Pak. J. Bot., 39(7): 2541-2552, 2007.

ELEMENTAL COMPOSITION OF MEDICINAL FLOWERS

MUHAMMAD AFZAL RIZVI

Hamdard Research Institute of Unani Medicine,
Faculty of Eastern Medicine, Hamdard University, Karachi-74600, Pakistan.

Abstract

Pakistan has lush and diverse flora. A comprehensive literature search was conducted to determine the medicinal flowering plants found in Pakistan and they are used as remedies for various disorders or diseases.

Certain commonly used medicinal flowers of Karachi were investigated for their elemental composition with the help of Atomic Absorption Spectrometer. Eleven elements Ca, Cd, Cr, Cu, Fe, K, Mg, Na, Ni, Pb and Zn were analyzed. On an average, the quantity of Na was found to be the highest among these flowers (39315.61 ppm) followed by Ca (22490.98 ppm) and K (20751.53 ppm). The average amounts of Zn (99.53 ppm) Cu (17.47 ppm) and Ni (6.20 ppm) were quite low; Cr was detected in lowest quantity (0.17 ppm). The results suggest that these medicinal flowers could potentially be used as raw materials in herbal formulation.

Introduction

Muslim scholars conducted research on a large number of flowers and penned down their observations in manuscripts for therapeutic purposes (Said, 1996). Ibn Sina (980-1037 A.D.) described Chamomile and Violet flowers for the cure of liver diseases. Ibn al-Baitar (1190-1248 A.D.) believed to have used saffron as tonic (Hasan, 1989).

According to Daud al-Antaki (1599 A.D.) the flower of Jasmine is beneficial for aphrodisiac (Adly, 1982). Elements are widely distributed in nature in variable proportions and they play a vital role in the maintenance of human body (Ahmad *et al*., 1989). Dried flowering tops of *Artemisia absinthium* Linn. contains Cu, 0.103; Zn, 0.219; Fe, 23.000; Mn, 0.425; Mg, 67.000; Cr, 0.026; Ni, 0.064; Cd, 0.0003; Co, 0.018; Pb, 0.850; Ag, 0.002; Mo, 0.029; Sn, 0.0001 mg/g ash. It possesses antiseptic properties with beneficial effect in cutaneous ailments, burns, wounds and dropsy (Hameed & Vohora, 2001).

The flowers *Nepeta hindostana* (Roth.) Haines., revealed the presence of Na 6.90, K 33.83, Ca 2.12, Mg 0.086, Zn 0.0057, Cu 0.00575, Ni 0.840, Fe 0.12658 mg/g ash. They are useful in cardio vascular complaint like angina pectoris and weakness of the heart (Ahmad & Siddiqi, 1985).

In developing countries, most of the flora remains virtually unexplored from point of view of the medicinal utilization through Eastern System of Medicine (Mirza *et al*., 2004). In the present study, 11 elements viz., Ca, Cd, Cr, Cu, Fe, K, Mg, Na, Ni, Pb and Zn have been estimated from medicinal flowers. The objectives of the study will cover to investigate distribution of various elements in single herbal drugs which are commonly used by practitioners in their Dawakhanas and for bulk manufacturing by the industry.

E-mail: marizvi_pk@yahoo.com

Material and Methods

Collection of medicinal flowers: A literature search was carried out to find which plants are used as flower remedies for various disorders or diseases in Table 1 (Athar & Siddiqi, 2004; Bhattacharjee & De, 2006; Bugti, 1998; Chouhan *et al*., 2002; Malik & Farooq, 1984; Nasir & Ali, 1972; Nasir *et al*., 1987; Pirzada and Talpur, 1999; Rizvi, 2001; Zaman & Khan, 1970). Out of these 10 samples belonging to 6 different plant families were collected (1 kg each) from Karachi. The best time to collect medicinal flowers is at midday, when they are fully open and in dry weather. The collected flowers were brought to the laboratory, where they were washed immediately with fresh running water to eliminate dust, dirt and possible parasites and then they were washed again with distilled water.

Ashing and digestion of flowers: The different flowers were initially dried under shade at room temperature and later on in an oven at 60–80^{o} C for 1 h. It was then powdered through grinder, 1 g of the grinded sample was taken in a porcelain crucible and ashed at 500^{o}C in a muffle furnace to constant weight for 2 h. the ash was cooled at room temperature, moistened with 10 drops of distilled water and carefully dissolved in 3 mL HNO_3 (1:1). The acid solution of the sample was then heated gently on a hot plate at 100-120^{o} C till nearly dry. The porcelain crucible was returned to muffle furnace and reashed again for one hour at 500^{o} C (Fig. 1). It was then cooled and dissolved in 10 mL HCl (1:1) and the solution was filtered through Whatman filter paper No. 42 (Schleicher & Schuell, Germany) into a 100 mL volumetric flask (Jones, 1984).

Elemental assay: The flame Atomic Absorption Spectrometry (AAS, Model Perkin-Elmer 3100, USA), was used at Hamdard University, Karachi for the purpose of estimating Ca, Cd, Cr, Cu, Fe, K, Mg, Na, Ni, Pb and Zn. Instruction for instrument setting, calibration and assay for specific elements were strictly followed as laid down in the operational manual (Table 2).

Table 2. Instrument parameters.

Elements	Symbol	Wave length (nm)	Slit (nm)	Sensitivity (mg / L)
Calcium	Ca	422.7	0.7	0.092
Cadmium	Cd	228.8	0.7	0.016
Chromium	Cr	357.9	0.7	0.041
Copper	Cu	324.8	0.7	0.077
Iron	Fe	248.3	0.2	0.039
Potassium	K	766.5	0.7	0.043
Magnesium	Mg	285.2	0.7	0.008
Sodium	Na	589.0	0.2	0.012
Nickel	Ni	232.0	0.2	0.014
Lead	Pb	283.3	0.7	0.079
Zinc	Zn	213.0	0.7	0.018

Recommended flame: Air-acetylene

Table 1. The taxonomy, distribution and flowering period of some of the medicinal flowers of Pakistan.

Species	Flowering period	Distribution	Remedies
Monocotyledons			
Poaceae			
Cymbopogon jwarancusa (Jones) Schult.	July – Oct.	Found in Karachi, Multan, Chitral, NWFP, Quetta and Gilgit.	Detoxifier, astringent and tonic.
Zea mays L.	Feb. – May	Cultivated in Sindh, Punjab, NWFP and Baluchistan.	Astringent, chloretic, diuretic, Remedy for urinary infection.
Dicotyledons			
Acanthaceae			
Adhatoda vasica Nees (=*Justicia adhatoda*) L.	Feb. – April	Planted in Karachi and Sindh. A common species of Punjab foot hill region.	Asthma, bronchitis, gonorrhea, high grade fever and conjunctivitis.
Amaranthaceae			
Achyranthes aspera L.	Sept. - April	Found in Gilgit, Karachi, Punjab and Baluchistan.	Anti-hemorrhoidal.
Anacardiaceae			
Mangifera indica L.	Jan. – March	Grown in Punjab and Sindh.	Astringent, urinary infection, catarrh, anti-diarrhoeal, anti-dysentery, veneral diseases.
Apocynaceae			
Catharanthus roseus (L.) G.Don.	Throughout the year	Cultivated and naturalized in the tropics	Asthma, anti-leukemia, eyes salve and flatulence.
Pergularia extensa Jacq. = *Pergularia daemia* (Forssk.) Chiov. var. *daemia*	Sept. – April	Found in Karachi, Sindh, Lasbella, Peshawar, Rawalpindi.	Anthelmintic, emetic, expectorant.
Vinca major L.	Dec. – March	Found in Parachinar,. Abbottabad and Murree hills. Cultivated as an ornamental in Punjab.	Fresh flowers are purgative.
Asclepiadaceae			
Calotropis procera (Aiton) W.T. Aiton	Throughout the year	Widely distributed in deserts and plains throughout Pakistan.	Asthma, catarrh, cold, cough, cholera, and for dyspepsia.
Asteraceae			
Achillea millefolium L.	Aug. – March	Occurs in Gilgit, Swat, Murree, Poonch, Baluchistan, Chagia	Hypotensive, haemostatic to arrest bleeding.
Artemisia absinthium L.	Aug. – Sept.	Grows in Thandiani	Anthelmintic, anti-scorpion venom an anti-snake venom
Artemisia maritima L.	Aug. – Sept.	Found in Astor, Baluchistan, Chitral, Swat.	Dyspepsia, tonic and anti-helminthic

Table 1. (Cont'd.).

Species	Flowering period	Distribution	Remedies
Calendula officinalis L.	Dec. – April	Cultivated in many parks and gardens of Pakistan.	Doudenal-gastric ulcers, hypotensive, emmenagogue and cures skin diseases.
Carthamus tinctorius L.	April – July	Distributed NWFP, Baluchistan, (Harnai), Punjab. Cultivated at Hamdard University.	Emmenagogue, laxative, sedative, stimulant.
Chrysanthemum cinerariifolium Trevir. Vis. = *Tanacetum cinerariifolium* (Trevir.) Sch. Bip.	March – July	Cultivated in Peshawar, Abbottabad.	Aperient, conjunctivitis and dyspepsia.
Helianthus annuus L.	July – Sept.	Widely cultivated in Pakistan.	Anti-diarrhoeal, anti-inflammatory carminative, diuretic.
*Matricaria chamomilla*L .=*Matricaria recutita* L.	July – Jan.	Found in plains of Punjab, Pishin.	Analgesic, antiseptic, carminative, anti-convulsant, diuretic, liver diseases, dyspepsia.
Silybum marianum (L.) Gaertn.	March – April	Found in Lahore, Peshawar, Saidu Sharif, Abbottabad, Mirpur, Rawalpindi.	Flower heads are consumed for diabetes control.
Tagetes erecta L.	June – Nov.	Grown in gardens of Pakistan.	Anti-dote against wasp stings cure for eczema, diuretic.
Tanacetum gracile Hook.f. & Thomson	Jan. – Aug.	Found in Hunza, Baluchistan.	Anti-helminthic.
Taraxacum officinale F.H. Wigg. Group	Feb. – April	Widely distributed throughout Baluchistan	Aperient, diuretic, stimulant, stomachic, tonic, detoxicant.
Xanthium strumarium L.	July – Aug.	Gilgit, Chitral, Baluchistan, Swat, NWFP, Hazara and Punjab.	Flowers useful for tooth-ache.
Balsaminaceae			
Impatiens balsamina L.	July – Oct.	Cultivated in Karachi, Chitral, Murree.	Antibiotic activity, inter-costal neuralgia and useful in lumbago.
Bignoniaceae			
Millingtonia hortensis L.f.	Nov. – March	Cultivated in Sindh, Punjab	Cures asthma
Stereospermum suaveolens DC. = *Stereospermum colais* (Buch.-Ham.ex Dillwyn) Mabb.	May – June	Occurs in Rawalpindi District.	Aphrodisiac, hiccoughs.
Bombaceae			
Bombax ceiba L.	Dec. - March	Cultivated as roadside and garden plant in Pakistan.	Diuretic and Laxative.
Boraginaceae			
Arnebia benthamii (Wall. ex G. Don) I.M. Johnst.	Oct. – Nov.	Found in Makran, Kaghan, Poonch.	Angina, fever, pharyngitis
Borago officinalis L.	Jan. – Feb.	Reproduced from seeds at Karachi.	Anti-cancer agent (breast or face), corns, sclerosis and tumors.

Table 1. (Cont'd.).

Species	Flowering period	Distribution	Remedies
Onosma hispidum Wall. & G. Don.	March – July	Found in Pishin, common in Landikotal, Swat Chitral, Kaghan.	Cardiac tonic, stimulant.
Trichodesma indicum (L.) Sm.	Aug. – Oct.	Occurs in Mangopir and Punjab foot hills.	Flowers used as emullient and diuretic.
Brassicaceae			
Cheiranthus cheiri L. *Erysimum cheiri* (L.) Crantz	March – May	Cultivated in gardens.	Cardiac disorders, emmenagogue, remedy for impotence and paralysis.
Byttneriaceae			
Pterospermum acerifolium (L.) Willd.	Dec. – July	Cultivated in Islamabad, Peshawar as an introduced tree and Punjab.	Dehydration, otalgia, haematuria, massage.
Caesalpiniaceae			
Bauhinia purpurea L.	Sept. – Nov.	Cultivated in Punjab, NWFP, Rawalpindi.	Flowers are used as purgative.
Bauhinia variegata L.	Feb. – April	Cultivated in Pakistan.	Flowers are aperient.
Caesalpinia pulcherrima (L.) Sw.	April – Sept.	Cultivated in gardens of Pakistan.	Asthma, bronchitis, anti-pyretic, expectorant, anti-malarial.
Cassia alata L. = *Senna alata* (L.) Roxb.	Oct. – Dec.	Sometimes cultivated in Pakistan.	Laxative. Useful in skin texture.
Cassia fistula L.	April – May	Naturalized throughout Pakistan, Cultivated in Karachi, Punjab.	Cough, diphtheria, laxative, edema.
Cassia siamea Lamk. = *Senna siamea* (Lam.) H.S. Irwin & Barneby	Oct. – Dec.	Cultivated in Karachi and Sindh.	Anthelmintic, anti-hyper-tensive, asthma, dandruff, insomnia, laxative, tranquilizer, sedative.
Delonix regia (Bojer ex Hook.) Raf.	May – June	Planted in Sindh and Punjab.	Anthelmintic.
Tamarindus indica L.	Feb. – April	Grown in Sindh, Punjab, Jehlum, Karachi.	Anti-viral against New Castle disease virus, astringent and sedative.
Canabaceae			
Humuus lupulus L.	July – Aug.	Found in Pangi on the upper Chenab.	Antiseptic, female inflorescence used as diuretic ,emmenagouge, dyspepsia.
Caprifoliaceae			
Sambucus nigra L.	March – April	Occurs in Parachinar, Nathiagali, Hazara Cultivated in Punjab.	Laxative, anti-pruritic and stimulant of blood circulation.
Cucurbitaceae			
Trichosanthes dioica Roxb.	June – Oct.	Found in Ravi, Rawalpindi	Lower cholesterol and blood sugar.
Irdiaceae			
Crocus sativus L.	Mid - October	Propagated by bulb in Baluchistan.	Beneficial for liver, brain, heart, regulates the menstrual function.

Table 1. (Cont'd.).

Species	Flowering period	Distribution	Remedies
Lamiaceae			
Hyssopus officinalis L.	June – Sept.	Cultivated in Kashmir, Pangi, Upper Chenab.	Used for chest congestion, flowers tea is expectorant.
Leucas aspera (Willd.) Link.	Aug. – Feb.	Found in Jammu, Ghat, Ravi, Chenab, Doab.	Antitussive, decongestant for children.
Mentha longifolia (L.) Huds.	Feb. – May	Common in home gardens.	Carminative and stimulant.
Ocimum basilicum L.	Nov. – April	Cultivated in Karachi, Baluchistan, Punjab.	Decongestant.
Pervoskia abrotanoides Kar.	Sept. – April	Occurs in Baluchistan, Chitral, Gilgit, Hunza, Quetta, Ziarat. Widely and extensively cultivated.	Anti-pyretic.
Linaceae			
Linum usitatissimun L.	Feb. – April	Cultivated in Karachi.	Cardiac and nerve tonic.
Lythraceae			
Lawsonia inermis L.	June	Found in Sindh, Baluchistan, Punjab.	Anti-pyretic, sedative, soporific.
Magnoliaceae			
Michelia champaca L.	Throughout the year	Cultivated in Punjab, NWFP.	Used in dyspepsia, anti-pyretic, anti-emetic.
Malvaceae			
Abutilon indium (L.) Sweet.	Feb. – March	Widely distributed in Karachi, Sindh, lower hills of Punjab.	Anti-diarrhoeal, demulcent, anti-hemoptysis, sedative and decongestant.
Althaea officinalis L.	July – Oct.	Grows in Azad Kashmir, Peshawar, Rawalpindi.	Emollient, demulcent, diuretic, bronchial, catarrah and rheumatism.
Gossypium herbaceum L.	May – July	Cultivated as a crop in Punjab and Sindh.	Extracted flowers used as abortificient and for inducing menstrual flow.
Hibiscus cannabinus L.	Autumn-Winter	Cultivated in Sindh, Karachi Swat, Punjab, Chitral.	Gastritis and popular laxative.
Hibiscus rosa-sinensis L.	April – Sept.	Grown as ornamental plant in Punjab, Sindh.	Cardiac tonic, expectorant, anti-pyretic, anti-tussive, decongestant.
Hibiscus sabdariffa L.	Aug. – Sept.	Cultivated in Punjab and Karachi.	Cathartic activity.
Urena lobata L.	Sept. – Dec.	Occurs in Lahore, Jehlum, Changa Manga.	Aphthosis, expectorant, decongestant.
Meliaceae			
Azadirachta indica A. Juss.	March – April	Found in Sindh, Southern Punjab, lower Balochistan.	Adrenalgic stimulant, dyspepsia, also used in skin diseases.
Melia azedarach L.	March – May	Found in Sindh and Punjab.	Poultice to relieve head-ache, nervousness.
Mimosaceae			
Acacia nilotica (L.) Delile	May – June	Found cultivated or wild in Sindh, Punjab, Baluchistan, NWFP.	Useful in jaundice and palpitations.

Table 1. (Cont'd.).

Species	Flowering period	Distribution	Remedies
Albizia lebbeck (L.) Benth.	July – Oct.	Grows in Sialkot to Hazara, Bajaur, Malakand.	Aperient, boils, carbuncle, antibacterial.
Prosopis cineraria (L.) Durce .	April – July	Found in Sindh, Baluchistan, Punajb (in Thal and Cholistan deserts)	Beneficial against miscarriage.
Moringaceae			
Moringa oleifera Lam.	Feb. – April	Cultivated in Rawalpindi, planted in Sindh.	Cholagogue, diuretic tonic.
Musaceae			
Musa sapientum L.	Feb. – Sept.	Cultivated in Sindh, Punjab, NWFP.	Anti-hypoglycemic.
Myrtaceae			
Myrtus communis L.	April – June	Wild in Baluchistan, NWFP.	As anti-septic, disinfecant.
Nyctaginaceae			
Mirabilis jalapa L.	Nov. – Jan.	Found in Karachi, NWFP, Hunza, Gilgit.	Cardiac tonic, diuretic, anti pyretic.
Nymphaceae			
Nelumbo nucifera Geartn.	May – July	Found in Charsada, Multan and Shahdara.	Cardiac tonic, diuretic, anti-pyretic.
Oleaceae			
Jasminum gradiflorum L.	Warm season	Occurs in Peshawar, Karachi.	Aphrodisiac, astringent, carminative, dysentery, hepatitis, suppresses excess lactation.
Jasminum sambac (L.) Aiton.	July – Oct.	Occurs in Karachi, Lahore, Islamabad.	Anti-pyretic, cardiac tonic, lactifuge
Paeoniaceae			
Paeonia emodi Wall. Ex Royle.	May – June	Common in moist ground, Kaghan, Thandiani, Chitral,Bahrin, Poonch.	Anti-diarrhoeal.
Papaveraceae			
Papaver rhoeas L.	June – Sept.	Cultivated in gardens.	Bronchitis, hoarseness, sedative sudorific.
Papilionaceae			
Butea frondosa Roxb.	March – April	Cultivated in Punjab, NWFP.	Anti-pyretic, appetizer, aphrodisiac, blood purifier, diuretic, tonic, viral hepatitis.
Butea monosperma (Lam.) Taub.	March – April	Cultivated in Punjab, NWFP.	Astringent, aphrodisiac, boil depurative, diuretic, gout, anti-leprosy agent.
Pongamia pinnata L. = *Millettia pinnata* (L.) Panigrahi	April – May	Cultivated in Sindh, Punjab.	Flowers are used in diabetes.
Sesbania grandiflora (L.) Pers.	Aug. – March	Planted in Karachi, Kutch, Sindh and Punjab.	Flower juice improves vision (as eye drops).
Sesbania sesban (L.) Merr.	April – Nov.	Found cultivated and wild in Sindh, Punjab.	Anti-fertility activity reported.
Trifolium pratense L.	Feb. – April	Occurs in Chitral, Astor, Swat, Hazara.	Anti-asthmatic, anti-spasmodic, bronchitis and expectorant.

Table 1. (Cont'd.).

Species	Flowering period	Distribution	Remedies
Passifloraceae			
Passiflora incarnata L.	July – Sept.	Cultivated in Karachi.	Asthma, dysentery, insomnia, whooping cough.
Pontederiaceae			
Eichhorina crassipes (Mart.) Sol.ns	April – July	Occasionally found filling ponds in plains. Quite common in Punjab.	Arthritis and gout.
Punicaceae			
Punica granatum L.	May – June	Commonly grown in Quetta, Sibbi, Karachi, Punjab, NWFP.	Anti-diarrhoeal, dysentery, bronchitis.
Rosaceae			
Eriobotrya japonica (Thunb.) Lindl.	July – Aug.	Cultivated in sub- Himalayan zone.	Flowers are expectorant.
Rosa damascena Mill.	Jan. – July	Cultivated in gardens of Pakistan.	Anti-HIV, aperient, cardio-active, liver protector.
Rosa foetida Herrm.	Jan. – July	Found in Baluchistan, Kurrum, Quetta, Ziarat.	Anti-diarrhoeal.
Sapotaceae			
Bassia latifolia Roxb. = *Madhuca longifolia* (L.) J.F. Macbr.	July – Aug.	Cultivated in Sindh, Punjab.	Regarded as bronchitis, cooling, cold, anti-tussive, demulcent and tonic.
Scruphulariaceae			
Verbascum thapsus L.	June – Aug.	Common in Chitral, Mansehra. Punjab foot hills.	Coughs, diarrhea, febrifuge, stimulant, pharyngitis.
Solanaceae			
Datura metel L.	May – June	Weedy places, Karachi. Throughout Punjab.	Smoke as anti-asthma.
Solanum surattense Burm. f.=*Solanum virginianum* L.	June – Nov.	Throughout Pakistan.	Paresthesia, carminative.
Rubiaceae			
Ixora coccinea L.	July – Jan.	Cultivated in Karachi.	Cure sores, relieve blood, ulcers.
Tropaeolaceae			
Tropaeolum majus L.	Dec. – Feb.	Cultivated in Karachi and throughout Pakistan.	Natural anti-biotic.
Verbenaceae			
Nyctanthes arbor-tristis L.	Aug. – Oct.	Naturalized in Punjab, Rawalpindi, NWFP, Mardan.	Anti-pyretic, faintness, anti-vertiginous.
Vitex negundo L.	March – June	Cultivated in Thal, Swat, Mirpur and Punjab.	Cardio tonic, cholera, diarrhoea, useful for liver disorders.
Violaceae			
Viola odorata L.	March – May	It is a common cultivated species in Pakistan.	Liver protector and decongestant.

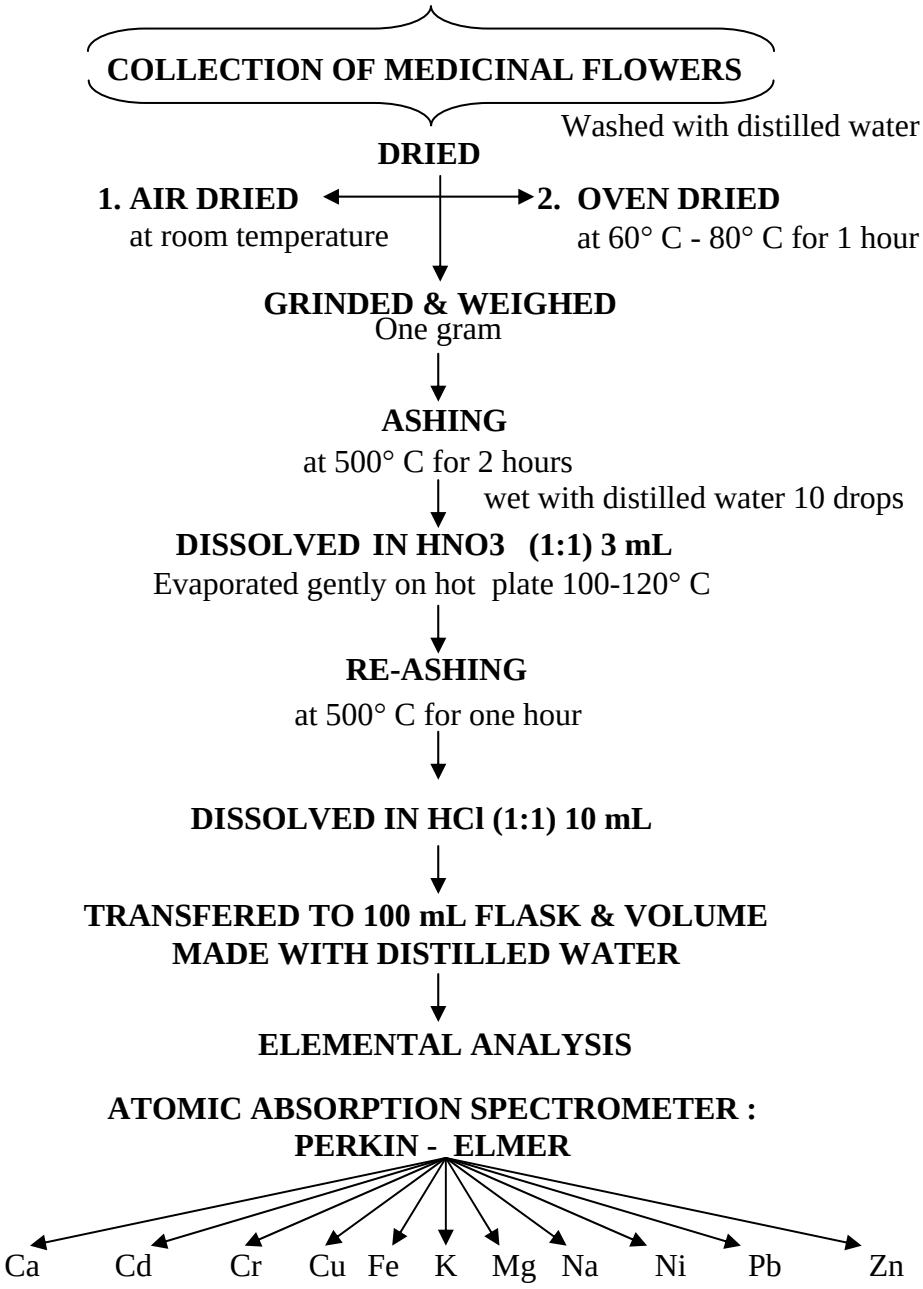

Fig. 1. Assay for the elemental composition of Angiosperms.

Table 3. Elemental composition of medicinal flowers (in ppm).

Medicinal flowers	Ca	Cd	Cr	Cu	Fe	K	Mg	Na	Ni	Pb	Zn
Altheae officinalis	39040.10	0.933	BDL	7.783	268.739	27707.22	6041.45	55664.44	6.099	8.516	24.549
Azadirachta indica	24937.5	1.675	1.00	8.925	878.75	29437.5	6812.5	38000	8.05	16.55	30.55
Cassia fistula	18207.065	0.683	0.333	6.799	430.399	14082.77	4666.48	38706.78	8.482	BDL	34.715
Cordia latifolia	25082.33	0.833	0.416	17.1815	561.227	21874.12	4166.5	36415.21	5.799	2.266	36.815
Delonix regia	13374.465	0.816	BDL	11.116	538.311	19332.56	4541.48	25957.29	8.083	BDL	26.665
Linum usitatissimum	30000.00	1.55	BDL	13.3	540.00	40250	7625.00	90375.00	11.7	BDL	46.9
Rosa canina	18749.25	1.466	BDL	10.549	310.404	25290.65	5999.76	39290.095	6.016	18.099	25.266
Rosa damascena	24749.01	0.949	BDL	8.382	370.818	17457.63	6041.42	45123.19	5.183	6.816	31.248
Sphaeranthus indicus	15812.432	BDL	BDL	81.79	162.214	BDL	12131.95	BDL	BDL	144.493	719.738
Tamarindus indica	14957.735	1.216	BDL	8.882	147.91	12082.85	3166.54	23624.055	2.616	8.38	1 8.899
Average amount	**22490.99**	**1.01**	**0.17**	**17.47**	**420.88**	**20751.53**	**6119.30**	**39315.61**	**6.20**	**20.51**	**99.53**

Results and Discussion

Ninety five Pakistani species distributed among 85 genera and 45 plant families were found to have medicinal values. The largest numbers of species were found in Asteraceae and Caesalpiniaceae (13 and 8 respectively) followed by Malvaceae (7 species), Lamiaceae and Papilionaceae (6 and 6 species respectively) and Boraginaceae (4 species). Apocynaceae, Mimosaceae and Rosaceae each contained 3 species of medicinal flowers. Other families contained only one or two species of medicinal flowers (Table 1). Out of these families certain species of flowers were analyzed for the composition of eleven elements (Table 3). In the present investigation Ca, Fe, K, Mg and Na were found in large amounts (22490.99 – 39315.61 ppm), Cu, Pb, Ni and Zn were present in small quantities (6.20–99.53 ppm), while Cr and Cd were detected in extremely small amounts (0.17–1.01ppm). The average quantity of Na was found to be the highest among these flowers (39315.61 ppm) followed by Ca (22490.99 ppm) and K (20751.53 ppm). Gul-e-Surkh (*Rosa damascena*) was detected to have Ca 21316.23 ppm, Cu 70.36 ppm. Fe 215.23 ppm, Mg 27938.74 ppm, Mn 227.65 ppm, Pb 41.39 ppm, Zn 507.04 ppm (Arora & Ansari, 1986). The average amounts of Zn (99.53 ppm) Cu (17.47 ppm) and Ni (6.20 ppm) were quite low; Cr was detected in lowest quantity (0.1749 ppm). Gul-e-Madar (*Calotropis procera*) contains Cu 100 ppm, Co 170 ppm, Cr 130 ppm, Fe 2630 ppm, K 20000 ppm, Mg 1790 ppm, Mn 320 ppm, Na 21000 ppm, Ni 80 ppm, P 6010 ppm, Pb 130 ppm, Zn 400 ppm (Khan *et al*., 1989). A variety of *Catharanthus roseus* (*Vinca rosea*) showed high level of Fe (2.49 ppm) and Zn (7.0 ppm). Other important trace elements were also present such as Co, Cr, Cu and Ni (Sahito *et al*., 2001). In all, the medicinal flowers or other parts of plant may be directly or indirectly helpful in the management of health care.

The present study was designed to obtain preliminary research information on the plant parts such as leaves, flowers, fruits and seeds etc., which have medicinal value as well as the elemental composition of different parts of plants. Further research is underway.

Acknowledgements

This work was financially supported by a research grant of Hamdard University for which I am greatly indebted to Research Committee of Hamdard University as well as Prof. Dr. Nasim A. Khan, Vice Chancellor of Hamdard University.

References

Adly, A. 1982. Jasmines. *Proceeding of the 2nd Int. Cong. on the History of Medicinal and Aromatic Plants*. Hamdard Foundation Pakistan. p. 145-149.

Ahmad, J., S.N. Ganapathy, T.O. Siddiqi and M.E. Hamdard. 1989. The distribution of elements in some plant species of the botanical kingdom. In: *Elements of Health and Disease*. (Eds.): M. Said, M.A. Rahman and L.A. D'Silva. Hamd. Univ. Press, Karachi, pp. 143-67.

Ahmed, J. and T.O. Siddiqi. 1985. Pharmacognostical and elementological studies on *Allium sativum*, *Curcuma longa* and *Nepeta hindostana*. In: *Development of Unani Drugs from Herbal Sources and the Role of Elements in their Mechanism of Action*. (Ed.): R. Arora. Hamdard National Foundation India, pp. 113-130.

Arora, R.B. and N. I. Ansari 1986. Unani drugs in therapy of skin diseases and possible role of elements. In: *Proceedings of the Symposium on Dermatology and Unani System of Medicine*. (Ed.): R.B. Arora. Hamdard National Foundation. Monographs No. 4, New Delhi, India.

Athar, M. and M.A. Siddiqi. 2004. Reflections on the taxonomy and distribution of medicinal flowers of Pakistan. *SIDA* 21(1): 357-368.

Bhattacharjee, S.K and L.C. De. 2006. Medicinal herbs and flowers. Aavishkar Publishers, Distributors Jaipur, India. pp. 293-306.

Bugti, R.A. 1998. Prospectus and potentials of Saffron (*Crocus sativus* Linn.) cultivation in Baluchistan. In: *Proceeding of Symposium on Underutilized Crops of Pakistan*. (Eds.): N. Haq, K. Anthony, M. Sarwar and Z. Ahmed. *Agha* Jee Printers, Islamabad, Pakistan, p. 101-103.

Chouhan, F., M.H.S. Wattoo., S.A. Tirmizi., F.Z. Memon., Aziz-ur-Rahman and M. Tufail. 2002. Analytical investigation of inorganic nutritive elements of *Capparis decidua* grown in Cholistan desert. *The Nucleus*, 39(3-4): 195-199.

Hameed, A. and S.B. Vohora. 2001. Indian systems of medicine skin disease. A herbo-mineral approach. *CBS Publishers and Distributors*, New Delhi, India, p. 1-74.

Hasan, M.Z. 1989. *Selected herbo-mineral remedies.* Ministry of Public Health. Govt. of Kuwait p. 1-256.

Jones, J.B. 1984. Plants. In: *An Official Method of Analysis*. (Ed.): S. William. Associ. Official Analyt. Chem. USA, p. 38-64.

Khan, H.A., S.U. Khan and M.S. Ahmad. 1989. Elemental analysis of some medicinal plants used as drugs in the indigenous system of medicine. In: *Research and Development of Indigenous Drugs*. (Eds.): P.C. Dandiya S. B. Vohora. IHMMR, Hamdard Nagar, New Delhi, pp. 278-280.

Malik, S. and S. Farooq. 1984. Cultivated tress shrub and climbers of gardens of Pakistan taxonomic studies. *PCSIR*, *Peshawar*, Pakistan.

Mirza, M., Z. Yaqeen, A. Bano., R.B. Qadri and M. Qadiruddin. 2004. Trace elements in indigenous medicinal diuretic plants health and disease (*Cymbopogon citrates* DC. Stapf. *Raphanus sativus* Linn., *Zea mays* Linn.). *Pak. J. Sci. Res*., 47(1): 42-45.

Nasir, E. and S.I. Ali. 1972. *Flora of West Pakistan*. Stewart Herbarium Gordon College, Rawalpindi and Department of Botany, University of Karachi.

Nasir, E., Y.J. Nasir and R. Akhtar. 1987. *Wild flowers of Rawalpindi–Islamabad Districts*. National Herbarium, PARC, Islamabad.

Pirzada, T. and M.M.A. Talpur. 1999. Determination of trace metals in some medicinally important plants. *Proc. Tenth Natl. Chem. Conference,* Department of Chemistry, Quaid-e-Azam University, Islamabad, pp. 34-38.

Rizvi, M.A. 2001. Medicinal flowers of Pakistan. In: *Medicinal Plants of Pakistan*. (Eds.): R. Anwar, N. Haq and S. Masood. PASTIC Press, Islamabad, p. 93-101.

Sahito, S.R., T.G. Kazi, G.H. Kazi, M.A. Jakhrani and M.S. Shaikh. 2001. Trace elements in two varieties of indigenous medicinal plant *Catharanthus roseus* (*Vinca rosea*). *The Sciences*, 1(2): 74-77.

Said, M. 1996. Aesthetic elements of Tibb. *Hamdard Medicus*., 9(1):14-18.

Zaman, M.B. and M.S. Khan. 1970. Hundred drug plants of West Pakistan. Medicinal Plants Branch, Pakistan Forest Institute Peshawar. pp. 1-105.

(Received for publication 14 February 2006)