Ethnobotanical Leaflets 9: 1-

Pharmacognostic Studies of Some Indigenous Medicinal Plants of Pakistan

Abid Mahmood, Mushtaq Ahmad, Asma Jabeen, Muhammad Zafar* and Saima Nadeem

Department of Botany, University of Arid Agriculture, Rawalpindi
Department of Biological Sciences, Quaid-I-Azam University, Islamabad-Pakistan
mushtaqflora@hotmail.com

Issued 9 January 2005

ABSTRACT

Medicinal plants constitute an effective source of traditional and modern medicines. The plant is a biosynthetic laboratory, not only for chemical compounds but also a multitude of the compounds. The present research work was confined to study the macro, microscopic features and analysis of powdered drug of *Acacia modesta* Wall., *Acacia nilotica* (L.) Delile, *Berberis lycium* Royle and *Zanthoxylum alatum* D. C. Prod. These studies were carried out in Botany laboratory of University of Arid Agriculture, Rawalpindi during 2004. These species are used as miswak (tooth brush) by local people of Pakistan in different areas. Anatomical features such as, fibres, parenchyma cells, vessels and pith were identified during microscopic studies. Powdered miswak of *Acacia modesta* Wall., *Berberis lycium* Royle and *Zanthoxylum alatum* D. C. Prod. were soluble in sulphuric acid only while insoluble in other solvents i.e., hydrochloric acid, acetic acid, benzene and water. Powdered miswak of *Acacia nilotica* was insoluble in these solvents. Powdered drug of these species did not retain their original colour in cold and hot tests and on dry filter paper, when mixed in various solvents.

Key words: Pharmacognosy, Indigenous medicinal plants, Pakistan.

INTRODUCTION

Since the beginning of human civilization, people have used plants as medicine. Perhaps as early as Neanderthal man, plants were believed to have healing power. The earliest uses are found in Babylonian circa 1770 BC in the code of Hammurabi and in ancient Egypt circa 1550 BC. In fact, ancient Egyptians believed medicinal plants to have utility even in the after life of their pharaohs. Plants have been recorded from the Gaza pyramids and can be found on display in a dark corner of Cairo Museum (Anna, 1993).

Pakistan is one of the few places on earth with such a unique biodiversity, comprising of different climatic zones with a wide range of plant species. Approximately 6000 plant species with medicinal properties are found in Pakistan. There is a dire need on the part of manufacturers of allopathic and herbal medicines to carryout systematic research on medicinal plants to save foreign exchange spend on their imports (Shinwari, 1989).

Traditional Unani medicine is a part of our culture and Pakistan is one of those countries where traditional Unani medicine is popularly practiced among the large segment of its population. It originated in Greece, founded by old ancient Greek philosophers and was used/documented by muslims during the glorious period of Islamic civilization. It was brought to the Indo-Pak subcontinent by muslim scholars and practiced here for centuries. It also benefited from the ayurvedic system of medicine, which was an important component of hindu civilization. Traditional Unani medicine heavily depends on medicinal plants, apart from using animals and minerals. Pakistan has a varied climate and is quite rich in medicinal herbs, though scattered over a large area. All the plants are growing wild and no systematic attempt has been made to carryout their pharmacognostic investigation of medicinal plants (Ahmad *et al.*, 2003).

In Pakistan medicinal plants are primarily used by tibia dawakhanas (medical centers of indigenous physicians known as hakims). Unfortunately, very little attention has been paid to the pharmacognostic and ethno botanical aspect of plants, as hakims are only concerned with the floral and vegetative parts of medicinal plants without any regard to their botanical characteristics, or distribution in the various ecological zones of Pakistan. Herbs are not only used in the ayurvedic system of treatment but in the preparation of many allopathic and homeopathic drugs, no wonder these herbs are now being commercially exploited for the extraction of various ingredients (Haq, 1983).

Many of the plants which are used for various ailments have either not been properly investigated or the findings have not been correlated with phytochemical and pharmacological studies. Medicinal plants are those plants which are used directly or indirectly in the extraction of the drug for the treatment of ailments. Medicinal plant botanists are trying to explore the precious assets of medicinal plants for the suffering humanity. In the world 30% of the pharmaceutical preparations are manufactured from plants (Khan, 1979).

The present work is also in continuation of the exploration of medicinal wealth of Pakistan with special reference to *Acacia modesta* Wall., *Acacia nilotica*, *Berberis lycium* Royle, *Zanthoxylum alatum* D. C. Prod.

Keeping in view the medicinal importance of these selected species, the objectives of the present study are:

- To study the anatomy, powdered drug analysis and chemical tests of selected species.
- To investigate the indigenous medicinal plants for pharmacognosy and pharmacology which might be useful for further investigation by botanists, pharmacologists, microbiologists, phytochemists or some other academic disciplines.
- Studies of indigenous medicinal plants to disseminate the dynamics of local knowledge and challenge modern health care development.

MATERIALS AND METHODS

➢ MATERIAL COLLECTION

The plant material was collected from the natural habitat of various localities. Branches of *Acacia modesta* Wall. and *Acacia nilotica* were collected from hills of district Attock. Branches of *Berberis lycium* Royle and *Zanthoxylum alatum* D. C. Prod. were collected from Murree hills. The branches were cleaned, washed and dried under shade for 20 days and in the oven for 24 hours at 100 °C. Then branches were cut into small pieces.

➢ POWDERED DRUG

The dried small pieces of branches were powdered by means of pistil and mortar and electric grinder. The macroscopic study was made. The physical characters of powdered drug that are colour, smell and taste were studied. The powdered drug was numbered and preserved in the bottles to avoid contamination.

➢ HISTOLOGY

The microscopic features of the powdered drug were studied in 1% chloral hydrate,glycerine and Iodine solution. For permanent mounting the safranin, hemotoxylon and xylene were used. The various tissues were identified and microphotography were done with the help of Olympus microscope.

➢**CHEMICAL ANALYSIS OF POWDERED DRUG**

The simple method to determine the solubility of powdered drug was adopted. 5 gram powdered drug was mixed in 20 ml sulphuric acid, hydrochloric acid, acetic acid, benzene and water. Each test tube was shaken and boiled. Method followed is that of Evers and Smith (1955). The retention of original colour of powdered materials were noted in various solvents in cold and hot conditions. Filter paper was also used to find out change in colour.

RESULTS AND DISCUSSION

1. *Acacia modesta* Wall.

Macroscopic and Anatomical Features

Acacia modesta Wall. locally known as phulai belongs to family Mimosaceae. It is a medium size deciduous tree grows on stony grounds and rarely found on salt range. The flowers (March-May) are pale white to pale yellow fragrant growing in bunches. It is mainly used in making agricultural implements, fodder, timber, fuel and apicultural purposes. Medicinally it is used for gas trouble and its young twigs are used for cleaning teeth, dental disorders and dental problems. Its miswak is approximately 20 cm long with 2 cm in diameter. It is slightly curved and tough with pleasant taste.

Acacia modesta Wall. wood showed vessels with few cells and parenchyma cells. Fibres were also found. Pith consisted of rounded cells.

Chemical Analysis

The powdered miswak of *Acacia modesta* Wall. was soluble only in sulphuric acid. It did not retain its original dark yellow colour on dry filter paper and in various solvents by cold and hot tests (Table 1, 2). Dastagir and Haq (1995) also reported similar features of *Acacia modesta* Wall., *Azadirachta indica* and *Dodonaea viscosa*.

Table-1 Solubility and colour analysis of powdered drug of selected medicinal plants in various solvents by cold and hot method.

	***Acacia modesta* Wall.**		***Acacia nilotica* (L.) Delile**		***Berberis lycium Royle* Royle**		***Zanthoxylum alatum D. C. Prod***	
Solvents	**Cold Test**	**Hot Test**	**Cold Test**	**Hot Test**	**Cold Test**	**Hot Test**	**Cold Test**	**Hot Test**
	Colour solubility	Colour solubility	Colour solubility	Colour solubility	Colour solubility	Colour solubility	Colour solubility	Colour solubility
Sulphuric Acid	Dark brown Sol.	Brownish Sol. black	Reddish Insol. Brown	Dark Insol. Brown	Dark sol. Brown	Brownish Sol. black	Dark sol. Brown	Dark sol. Brown
Hydrochl-oric Acid	Greenish Insol.	Conker Insol.	Marool Insol.	Conker Insol.	Brownish Insol. Black	Conker Insol.	Greenish Insol.	Conker p.sol.
Acetic Acid	Yellow Insol.	Dark Insol. Yellow	Light Insol. Red	Light Insol. Red	Light Insol. Red	Copper Insol.	Light Insol. Red	Golden Insol. Brown
Benzene	Yellow Insol.	Dark Insol. Mustard	Light Insol. Mustard	Light Insol. Brown	Light Insol. Mustard	Mustard Insol.	Mustard Insol.	Dark Insol. Mustard
Water	Light Insol. Yellow	Light Insol. Yellow	Butter Insol. Scotch	Golden Insol. Brown	Light Insol. Yellow	Dark Insol. Brown	Golden Insol. Brown	Brown Insol.

Table 2. Colour analysis of powdered drug of selected medicinal plants in various solvents with known volume by filter paper.

	Acacia modesta			*Acacia nilotica*			*Berberis lycium*			*Zanthoxylum alatum*		
Solvents	*volume*	**Actual colour of powdered drug**	**Colour in solvents**	**Colour on filter paper**	*volume*	**Actual colour of powdered drug**	**Colour in solvents**	**Colour on filter paper**	*volume*	**Actual colour of powdered drug**	**Colour in solvents**	**Colour on filter paper**	*volume*	**Actual colour of powdered drug**	**Colour in solvents**	**Colour on filter paper**
Sulph-uric Acid	4ml	Dark Brown	Dark Brown	conker	4ml	Light maroon	Reddish Brown	Light brown	4ml	Light brown	Dark brown	Dark copper	4ml	Dark grey	Dark brown	Dark copper
Hydro-chloric Acid	4ml	Dark Brown	Greenish	No. colour	4ml	Light maroon	Maroon	Light copper	4ml	Light brown	Brownish black	No. colour	4ml	Dark grey	Greenish Brown	No. Colour
Acetic Acid	4ml	Dark Brown	Yellow	No. colour	4ml	Light maroon	Light Red	No. Colour	4ml	Light brown	Light red	Off White	4ml	Dark grey	Light Red	Off White
Benzene	4ml	Dark Brown	Yellow	No. colour	4ml	Light maroon	Light mustard	No. colour	4ml	Light brown	Light mustard	No. Colour	4ml	Dark grey	Mustard	No. Colour
Water	4ml	Dark Brown	Light Yellow	No. colour	4ml	Light maroon	Butter scotch	No. colour	4ml	Light brown	Light Yellow	No. Colour	4ml	Dark grey	Golden brown	No. colour

2. Acacia nilotica Linn.

Macroscopic and Anatomical Features

Acacia nilotica Linn. locally known as kikar belongs to family Mimosaceae. It is a moderately size erect tree. Bark is dark brown, rough and often longitudinally fissured. Flowers in globose heads, golden yellow and scented. Leaves bipinnate, 4-9 pairs and leaflets 20-40 pairs. Its tender branches are used as fodder for goats and sheep. Bark medicinally used in toothache. Seeds useful in treating stomach complaints and skin disorders. Leaves are good for treatment of diarrhoea. Its miswak is approximately 22 cm long with 1.66 cm in diameter. It is curved and tough with sweet but slightly bitter taste.

Acacia nilotica wood showed solitary vessels with few multiple of 2-3 cells and with rare occurrence of some unknown irregular clusters and abundant paratracheal parenchyma. Fibres are rounded while rays are two celled wide exclusively uniseriate and few biseriate rays. Pith consisted of rounded cells without intercellular spaces.

Chemical Analysis

The powdered miswak of *Acacia nilotica* was partially soluble in sulphuric acid only. It did not retain its original light maroon colour in various solvents by cold and hot tests and on dry filter paper (Table 1,2).

3. *Berberis lycium Royle* Royle.

Macroscopic and Anatomical Features

Berberis lycium Royle locally known as simlu belongs to family Berberidaceae. It is found in the northern areas of Pakistan and also in Murree hills. It is a medium sized tree. Locally its fruit is edible, powdered roots are used in throat inflammations. Medicinally its extract is used in opthalmia. The roots are febrifuge. They are used in chronic diarrhoea and piles (Zaman, 1970). The juice is applied over the eyelid as useful household remedy in acute conjunctivitis and chronic opthalmia. Washing unhealthy ulcers with *Rasaut*n is considered useful (Khan *et al*., 1979). The anatomy of the roots and rhizomes plays an important role in pharmacognostic studies. The cork was 5-10 celled thick, cortex several layered 2-3 layered, cambium, xylem with spiral, pitted and reticulate tracheae.

Chemical Analysis

The powdered miswak of *Berberis lycium* Royle was soluble only in sulphuric acid. It did not retain its original light brown colour in various solvents by cold and hot tests and on dry filter paper (Table 1,2).

4. *Zanthoxylum alatum* D. C. Prod Roxb.

Macroscopic and Anatomical Features

Zanthoxylum alatum D. C. Prod locally known as Timur belongs to family Rutaceae. It is a aromatic, prickly dioecious or rarely monoecious evergreen tree, or shrub with dense foliage mainly pantropical, though also distributed in the subtropics. It grows widely in the hilly tracts of Murre, Galliyat etc. The plant,s bark, fruits and seeds are extensively used in indigenous system of medicine as carminative, stomachic and anthelmintic. The bark is pungent and is used to clean the teeth. The fruit and seeds are employed as aromatic tonic in fever and dyspepsia. The extract of the fruit is reported to be effective for expelling round worms. The fragrant twigs are chewed for cleaning teeth.

It ranges from a shrub to a small-sized tree, yet sometimes attaining a height of 45 feet. The bark is beset with verrucose prickles. The leaves are odd-pinnate; the leaflets from 5 to17 in number, ovate-lanceolate, unequilateral, the terminal one only being equilateral, shining and smooth on the upper surface. The flowers are plentiful, of a greenish hue, appear before the leaves, and have but 3 pistils.

The wood showed vessels, fibres, pith with few cells. The two official barks are curved or quilled fragments, about 1 Mm. thick; outer surface brownish-gray, inner surface whitish in colour.

Chemical Analysis

The powdered miswak of *Zanthoxylum alatum* D. C. Prod was soluble in sulphuric acid only. It did not retain its original dark grey colour in various solvents by cold and hot tests and on the dry filter paper (Table 1,2).

CONCLUSION

It is concluded that medicinal plants have contributed hugely to the traditional and western medicines through providing ingredients for drugs or having played central roles in the drug discovery. Pakistan has a variety of climate and soil conditions and is quite rich in medicinal plants, but no systematic attempt has been made to work on these natural resources properly. Many of the plants which are used for various ailments have either not been properly investigated or the findings have not been correlated with phytochemical and pharmacological studies.

It is suggested that a nation wide survey of medicinal plants should be carried out to update the inventory of existing natural drug plant resources of the country. In view of the plentiful occurrence of a number of unexploited drug plants in Pakistan, it is suggested that Industrial Development Corporation of Pakistan may be persuaded to prepare a feasibility report for the establishment of small scale processing units for the preparation of valued products.

REFERENCES

Ahmad, M., R.A. Qureshi, M.A. Khan and M. Saqib. 2003. Ethnobotanical studies of some cultivated plants of Chhahh region (District-Attock) Pakistan. Scient. Khyb.,16(2):109-121.

Anna, K. 1993. An illustrated Guide to Herbs, their Medicine and Magic, USA. pp:35-45

Dastagir, G. and I. Haq. 1997. Pharmacognostic study of *Acacia nilotica* (Linn.) Delile ssp Nilotica and Juglans regia Wall used as Miswak. Pak. J. Pi.Sci. , 3(2): 93-100.

Evers, N. and W. Smith. 1955. The Analysis of Drugs and Chemicals. Charles Griffin and Company Limited, London. 20-21.

Haq, I. 1983. Medicinal Plants-Report of Committee on Economic and Therapeutic importance of Medicinal Plants. Ministry of Health. Government of Pakistan-Hamdard Foundation Press.pp:1-13.

Khan, A.A., A. Ashfaq and M.N. Ali, 1979. Pharmacognostic Studies of Selected Indigenous Plants of Pakistan, Pakistan Forest Institute, Peshawar, Spinezer Printers, Peshawar.

Shinwari, Z.K. and S. Malik. 1989. Plant Wealth of Dera Bughti area, Progressive Farming., 9: 39-42.

Zaman, M.B. and S. Khan. 1970. Hundred Drug Plants of West Pakistan, Med. Plants Branch, Pakistan Forest Institute, Peshawar.