%), and others (macerations, oils, tincture, etc.) (Table 3).

In the sense of taxonomy, plants that are being

used for therapeutic purpose in this region belong to divisions of Pteridophyta (one species from Equisetaceae, Aspleniaceae and Adiantaceae) and Spermatophyta with its two subdivisions: Coniferophytina (one species from *Cupressaceae* and *Pinaceae*) and Magnoliophytina (with two classes Magnoliopsida and Liliopsida, including 35 families all together). Domination of Magnoliopsida has been very noticeable with its 32 families comprised of 84 species that are used in therapeutic purposes. Labiatae family (Lamiaceae) represents the highest portion 20, followed by Compositae (Asteraceae) 11, Rosaceae 7, Leguminosae (Fabaceae) 4 and Umbelliferae (Apiaceae) 4. Class Liliopsida is represented by five families, 2 species are Liliaceae and one species each from Asparagaeceae, Convallariaceae, Araceae and Orchidaceae. The rest of the families are represented by one or two species only (Table 1 and 4).

According to the EUNIS classification (EUNIS, 2006), 22 different habitats have been detected in the area of interest and they can be divided into several groups: woods and shrubs, meadows and rock debris communities, rock crevices and scree, swamps and abandoned places (Figure 3). The majority of medicinal plants (40%) are being found by people in open places, such as Mediterranean and sub-Mediterranean rock debris communities from the orders *Thero-Brachypodietalia* and *Scorzonero-Chrysopogonetalia*, termophilous meadows from order *Brometalia erecti* and wet meadows from the orders *Arrhenatheretalia* and *Trifolio-Hordeetalia secalini*. About 30% of species grows in the evergreen woods belonging to the order *Quercetalia ilicis*, termophilous broadleaved woods and shrubs from the orders *Quercetalia pubescentis* and *Ostryo-Carpinetalia orien*talis and black pine woods from the order *Pinetalia heldreichii-nigrae*. Significant number of species (about 20%) inhabits abandoned places (Figure 3).

## DISCUSSION

Through the analysis of records of plant based medicinal treatments (Table 1), it becomes obvious that some of the plants are being used more frequently than the others (*Achillea millefolium, Hypericum perforatum, Salvia officinalis, Taraxacum officinale, Thymus serpyllum, Tilia cordata, and Urtica dioica*). These species were the most quoted by the informants in the entire area of investigation. Besides this, majority of these species play an important role in therapy of other regions, too (Antonone et al., 1988; Merzouki et al., 2000; Agelet and Valles's, 2001, 2003a, b; Bnouham et al., 2003; Loi et al., 2004; Gülcin et al., 2004; Novais et al., 2004; Guarrera et al., 2005a, b; Daher et al., 2006). Some of these species are used in a different way than in any other country. One such case is *Salvia officinalis* that in majority of Mediterranean countries is being used for throat rinsing, after the tooth extraction and wound healing, while in the investigated area it is used to treat, first of all, heart diseases and then nervous system illnesses and kidney and liver problems (Lalićević and Djordjevic, 2004; Edi et al., 2005). This is also true for *Thymus serpyllum*. While the people of other areas use it as an excellent bronchial dilatators (Rasoli and Mirmostafa, 2002), in this region it is used to treat heart diseases, hand tremor or to regulate the period. Species with wide distribution *Urtica dioica* is usually applied as a mean against anemia and cardiovascular diseases (Testai et al., 2002), but people in the area of interest also use it against a cough, fever, liver and gall diseases. In the entire world, *Taraxacum officinale* is known as a plant with the underlined healing character and here it is also used to treat anemia, hemorrhoids and jaundice. *Hypericum perforatum* is being used to treat different skin conditions in many countries, but in the area of investigation, its main purpose is to heal lung diseases and inflammation of kidneys. Next good example represent usage of *Tilia cordata* and *Tilia argentea* inflorescence that are used to treat illnesses of nervous system, such as epilepsy and hysteria, while in other parts of the world they are used as a medicine against a cough, mean to provoke sweating and in recent time for anti inflammatory effects (Anesini et al., 1999; Toker et al., 2004).

Comparative analysis of the ethno botanical practice between investigated area and other territories in the region (Capasso et al., 1982; De Feo et al., 1991; 1992; 1993; Malamas and Marselos, 1992; Bonet at al., 1999; Ballero et al., 2001; Comejo-Rodrigeus et al., 2003; Guarrera, 2005; Ghorboni, 2005; Everest and Ozturh, 2005; Azaizeh et al., 2006; Avci et al., 2006) has shown that some identified plants possess many healing properties as they are being used to treat different diseases that are often diseases of completely different physiological systems. Thus, there is a group of plants that locals call "plants used for the treatment of any sickness" that is comprised of following species: *Achillea millefolium, Acorus calamus, Althaea officinalis, Arctium lappa, Artemisia absinthium, Centaurium maritimum, Chelidonium majus, Equisetum arvense, Hypericum perforatum, Juniperus oxycedrus, Juglans regia, Pimpinella saxifraga, Polygonum aviculare, Salvia officinalis, Sambucus ebulus, Thymus serpyllum* (including several species of the same genus) and *Teucrium montanum.* The good example is *Arctium lappa* that is used to treat skin conditions, to strengthen the hair root, against intestinal parasites, for dissolution of kidney stone, for improved urination, against diabetes and rabies, dog's bites, to release stomach gases, against sexually transmitted diseases, to treat facial nerve inflammation etc. Leaves of walnut *Juglans regia*, in addition to common healing the wounds are also used for the treatment of bacterial infections of female reproductive organs, liver diseases, various inflammations, strengthening the muscles and enlargement of the female

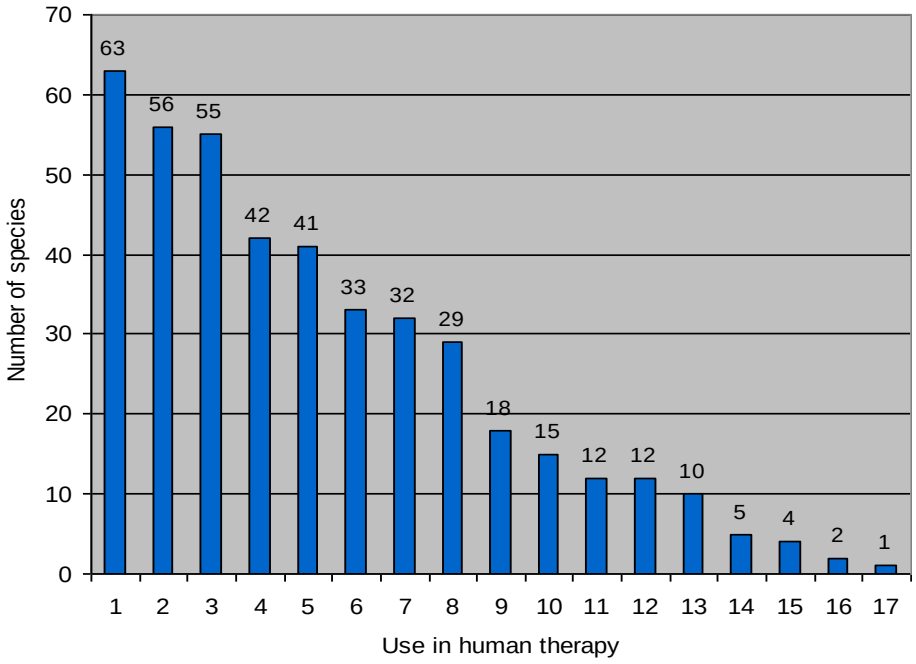


**Figure 2.** The frequency of wild medicinal plants used in human therapy. 1. Respiratory system, 2. Skin and hair, 3. Gastrointestinal system, 4. Genital system, 5. Liver, 6. Urinary system, 7. Miscellaneous, 8. Nervous system, 9. Gall disorders, 10. Blood system, 11. Heart disorders, 12. Bon and muscles, 13. Mouth, nose and throat, 14. Pancreas, 15. Spleen, 16. Bites of animals, 17. Eyes.

**Table 2.** Plant parts used in preparation.

| Plant part | Number of plant part | Proportion (%) |
|---|---|---|
| Aerial part (all plant with flower) | 42 | 34.15 |
| Leaf | 26 | 21.14 |
| Fresh leaf | 3 | 2.44 |
| Young shoots | 2 | 1.63 |
| Flower | 8 | 6.50 |
| Fruit | 9 | 7.32 |
| Immature fruit | 1 | 0.81 |
| Seed | 3 | 2.44 |
| Rhizome | 5 | 4.06 |
| Root | 14 | 11.38 |
| Tuber and bulb | 2 | 2.08 |
| Bark | 5 | 4.06 |
| Resin | 2 | 1.62 |
| Fresh juice | 1 | 0.81 |
| Total: | 123 | 100 |

breasts, raising a male potency, etc.

It has also been noticed that some medicinal plants, which are very popular in the Mediterranean area and wider, are rarely used in human therapy of population from the area of interest, such as: *Ruscus aculeatus, Punica granatum, Verbascum thapsus, Fraxinus ornus, Glycyrrhiza glabra, Herniaria hirsuta, Paliurus spina-christi, Cnicus benedictus* and *Vitex agnus-castus.* Medicinal plants of the investigated area are being used to prevent and heal 140 different “diseases”. In the course of this research, 527 ways of herbal usage in human phytotherapy have been identified (Table 1 and Figure 2). It is common that the same species is used for the treatment and prevention of several different

**Table 3.** Preparations.

| Type of preparation | Number of species | Proportion (%) |
|---|---|---|
| Infusion | 78 | 41.71 |
| Light infusion | 1 | 0.53 |
| Infusion in vinegar | 1 | 0.53 |
| Infusion with honey | 1 | 0.53 |
| Infusion in cooked wine | 1 | 0.53 |
| Extract in Olive oil | 3 | 1.60 |
| Extract in wine | 2 | 1.07 |
| Decoction | 23 | 16.67 |
| Decoction in milk | 3 | 1.60 |
| Decoction in wine | 1 | 0.53 |
| Beverage | 1 | 0.53 |
| Fresh fruit | 2 | 1.07 |
| Fresh juice | 14 | 8.33 |
| Maceration | 9 | 4.17 |
| Maceration in honey | 1 | 0.53 |
| Powder | 13 | 2.08 |
| Resin | 2 | 2.08 |
| Tincture | 25 | 1.04 |
| Oil | 2 | 1.04 |
| Traditional balm | 2 | 1.07 |
| Fresh crushed leaves | 1 | 0.53 |
| Crushed leaves with honey | 1 | 0.53 |
| Total: | 187 | 100 |

**Table 4.** Taxonomy belonging of medicinal plants to botanical family.

| No | Plant family | Number of species | Proportion (%) |
|---|---|---|---|
| 1 | *Lamiaceae* | 20 | 20.83 |
| 2 | *Asteraceae* | 11 | 11.46 |
| 3 | *Rosaceae* | 7 | 7.29 |
| 4 | *Fabaceae* | 4 | 4.17 |
| 5 | *Apiaceae* | 3 | 3.12 |
| 6 | *Crassulaceae* | 3 | 3.12 |
| 7 | *Liliaceae* | 2 | 2.08 |
| 8 | *Malvaceae* | 2 | 2.08 |
| 9 | *Papaveraceae* | 2 | 2.08 |
| 10 | *Anacardiaceae* | 2 | 2.08 |
| 11 | *Boraginaceae* | 2 | 2.08 |
| 12 | *Rutaceae* | 2 | 2.08 |
| 13 | *Rhamnaceae* | 2 | 2.08 |
| 14 | *Pinaceae* | 2 | 2.08 |
| 15 | *Violaceae* | 2 | 2.08 |
| 16 | The other 29 families have been presented by one plant species | 31 | 32.29 |
| | Total: | 96 | 100 |

diseases as its healing properties influences different functional systems. Thus the study has shown that the average number of health disorders being treated by the same plant is approximately 4 - 5. For example *Arctium lappa* is applied in 12 cases, *Achillea millefolium* in 11, *Salvia officinalis* in 9, *Polygonum aviculare* and *Juglans*

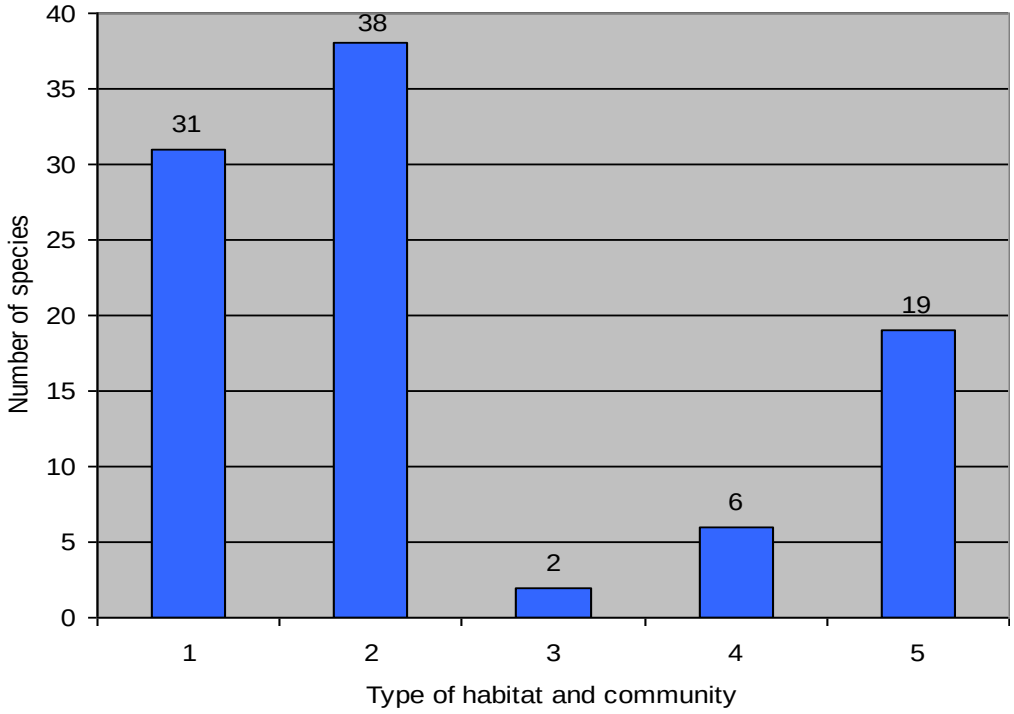


**Figure 3.** Wild medicinal plants in relate to their habitat and community. 1. Forest and scrubs; 2. Grassland and rocky grasslands; 3.Wetlands; 4. Cliffs and scree; 5. Abandoned habitats.

*regia* in 8, *Sambucus ebulus*, *Pimpinella saxifraga* and *Centaurium maritimum in* 7 etc. Most of the plants are being used for medicinal treatment of five different illnesses. There are only few species which usage is limited to only one, two or three diseases (*Adiantum capillus-veneris, Eryngium campestre, Geranium macrorrhizum, Lilium cattaniae, Pinus nigra, Pistacia lentiscus, Polygonum odoratum, Polypodium vulgare, Punica granatum, Sedum maximum, Sedum sexangulare*). Some plants treat disorders of a single functional system, such as entire genus *Teucrium* (*T. montanum, T. chamaedrys, T. arduini,* and *T. polium*) that is only used for the treatment of digestive system.

Through the comparative record's analysis (Table 1 and Figure 2), one comes to the conclusion that despite being uneducated or lacking basic medicinal knowledge, common people make a positive difference in the treatments of numerous unfavorable health conditions (over 140). Majority of species are being used to fight respiratory system difficulties (63), especially against cough (even 32 species) and asthma and lung diseases (16). There are few species, such as *Chelidonium majus, Sedum acre* and *Satureja subspicata* that are commonly used to treat tuberculosis or lung cancer. Digestive system is often an object of herbal medicinal treatment too and over 30 different diseases or disorders are prevented and cured by herbal preparations. 55 species are used for stomach and intestinal therapy of which major proportion is for the stomach difficulties (19 species) and digestion disorders on such as constipation and diarrhea (11 species). 41 species are being used in the treatment of lever sicknesses, including jaundice and the gall. Treatment comprised of five plants has achieved a great success in the maintenance of stable sugar level in the bloodstream.

Traditional phytotherapy provides excellent results in the treatment of diverse cardiovascular disorders, especially arrhythmia, heart fibrillation and the diseases of blood vessels. In the investigated area, unlike other parts of BiH (Redzic, 2006b) or wider (Ivancheva and Stantcheva, 2000; Pieroni et al., 2003; Jaric et al., 2007), different heart disorders have been cured with great success. For this, preparations of *Satureja montana* and *S. subspicata have been used,* while in other regions *Artemisia absinthium* is used for the same purpose, as well as for treatment of arrhythmia. *Acorus calamus* is used for the treatment of heart fibrillation while *Salvia officinalis* is well known in the investigated area as a „cardiac treatment plant“used to strengthen heart muscle and to treat arrhythmia. *Thymus serpyllum* strengthens heart muscle, etc. There are many species that regulate nervous system and by that positively regulate cardiovascular system too.

There are several plants used for the treatment of diseases that affect blood, mainly in terms of «blood cleansing» and against anemia, while some of them, such as *Satureja montana* and local endemic species *Satureja subspicata,* are used to treat leukemia and

syndromes of lymphatic nodes since long ago. There is an interesting story of a 70 years old man from nearby Stolac, who was as a 23 old boy dismissed from the military academy in Belgrade for his bad health, with a life expectancy of only 2 - 3 months. Afterwards, he was subjected to the intense therapy of powder and infusion prepared with *Satureja montana* and *S. subspicata* (combined with goat's milk). The final result had astonished doctors in the region and he started his new life as a healthy man where medicinal plants became an obligatory part of it.

Thirty-three plants are applied in the treatment of kidney and urinary system diseases, mainly as a mean to dissolve a stone in kidneys, for the treatment of urinary infections and inflammation processes, or to improve urination. The best effects have been reached by following species: *Arbutus unedo, Adiantum capilus-veneris, Arctium lappa, Asparagus officinalis, Carlina acaulis, Hieracium pilosella, Hypericum perforatum, Polygonum aviculare, Sambucus ebulus* and others.

At present, plants are being used for the treatment of kidney and urinary system diseases in other regions too (Abu-Rabia, 2005; Lans, 2006). 42 plant species have been used in the treatments of conditions affecting genital system. Informants have suggested 21 different modes of usage of these plants, covering all possible unfavorable conditions of genital system. Majority of plants (13 species) are used for the healing of female genital infections (*Achillea millefolium, Artemisia vulgaris, Capsella bursa-pastoris, Juglans regia, Pimpinella saxifraga, Plantago meda, Quercus pubescens, Potentilla anserina, Mentha pulegium*, and especially *Sedum sexangulare*). 5 species have been used for the treatment of prostate inflammatory processes (*Asparagus officinalis, Hieracium pilosella* and especially *Nigella damascena*). The underlined use of plants as an aphrodisiac aimed to raise male potency (*Juglans regia, Satureja montana, Hyssopus officinalis,* especially *Orchis morio* and *Origanum heracleoticum*) reflects southern temperament of the people in the investigated area. Significant experiences in the usage of traditional herbal remedies for female gynecological disorders have also been recorded in the other parts of the world (Arnel-Schnebelen et al., 2004; Vidyasagar and Prashantkumar, 2007).

Fifty-six species have been used for the treatment of different skin conditions of which the most significant are: *Althaea officinalis, Arctium lappa, Carlina acaulis, Cotinus cggygria, Pinus nigra, Pistacia lentiscus, Polypodium vulgare, Sedum maximum and Viola alba*. Emphasized use of medicinal plants for the treatment of skin conditions has been recognized in some other regions as well (Burnstock et al., 1999; Onanga et al., 1999; Saikia et al., 2006).

Significant results are also being reached in terms of treatments of nervous system disorders such as hysteria, epilepsy and psychotic state of mind for which 29 plant species have been used. The most efficient are: *Hypericum perforatum, Acorus calamus, Vitex agnus-castus, Dictamnus albus, Glechoma hederacea, Micromeria thymifolia, Nepeta cataria, Mentha pulegium, Thymus pulegioides, and Viscum album*.

About 20 plants are used to treat the diseases of muscles and skeletal system, mouth, nose and throat (Table 1). It should be emphasized that *Sanguisorba minor* is used to treat bites of the most venomous snakes in the area, such as *Vipera berus* and *Vipera ammodytes*.

This characteristic of *Sanguisorba minor* arises from its content of unique phenol carboxylic acids (Nahla, 2003). In the region of high biological diversity, where poisonous animal bites occur, seeking for a plant that can treat these states is a specially protruding (Otero et al., 2000).

Similar to other countries (Bandeira et al., 2001; Palmese et al., 2001; Passalacqua et al., 2007) in terms of plant's part being used, the most prominent practice is use of aerial parts where usage of flowering plants (about 34%) and leaves (about 22%) dominate. This proportion correlates with the general domination of hemi cryptophytes in the area (meaning perennial plants), as well as the simple way of collecting them. This isn't the case with trees or plants developing massive root system organs, making a collection more complicated, in a karsts dominated territory (substratum is very hard to penetrate). Even though the proportion of geophytes in the investigated area is much higher, the usage of the root system (root, bulb and rhizome) for the medicinal treatments comes from only 19 plants. Similar to the other territories in BiH (Redzic et al., 1989; 1991; 2006b), usage of coniferous tree's resin as an important ingredient of some traditional pharmaceutics is very popular here. Pharmaceutical preparations are often prepared from several species of plants, (usually mixing three, five or up to seven). It is believed that the effect of cure is better if more plants are used in its preparation.

Majority of plant parts, which are usually aerial parts, are being used to prepare diverse infusion. These preparations are made with simple boiling of plant leaves or flowers in the water, removing it from a heat and leaving it covered until cooled. Afterwards, the infusion is filtrated and served in a traditional manner with the sage honey. A cup of this should be taken several times a day. It can also be consumed instead of water or any other liquid, such as infusion of *Teucrium montanum* (usually 2 - 3 L of tea are made in one go). Jaundice is very successfully treated in this way, as well as liver and stomach diseases, depression etc. Maceration is prepared in way where a crushed plant has been sunk in the warm water over the night.

Homemade tinctures, also frequently used for treatments, are prepared in the way that plant parts are sunk into brandy, kept on the sunlight for 7 - 10 days and applied in a form of drink or cataplasm to cure stomach aches, respiratory system diseases and skin conditions.

Unique preparations are creams known as "*mehlemi*"

whose traditional use in this area is very long. They are prepared using fresh plant parts or pine's resin and mixed with cow's butter or pig's fat. *Mehlems* are common cure for hard healing wounds.

Apart from home made medicinal preparations, medicinal plants are commonly used for a traditional nutrition. The dishes are mainly made with olive oil (Redzic, 2006a).

Compared to the international databases on medicinal and edible plants (PFAF, 2006), and to the other countries in Mediterranean region (Ivancheva and Stantcheva, 2000; Pieroni et al., 2002b; 2003; El-Hilaly et al., 2003; Pieroni and Quave, 2005; Scherrer et al., 2005) to the area of interest, significant difference regarding plant diversity has been detected, including its taxonomical position, ecological character, way of preparing medicinal substances and forms of its application in traditional human therapy.

Comparison of obtained results to the most encompassing database plants for the future (PFAF, 2006), has lead to discovery of 17 species whose therapeutic usage was mentioned for the first time. This represents an important contribution to the advancement of ethno botany and pharmaceutics on global scale (Table 1). Special attention, in terms of being valuable therapeutic resource, should be paid to: *Teucrium montanum* (that according to local people beliefs «heal every disease»), *Teucrium arduini* (endemic species), *Centaurium maritimum* (very popular plant when it comes to stomach and «female» sickness) and *Eryngium amethystinum* (used to treat «water sickness» and hepatitis). Despite being SE European endemic species, *Eryngium amethystinum* posses wide distribution in the investigated area, representing therefore secure resource for further research and modern therapeutic practice.

Using the above mentioned database, it appears that *Helichrysum italicum* hasn't been known for its medicinal characteristics so far and it was only recorded as a spice. Nevertheless, in the area of interest, this is the mostly used medicinal plant used in traditional therapy for liver, gall and stomach sickness, plus it works as an excellent insecticide. The list of species with so far less known or even completely unknown therapeutic use includes the following: *Lilium cattaniae* (local endemic plants), *Marrubium incan*um (excellent anti-arrhythmic), *Micromeria thymifolia* (has an odor similar to that of genus *Mentha* and *Thymus*), *Origanum heracleoticum* (has a luscious smell), resin of the endemic kind of pine *Pinus heldreichii*, then *Prunella laciniata*, *Psoralea bituminosa* (used in the treatment of skin conditions), *Rubus heteromorphus* (used in the treatment of diarrhea and cough) and *Salvia bertolonii* (used in the treatment of skin conditions and cough). Comparing to the same database, *Sanguisorba minor* has been used rarely in the therapy and yet, in the area of interest, this plant is used to treat bites of the most venomous snakes that frequently occur in this area, such as *Vipera ammodytes* and *Vipera berus* subsp. *bosniaca.* It is also used for the treatment of diabetes.

Species such as *Satureja subspicata* (used to treat the most severe blood diseases, such as leukemia), *Sedum maximum* and *Sedum sexangulare* (used to treat skin conditions and complicated vaginal infections) have also been unknown to the world's ethno botanical databases: Further ethno pharmacological research is needed to confirm true potential of these plants in medicinal treatment in the above named or any other pathological condition in human health.

The comparison of the generated data with the international databases in the pertaining field (PFAF, 2006) and mentioned references revealed that the species of *Centaurium maritimum* (L.) Fritsch (Syn: *Centaurium discolor* (Gand.) Ronniger) have not been registered previously to have any use in the traditional therapy. Comparative studies of this plant to the one preformed on very popular species in ethno botany *Centaurium umbellatum* (Grujic-Vasic et al., 2005) showed that the species *C. maritimum* have a significantly higher degree of bitterness. This may indicate its potentially higher phytochemical capacities, and should be confirmed in a concrete pharmacological research. The traditional tincture of „grape brandy“with an aerial part of the species *C. maritimum* has been proved to have an excellent influence on heart strengthening as well as on elimination of stomach discomfort. It is also very popular as an everyday aperitif.

There is no previous record of species *Eryngium amethystinum* L. (Syn.: *Eryngium multifidum* Sibth. and Sm.; *Eryngium glomeratum* Lam.) in the human therapy. This generates the need for more detailed both phyto-chemical and bio-assay research efforts aimed at this productive species, because complex researches of similar species of the genus *Eryngium* (in particular *Eryngium campestre, Eryngium maritimum*) indicate obvious anti-inflammatory activity (Kupeli et al., 2006). As a matter of fact, some species of this genus such as the more widely distributed *Eryngium campestre* contains cyclohexenone and cyclohexadienone glycoside (Clemens et al., 1986).

So far, species *Marrubium incanum* Desr. (Syn.: *Marrubium candidissimum* auct., non L.) was not registered in human therapy even though, according to this research, has shown to be very effective in the treatment of not only stomach diseases but also heart conditions such as arrhythmia. It is extremely important to identify pharmacological effects of this species, the more so because a seed of *Marrubium candidissimum* contains anti Tn (Bird and Wingham, 1981).

*Lilium cattaniae* (Vis.) Vis. (Syn.: *Lilium martagon* L. var. *cattaniae* Vis.; *Lilium. martagon* L. var. *atropurpureum* Neilr.; *Lilium dalmaticum* Vis. in Sched.) is an endemic, very decorative species. It grows in thermofilous forests and shrubs of Herzegovina. So far, it was neither recorded in traditional therapy, nor it was

researched from the phytochemical aspect. It represents an important resource both for phytochemical and pharmacological research, because its closest species *Lilium martagon* in the neighboring Albania is being used in therapy „to eliminate lipids from the blood“, to treat every liver disease (Pieroni et al., 2005b), and it also contains pyrroline glycoside ester and steroidal saponins (Satou et al., 1996).

*Origanum heracleoticum* L. (Syn.: *Origanum hirtum* Link) is an endemic species of strong odor. So far, it was not recorded in the human therapy in the Mediterranean region. The research that was conducted on this species showed that its essential oil has a significant antimicrobial activity on *Pseudomonas putida* (Oussalah et al., 2006), *Escherichia coli* O157:H7, *Salmonella Typhimurinum*, *Staphylococcus aureus* and *Listeria onocytogenes* (Oussalah et al., 2007). It also contains very unique chemical compositions such as 4, 5-*epoxy-p-menth-1-ene* (Lawrence et al., 1974), and a series of other organic compositions (Nhu-Trang et al., 2006). This indicates a need for thorough bio-assay research of these very popular species in BiH coastline.

*Pinus heldreichii* H. Christ (Syn.: *Pinus leucodermis* Antoine p.p.), endemic Balkan-Apennine pine with its distribution in the Central and Western Balkans, is used in the human therapy in the area of interest. Its usage in the other areas has not been recorded. Tree sap is mainly used from this species. This may indicate a medicinal value of both twigs and bark because it contains cembratrienols and other organic compounds at white bark of this species (Werner et al., 1994).

Species *Prunella laciniata* (L.) L. (Syn.: *Prunella alba* Pall. ex M. Bieb.), which mainly inhabits warmer habitats of open sub-Mediterranean meadows, so far hasn't been recorded in human phytotherapy either. In the surveyed area, this species is used for making infusions for the cough treatment, gall and skin diseases. Its closest relative species, the more widely distributed *Prunella laciniata*, is used externally „for cleaning open sores and wounds“(Rivera and Obon, 1995). Given that *Prunella laciniata* inhabits ecologically clean habitats and it is numerous, it could be considered as a serious resource in modern phytotherapy.

Bitumen trefoil *Psoralea bituminosa* L. is Mediterranean species which so far has not been used by humans in BiH. However, it was recorded in therapy of Madeira and Porto Santo, where they use its leaves for making „decoction with alcohol and iodine that is applied externally as a hair restorer“(Rivera and Obon, 1995).

For the first time, *Salvia bertoloni* Vis. (Syn.: *Salvia pratensis* L. subsp. *bertoloni* (L.) Visiani) has been mentioned in human therapy of Mediterranean countries where this species is located. There are several indicators that this is truly a medicinal plant because its closest relative, a typical meadow sage *Salvia pratensis* L. in addition to a series of compositions which have an antioxidant effect (Miliauskas et al., 2004; Lima et al., 2005; Eidi et al., 2005), contains lupeol derivates (Anaya et al., 1989). It is also necessary to make a thorough investigation of pharmacological effects of the species *Salvia bertoloni*, which may have been unjustifiably left out in favor of the more popular medicinal plant *Salvia officinalis,* since the two frequently share same habitats.

Red heather *Satureja subspicata* (Syn.: *Satureja illyrica* Host; *Satureja montana* L. subsp. *illyrica* Nyman) is a Balkan endemic species with its center of distribution in the investigated area (Silic, 1984). So far, its official usage in a therapy has not been recorded. It was probably pushed out from the use by the species *Satureja montana*, which is more widely distributed and more popular among people. Having in mind an extremely prominent chemical diversity and antimicrobial activity of the species *Satureja subspicata* from the habitat of the neighboring Croatia (Skočibušić et al., 2006), it is necessary to do more detailed pharmacological researches, because of a belief that this species successfully treats and „protects“ from very serious diseases.

Species of the genus *Sedum* such as *Sedum sexangulare* (Syn.: *Sedum mite* auct.; *Sedum boloniense* Loisel.), as well as *Sedum maximum* (L.) Suter (Syn.: *Sedum telephium* L. subsp. *maximum* (L.) Krock) have not been registered in the therapy of either BiH region or in the wider Mediterranean region. Having in mind their role in treating skin diseases, infections, vaginal discharge and liver, it would be necessary to complete pharmacological researches on these species. The reason for this is mostly because of flavonol glycosides (Mulinacci et al., 1995) that were isolated in the leaves of *Sedum maximum*, which have been used to treat wounds during the last war in BiH.

Although the popular *Teucrium montanum* L. (Syn.: *Teucrium pannonicum* A. Kern.; *Teucrium praemontanum* Klokov; *Teucrium helianthemoides* Adamovic; *Teucrium jailae* Juz.) has been in use for a long time, its effects are yet to be sufficiently pharmacologically researched and its medicinal effects confirmed. Available phyto chemical researches pointed at the presence of neo-clerodane diterpenoids (Malakov et al., 1992), and the populations of this species from the region of the neighboring Serbia, has indicated the antimicrobial and free radical scavenging activities (Djilas et al., 2006). In particular, it would be necessary to examine its pharmacological effects on the human liver.

Dinaric endemic species *Teucrium arduinii* L. (Syn.: *Teucrium hircanicum* auct. eur., non L.) is a sort of novelty in the therapy but it deserves a full attention in the sense of both more detailed phyto chemical and pharmacological researches, because of neo-cleodane diterpenoids indication of a anti-feedant activity (Bruno et al., 2002).

True significance of possible usage of the abovementioned wild plants can be revealed through modern tendencies in the ethno pharmacology (Gilani

and Rahman, 2005) and through the stronger connection between the ethno botany and ethno pharmacology (Heinrich et al., 2006).

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