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Medicinal Plants from Chatkal Biosphere Reserve Used for Folk Medicine in Uzbekistan

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ABSTRACT

Chatkal Nature Reserve area, which is situated in Western Tien Shan of Uzbekistan, is unique for its significant role in biodiversity conservation and ethnobotany. Nevertheless, extensive studies on such a rich natural resource region of the area have not been well documented. This paper aimed to create an inventory of and describe medicinal plants grown in the region. Questionnaires were distributed to 25 respondents, which were local people, in order to explore the present use of medicinal plants and their reputed therapeutic effects. It was revealed that there were 117 medicinal plants locally utilized for medicinal use. Plant species, botanical name, vernacular name, part(s) used, popular medicinal were among the information provided. Additionally, the invented plants consisted of *Asteraceae* (9 species), *Lamiaceae* (10 species), *Liliaceae* (4 species), *Fabaceae* (9 species), *Polygonaceae* (4 species), *Rosaceae* (14 species), and *Ranunculaceae* (6 species) having therapeutic values for digestive ailments, gastrointestinal disorders, anti-inflammatory, and heart disease.

Keywords: medicinal plants, therapeutic effect, Western Tien Shan

INTRODUCTION

For centuries, plant-derived medicines have been practiced for traditional healthcare worldwide and the interest to employ such plants in healing microbial diseases tended to increase (Chariandy *et al*. 1999). Various Chinese, Egyptian, Babylonian, Greek, Arab, and Muslim scientists enriched our current knowledge with their expertise in herbal medicine (Abu Irmaileh and Afifi 2003). Uzbekistan is globally and regionally important because it is situated between the European, Middle Eastern and Asian biogeographical regions and has an excellent historic research base of herbal medicine. "The Book of Healing", written by Avicenna, is a whole epoch in the history and classic consolidated work and considered him to be "*the father of modern medicine*" (UNESCO 1993). Popular knowledge of plants used by humans is based on the long time range of experiences. People learn how to identify and use plants, including those with a magic-religious function (Camejo-Rodrigues *et al*. 2003). The majority of the world's population in developing Countries still relies on herbal medicines to meet their health needs, because antibiotics are very expensive for low income Countries (Abu-Irmaileh and Afifi 2000).

The selection procedures of different treatment options at household level are also important factor to integrate herbal medicine in a country's health care system (Algarova *et al*. 2008; Shabbir 2012). It is well known that plants contain numerous biologically active compounds, many of which have been shown to have antimicrobial and antifungal properties (Cowan 1999; Tomczykowa 2008; Singh *et al*. 2011).

A number of studies have revealed the existence of a range of natural products with promising activity against various diseases (Newton and Wright 2000; Palombo and Semple 2001; Zia-Ul-Haq *et al*. 2012). Recent studies have focused on the role of medicinal plants in cancer therapy (Bora and Sharma 2011; Bubulica *et al*. 2012; Kataki *et al*. 2012).

The traditional use of medicinal plants in Uzbekistan is widespread with over 70% of Uzbek households using medicinal plants for centuries. The flora of Central Asia includes more than 6500 species of vascular (higher) plants and over 600 of these plants are used in traditional or conventional medicine (Mamedov 2004). There is also a specific group of relic endemic plants, which are nearly extinct, for instance *Bergenia ugamica*, *Ostrrowskkia magnifica*, *Callispepla aegacanthoide* and *Spirostegia bucharica* (Czerepanov 1995). If certain plant species are nearly in extinction due to a high demand for plant medicines then measures can be implemented to ensure the plant sustainability (Ladio and Lozada 2004). Preserving the sustainability of such plants is also imperative from a cultural point of view to prevent lost of knowledge among generations (Thring and Weitz 2006).

Central Asian medicine is not as widely known or understood as medical systems developed in neighbouring countries and few sources of information in the literature are available about the medicinal plants of Uzbekistan (Mamedov *et al*. 2004; Sezik *et al*. 2004). Sezik *et al*. (2004) reported medicinal plants used in 3 provinces of Uzbekistan (Samarkand, Djizak and Buhara). However, the medicinal plants of Chatkal Biosphere Reserve, single protected area in Western Tien Shan have not been well invented and scientifically published (Kogure *et al*. 2004). In our previous studies we reported that the extract from *Origanum tyttanthum* showed the broadest spectrum of action against human pathogenic bacteria Egamberdieva *et al*. 2010). Kogure and others (2004) found various new antioxidants, some of which had a unique mechanism of action in *Ferula*, *Inula*, *Prangos* and *Rheum*. Shikishima *et al*.

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Research Note

(2001) reported that compounds isolated from various plants collected in Uzbekistan showed anti-HIV activity *in vitro* and preventive effects on the generation and release of inflammation agents such as TNF-a and IL-2 *in vitro*. In this study we invented and describe, by means of questionnaire, medicinal plants grown in Chatkal Biosphere reserve.

MATERIALS AND METHODS

Geographical location

The Republic of Uzbekistan is located at the centre of the Eurasian continent developed from various landscapes such as high mountain ranges, wide steppes, deserts and riparian wetlands. Such geomorphological features resulted in a diversity of habitats. Chatkal Biosphere Reserve, established in 1947, is situated in Ugam-Chatkal National Park, which is located in the Tashkent Region, within the Chatkal mountain range of the West Tien-Shan Mountains. Bordering Kazakhstan and Kyrgyzstan, the park has an approximate area of 5746 km^2 and includes Chatkal Biosphere Reserve (452 km^2) within its borders. The high point of Chatkal range on territory of Uzbekistan - Large Chimgan peak (3309 m). The amplitude of the average annual temperatures is about 20-25°C. Such high amplitudes explain that summer temperatures are very high. To east and south-east with changes of relief (from plains to mountains) increase the quantity of precipitation, reaching to 700-800 mm.

Almost all types of vegetation of Central Asian Mountains grow within the region. The flora of Western Tien Shan significantly surpasses the other areas by the absolute number of endemics and the percentage of endemism. The abundance of endemic, rare and relict plants suggests that the region is one of the centres of formation and conservation of species. Over 40 species of rare and endemic plant species included into the Red Data Book of Uzbekistan (2009) are protected in Chatkal Nature Reserve, which constitutes 47% of endangered plants of Western Tien Shan. The basic vegetation pattern consists of trees and shrubs alternating with steppe and meadow areas or bare rocks. The largest areas of deciduous species are concentrated in the Western Tien-Shan Mountains. They are located at altitudes from 800 to 2000 m and contain relict forests of walnut (*Juglans regia*) mixed with wild apple, apricot, plum, and other fruit tree species. Subalpine and alpine meadows are located at altitudes between 2800 m and 3700 m. Meadow vegetation is dominated by *Polygonum*, *Prangos* and *Ferula*.

Field work methodology

Field data were collected during the periods May-September 2006 in the Chatkal Biosphere Reserve region. The method used to gather information was the ethnobotanical interview. Respondents were selected among local people (mainly elderly) having relatively enough information on the local medicinal plants and their uses. Twenty five respondents consisted of 10 traditional medical practitioners, 5 village heads, and 10 elderly living in villages near Chatkal Biosphere Reserve. The respondents are mainly belonging to families having strong connection with traditional agricultural activities. Preliminary interviews were arranged by appointment and a basic questionnaire implemented to explore information on type and medical uses of each plant. In addition to the questionnaire, information from the existing medical plant literatures as well as herbalists, who have permission to enter to the Biosphere Reserve and collect herbal plants were collected.

Medical plant nomenclatures were listed following the identification method provided by Institute of Botany, Uzbekistan. Plant inventory comprises common local name, uses or effects, and part of the plant used. Some species were ratified by plant samples, book images. Complete names, including authorities, of the taxa reported are given in **Table 1**.

RESULTS AND DISCUSSION

The study results are presented in **Table 1**, in which the plants are arranged in alphabetical synopsis. For each species, ethnobotanical and pharmacognostic elements consisted of botanical name; local names; part(s) used; ailments treated; and uses recorded in the literature of each plant.

One hundred and seventeen species belonging to 48 families of medicinal plants were found in the study area (**Table 1**). The dominant families with the largest number of species are *Asteraceae* (9 species), *Lamiaceae* (10 species), *Liliaceae* (4 species), *Fabaceae* (9 species), *Polygonaceae* (4 species), *Rosaceae* (14 species), and *Ranunculaceae* (6 species).

Majority of the plants invented in this study are commonly used in Uzbekistan and neighbouring countries as traditional medicine. The use of herbal plants for the treatment of ailments became popular after independence of Uzbekistan, because of economical unbalance and low income. Marketing herbal plants are extra income for families and people living in villages near Chatkal Biosphere Reserve.

The remedies were rank-ordered according to their therapeutic category (**Table 2**). Thus, a number of indigenous plants are employed for the treatment of gastro-intestinal problems (25.1%), skin disorders (23.5%) and followed by respiratory system ailments (18.2%), then urinary problem (17.6%) and nervous system complaints (7.0%) and hepatic diseases (5.3%).

The most widely treated illness are diuretic, diarrhoea, urinary infections, skin infections inflammation, gastrointestinal disease, bladder and kidney trouble, diabetes, fever and stomach ache. *Elaeagnus angustifolia*, *Punica granatum* and *Amygdalus communis* are the mostly used to remedy gastrointestinal disease in Uzbekistan. In relation to plant use, we found that those diseases are among the most important ones in the community. *Origanum tytthanthum*, *Melissa officinalis*, *Ziziphora pedicellata*, *Melilotus officinalis*, *Ficus carica*, *Amygdalus spinosissima*, *Artemisia absinthium*, *Crataegus pontica* and *Peganum harmala* was recommended by most people interviewed to treat coughs, lung disease, and skin infections (Mamedov 2001; Sezik *et al*. 2004). Many of the same genera around the world are also used in traditional medicine: for instance, *Artemisia absinthium* is widely used in Europe as an appetite stimulant and to treat dyspepsia and gastritis (Van Wyk and Wink 2004), while *Origanum tytthanthum* is used for a wide variety ailments, such as whooping cough, lunge disease, skin infections, antiseptic, stimulant, carminative, diaphoretic, tonic, pain, dyspeptic colic complains, headache (Furnell 1985; Grieve 1998). Özyürek *et al*. (2012) observed antioxidant activity of *Crataegus* species grown in Turkey, *Tanacetum vulgare*, *Fagopyrum saggittatum* and *Gratiola officinalis* were widely used for hepatitis, which is considered one of the most problems in the community. In rural and poor communities hepatitic illness shows the highest importance (Leonti *et al*. 2001; Scarpa 2002). Furthermore, pomegranate (*Punica granatum*) has been traditionally used to treat skin infections such as pioderma and boils caused by *Staphylacoccus aureus* and *Candida albicans* (Avicenna 1956). Antimicrobial compounds may occur in stems, roots, leaves, bark, flowers of plants and are bactericidal and influencing growth rate of microorganisms (Akhtar *et al.* 2008; Dzamici *et al.* 2008; Gupta *et al.* 2012).

For whooping cough and asthma, local people used a decoction of *Acanthophyllum gypsophiloides*, *Inula helenium*, *Tussilago farfara*, *Convolvulus subhirsutus*, *Origanum tytthanthum* and *Anisum vulgare* (Khodjimatov *et al*. 1995; Sezik *et al*. 2004). The decoction of *Bidens tripartita*, *Paeonia hybrida*, *Trachyspermum ammi* is also drunk for kidney disorders and stones. Tomczykowa *et al.* (2008) reported about the antimicrobial and antifungal activities of the extracts and essential oils of *Bidens tripartita*. Kogure *et al*. (2004) found various new antioxidants, some of which had a unique mechanism of action, in *Ferula*, *Inula*, *Prangos* and *Rheum* plants collected in Uzbekistan as seeds used in medicine.

In term of their exist, *Allium pskemense*, *Astragalus rubrivenosus* and *Salsola titovii* are considered as endangered plants in accordance with IUCN classification (Muha-

Table 1 Medicinal plants from Chatkal Biosphere Reserve used in traditional medicine in Uzbekistan.

Family	Species	Local name	Part used	Medicinal use
Amaryllidaceae	*Ungernia victoris* Vved.	O'monqora	leaves, bulb	Treat myasthenia gravis, muscle pain, bronchitis, ulcers, poliomyelitis and other neurological diseases (Khodjimatov *et al*. 1995; Kholmatov and Akhmedov 1995; Berkov *et al.* 2009)
Anacardiaceae	*Pistacia vera* L.	Pista	seeds	Stimulant, diuretic, for abdominal ailments, abscesses, amenorrhoea, bruises, chest ailments, circulation, dysentery, gynecopathy, pruritus, rheumatism, sclerosis of the liver, sores and trauma (Khodjimatov *et al*. 1995; Shinwari *et al.* 2006)
	Rhus coriaria L.	Toron	root, berries	Tonic, astringent, antiseptic, diuretic, to possess antibacterial, hepatoprotective, antioxidant, antiinflammatory/chondroprotective, anti-ischemic, vasorelaxant, vascular smooth muscle cell migration inhibition, hypoglycemic, xanthine oxidase inhibition, non-mutagenic properties (Grieve 1998; Khodjimatov *et al*. 1995; Kholmatov and Akhmedov 1995; Shabbir 2012)
Apiaceae	*Pimpinella anisum* L.	Arpabodien	fruits	Bronchitis, asthma, cough, lung inflammation, urinary excretion, used as a stimulating effect of digestion and antiparasitic, antifungal, antipyretic; used for treatment seizures and epilepsy; have anticonvulsant and muscle relaxant effects (Khodjimatov *et al*. 1995; Kholmatov and Akhmedov 1995; Akhtar *et al.* 2008)
	Bunium persicum (Boiss.) B. Fedtsch.	Zira	fruits	Gastritis, liver disease, gastrointestinal disease, diuretic, bleeding, anticonvulsant activity (Grieve 1998; Khodjimatov *et al*. 1995; Kholmatov and Akhmedov 1995; Sezik *et al*. 2004; Mandegary *et al.* 2012)
	Fumana juniperina Korov.	Shair	root, oil, leaves	Tuberculosis, diabetes, stomach disorders, gastrointestinal disease, dyspepsia, wounds, allergic rashes, skin infections, stimulant, asthma, bronchitis, whooping cough (Furnell 1985; Kholmatov and Akhmedov 1995; Mamedov *et al.* 2004)
	Trachyspermum ammi (L).	Ajgon	leaves	Mouth disinfection, teeth pain, skin fungal disease, against gastric worms, bladder stone, urinary infection, snack bite (Furnell 1985; Grieve 1998)
Apocynaceae	*Vinca erecta* Rgl. et. Schmalh	Burigul	whole plant	Headache, lowering blood pressure, hypertonic disease, tonic, astringent, diabetes, bleeding, nervous disorders, lungs (Grieve 1998; Khodjimatov *et al*. 1995; Kholmatov and Akhmedov 1995)
Asparagaceae	*Asparagus officinalis* L.	Sarsabil	leaf, row shoots	Kidney, urinary tract, gall bladder infections, diuretic (Kholmatov and Akhmedov 1995)
Asphodelaceae	*Eremurus lactiflorus* O. Fedtsch. *E. robustus* (Regel) Regel	Shirach	information	information
Asteraceae	*Achillea millefolium* L.	Buymodaron	steam, leaves, flowers	Diaphoretic, antioxidant, astringent, tonic stimulant, colds, fever, perspiration, eruptive disease, kidney disorders, bleeding piles, inflammation, rheumatism, anaemia, haemorrhoid, asthma, tuberculoses, diarrhoea (Grieve 1998; Khodjimatov *et al*. 1995; Kholmatov and Akhmedov 1995; Vitalini *et al.* 2011)
	Artemisia serotina Bunge *A. dracunculus* L.	Ermon Kechki shuwoq	whole plant	Increasing food digestion, appetite , blood circulation, tonic, stomachic, anthelmintic, dysentery, antiparasitic, antimicrobial, heart disease (Khodjimatov *et al*. 1995; Kholmatov and Akhmedov 1995; Aglarova *et al.* 2008)
	Bidens tripartita L.	Ittikanak	whole plant	Antimicrobial, antifungal, diuretic, astringent, fevers, stone and bladder in kidney, blood vessels, bleeding, liver disease, skin disease, to take snake poisoning, wound (Grieve 1998; Kholmatov and Akhmedov 1995; Tomczykowa 2008)
	Cichorium intybus L.	Sachratki	whole plant	Wounds, allergic rashes, skin infections, laxative diuretic , used antihepatotoxic, antiulcerogenic, antiinflammatory, appetizer, digestive, stomachic, liver tonic, cholagogue, cardiotonic, depurative, diuretic, emmenagogue, febrifuge, alexeteric and also as tonic (Khodjimatov *et al*. 1995; Kholmatov and Akhmedov 1995; Mamedov *et al.* 2004; Nandagopal and Ranjitha Kumari 2007)
	Inula grandis Schrenk. Enum.	Sariandiz	leaves, flowers	Tuberculoses, intestinal track infection, against worm (Khodjimatov *et al*. 1995; Kholmatov and Akhmedov 1995)
	I. helenium L.	Qora-andiz	root	Antibacterial, antifungal, stomach disorders and gastrointestinal disease, diuretic, stimulant, dropsy, skin affections, coughs, pulmonary complains, asthma bronchitis (Furnell 1985; Khodjimatov *et al*. 1995)
	Tanacetum santolina C. Winkl.	Dastarbosh	whole plant, flowers	Hepatitis disease, hysteria, kidney disorders, diaphoretic, liver disease, stomach disease fever, against worms, tonic stimulant (Grieve 1998; Khodjimatov *et al*. 1995; Kholmatov and Akhmedov 1995)
	Tussilago farfara L.	Oqqaldirmoq	leaves, flowers	Cold and inflammation, against cough, heart ailments, cardiac, chest infection, tonic, asthma, bronchitis, tuberculoses, diuretic (Grieve 1998; Khodjimatov *et al*. 1995; Uzun *et al.* 2004)
Caprifoliaceae	*Lonicera korolkovii* Stapf *L. tatarica* L.	Korolkov uchkati Uchkat	flowers, leaves, seeds	Diuretic, digestive, inflammation, influenza, fever, headache, coughing, spasm, intestinal ailments, antioxidant (Grieve 1998; Khodjimatov *et al*. 1995; Bubulica *et al.* 2012)

Table 1 (Cont.)

Family	Species	Local name	Part used	Medicinal use
Caryophyllaceae	*Allochrusa gypsophiloides* (Regel) Schischk. *Acanthophyllum glandulosum* Bunge	Etmak Bezli etmak	roots	Bronchitis, lung disease, asthma, ulcers, tonic, antimicrobial, cough, expectorant and emetic (Grieve 1998; Khodjimatov *et al*. 1995; Kholmatov and Akhmedov 1995; Gaidi *et al.* 2004)
	Herniaria glabra L.	Saminchup	herb	Lung disease, stomach disease, urinary infection, kidney inflammation, diuretic, dropsy, cardiac, nephritic, hepatitis, antihypertensive (Grieve 1998; Khodjimatov *et al*. 1995; Mamedov *et al.* 2004; Rhiouani *et al.* 2001)
Chenopodiaceae	*Chenopodium album* L.	Sho'ra	aerial parts	Wounds, allergic rashes, skin infections, useful in curing anorexia, cough, dysentery, and diarrhea, piles and kills small worms (Kholmatov and Akhmedov 1995; Mamedov *et al.* 2004; Singh *et al.* 2011)
	Nanophyton erinaceum (Pall.) Bunge	Tashburg'un	fruit, oil	Wounds, allergic rashes, skin infections (Kholmatov and Akhmedov 1995; Mamedov *et al.* 2004)
	Salsola titovii Botsch.	Titov sho'ragi	fruit, aerial part	Blood pressure, headache, heart problems (Khodjimatov *et al*. 1995; Kholmatov and Akhmedov 1995)
	Spinacia turkestanica Litv.	Ismalok	leaves, aerial parts	Improving blood formation, hypertonic (Khodjimatov *et al*. 1995; Grieve 1998)
Convolvulaceae	*Convolvulus purpureus* L.	Pechak	root	Cathartic, purgative action, pain, colic, against skin disease, making soft stomach (Furnell 1985; Khodjimatov *et al*. 1995; Grieve 1998)
	C.subhirsutus Regel & Schmalh.	Mingbosh	roots	Asthma, against nose and ear pains, poisoning (Grieve 1998; Khodjimatov *et al*. 1995)
Cupressaceae	*Juniperus turkestanica* Kom. *J. seravschanica* Kom.	Orik archa Qizil archa	needles, fruits, oil	Wounds, allergic rashes, skin infections, renal colic, dyspepsia, disorders of the prostate gland and cystitis, diuretic, stomachic, kidney and bladder disease, cardiac and hepatic dropsy, antimalarial, carminative, heart disease, kidney diseases, and as a diuretic, and abortive (Khodjimatov *et al*. 1995; Kholmatov and Akhmedov 1995; Mamedov *et al.* 2004; Okasaka *et al.* 2006)
Brassicaceae	*Capsella bursa-pastoris* (L.) Medik.	Jag'Jag	whole plant	Liver disease, blood flow stopping, urinary infections, uterus, stomach haemorrhage, wounds, bleeding. chronic diarrhoea, dysentery, stimulant diuretic, dropsy, nephritis, odynuria, hemafecia, menorrhagia, chyluria and hypertension (Furnell 1985; Grieve 1998; Khodjimatov *et al*. 1995; Song *et al.* 2007)
Elaeagnaceae	*Elaeagnus angustifolia* L.	Jiyda	fruits	Gastrointestinal disease, diarrhoea (Furnell 1985; Khodjimatov *et al*. 1995; Kholmatov and Akhmedov 1995; Grieve 1998)
	Hippophae rhamnoides L.	Chakanda	fruits, oil	Cure blindness, wounds, burn infections, intestinal disorders, to protect from atopic dermatitis, hepatic injury, cardiac disease, ulcer, and atherosclerosis (Grieve 1998; Kholmatov and Akhmedov 1995; Padmavathi *et al.* 2005)
Euphorbiaceae	*Euphorbia rapulum* Kar.& Kir.	Ihroj	leaves, resin	Chronic inflammation of respiratory tract asthma, bronchitis (Furnell 1985; Grieve 1998)
Equisetaceae	*Equisetum arvense* L.	Dala kirkbugin	steam	Blood circulation, blood flow stopping, liver disease, skin disease, cough, gastric ulcer, gallstones, kidney bladder, tuberculoses, antioxidant, aquaretic and antihaemorragic (Khodjimatov *et al*. 1995; Kholmatov and Akhmedov 1995; Grieve 1998; Mimica-Dukic *et al.* 2008)
Fabaceae	*Alhagi pseudalhagi* (Bieb.) Fisch.	Yantok	aerial part, roots	Cough, bleeding, dysenteries, diuretic, gastritis, hommorhoids, dysentery, nasopharynx, angina, antipyretic, eczema (Khodjimatov *et al*. 1995; Kholmatov and Akhmedov 1995; Sultan *et al.* 2011)
	Amorpha fruticosa L.	Butasimon amorfa[a]	leaves, seeds	Antibacterial, dysentery, nerve disorders, heart problems (Khodjimatov *et al*. 1995; Kholmatov and Akhmedov 1995)
	Astragalus abolinii M.Pop. *A. rubrivenosus* Gontsch.	Astragal	leaves, gummy exudation	Kidney disease, hypertonic disease, burns, demulcent (Khodjimatov *et al*. 1995; Kholmatov and Akhmedov 1995)
	Glycyrrhiza glabra L.	Qizilmiya	roots	Wounds, allergic rashes, skin infections, bronchitis, chest infections, demulcent, cough, sore throat laryngitis, stomach ulcers, antimicrobial, detoxifies, protects liver, arthritis, peptic and mouth ulcers, gastric, psoriasis, inflammations, eye diseases, throat infections, peptic ulcers, arthritic conditions, treatment of sex-hormone imbalances and menopausal symptoms in women (Khodjimatov *et al*. 1995; Kholmatov and Akhmedov 1995; Gupta *et al.* 2008)
	Medicago sativa L.	Beda	aerial, flower	Stomach ulcers, improve the memory, to cure kidney pain, cough, sore muscles, as rejuvenator, antidiabetic, antioxidant, antiinflammatory, antimicrobial and in CNS disorders (Khodjimatov *et al*. 1995; Kholmatov and Akhmedov 1995; Bora and Sharma 2011)
	Melilotus officinalis (L.) Pall.	Qashqarbeda	herb, whole plant	Skin disease, after burn, lung disease, antiseptic, antibacterial activity, digestive, rheumatic pains, emollient and digestive (Furnell 1985; Kholmatov and Akhmedov 1995; Grieve 1998; Anwer *et al.* 2008)
	Psoralea drupacea Bunge	Oqquray	fruits, roots, leaves	Eczema, pigment disorders, skin disease, infections, antibacterial, antidepressant, glycosidase inhibitory activity, antioxidant, antiviral, antitumor, estrogenic, antimicrobial, anti-inflammatory and antipyretic (Khodjimatov *et al*. 1995; Kholmatov and Akhmedov 1995; Ramezani *et al.* 2011)

Table 1 (Cont.)

Family	Species	Local name	Part used	Medicinal use
	Goebelia pachycarpa (C.A. Mey) Bunge	Achchiqmiya	flower, fruit, aerial parts	Wounds, allergic rashes, skin infections, typhus, purgative, emetic stimulant, astringent, antiseptic, eczema, as an analgesic and as a spasmolytic agent (Kholmatov and Akhmedov 1995; Mamedov *et al.* 2004; Muminova *et al.* 2006)
Fumariaceae	*Corydalis sewerzowii* Regel	Karidal	root	Scrofulous aliments, diuretic, alterative (Khodjimatov *et al*. 1995; Kholmatov and Akhmedov 1995)
Gentianaceae	*Gentiana olivieri* Griseb.	Gazakut	root	Stimulant, tonic, antiseptic, diarrhea, common cold, stomachache, wound and ease of digestion (Grieve 1998; Khodjimatov *et al*. 1995; Yang *et al.* 2010)
Geraniaceae	*Geranium collinum* Steph.	Erongul	root leaves	Diarrhoea, against bleeding, tonic, styptic, leucorrhoea (Furnell 1985; Kholmatov and Akhmedov 1995; Grieve 1998)
	G. transversale (Kar. & Kir.) Vved.	Yarongul	leaves	Tonic, internal bleeding, leucorrhoea, diarrhea, cholera (Khodjimatov *et al*. 1995; Kholmatov and Akhmedov 1995; Grieve 1998)
Hupericaceae	*Hypericum perforatum* L.	Dalachoy	leaves, flowers, oil	Wounds, gastric, pain, bruises, cuts and scalds, skin infections, astringent, expectorant, pulmonary, bladder troubles, dysentery, diarrhoea, hysteria, nervous depression, haemoptysis, haemorrhoidal, lung disease, excitability, neuralgia, fibrositis, sciatica, menopausal neurosis, anxiety, depression, tonic, treatment of wounds (Furnell 1985; Khodjimatov *et al*. 1995; Kholmatov and Akhmedov 1995; Grieve 1998; Barnes *et al.* 2001; Mamedov *et al.* 2004)
	H. scabrum L.	Dag'al qizilpoycha	flowers, oil, aerial parts	Bladder troubles, pulmonary complains, suppression of urine, dysentery worms, diarrhoea, hysteria, nervous depression, haemorrhages, jaundice, trauma, rheumatism, neuralgia, gastroenteritis, ulcers, hysteria, bedwetting, depression, sedative, anti-inflammatory, antiseptic, antimicrobial, antifungal and antioxidant (Furnell 1985; Kholmatov and Akhmedov 1995; Grieve 1998; Pirbalouti *et al.* 2011)
Iridaceae	*Crocus alatavicus* Regel & Semen.	Shafran	flowers	Promote menstruation, abdominal illness, diuretic (Furnell 1985)
Juglandaceae	*Juglans regia* L.	Grek engog'i	fruit seed, leaves	Inflammation, diarrhoea, skin disease, mouth wash, mouth infections, dysentery, syphilis, old ulcers, eczema, antioxidant, anti-inflammatory, antidiarrheic, antihelmintic, depurative, astringent, keratolytic, antifungal, hypoglycaemic, hypotensive, anti-scrofulous, sedative activities (Khodjimatov *et al*. 1995; Grieve 1998; Jalili and Sadeghzade 2011)
Lamiaceae	*Dracocephalum komarovii* Lipsky	Bo'znoch Dragonhead	aerial part, seeds	Antispasmodic, astringent, carminative; tonic, vulnerary (Khodjimatov *et al*. 1995; Kholmatov and Akhmedov 1995; Mamedov *et al.* 2004)
	D. spinulosum M. Pop.			
	Lagochilus setulosus Vved.	Gangituvchi bozulbang	flowers, leaves	To staunch flow of blood, blood hypoxia, against high blood pressure (Khodjimatov *et al*. 1995; Kholmatov and Akhmedov 1995)
	Leonurus turkestanicus V. Krecz. & Kuprian.	Arslon quyruq	aerial parts	Diaphoretic, antispasmodic, tonic, nervine, strengthening heart, neuralgia, heart disease, nervous disorders (Furnell 1985; Khodjimatov *et al*. 1995; Kholmatov and Akhmedov 1995)
	Melissa officinalis L.	Limono't	whole plant	Epilepsy, mental illness, diuretic, digestive, fevers and colds, indigestion associated with nervous tension, hyperthyroidism, depression, mild insomnia, epilepsy, headaches, toothaches, flatulence, colic, nausea, nervousness, anaemia, vertigo, syncope, malaise, asthma, bronchitis, amenorrhea, cardiac failure, arrhythmias, depression, psychosis, hysteria, ulcers, wounds, against Alzheimer disease, antioxidant, sedative, anti-inflammatory, hepatoprotective, digestive, antiviral, antilipidaemic, anxiolytic (Khodjimatov *et al*. 1995; Kholmatov and Akhmedov 1995; Uzun *et al.* 2004; Martins *et al.* 2012)
	Origanum tytthanthum Gontsch.	Tog rayhon	leaves, flowers, aerial parts	Whooping cough, lunge disease, skin infections, antiseptic, stimulant, carminative, diaphoretic, tonic, pain, dyspeptic colic complains, headache (Furnell 1985; Khodjimatov *et al*. 1995; Kholmatov and Akhmedov 1995; Grieve 1998; Camejo-Rodrigues *et al.* 2003)
	Salvia sclarea L.	Marmarak	leaves, flowers	Wounds, allergic rashes, skin infections, antispasmodic, tonic, stomachic digestion, kidney disease, eye inflammation, headache, antidepressant, antiseptic, antispasmodic, carminative, and aphrodisiac (Furnell 1985; Khodjimatov *et al*. 1995; Grieve 1998; Dzamici *et al.* 2008)
	Scutellaria galericulata L.	Ko'kamaron	whole plant	Against nervous disorders, and heart vascular disease, tonic, nervine, antispasmodic, astringent, headache, neuralgia (Khodjimatov *et al*. 1995; Kholmatov and Akhmedov 1995; Grieve 1998)
	Thymus seravschanicus Klok.	Togjambil	aerial part, oil	Wounds, allergic rashes, skin infections, antiseptic antispasmodic, tonic, gastric fermentation, spasm, colic, perspiration, fever, febrile complains (Furnell 1985; Khodjimatov *et al*. 1995; Kholmatov and Akhmedov 1995; Grieve 1998; Camejo-Rodrigues *et al.* 2003; Mamedov *et al.* 2004)
	Ziziphora pedicellata Pazij & Vved	Kiyik uti	leaves, aerial part	Blood circulation, against cold, gastric, intestinal, cardiovascular (Dembitskii *et al.* 1994; Khodjimatov *et al*. 1995; Kholmatov and Akhmedov 1995; Mamedov *et al.* 2004; Sezik *et al*. 2004)

Table 1 (Cont.)

Family	Species	Local name	Part used	Medicinal use
Liliaceae	*Allium aflatunense* B.Fedtsch. *A. baschkyzylsaicum* Krassovskaja *A. pskemense* B.Fedtsch. *A. motor* R.Kam.& Levichev	Piyoz	bulb	Diaphoretic, diuretic, expectorant, stimulant, antiseptic, wounds, burn, skin, cough, antiseptic, diarrhoea, stomach problems, tuberculosis, strong cold, tonic (Furnell 1985; Khodjimatov *et al*. 1995; Kholmatov and Akhmedov 1995; Keusgen *et al.* 2006)
Linaceae	*Linum humile* Mill.	Zigir	whole herb	Mouth lung inflammation, stomach disorders, after burn for skin cream, gastritis, tuberculosis, diuretic, tonic, diabetes, dropsy, kidney disease (Furnell 1985; Khodjimatov *et al*. 1995; Grieve 1998)
Melanthiaceae	*Colchicum kesselringii* Regel	Boychechak	seeds, flowers	Head rashes, dropsy, asthma, arthritis, skin disease (Khodjimatov *et al*. 1995; Kholmatov and Akhmedov 1995)
Moracae	*Ficus carica* L.	Anjir	leaves, fruit	Laxative, mouth ulcers, cough, wounds, gastric disease, bronchitis, vitiligo, hepatoprotective, antimicrobial, anti-inflammatory, antioxidant (Furnell 1985; Kholmatov and Akhmedov 1995; Grieve 1998; Ali *et al.* 2012)
Oleaceae	*Fraxinus raibocarpa* Regel	Shumtol	leaves, seeds	Dropsy, malaria fever, diuretic (Kholmatov and Akhmedov 1995)
Oxalidaceae	*Oxalis corniculata* L.	Kislitsa	leaves	Wounds, allergic rashes, skin infections, antibacterial, antifungal, abortifacient, antiepileptic, antitumor, antioxidant, antihypertensive, antipsyhotic, pain, rheumatism (Kholmatov and Akhmedov 1995; Mamedov *et al.* 2004; Kumar *et al.* 2012)
Paeoniaceae	*Paeonia hybrida* Pall.	Sallagul	leaves, flowers	Dissolve stones from bladder and kidney, nerve disease (Furnell 1985; Grieve 1998; Okasaka *et al.* 2008)
Papaveraceae	*Papaver pavoninum* Schrenk	Kizgaldok	flower, seeds	Angina, asthma, sleeping drug (Furnell 1985; Grieve 1998; Sezik *et al*. 2004)
Peganaceae	*Peganum harmala* L.	Isiriq	aerial parts	Epilepsy, nervous disease, nervous inflammation, arthritis, cold, antimicrobial, antiviral, antioxidant, hypothermic, hallucinogenic, antihelmitic, lactogogue, antispasmodic, antipyretic, abortifient, emetic and emmenagogue (Khodjimatov *et al*. 1995; Kholmatov and Akhmedov 1995; Hayet *et al.* 2010)
Plantaginaceae	*Plantago ovata* Forssk.	Zupturum	leaves	Wounds, allergic rashes, skin infections, diarrhea, dysenteric, inflammation, astringent, genitor urinary tract (Furnell 1985; Khodjimatov *et al*. 1995; Grieve 1998; Camejo-Rodrigues *et al.* 2003)
	P. major L.	Zupturum	leaves, seeds	Stomach disease, against blood solidity, headache, pains, skin infections (Furnell 1985; Grieve 1998)
	P. squalida Salisb.	Bargizub	seeds, leaves	Cough, bleeding, inflammation, wounds, headache, rheumatism, skin infections, digestive ailments, wound bleeding (Furnell 1985; Khodjimatov *et al*. 1995; Grieve 1998)
Poaceae	*Agropyron aucheri* Boiss.	Tukli bugdoyoek	rhizome	Diuretic, catarrhal disease, rheumatism (Furnell 1985; Kholmatov and Akhmedov 1995; Grieve 1998)
	Hordeum bulbosum L.	Piezli arpa	leaves, steam	Pulmonary complains, diuretic, headache (Grieve 1998; Khodjimatov *et al*. 1995)
Polygonaceae	*Rheum maximowiczii* Losinsk.	Ravoch	roots	Wounds, allergic rashes, skin infections, tonic, stomachic, purgative, diarrhoea, antibacterial activity (Kholmatov and Akhmedov 1995; Mamedov *et al.* 2004; Komakine *et al.* 2005)
	Aconogonon bucharicum (Grig.) Holub. *Persicaria maculata* (Rafin.)A.&D. Löve	Toron	roots, aerial part	Wounds, allergic rashes, skin infections, inflammation, diarrhea, bleeding piles, haemorrhoids bleeding (Kholmatov and Akhmedov 1995; Mamedov *et al.* 2004)
	Polygonum aviculare L.	Qiziltasma	flower, leaves, aerial parts	Against blooding, diarrhea, digestive tract infections, cystitis, ulcers, worms (Kholmatov and Akhmedov 1995; Grieve 1998)
Punicaceae	*Punica granatum* L.	Anor	root, bark, fruits, flowers	Diarrhoea, blood flow stopping, skin disease, urinary infection, astringent, chronic dysentery, anticarcinogenic properties, antioxidant, wound healing (Furnell 1985; Grieve 1998; Murthy *et al.* 2004)
Ranunculaceae	*Adonis tianschanica* (Adoplf) Lipsch.	Tyanshan adonisi	herb, aerial parts	Heart disease, kidney disease (Kholmatov and Akhmedov 1995; Grieve 1998)
	A. leiosepala Butk.	Syvurut	aerial parts	Heart disorders, fever, lung disease (Khodjimatov *et al*. 1995; Kholmatov and Akhmedov 1995)
	Delphinium confusum M. Pop *D. elatum* L. *D.semibarbatum* Bien.ex Boiss. *D. rotundifolium* Afan	Chalkash isparak Baland isparak Sarik gulli Isparak Yumaloqbarg isparak	flower, seeds, leaves	It is used in surgery clinics, to stop bleeding, or lowering muscles functions, insecticide, asthma dropsy, colic (Furnell 1985; Grieve 1998)
Rhamnaceae	*Rhamnus cathartica* L.	Itjumrut	berries, fruits	Against various cancer disease, tonic, cathartic, diuretic (Furnell 1985; Khodjimatov *et al*. 1995; Kholmatov and Akhmedov 1995)
	Zisyphus jujuba Mill.	Chilonjiyda	roots, leaves, fruits	Gonorrhea, venereal disease, washing ulcers, fevers astringent, bleeding, cough, diuretic (Furnell 1985; Khodjimatov *et al*. 1995)
Rosaceae	*Amygdalus communis* L.	Bodom	seed, oil	Gastrointestinal disease, against pain, asthma lung disease, kidney disease, stomach disease, antioxidant (Furnell 1985; Khodjimatov *et al*. 1995; Grieve 1998; Sfahlan *et al.* 2009)
	Amygdalus spinosissima Bunge	Bodomcha	oil	Skin disease, stone, gravel (Grieve 1998)

Table 1 (Cont.)

Family	Species	Local name	Part used	Medicinal use
	Crataegus pontica C. Koch	Sarik dulana	fruits	Heart disease, hypertonic disease, helping in nervous system disorders, against depression, antioxidant (Furnell 1985; Grieve 1998; Sezik *et al*. 2004; Özyürek *et al.* 2012)
	C. turkestanica Pojark	Kizil dulana	fruits	Diabetes, liver disorders, gastrointestinal disease (Khodjimatov *et al*. 1995; Kholmatov and Akhmedov 1995)
	Malus sieversii (Ledeb.) M. Roem.	Olma	fruit	Diarrhea, bronchitis, sever coughs, sore throats, wounds, allergic rashes, skin infections (Khodjimatov *et al*. 1995; Kholmatov and Akhmedov 1995; Mamedov *et al.* 2004)
	Orthurus kokanicus (Regel & Schmalh.) Juz.	Erchoy	aerial parts, roots	Teeth pain, mouth wash, antiseptic, diarrhoea, mouth ulcers (Khodjimatov *et al*. 1995; Kholmatov and Akhmedov 1995)
	Potentilla reptans L.	Gozpanja	roots	Diarrhoea, leucorrhoea, antiseptic activity, gastrointestinal disease, mouth ulcers (Furnell 1985; Khodjimatov *et al*. 1995; Kholmatov and Akhmedov 1995)
	Prunus sogdiana Vass.	Yowwoyi olhuri	fruit, roots	Tonic, pectoral, bronchitis, nervous cough, dyspepsia (Grieve 1998; Khodjimatov *et al*. 1995)
	Rosa canina L.	Namatak	roots	Digestion, against hypertonic, kidney cleaning purpose, cold, prevention of inflammation of the gastric mucosa and gastric ulcer, for gallstones and biliary complaints, as a laxative, for disorders of the kidney and the lower urinary tract, as a diuretic, astringent, inflammatory diseases, to reduce osteoarthritis symptoms, antioxidant, antimutagenic, anticarcinogenic (Furnell 1985; Khodjimatov *et al*. 1995; Montazeri *et al.* 2011)
	Rubus caesius L. *R. idaeus* L.	Maymunjon	shoots, leaves	Digestive ailments, skin problems, eczema, mild anemia and debility, astringent tonic, dysentery, diarrhea, wounds, colic pain, diarrhea, renal disease, uterine relaxant (Kholmatov and Akhmedov 1995; Grieve 1998; Venskutonis *et al.* 2007)
	Sanguisorba alpina Bunge	Ko'k o't	roots	Wounds, allergic rashes, skin infections, tonic astringent, diarrhoea, dysentery, leucorrhea (Khodjimatov *et al*. 1995; Kholmatov and Akhmedov 1995; Mamedov *et al.* 2004)
	S. officinalis L.	Ko'k o't	roots	Gastrointestinal disease, diarrhoea, antiseptic for skin disease, tonic, astringent, dysentery, leucorrhoea, bleeding, wounds, burns, anticancer, haemostatics, antiinflammatory (Grieve 1998; Kholmatov and Akhmedov 1995; Sun *et al.* 2012)
	Sorbus tianschanica Rupr.	Chetan	bark fruit	Diarrhoea, leucorrhoea, antioxidant, antitumor, antibacterial and treatment of asthma activities, anti-inflammation, gastritis, dyspnoea, ventricular myositis (Furnell 1985; Grieve 1998; Ayupbek *et al.* 2012)
Salicaceae	*Populus* sp.	Terak	bark	Tonic, fever, diuretic, gonorrhoea, chronic diarrhoea (Furnell 1985; Khodjimatov *et al*. 1995; Kholmatov and Akhmedov 1995)
Scrophulariaceae	*Gratiola officinalis* L.	Safroo't	leaves, aerial part	Liver, kidney, hepatitis, worms, cystitis, colic, certain stomach and menstrual disorder, skin and liver diseases, enlargement of the spleen, dropsy, jaundice, intestinal worms, used as diuretic and emetic, hematopoietic, liver and respiratory disorders, cardiac tonic, diuretic, violently purgative and vermifuge, homoeopathy, antihelminthic (Furnell 1985; Grieve 1998; Zia-Ul-Haq *et al.* 2012)
Simaroubaceae	*Ailanthus altissima* (Mill.) Swingle	Sassiqdaraht	fruits, leaves	Dysentery, stone in kidney and livers, gonorrhea, haemorrhoids, for cough, gastric and intestinal upsets, to treat anaemia, diarrhea, heamorrhage and spermatorrhea, used as antispasmodic, antiasthmatic, cardiac depressant, astringent and for treatment of epilepsy (Furnell 1985; Grieve 1998; Rashed *et al.* 2012)
Tiliaceae	*Corchorus olitorius* L.	Gut	seeds	Blood circulation disorders, heart disease, antibacterial, demulcent, bittertonic, laxative, carminative, refrigerant, febrifuge, diuretic, useful in chronic cystitis, gonorrhea and cardiotonic (Furnell 1985; Kholmatov and Akhmedov 1995; Ramadevi and Ganapaty 2011)
Ulmaceae	*Ulmus minor* Mill.	Karagach	leaves, oil	Digestive ailments, intestinal infectious, diarrhoea, skin infections, wounds, stomach ailments, easing colitis, gastric and peptic ulcers (Grieve 1998; Kholmatov and Akhmedov 1995)
Urticaceae	*Urtica dioica* L.	Qichitqi o't	seeds, flowers	Vitamin deficiency, liver disease, stopping blood flow, skin disease, gastrointestinal disease, diuretic, tonic, diuretic, emmenagogue, blood purifier and as anthelminthic, in nephritis, haematuria, jaundice and menorrhagia, possess diuretic, natriuretic, antidiabetic and antihypertensive activity (Grieve 1998; Uzun *et al.* 2004; Kataki *et al.* 2012)
Violaceae	*Viola arvenis* Murr.	Binafsha	leaves, flowers	Heart ailments, inflammation, diuretic, cardiac disorders, eczema, psoriasis, wounds, allergic rashes, skin infections, urinary excretion, cough, epilepsy, asthma (Grieve 1998; Kholmatov and Akhmedov 1995; Mamedov *et al.* 2004)
Vitaceae	*Vitis vinifera* L.	Tok	leaves, fruit	Wounds, allergic rashes, skin infections, astringent, haemorrhoid, bleeding, kidney disorders, neuralgia sleeplessness, skin disease, astringent, antioxidant, antiviral, antibacterial, haemostatic, diarrhea, hemorrhage, varicose veins, inflammatory disorder, pain, hepatitis, to heal wounds and drain furuncles, antiseptic for eye wash (Sezik *et al*. 2004; Orhan *et al.* 2009)

Table 2 Rank-ordered list of folk remedies according to group of ailments employed for the treatment.

Type of symptoms/diseases	Number of remedies	Ratio in all remedies (%)
Gastro-intestinal symptoms	47	25.1
Skin disorders	44	23.5
Respiratory system ailments	34	18.2
Urinary problems	33	17.6
Nervous system complaints	13	7.0
Hepatic diseases	10	5.3
Cardiovascular diseases	6	3.2
Total	187	100

medjanova 2004). In addition, some other plants such as *Adonis leiosepala*, *Allium aflatunense*, *Allium baschkyzylsaicum*, *Allium motor*, *Astragalus abolinii*, *Crocus alatavicus*, *Dracocephalum komarovii*, *Dracocephalum spinulosum*, *Eremurus lactiflorus*, *Eremurus robustus*, *Ferula juniperina*, *Paeonia hybrida*, *Vitis vinifera* have been considered as rare plants. Some medicinal plants such *Equisetum arvense*, *Allium pskemense*, *Plantago major*, *Hordeum bulbosum*, *Polygonum aviculare*, *Urtica dioica* and *Cichorium intybus* were also used for the same purposes in Turkey (Yesilada *et al*. 1993; Gürbüz *et al*. 2002; Sezik *et al*. 2004). In other studies, Kataki *et al.* (2012) observed that the leaf extract of *Urtica dioica* showed antioxidant, hepatoprotective, and anthelmintic activities. Rashed *et al*. (2012) found *Ailanthus altissima* to demonstrate analgesic, antipyretic and antiulcer activities. Those studies justify the use of the medicinal plants for treating most common illness in Central Asia.

CONCLUSION

Our results show that the Chatkal Biosphere reserve has ethnobotanical potential for medicinal plants and the usage increases with age, i.e. older people use more medicinal species than younger ones. The reserve region is a suitable place for further ethnobotanical and ethnopharmacological studies and such survey can be a reliable source of discovering new plants. The phytochemistry of many species is poorly known and new bioactive compounds could be discovered from native plants in further studies.

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REFERENCES

Abu-Irmaileh BE, Afifi FU (2003) Herbal medicine in Jordan with special emphasis on commonly used herbs. *Journal of Ethnopharmacology* **89**, 193-197

Abu-Irmaileh BE, Afifi FU (2000) Treatment with medicinal plants in Jordan. *Dirasat, Medical and Biological Sciences* **27**, 53-74

Abu Ali Bin Sina (Avicenna) (1956) *Canon of Medicine* (Vol 2), Academy of Sciences of Uzbekistan, Tashkent, 827 pp (in Russian)

Aglarova AM, Zilfikarov IN, Severtseva OV (2008) Biological characteristics and useful properties of tarragon (*Artemisia dracunculus* L). *Pharmaceutical Chemistry Journal* **42 (2)**, 81-86

Akhtar A, Deshmukh AA, Bhonsle AV, Kshirsagar PM, Kolekar MA (2008) *In vitro* antibacterial activity of *Pimpinella anisum* fruit extracts against some pathogenic bacteria. *Veterinary World* **1 (9)**, 272-274

Ali B, Mujeeb M, Aeri V, Mir SR, Faiyazuddin M, Shakeel F (2012) Anti-inflammatory and antioxidant activity of *Ficus carica* Linn. leaves. *Natural Products Research* **26 (5)**, 460-465

Anwer MS, Mohtasheem M, Azhar I, Ahmed SW, Bano H (2008) Chemical constituents from *Melilotus officinalis*. *Journal of Basic and Applied Sciences* **4 (2)**, 89-94

Ayupbek A, Ke-lin H, Aisa HA (2012) Chemical constituents from the leaves of *Sorbus tianschanica*. *Chemistry of Natural Compounds* **48 (1)**, 133-134

Barnes J, Anderson LA, Phillipson JD (2001) St John's wort (*Hypericum perforatum* L.): A review of its chemistry, pharmacology and clinical properties. *Journal of Pharmacy and Pharmacology* **53**, 583-600

Berkov S, Georgieva L, Kondakova V, Atanassov A, Viladomat F, Bastida J, Codina C (2009) Plant sources of galanthamine: Phytochemical and biotechnological aspects. *Biotechnology and Biotechnological Equipment* **23 (2)**, 1170-1176

Bora KS, Sharma A (2011) Evaluation of antioxidant and cerebroprotective effect of *Medicago sativa* Linn. against ischemia and reperfusion insult. *Evidence-Based Complementary and Alternative Medicine* Article ID 792167, 9 pp

Bubulica M-V, Chirigiu L, Grumezescu AM, Popescu A, Simionescu A (2012) Screening of antioxidant potential of *Lonicera tatarica*, *Viburnum opulus* and *Sambucus ebulus* L. by multiple *in vitro* assays. *Journal of Medicinal Plants Research* **6 (3)**, 544-552

Camejo-Rodrigues J, Ascensão L, Bonet MÀ, Vallès J (2003) An ethnobotanical study of medicinal and aromatic plants in the Natural Park of "Serra de São Mamede" (Portugal). *Journal of Ethnopharmacology* **89**, 199-209

Cowan MM (1999) Plant products as antimicrobial agents. *Clinical Microbiology Reviews* **12 (4)**, 564-582

Chariandy CM, Seaforth CE, Phelps RH, Pollard GV, Khambay BPS (1999) Screening of medicinal plants from Trinidad and Tobago for antimicrobial and insecticidal properties. *Journal of Ethnopharmacology* **64**, 265-270

Czerepanov SK (1995) *Vascular Plants of Russia and Adjacent States* (*The former USSR*), Semya, Saint Petersburg, 812 pp (in Russian)

Dembitskii AD, Bergaliev ES, Kyazimov IM (1994) Chemical composition of the essential oils of *Ziziphora* growing under various ecological conditions. *Chemistry of Natural Compounds* **30 (6)**, 673-675

Dzamici A, Sokovic M, Ristic M, Grujic-Jovanovici S, Vukojevic J, Marin PD (2008) Chemical composition and antifungal activity of *Salvia sclarea* (*Lamiaceae*) essential oil. *Archives of Biological Science (Belgrade)* **60 (2)**, 233-237

Egamberdieva D, Mamadalieva M, Edwards Jones V, Shakhidoyatov Kh (2010) Antimicrobial activity of herbal plants used in traditional medicine of Uzbekistan. *Uzbek Journal of Biology* **2**, 20-27

Furnell D (1985) *Health from the Hedgerow. A Naturalist's Encyclopedia of Medicinal Plants*, B.T. Batsford Ltd., London, 217 pp

Gaidi G, Miyamoto T, Ramezani M, Lacaille-Dubois M-A (2004) Glandulosides A-D, triterpene saponins from *Acanthophyllum glandulosum*. *Journal of Natural Products* **67**, 1114-1118

Grieve M (1998) *A Modern Herbal*, Tiger books International, London, 647 pp

Gupta VK, Fatima A, Faridi U, Negi AS, Shanker K, Kumar JK, Rahuja N, Luqman S, Sisodia BS, Saikia D, Darokar MP, Khanuja SPS (2008) Antimicrobial potential of *Glycyrrhiza glabra* roots. *Journal of Ethnopharmacology* **116**, 377-380

Gürbüz I, Üstün O, Yesilada E, Sezik E, Akyürek N (2002) *In vivo* gastroprotective effect of five Turkish folk remedies against ethanol-induced lesions. *Journal of Ethnopharmacology* **53**, 75-87

Hayet E, Maha M, Mata M, Mighri Z, Laurent G, Mahjoub A (2010) Biological activities of *Peganum harmala* leaves. *African Journal of Biotechnology* **9 (48)**, 8199-8205

Jalili A, Sadeghzade A (2012) Comparative phenolic profile of Persian walnut (*Juglans regia* L.) leaves cultivars grown in Iran. *African Journal of Biochemistry Research* **6 (3)**, 33-38

Kataki MS, Murugamani V, Rajkumari A, Mehra PS, Awasthi D, Yadav RS (2012) Antioxidant, hepatoprotective, and anthelmintic activities of methanol extract of *Urtica dioica* L. leaves. *Pharmaceutical Crops* **3**, 38-46

Keusgen M, Fritsch RM, Hisoriev H, Kurbonova PA, Khassanov FO (2006) Wild *Allium* species (*Alliaceae*) used in folk medicine of Tajikistan and Uzbekistan. *Journal of Ethnobiology and Ethnomedicine* **2 (18)**, 1-9

Khodjimatov K, Aprasidi GS, Khodjimatov AK (1995) *Wilde Growing Medicinal Plants of Central Asia*, Abu Ali ibn Sino, Tashkent, 112 pp (in Russian)

Kholmatov KH, Akhmedov OA (1995) *Pharmacognoziya* (in Russian), Ibn-Sino, 477 pp

Kogure K, Yamauchi I, Tokumura A, Kondou K, Tanaka N, Takaishi Y (2004) Novel antioxidants isolated from plants of the genera *Ferula*, *Inula*, *Prangos* and *Rheum* collected in Uzbekistan. *Phytomedicine* **11**, 645-651

Komakine N, Takaishi Y, Honda G, Ito M, Takeda Y, Kodzhimatov OK, Ashurmetov O (2005) Indole alkaloids from *Rheum maximowiczii*. *Natural Medicine* **59 (1)**, 45-48

Kumar VS, Venumadhav V, Jagadeshwar K, Bhaskar B, Lahkar M (2012) Evaluation of antioxidant, antinociceptive activities of *Oxalis corniculata* in diabetic neuropathy rats. *International Journal of Pharmacology* **8 (2)**, 122-127

Ladio AH, Lozada M (2004) Patterns of use and knowledge of wild edible plants in distinct ecological environments: A case study of a Mapuche community from Nothwestern Patagonia. *Biodiversity Conservation* **13**, 1153-1173

Leonti M, Vibrans H, Sticher O, Heinrich M (2001) Ethnopharmacology of the Popoluca, Mexico: An evaluation. *Journal of Pharmacy and Pharmacology* **53**, 1653-1669

Mamedov N, Gardner Z, Craker LE (2004) Medicinal plants used in Russia and Central Asia for the treatment of selected skin conditions. *Journal of Herbs, Spices and Medicinal Plants* **11**, 191-222

Mamedov N, Craker LE (2001) Medicinal plants used for the treatment of bronchial asthma in Russia and Central Asia. *Journal of Herbs, Spices and Medicinal Plants* **8 (2/3)**, 91-117

Mandegary A, Arab-Nozari M, Ramiar H, Sharififar F (2012) Anticonvulsant activity of the essential oil and methanolic extract of *Bunium persicum* (Boiss). B. Fedtsch. *Journal of Ethnopharmacology* **140 (2)**, 447-451

Martins EN, Pessano NTC, Leal L, Roos DH, Folmer V, Puntel GO, Teixeira Rocha JB, Aschner M, Ávila DS, Puntel RL (2012) Protective effect of *Melissa officinalis* aqueous extract against Mn-induced oxidative stress in chronically exposed mice. *Brain Research Bulletin* **87 (1)**, 74-79

Mimica-Dukic N, Simin N, Cvejic J, Jovin E, Orcic D, Bozin B (2008) Phenolic compounds in field horsetail (*Equisetum arvense* L.) as natural antioxidants. *Molecules* **13**, 1455-1464

Montazeri N, Baher E, Mirzajani F, Barami Z, Yousefian S (2011) Phytochemical contents and biological activities of *Rosa canina* fruit from Iran. *Journal of Medicinal Plants Research* **5 (18)**, 4584-4589

Muhamedjanova MM (2004) Chatkal Nature Reserve as important area for plant's diversity conservation in Western Tien Shan. In: *Proceeding Book of 4th European Conference on the Conservation of Wild Plants*, 17-20 September, Valencia, Spain, p 65

Muminova BA, Batirov Ekh, Yuldashev MP, Inamova ZG (2006) Flavonoids from *Sophora griffithii* and *Goebelia pachycarpa. Chemistry of Natural Compounds* **42 (1)**, 108

Murthy KNC, Reddy KV, Veigas JM, Murthy UD (2004) Study on wound healing activity of *Punica granatum* peel. *Journal of Medicinal Food* **7 (2)**, 256-259

Nandagopal S, Ranjitha Kumari BD (2007) phytochemical and antibacterial studies of chicory (*Cichorium intybus* L.) - A multipurpose medicinal plant. *Advances in Biological Research* **1 (1-2)**, 17-21

Newton SM, Lau C, Wright CW (2000) A review of antimycobacterial natural products. *Phytotheraphy Research* **14**, 303-322

Okasaka M, Takaishi Y, Kashiwada Y, Kodzhimatov OK, Ashurmetov O, Lin AJ, Consentino LM, Lee K-H (2006) Terpenoids from *Juniperus polycarpus* var. *seravschanica*. *Phytochemistry* **67**, 2635-2640

Okasaka M, Kashiwada Y, Kodzhimatov OK, Ashurmetov O, Takaishi Y (2008) Monoterpene glycosides from *Paeonia* hybrid. *Phytochemistry* **69**, 1767-1772

Orhan DD, Orhan N, Özcelik B, Ergun F (2009) Biological activities of *Vitis vinifera* L. leaves. *Turkish Journal of Biology* **33**, 341-348

Özyürek M, Bener M, Güçlü K, Dönmez AA, Süzgeç-Selçuk S, Pırıldar S, Meriçli AH, Apak R (2012) Evaluation of antioxidant activity of *Crataegus* species collected from different regions of Turkey. *Records of Natural Products* **6 (3)**, 263-277

Padmavathi B, Upreti M, Singh V, Rao AR, Singh RP, Rath PC (2005) Chemoprevention by *Hippophae rhamnoides*: Effects on tumorigenesis, phase II and antioxidant enzymes, and IRF-1 transcription factor. *Nutrition and Cancer* **51 (1)**, 59-67

Palombo EA, Semple SJ (2001) Antibacterial activity of traditional Australian medicinal plants. *Journal of Ethnopharmacology* **77**, 151-157

Pirbalouti AG, Rahnama GH, Malekpoor F, Broujeni HR (2011) Variation in antibacterial activity and phenolic content of *Hypericum scabrum* L. populations. *Journal of Medicinal Plants Research* **5 (17)**, 4119-4125

Ramadevi D, Ganapaty S (2011) Antimicrobial activity of *Corchorus olitorius* L. *Pharmacologyonline* **2**, 1303-1308

Ramezani M, Hosseinzadeh H, Moradi M, Taghiabadi E (2011) Phototoxicity activity of *Psoralea drupacea* L. using *Atremia salina* bioassay. *Avicenna Journal of Phytomedicine* **1 (1)**, 24-28

Rashed SK, Slowing K, Said A, Cueto M (2012) Analgesic, antipyretic and antiulcer activities of *Ailanthus altissima* (Mill.) *Phytopharmacology* **3 (2)**, 341-350

Rhiouani H, Lyoussi B, Settaf A, Cherrah Y, Hassar M (2001) Antihypertensive effect of *Herniaria glabra* saponins in the spontaneously hypertensive rat. *Annales Pharmaceutiques Francaises* **59 (3)**, 211-214

Sezik E, Yesilada E, Shahidoyatov Kh, Kuliev Z, Nigmatullaev AM, Aripov H, Takaishi Y, Takeda Y, Honda G (2004) Traditional Medicine in Uzbekistan I. Folk medicine in Uzbekistan I. Toshkent, Djizzax and Samarqand provinces. *Journal of Ethnopharmacology* **92**, 197-207

Scarpa GF (2002) Plantas empleadas contra trastornos digestivos en la medicina tradicional criolla del Chaco Noroccidental. *Dominguezia* **18**, 36-50

Sfahlan AJ, Mahmoodzadeh A, Hasanzadeh A, Heidari R, Jamei R (2009) Antioxidants and antiradicals in almond hull and shell (*Amygdalus communis* L.) as a function of genotype. *Food Chemistry* **115**, 529-533

Shabbir A (2012) *Rhus coriaria* Linn, a plant of medicinal, nutritional and industrial importance: A review. *The Journal of Animal and Plant Sciences* **22 (2)**, 505-512

Shikishima Y, Takaishi Y, Honda G, Ito M, Takeda Y, Kodzhimatov OK, Ashurmetov O (2001) Terpenoids and α-pyrone derivatives from *Prangos tschimganica. Phytochemistry* **57**, 135-141

Shinwari ZK, Watanabe T, Rehman M, Yoshikawa T (2006) *A Pictorial Guide to Medicinal and Aromatic Plants of Pakistan*, Kohat University of Science and Technology, Kohat, Pakistan, 492 pp

Singh KP, Dwevedi AK, Dhakre G (2011) Evaluation of antibacterial activities of *Chenopodium album* L. *International Journal of Applied Biology and Pharmaceutical Technology* **2 (3)**, 398-401

Song N, Xu W, Guan H, Liu X, Wang Y, Nie X (2007) Several flavonoids from *Capsella bursa-pastoris* (L.) Medic. *Asian Journal of Traditional Medicines* **2 (5)**, 218-222

Sultan A, Moohammadnor M, Eshhakova K (2011) Chemical constituents of *Alhagi pseudalhagi*. *Chemistry of Natural Compounds* **47 (1)**, 140-141

Sun W, Zhang Z-L, Liu X, Zhang S, He L, Wang Z, Wang G-S (2012) Terpene glycosides from the roots of *Sanguisorba officinalis* L. and their hemostatic activities. *Molecules* **17**, 7629-7636

Thring TS, Weitz FM (2006) Medicinal plant use in the Bredasdorp/Elim region of the Southern Overberg in the Western Cape Province of South Africa. *Journal of Ethnopharmacology* **103 (2)**, 261-275

Tomczykowa M, Tomszyk M, Jakoniuk P, Tryniszewska E (2008) Antimicrobial and antifungal activities of the extracts and essential oils of *Bidens tripartita*. *Folia Histochemica et Cytobiologica* **46 (3)**, 389-393

UNESCO (1993) International Bureau of Education, vol. XXIII, no. 1/2, pp 53-69

Red Data Book of Republic of Uzbekistan (1998) Volume 1. Plants. Chinor ENK, Tashkent

Uzun E, Sariyar G, Adsersen A, Karakoc B, Iten G, Oktayoglu E, Pirildar S (2004) Traditional medicine in Sakarya province (Turkey) and antimicrobial activities of selected species. *Journal of Ethnopharmacology* **95**, 287-296

Venskutonis PR, Dvaranauskaite A, Labokas J (2007) Radical scavenging activity and composition of raspberry (*Rubus idaeus*) leaves from different locations in Lithuania. *Fitoterapia* **78 (2)**, 162-165

Yang JL, Liu LL, Shi YP (2010) Phytochemicals and biological activities of *Gentiana* species. *Natural Products Communications* **5 (4)**, 649-664

Yesilada E, Sezik E, Honda G, Tanaka T, Takeda Y, Takaishi Y (1999) Traditional medicine in Turkey. IX. Folk medicine in north-west Anatolia; Sakarya, Kocaeli, Bolu, Zongulldak, Bartin Karabuk province. *Journal of Ethnopharmacology* **64**, 199-206

Van Wyk B, Wink W (2004) *Medicinal Plants of the World*, Timber Press, Portland, OR, 480 pp

Vitalini S, Beretta G, Iriti M, Orsenigo S, Basilico N, Dall'Acqua S, Iorizzi M, Fico G (2011) Phenolic compounds from *Achillea millefolium* L. and their bioactivity. *Acta Biochimica Polonica* **58 (2)**, 203-209

Zia-Ul-Haq M, Kausar A, Shahid SA, Qayum M, Ahmad S, Khan I (2012) Phytopharmacological profile of *Gratiola officinalis* Linn.: A review. *Journal of Medicinal Plants Research* **6 (16)**, 3087-3092