

Phytochemical Analysis of Medicinal Plants Occurring in Local Area of Mardan

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Abstract

Medicinal plants have bioactive compounds which are used for curing of various human diseases and also play an important role in healing. Phytochemicals have two categories i.e., primary and secondary constituents. Primary constituents have chlorophyll, proteins sugar and amino acids. Secondary constituents contain terpenoids and alkaloids. Medicinal plants have antifungal, antibacterial and anti-inflammation activities. The present study involves ten different medicinal plants *Acacia nilotica*, *Psidium guajava*, *Luffa cylindrical*, *Morus alba*, *Morus nigra*, *Momordica charantia*, *Fagonia cretica*, *Punica granatum*, *Ficus palmate* and *Prunus persica* locally available in Mardan region of Pakistan. The leaves of the selected medicinal plants were washed, air dried and then powdered. The aqueous extract of leaf samples were used for the phytochemical analysis to find out the phytochemical constituents in the plants. The main objective of the research work was to check the presence or absence of the phytochemical constituents in all the selected medicinal plants. The results of the phytochemical analysis of these medicinal plants showed that the terpenoids, phlobatannins, reducing sugar, flavonoids and alkaloids were found to be present in afore mentioned medicinal plants.

The phytochemical analysis of the plants is very important commercially and has great interest in pharmaceutical companies for the production of the new drugs for curing of various diseases. It is expected that the important phytochemical properties recognized by our study in the indigenous medicinal plants of Mardan will be very useful in the curing of various diseases of this region.

Keywords: Medicinal plants; Phytochemicals; Anti-fungal; Anti-bacterial; Anti-inflammation activities

Introduction

The medicinal plants are useful for healing as well as for curing of human diseases because of the presence of phytochemical constituents [1]. Phytochemicals are naturally occurring in the medicinal plants, leaves, vegetables and roots that have defense mechanism and protect from various diseases. Phytochemicals are primary and secondary compounds. Chlorophyll, proteins and common sugars are included in primary constituents and secondary compounds have terpenoid, alkaloids and phenolic compounds [2]. Terpenoids exhibit various important pharmacological activities i.e., anti-inflammatory, anti-cancer, anti-malarial, inhibition of cholesterol synthesis, anti-viral and anti-bacterial activities [3]. Terpenoids are very important in attracting useful mites and consume the herbivorous insects [4]. Alkaloids are used as anaesthetic agents and are found in medicinal plants [5]. The *Momordica charantia* belongs to the Cucurbitaceae family and it has common names such as bitter melon, karela and bitter gourd. More than thousand herbal products of *Momordica charantia* are used for treatment of diabetic patients and also helpful in lowering of glucose level in the blood [6]. The bioactive constituents are present in *Momordica charantia* that is charantosides, momordin and gogaglycosides. It also includes terpenoids constituents such as momordicin, momordenol, momordicin-28, momordicin and momordol [7-11]. *Morus nigra* is the botanical name of the mulberry and it belongs to the family Moraceae. Mulberries have shown various biological properties such as anti-inflammatory activities [12]. Guava is the common name of the *Psidium guajava* and it belongs to the family Myrtaceae. Its phytochemical study shows that its extracts have more than twenty compounds [13,14]. *Prunus persica* belongs to the Rosaceae family. It is used as medicinal plants in African countries and this medicinal plant has shown strong anti-fungal activities [15].

Pomegranate is the common name of the *Punica granatum* (PG) and

belongs to the family Lythraceae. It has much medical significance and used as medicines for centuries [16]. The recent studies have investigated that pomegranates are used for the treatment of a number of diseases e.g., diabetes, dysentery, diarrhea, cough, asthma, bleeding disorders, bronchitis, fever, AIDS, inflammation, ulcers, malaria, prostate cancer, hypertension, atherosclerosis, hyper lipidemia, male infertility, infant brain ischemia and obesity. *Fagonia cretica* (Zygophyllaceae) is one of the plants which are locally used in Pakistan as a cure of snake bite [17]. *Acacia nilotica*, it is the member of the Leguminosae family. The subfamily of the *Acacia nilotica* is Mimosoideae [18]. *Luffa cylindrical* is the botanical name of the sponge gourds and belongs to Cucurbitaceae family. The fruits of this plant have flat seeds and black in colour which is enclosed by group of fibers [19]. Medicinal and nutritional properties are the characteristics of *Luffa cylindrical* and seeds of this plant are used for curing of asthma, fever and sinusitis [20]. *Morus alba* is included in the Moraceae family. Their leaves and fruits are used for curing prematurely grey hair. Its root bark is used by humans for more than 4 thousand years [21,22]. *Ficus palmate* is included in the family of Moraceae and is used as dry vegetable. It is herbaceous perennial plant. Its leaves have hypotensive actions [23].

The main objective of our research work was to analyze the presence

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or absence of different phytochemicals in the selected ten medicinal plants from Mardan region (Pakistan) used for healing and curing of various diseases.

Materials and Methods

Plant materials

The present study included plant species which were *Acacia nilotica*, *Punica granatum*, *Psidium guajava*, *Ficus Palmata*, *Morus alba*, *Morus nigra*, *Fagonia cretica*, *Momordica charantia*, *Prunus persica* and *Luffa cylindrical*.

Chemicals

Fehling solution A and Fehling solution B, ethanol, distill water, aqueous HCl, methanol, chloroform, concentrated sulphuric acid, Ammonia solution, picric acid, Hexane.

Sample collection

Ten medicinal plants were collected locally from the farm lands of Mardan area (Pakistan). The plants were used for the purpose of their phytochemical analysis. The plants collected were identified botanically in department of Botany UCS, Shunkar, Abdul Wali Khan University Mardan. Fresh and tender leaves of selected plants were used for phytochemical analysis. Plant species selected during present investigation were given in Table 1.

Preparation of plant extract

The leaves of the selected plants were removed from the plants and then washed under running tap water to remove dust. The plant samples were then air dried for few days and the leaves were crushed into powder and stored in polythene bags for use.

The plant powder was taken in a test tube and distilled water was added to it such that plant powder soaked in it and shaken well. The solution then filtered with the help of filter paper and filtered extract of the selected plant samples were taken and used for further phytochemical analysis.

Test for phlobatannins

Plant powder sample was mixed with distill water in a test tube, then shaken it well, and filtered to take plant extract. Then to each plant extract, 1% aqueous hydrochloric acid was added and each plant sample was then boiled with the help of Hot plate stirrer. Formation of red colored precipitate confirmed a positive result.

Test for reducing Sugar

An amount of 0.50 g of selected plant sample was added in 5 ml of

S.No	PLANT SPECIES	LOCAL NAME	PART USED
1	<i>Acacia nilotica</i>	Kikar	Leaves
2	<i>Psidium guajava</i>	Amrood	Leaves
3	<i>Luffa cylindrical</i>	Torai	Leaves
4	<i>Morus alba</i>	Spin tooth	Leaves
5	<i>Morus nigra</i>	Tor tooth	Leaves
6	<i>Momordica charantia</i>	Karela	Leaves
7	<i>Fagonia cretica</i>	Azghakey	Leaves
8	<i>Punica granatum</i>	Anaar	Leaves
9	<i>Ficus palmata</i>	Enzar	Leaves
10	<i>Prunus persica</i>	Shaltalu	Leaves

Table 1: Ethnobotanical information of selected medicinal plant species for phytochemical analysis in Mardan area of Pakistan.

distilled water. Then 1 ml of ethanol mixed in plant extract. After that we took 1 ml of Fehling solution A and 1 ml of Fehling solution B in a test tube, heated it to boiling and then poured it in the aqueous ethanol extract. When color reaction was observed, it shows a positive result.

Test for terpenoids

An amount of 0.8 g of selected plant sample was taken in a test tube, then poured 10 ml of methanol in it, shaken well and filtered to take 5 ml extract of plant sample. Then 2 ml of chloroform were mixed in extract of selected plant sample and 3 ml of sulphuric acid were added in selected sample extract. Formation of reddish brown color indicates the presence of terpenoids in the selected plants.

Test for flavonoids

For the confirmation of flavonoid in the selected plants, 0.5 g of each selected plant extract were added in a test tube and 10 ml of distill water, 5 ml of dilute ammonia solution were added to a portion of the aqueous filtrate of each plant extract followed by addition of 1 ml concentrated H_2SO_4 . Indication of yellow color shows the presence of flavonoid in each extract.

Test for alkaloids

For the purpose of phytochemical analysis of the selected plants, 0.2 g of the selected plant samples were added in each test tube and 3 ml of hexane were mixed in it, shaken well and filtered. Then took 5 ml of 2% HCl and poured in a test tube having the mixture of plant extract and hexane. Heated the test tube having the mixture, filtered it and poured few drops of picric acid in a mixture. Formation of yellow color precipitate indicates the presence of alkaloids.

Results

This study has revealed the presence of phytochemicals considered as active medicinal chemical constituents. Important medicinal phytochemicals such as terpenoids, reducing sugar, flavonoids, alkaloids and phlobatannins were present in the samples. The result of the phytochemical analysis shows that the ten plants are rich in at least one of alkaloids, flavonoids, terpenoids, reducing sugars and phlobatannins. Plant *Psidium guajava* having all these phytochemicals. The phytochemical screening and qualitative estimation of 10 medicinal plants studied showed that the leaves were rich in phlobatannins, terpenoid, flavonoids, alkaloids and reducing sugar (Table 2).

Phlobatannins are present in *Psidium guajava*, *Momordica charantia* and *Prunus persica*. Phlobatannins have been reported for its wound healing properties, these are anti-inflammatory and analgesic [23] and antioxidant [24]. Reducing sugars are present only in two plants out of 10 plants i.e., *Psidium guajava* and *Acacia nilotica*. Terpenoids are present in *Psidium guajava*, *Fagonia cretica* and *Acacia nilotica*. Terpenoids are reported to have anti-inflammatory, anti-viral, anti-malarial, inhibition of cholesterol synthesis and anti-bacterial [3]. Flavonoids are found in *Punica granatum*, *Psidium guajava*, *Morus alba*, *Ficus palmate*, *Fagonia cretica* and *Acacia nilotica*. Epidemiologic studies recommend that coronary heart disease is opposed by dietary flavonoids. Alkaloids are present in *Punica granatum*, *Psidium guajava*, *Morus nigra* and *Prunus persica* as shown in Table 2. Plants having alkaloids are used in medicines for reducing headache and fever. These are attributed for antibacterial and analgesic properties [25].

Discussion

The research work was carried out on the ten selected medicinal

S.No	Plant species	Phlobatannins	Reducing sugar	Terpenoid	Flavonoids	Alkaloids
1	Punicagranatum	-	-	-	+	+
2	Psidium gujauva	+	+	+	+	++++
3	Morusnigra	-	-	-	-	++
4	Morus alba	-	-	-	+	-
5	Ficus palmate	-	-	-	+	-
6	Momordica charantia	+	-	-	-	-
7	Luffa cylindrical	-	-	-	-	-
8	Prunus persica	+	-	-	-	+++
9	Fagonia cretica	-	-	+++	+++++	-
10	Acacia nilotica	-	+	+	+	-

+ = indicates presence of phytochemicals and

- = indicates absence of phytochemicals.

++++ = shows high concentration.

+++ = shows moderate concentration.

Table 2: Preliminary phytochemical analysis of screened medicinal plant species.

plants which shows that phytochemical constituent's i.e., terpenoids, flavonoids, alkaloids, reducing sugars and phlobatannins are either present or absent in these plants and the results were summarized in Table 2. In our studies it was investigated that alkaloids and flavonoids are present in Punica granatum and phlobatannins, whereas reducing sugars and terpenoids were found to be absent. In previous studies it was reported that flavonoids and terpenoids were present in aqueous extract of the Punica granatum [25] while alkaloids and phlobatannins were found to be absent in it. The recent research studies and previous research studies results were different so it might be due to the change in location and genetic variation due to cross pollination, so their genetic makeup were changed and that is why shows the different results.

Reducing sugars, flavonoids and traces of alkaloids were found to be present in Psidium gujauva according to the previous investigations [26] while in present investigation, reducing sugars, terpenoids, alkaloids, flavonoids and phlobatannins all were present in it and alkaloids were more in concentration as compared to other phytochemicals in *Psidium gujauva* plant. Alkaloids were present in *Morus nigra* and the remaining phytochemical constituents were absent. From previous research work it was reported that in the leaves of *Morus nigra* [27], phytoconstituents i.e., alkaloid contents were found to be present [28].

In our recent research studies Terpenoids, phlobatannins, flavonoids, alkaloids and reducing sugars were absent in *Luffa cylindrical*, while the previous research studies showed that flavonoids and alkaloids were present in it [29]. The phytochemical analysis of *Acacia nilotica* showed the presence of terpenoids, reducing sugars and flavonoids. While the previous studies showed that the flavonoids were present [30], the researchers found the same result about the flavonoids and they did not study the remaining phytochemicals in *Acacia nilotica*. The result obtained from this work revealed that *Ficus palmate* contained flavonoids. The previous research work showed that flavonoids were present in methanolic extract and petroleum ether extracts of *Ficus palmate* [31].

It was reported that the ethanolic/aqueous extract of *Momordica charantia* contained alkaloids, flavonoids and phlobatannins [32] while in our research investigations phlobatannins were found to be present in it. It was investigated that flavonoids were found to be present in *Morus alba* and the flavonoids in the *Morus alba* leaves have excellent antioxidant activities and are important bioactive components in *Morus alba* (mulberry leaves), which can cause inhibition of the oxidative modification of the human lipoproteins [33] while our studies also showed the same results that is flavonoids were detected in it. From

previous studies it is confirmed that flavonoids and reducing sugars were present in the methanolic extract of *Fagonia cretica* while terpenoids were present in the n-hexane extract of the *F. cretica* [34] and in our recent research studies, it is investigated that flavonoids and terpenoids were found to be present in this plant. In our research studies, alkaloids were found to be present in *Prunus persica* while the previous studies showed that flavonoids were present in this plant [35].

Conclusion

The selected ten medicinal plants are the source of the secondary metabolites i.e., alkaloids, flavonoids, terpenoids, phlobatannins and reducing sugars. Medicinal plants play a vital role in preventing various diseases. The antidiuretic, anti-inflammatory, antianalgesic, anti-cancer, anti-viral, anti-malarial, anti-bacterial and anti-fungal activities of the medicinal plants are due to the presence of the above mentioned secondary metabolites. Medicinal plants are used for discovering and screening of the phytochemical constituents which are very helpful for the manufacturing of new drugs. The previous phytochemical analysis and present studied show nearly the similar results due to the presence of the phytochemical constituents. The phytochemical analysis of the medicinal plants are also important and have commercial interest in both research institutes and pharmaceuticals companies for the manufacturing of the new drugs for treatment of various diseases. Thus we hope that the important phytochemical properties identified by our study in the local plant of Mardan will be helpful in the coping different diseases of this particular region.

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