

PRELIMINARY PHYTOCHEMICAL PROFILING OF
SELECTED MEDICINAL AND AROMATIC PLANTS AT
SARDAR BAHADUR KHAN WOMEN'S UNIVERSITY, QUETTA

Shahida Abdul Ghafoor Jamali¹, Tahira Bibi^{*2}, Shazia Irfan³, Nelofer Jamil⁴,
Kanval Shaukat⁵, Hina Ali Ahmed⁶, Farah Naz Channa⁷

^{1, 2}Department of Botany, Sardar Bahadur Khan Women's University, Quetta

⁴Department of Environmental Sciences, Sardar Bahadur Khan Women's University, Quetta

⁵Department of Botany, University of Balochistan, Quetta

⁶Department of Zoology, Sardar Bahadur Khan Women's University, Quetta, Pakistan

⁷Department of Biotechnology, Sardar Bahadur Khan Women's University Quetta

¹jamalilaiba@yahoo.com, ²tahira_botany@yahoo.com, ³irfanshazia16@gmail.com,
⁴nelofer.sbkwu@gmail.com, ⁵kanval_shaukat777@yahoo.com, ⁶hina29_zoo@yahoo.com,
⁷farah.naz@sbkwu.edu.pk

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Corresponding Author: *

Tahira Bibi

Abstract

A qualitative phytochemical analysis was carried out for the detection of alkaloids, tannins, phlobatannins, saponnins, steroids, terpenoids, flavonoids and cardiac glycoside distribution in twenty medicinal plants. Phytochemical screening of the water extract of stem bark, leaves and inflorescence of medicinal plant revealed some major groups of pharmacological importance including, alkaloids, tannins, phlobatannins, saponnins, steroids, terpenoids, flavonoids and cardiac glycoside. The study establishes some relation between the local medicinal applications of plants studied and their constituent phytochemical groups which are relevant to the pharmaceutical industries. Lastly it confirmed that phytochemical screening is a viable tool in search for chemical components and medicinal properties of plants.

INTRODUCTION

Medicinal plants are plants possessing pharmacological properties of possible therapeutic use. Medicinal plants are of great importance to the health of communities and individual. The medicinal value of these plants lies in some chemical components that produce a definite physiological action on the human body. The most important of these chemical constituents of plants are alkaloids, tannins, flavonoids, and phenolic compounds (Hill, 1952). Moreover herbal source drugs are in high demand because of less side effects and low cost remedies.. The presence of secondary plant metabolites as revealed by the

phytochemical screening supports the resourcefulness of the plant extracts (Sofowora, 1993).

Phytochemicals are non-nutritive plant chemicals that have protective or disease preventive qualities. A plant is designed to produce different phytochemicals. Each different type of phytochemical works differently. Some ways in which phytochemicals act including working as antioxidants, influencing hormones which can reduce symptoms of osteoporosis, stimulate enzymes resulting in preventing diseases like breast cancer, interfere with DNA replication which can stop the spread of cancerous cells, and act

as anti-bacterial fighters. Most of the phytochemical introduced in modern pharmaceutical industry are secondary metabolites. Plants have an almost limitless quality to contain aromatic components mainly secondary metabolites. Further, some of which may participate in plant odour (terpenoids), pigmentation (tannins and quinines), and flavour (capsacin). Chemical compounds may be therapeutically active or inactive. The constituents which are active are called active constituents and the inactive ones are called inert chemical constituents. (Iyengar, 1995).

MATERIALS AND METHODS

Collection and identification of plant materials

A survey was conducted at Sardar Bahadur Khan Women's University Quetta to collect the medicinal plant. The plants were identified with the help of available literature (Nasir and Ali 1970-1987). Further identifications were done by comparing the plant species with the collection in herbarium of department of plant sciences S.B.K Women's University. The leaves, stems bark and inflorescence of the twenty medicinal plants, were collected.

Sampling of plant material: Fresh leaves, stem bark, inflorescence and whole part were collected and sampled separately. All the twenty plant samples were identified. Dried in shadow. Exposure to sunlight was avoided to prevent the loss of active components (Thakra, 2004). After shade drying the plant material was grounded into powder using pestle mortar. The powder was kept in small plastic bags with proper labeling.

Extraction procedure: The aqueous extract of all plant samples was prepared by soaking required amount of dried powdered samples in distilled water for 12 hrs. The extracts were filtered using Whatman filter paper.

Phytochemical screening: Chemical tests were carried out on the aqueous extract and on the powdered specimens using standard procedure to identify the chemical constituents. Such as alkaloids, tannins, phlobatannins, saponins,

flavonoids, steroids, terpenoids and cardiac glycosides (Sofowara, 1993).

Test for tannins: About 0.5 g of the dried powdered samples were boiled in 20 ml of water in a test tube and then filtered. A few drops of 0.1% ferric chloride was added and brownish green or a blue-black colouration indicates the presence of tannins.

Test for terpenoids: Five ml of each extract was mixed in 2 ml of chloroform, and concentrated H_2SO_4 (3 ml) was carefully added to form a layer. A reddish brown colouration of the interface was formed to show positive results for the presence of terpenoids.

Test for saponin: About 2 g of the powdered samples were boiled in 20 ml of distilled water in a water bath and filtered. 5 ml of distilled water was mixed with 10ml of the filtrate and shaken vigorously for a stable persistent froth with the help of mechanical shaker. The frothing were mixed with 3 drops of olive oil and shaken vigorously, then observed for the formation of emulsion.

Test for steroids: One ml of concentrated I was added to one ml of each extract. A red coloration was an indication of presence of steroids. (Eluyode O.S and Alabi O.S. 2007)

Test for cardiac glycosides: Five ml of each extracts was treated with 2 ml of glacial acetic acid containing one drop of ferric chloride solution. This was underlayered with 1 ml of concentrated sulphuric acid. A brown ring of the interface indicates a deoxysugar characteristic of cardenolides. Violet ring may appear below the brown ring, while in the acetic acid layer, a greenish ring may form just gradually throughout thin layer.

Test for flavonoids: A portion of the powdered plant sample was in each case heated with 10 ml of ethyl acetate over a steam bath for 3 min. The mixture was filtered and 4 ml of the filtrate was shaken with 1 ml of dilute ammonia solution. A yellow colouration was observed indicating a positive test for flavonoids.

Test for alkaloids: Portion of each extract were treated with few drops of mayer's reagent. A reddish brown and orange precipitate regarded as evidence of the presence of alkaloids (Eluyode, O.S and Alabi, O.S. 2007)

Test for phlobatannins: When an aqueous extract of each plant sample was boiled with 1% aqueous hydrochloric acid Deposition of a red precipitate was taken as evidence for the presence of phlobatinins.

RESULTS

The present study carried out on the plant samples revealed the presence of medicinally active constituents, the phytochemicals. Alkaloids, tannins, phlobatannins, saponins, flavonoids, steroids, cardiac glycosides and terpenoid distribution in leaves, whole parts, inflorescence and stem bark of twenty medicinal and aromatic plants. The leaves of ten plants, *Achillia millifolium*, *Cedrus deodara*, *Datura inoxia*, *Eucalyptus globules*, *Juglans regia*, *Mellia azedarach*, *Platanus orientalis*, *Salvia officinalis*, *Solanum nigram*, *Sophora molis*, belonging to nine families were studied. Result showed the presence of phytochemicals in these plants. In the form of extract eight phytochemical were tested in the leaves of ten plants. Tannin, saponin, steroids and terpenoids were present in all plants while

alkaloids were absent in *Cedrus deodara* and *Datura inoxia*, phlobatannins were absent in *Achillia millifolium*, *Cedrus deodara*, *Datura inoxia*, *Mellia azedarach*, *Platanus orientalis*, *Sophora molis*, flavonoids were absent in *Cedrus deodara* and *Eucalyptus globules*, and cardiac glycosides were absent only in *Mellia azedarach* and *Salvia officinalis*.

Stem bark of four plants, belonging four families were studied. Result showed the presence of alkaloids, tannins, saponins, phlobatannins, flavonoids, cardiac glycosides and steroids in all plants but terpenoids were absent in *Juglans regia*, and *Platanus orientalis*.

Inflorescence of *Achillia millifolium* was tested for the presence of phytochemicals. The entire bioactive compounds were present except phlobatannins.

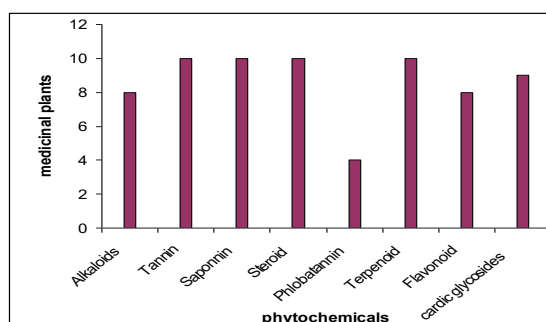
Ten medicinal herbs, belonging to eight families were tested for the presence of phytochemicals. Saponin, steroids, cardiac glycosides and terpenoids were present in all plants but alkaloids were absent in *Tribulus terresteris*, tannins were absent in *Oxalis corniculata* and *Peganum harmala*, flavonoids were absent in *Oxalis corniculata*, while phlobatannins were present only in three plants, *Portulaca oleracea*, *Ocimum basilicum*, *Peganum harmala*.

Table.1. Chemical constituents and medicinal uses of plants

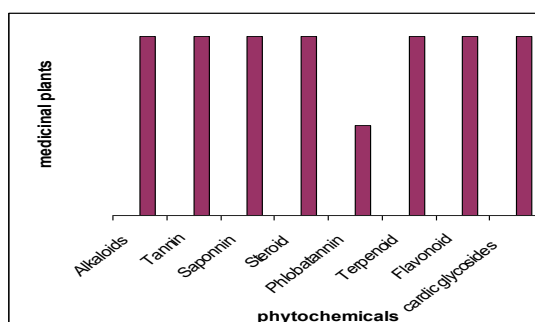
Botanical name/ Vernacular name/Family	Parts used	Chemical constituents	Medicinal Uses
<i>Achillea millefolium</i> L./Birangesif / Asteraceae	stem	Alkaloids, tannin, saponin, steroids, terpenoid, flavonoid and cardiac glycoside	Carcing, toothache, tonic, dysentery
<i>Cedrus deodara</i> Roxb./ Diar/ Pinaceae	Leave ,seed	Tannin, saponin, Alkaloids,steroids, terpenoid and cardiac glycoside.	Bitter, stomachic, anthelminthic, febrifuge.
<i>Convolvulus arvensis</i> L / Lehli / Convolvulaceae	whole plant	Alkaloids, tannin, saponin, steroids, terpenoid, flavonoid and cardiac glycoside	Abdominal worms, abdominal pain, skin disorders.
<i>Conyza canadensis</i> L. /Horse weed/ Asteraceae	whole, plant	Alkaloids, tannin, saponin, steroids, terpenoid, flavonoid and cardiac glycoside	Inflammations, asthma and diseases

<i>Datura Innoxia</i> L./ Thorn-apple/ Solanaceae	Leaf, seed	Tannin, saponin, steroids, terpenoid, flavonid and cardiac glycoside	Used externally,treat microbial infection, injuries, wounds, bleedings and pain,baldness.
<i>Eucalyptus globules</i> <i>Labill./Sufaida/</i> Myrtaceae	L eaf, seed	Alkaloids, tannin, saponin, steroids, terpenoid, phlobatannin and cardiac glycoside	Cold, cough, throat lozenges, malaria and toothache.
<i>Juglans regia</i> L./ Akhor / Juglandaceae	Leaf, bark	Alkaloids, tannin, saponin, steroids, terpenoid, flavonoid, phlobatannin and cardiac glycoside	Antidiarrhoeal, demulcent, cleaning and sparkling teeth, eczema, intestinal worms.
<i>Malva neglecta</i> Wallr./ Dwarf mallow/ Malvaceae	Leaf	Alkaloids, tannin, saponin, steroids, terpenoid, flavonid and cardiac glycoside	Demulcent, aphrodisiac, laxative
<i>Melia Azedarach</i> L./ Drek/ Meliaceae	Leaf	Alkaloids, tannin, saponin, steroids, terpenoid, flavonoid and cardiac glycoside	Anthelmintic, diuretic, anemia, eczema, measles jaundice, bloody piles, wounds, pimples
<i>Mentha royleana</i> L./ Jangli podina/ Lamiaceae	whol eplan t	Alkaloids, tannin, saponin, steroids, terpenoid, flavonoid and cardiac glycoside	Stomachic agent, diarrhoea, dysentery.
<i>Ocimum basilicum</i> L./ Niazboo/Lamiaceae	seed, Leaf	Alkaloids, tannin, saponin, steroids, terpenoid, flavonoid, phlobatannin and cardiac glycoside	Antidepressant, antiseptic, stimulant, diaphoretic, carminative, diuretic,
<i>Oxalis Corniculata</i> Linn. / Khuti booti/Oxalidaceae	Leaf	Alkaloids, saponin, steroids, terpenoid and cardiac glycoside	Diarrhoea & dysentery.
<i>Peganum harmala</i> L / Harmal/ Zygophyllaceae	Seed	Alkaloids, saponin, steroids, terpenoid, flavonoid, phlobatannin and cardiac glycoside	Fevers, asthma, mouth wash. Stimulant, narcotic, antiseptic, joint pain.
<i>Plantago ovata</i> Forssk. / Ispaghul/ Plantaginaceae	Seed, husk	Alkaloids, tannin, saponin, steroids, terpenoid, flavonoid and cardiac glycoside	Chronic constipation, dysentery, abdominal pain, Piles, kidney bladder, cough, cold
<i>Platanus orientalis</i> L./ Chinar/ <u>Platanaceae</u>	LeaF, bark	Alkaloids, tannin, saponin, steroids, terpenoid, flavonoid and cardiac glycoside	Ophthalmia, dysentery, heal wounds chilblains. diarrhoea, dysentery, hernias toothache.
<i>Portulaca oleracea</i> L. / Kulfa, Purslane / Portulacaceae	whol eplan t	Alkaloids, tannin, saponin, steroids, terpenoid, flavonoid, phlobatannin and cardiac glycoside	Jaundice, typhoid, iron deficiency and skin allergy
<i>Salvia officinalis</i> L / Sage / Lamiaceae	Leaf	Alkaloids, tannin, saponin, steroids, terpenoid, flavonoid,	Strengthens brain, senses and memory, helps spitting

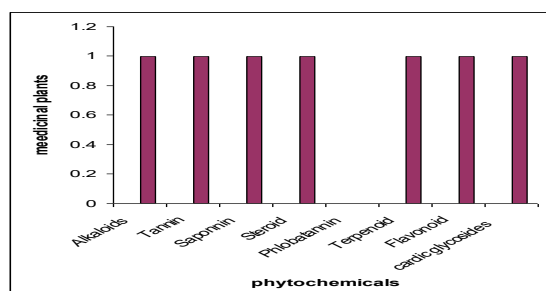
		phlobatannin.	and vomiting of blood.
<i>Solanum nigrum</i> L. / Mako / Solanaceae	whole plant	Alkaloids, tannin, saponin, steroids, terpenoid, flavonoid, Phlobatannin and cardiac glycoside	Antispasmodic, diuretic, sedative, tonic, fevers, asthma, eczema, ulcer, constipation.
<i>Sophora mollis</i> Royle. / Zagherah / Leguminosae	Leaf	Alkaloids, tannin, saponin, steroids, terpenoid, flavonoid and cardiac glycoside	Kill lice, headache, healthy hair
<i>Tribulus terrestris</i> L. / Gokhur / Zygophyllaceae	Fruit, root	tannin, saponin, steroids, terpenoid, flavonoid and cardiac glycoside	Diuretic, antiseptic, demulcent, smallpox, Gonorrhoea, bladder stones



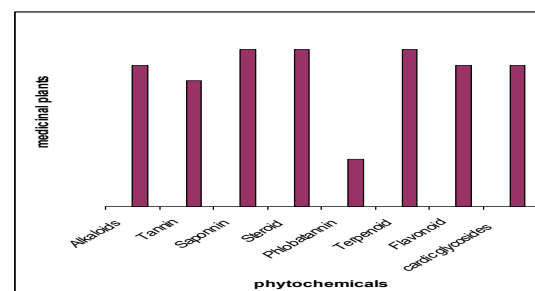
Phytochemicals analysis of leaves of medicinal plants.



Phytochemical analysis of bark of medicinal plants.



Phytochemicals analysis of inflorescence of *Achillia millifolium*.



Phytochemical analysis of bark of medicinal plants.

DISCUSSION

The presence of alkaloids suggests the ability of a plant to contain detoxifying and antihypertensive properties (Trease and Evans 1978, Zee-Cheng 1997). Due to the presence of alkaloids, *Ocimum basilicum* and *Peganum harmala* are used as antidepressant, leaves of *Juglans regia* and *Oxalis Corniculata* use to

detoxifying blood, seeds of *Plantago ovata* are use in correcting kidney bladder and fruit powder of *Tribulus terrestris* is given orally to cure urinary disorders. *Solanum nigrum*, *Sophora mollis*, *Tribulus terrestris* and are use as powerful pain killer in traditional medicine. Harmaline found in *Peganum harmala* is a poisonous alkaloid. Seeds of *Peganum harmala* are use for

fever, asthma and mouth wash. Presence of tannins in plant suggests the ability of the plants to play a major role as antidiarrhoea and antihemorrhagic agent (Asguith and Butler 1986). Thus *Achillea millefolium* has potential as a source for the treatment and prevention of cancer. Tannins are basically astringent. Tannins include application on burns to heal the injury and on cuts to stop bleeding. Presence of tannins in *Juglans regia*, *Mentha royleana* and *Oxalis corniculata*, these plants use to cure diarrhea. *Achillea millefolium*, *Juglans regia*, *Mentha royleana*, *Cedrus deodara*, *Convolvulus arvensis*, *Oxalis corniculata*, *Plantago ovata* and *Eucalyptus globules* are used to treat dysentery. Astringent property of *Malva neglecta*, *Tribulus terrestris*, *Melia azedarach* and *Plantago ovata* is due to the presence of tannins. Wounds are fumigated by burning of leaves and seeds of *Peganum harmala*. Decoction of leaves of *Eucalyptus globules* used for washing wounds. *Tribulus terrestris*, *Melia azedarach* and *Plantago ovata* are applied on burns to heal injury. *Melia azedarach* and *Datura innoxia* are applied on cuts to stop bleeding. Leaves of *Platanus orientalis* are applied to the eyes in the treatment of ophthalmia. Saponins have been shown to contain great significance as antihypercholesterol, hypotensive, effective against colon cancer and has cardiac depressant properties (Trease and Evans 1985, Price 1987). Saponins have inhibitory effect on inflamed cells (Just et al 1998). Saponin was found to be present in plants extract and has supported the usefulness of these plants in managing inflammation. Saponins have hemolytic, expectorant, anti-inflammatory and immune-stimulating activity. Leaf decoction of *Plantago ovata*, *Ocimum basilicum* and *Eucalyptus globules* is useful for cure cold and cough. Seeds of *Plantago ovata* are used in lowering cholesterol level. *Conyza canadensis* for inflammation, *Peganum harmala* and *Ocimum basilicum* has immune-stimulating activity. Cardiac glycosides are an important class of naturally occurring drugs. The cardiac glycosides have been used as stimulant in case of cardiac failure (Trease and Evans 1985, Olayinka et al 1992). *Melia azedarach*, *Ocimum basilicum*, *Malva neglecta*, *Tribulus terrestris* and *Solanum nigrum* contain

cardiac glycosides are used as emetic, diuretic and heart tonics. *Convolvulus arvensis* and *Ocimum basilicum* play a major role in treatment of hypertension. The presence of phlobatannins suggests the diuretic property of the plant (Okuda 1991). Flavonoids contribute to the brilliant multicolor for most plants (Sofowara, 1993). Flavonoids relieve hay fever, eczema, asthma and heart diseases. Flavonoids exhibit a wide range of biological activities like antimicrobial, anti-inflammatory, anti-angiotic, analgesic, anti-allergic, cytostatic and antioxidant properties (Hodek et al., 2002).

Plants that contain flavonoid are *Juglans regia*, *Cedrus deodara*, *Peganum harmala* and *Solanum nigrum* used for cure hay fever, *Juglans regia*, *Melia azedarach* and *Solanum nigrum* for eczema, *Conyza canadensis* and *Peganum harmala* for asthma, *Conyza canadensis* for inflammation, *Juglans regia*, *Convolvulus arvensis* and *Portulaca oleracea* for skin disorders. Steroids compounds are of great importance and interest in pharmacy due to their relationship with compounds such as sex hormones (Okwu 2001). *Tribulus terrestris* play a role in stimulating the production of the sexual hormones within the body. *Tribulus terrestris* fruit powder is taken orally with a glass of milk by rural men to cure impotency. Presence of terpenoids in medicinal plants is widely used in herbal medicine. Phytochemical screening results in this work were in agreement with the result obtained by other authors (Akpan and Usoh 2004, Amah et al 2001, Hassan et al 2004, Bansa and Adegmo 2006, Edeoga 2005, Eluyode O.S and Alabi O.S 2007, Kayani et al 2007).

CONCLUSION

This study shows that the twenty medicinal plants investigated were relevant to herbal medicine. There is also evidence to show some concordance between the local medicinal applications of the plants and their constituent phytochemical groups. The result of the phytochemical screening of the extract of leaves, stem bark, inflorescence and whole plant parts varied, while some of the components were present, some were absent. It was noted that phytochemical were present in all

plant studied. Due the presence of these secondary metabolites it may be necessary to recommend the plants understudy to be integrated into medical program.

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