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Phytochemical Screening of Some Traditional Medicinal Plants.

Sweta Thakur* and MC Sidhu.

Department of Botany, Panjab University, Chandigarh - 160014, India.

ABSTRACT

Plants contain various chemical compounds, which imparts medicinal properties to them. This is likely the reason that plants have been used in traditional medicine in different parts of the world. During present study, 20 plant species belonging to 17 families used in folklore medicines by the natives of District Mandi, Himachal Pradesh have been screened for phytochemicals both in aqueous and ethanol extracts. The extracts have shown the presence of alkaloids, carbohydrates, flavonoids, glycosides, gums & mucilages, phenolics, phlobatannins, reducing sugars, saponins, steroids, tannins and terpenoids. The detailed chemical analysis of these phytoconstituents may provide some valuable raw material for the preparation of medicines.

Keywords: Medicinal plants, Phytoconstituents, Extracts, Analysis, Solvents.

**Corresponding author*



INTRODUCTION

Medicinal plants, belonging to various categories are the richest bio-resource of drugs like traditional systems of medicines, modern medicines, nutraceuticals, food supplements, pharmaceutical intermediates and chemical entities [7]. Various plants and plant products has enriched the human culture since long time but today people are not much aware about the role of plant species. The knowledge about the use of plants and their products by people is based on hit and trial experiences of thousand years [3, 20]. Most of the information related to medicinal plants is still restricted only to the traditional healers. This knowledge is passed orally to the next generation and may be lost if not taken care of immediately. In many developing countries, many plants species have still not been explored for their medicinal potential. Phytochemicals present in plants, protect from various diseases. The phytochemical screening of the medicinal plants is the first step to verify the presence of chemical constituents that can be utilized in the preparation of new herbal drugs [14, 17]. Therefore, need of the hour is to evaluate and scientifically exploit these traditionally important plants to check their effective therapeutic application for the treatment of various diseases since these plant based medicines are cost effective, easily available and have very few or no side effects [26, 27].

MATERIALS AND METHODS

Study area

The study has been carried out in district Mandi of Himachal Pradesh that lies between 31°13'50" and 32°04'30"N latitude and between 76°37'20" and 77°23'15"E longitude. The geographical location, climate and topography have blessed the study area with floristic diversity. In valley, the climate is subtropical whereas it tends to be temperate on the hill tops [19].

Ethnomedicinal studies

To collect information about the use of medicinal plants, field surveys have been conducted in the study area during 2011-2013. A semi-structured questionnaire was prepared and used for the same purpose. The respondents above 50 years of age were randomly selected irrespective of their educational qualification, sex and occupation. The interviews were conducted preferably in language and time convenient to the respondents so that they can interact in a better way. Information about the local name of the plants, plant parts used for the treatment of particular diseases, methods of preparation and administration have also been recorded.

Plant materials

The plant specimens were collected and identified for phytochemical screening with the help of traditional healers and natives. The plant specimens were also compared with herbaria of Botany Department, Panjab University, Chandigarh and given PAN numbers 20383 to 20402. These plants were selected on the basis of their occurrence, usage by natives and local healers. The plant materials were washed thoroughly in running tap water, followed by washing in distilled water. They were chopped into small pieces if required and

dried completely at room temperature between the folds of filter paper. The collected materials were powdered using an electronic grinder and stored in polythene bags till further use.

Preparation of aqueous extracts

The aqueous extracts were prepared by following method with slight modifications [6]. 20gm of powdered plant material was added to 100ml of distilled water in a conical flask. The flask was covered and kept for 24hrs on an orbital shaker at room temperature. The mixtures were filtered through muslin cloth. The filtrates were then passed through Whatman No. 1 filter paper and stored in vials and kept in refrigerator at 4⁰C till use for phytochemical study.

Preparation of ethanol extracts

The powdered plant material was extracted with ethanol using Soxhlet extraction method [25]. 10gm of plant powder was extracted with 130ml of ethanol in the round bottom flask at 60⁰C. The extraction was done for 24hrs or more if required until the mixture become colourless. The extract was allowed to evaporate at room temperature till it reaches to 1/3rd of the original volume. The extracts were stored in vials and kept in refrigerator at 4⁰C.

Phytochemical analysis

The aqueous and ethanol extracts of plant materials were studied for various phytochemicals like alkaloids [10], carbohydrates [13], flavonoids [10, 22], glycosides [21], gums and mucilages, phenols [21, 23], phlobatannins [2], reducing sugars [5], saponins [10], steroids [10, 22], tannins [5, 21] and terpenoids [21, 22] by using precipitation and coloration reactions.

RESULTS

The present study has revealed the ethnomedicinal importance of twenty plant species used for the treatment of various ailments by the natives. These species belongs to 20 genera and 17 families. Out of these, seventeen species are growing wild whereas three species i. e. *Azadirachta indica*, *Carica papaya* and *Ficus religiosa* are cultivated. Leaves were the most commonly used plant part. Plants for medicines were used either individually or in combination with parts of other plants. Also, same plant parts were found to be used in different forms by people for the treatment of different diseases. Plants such as *Achyranthes aspera*, *Berberis aristata* and *Pogostemon benghalensis* were most commonly used by the people. The botanical names of species are arranged alphabetically alongwith their local names, family, accession number and uses (Table 1).

Variation in phytochemicals has been observed in both extracts. In aqueous plant extracts, carbohydrates and reducing sugars were observed in all plant species. Steroids were present in all aqueous extracts except *Achyranthes aspera*, *Carica papaya* and *Gonostegia hirta*. Saponins and terpenoids were absent only in aqueous extracts of *Acorus*

calamus and *Fumaria parviflora* respectively. *Carica papaya* and *Tinospora cordifolia* do not contain glycosides. Similarly, gums and mucilages were absent in *Ficus religiosa* and *Prunus cerasoides*. Phlobatannins were present in six aqueous extracts i. e. *Achyranthes aspera*, *Centrathrum anthelminticum*, *Colebrookea oppositifolia*, *Ficus religiosa*, *Fumaria parviflora* and *Lepidagathis cuspidata*. Among aqueous extracts maximum numbers of phytochemicals were present in *Centrathrum anthelminticum* and *Fumaria parviflora*. Ethanol extracts have shown variation in phytochemicals from the aqueous extracts. Carbohydrates and terpenoids were present in all plant species whereas saponins were absent in all of them. Gums and mucilages were absent in all species except *Berberis aristata* and *Reinwardtia indica* whereas tannins were absent in *Reinwardtia indica* only. Eleven species indicated the absence of phlobatannins. Similarly, alkaloids, phenolics and flavonoids were not found in six species. The various phytochemicals present in aqueous and ethanol extract of twenty traditional medicinal plants have been summerized in Table 2.

Table 1: List of medicinal plants and their uses

Sr. No.	Plant Name (Family)	Vernacular name	Uses
1.	<i>Achyranthes aspera</i> L. (Amaranthaceae, 20383)	Puthkanda	<ul style="list-style-type: none"> ➤ Roots are chewed to cure toothache. ➤ Dry roots are pounded with flowers of <i>Zanthoxylum armatum</i> and mixed to form toothpowder. ➤ Roots are tied in the waist of pregnant woman for easy delivery. ➤ Roots are given to cattles as galactagogue. ➤ Roots are pounded with 2-3 fruits of <i>Piper nigrum</i>, dissolved in water, filtered and given to drink in snake bites. ➤ Decoction of roots is given with sugar for kidney stones. ➤ Roots are used as an abortifacient. ➤ Leaves and seeds are made into tablets and given to eat for seven days in dog bites. ➤ Paste of roots and leaves are applied in severe backache. ➤ Juice of pounded leaves is applied on cuts to stop bleeding and also used as ear drops. ➤ Roasted seeds are powdered and taken with jaggery in whooping cough. ➤ Seeds are cooked and eaten as energy tonic. ➤ Dried seeds are powdered, mixed with water and filtered through muslin cloth. Drops are given in small doses for the treatment of dysentery in children. ➤ Smoke of the whole plant is useful to asthma patients.
2.	<i>Acorus calamus</i> L. (Acoraceae, 20384)	Bare	<ul style="list-style-type: none"> ➤ Necklace of powdered rhizome stitched inside a muslin cloth is worn by small children in cough and pneumonia. ➤ Powdered rhizome is warmed in mustard oil and used as massage oil for post-delivery complications. ➤ Powdered rhizome is applied on nostrils and sides of the forehead to relieve headache. ➤ Powdered rhizome is given with fruits of <i>Piper nigrum</i> in morning time in piles. ➤ Rhizome is given to cattles to cure throat problems. ➤ Powdered rhizome is scrubbed over the ticks on the bodies of cattles to kill them. ➤ Rhizome is chewed to relieve toothache. ➤ Rhizome is eaten to cure epilepsy.
3.	<i>Adhatoda vasica</i> Nees. (Acanthaceae, 20385)	Basuti	<ul style="list-style-type: none"> ➤ Paste of the fresh roots and leaves is applied on cuts to stop bleeding. ➤ Roots and twigs are used as toothbrush. ➤ Roots are used as an abortifacient.

			<ul style="list-style-type: none"> ➤ Twigs and leaves are given with <i>Vitex negundo</i> and <i>Zanthoxylum armatum</i> with salt to cattles as an appetizer in anorexia. ➤ Poultice of leaves is given to treat swelling of limbs. ➤ Warm leaves with mustard oil are used in stomachache, chest infection and eye flu. ➤ Paste of leaves is applied over the abscesses to drain them. ➤ Decoction of leaves is taken during cough.
4.	<i>Azadirachta indica</i> L. (Meliaceae, 20386)	Neem	<ul style="list-style-type: none"> ➤ Leaves are pounded into paste and applied over fungal infection on toes. ➤ Paste of leaves is applied over burnt skin and secretion from the scalp in children.
5.	<i>Berberis aristata</i> DC. (Berberidaceae, 20387)	Kashmal	<ul style="list-style-type: none"> ➤ Roots are boiled well in water. The decoction (extract) is filtered through a muslin cloth and mixed with honey and alum in appropriate proportion to form 'rasaunt' which is used in eye problems. ➤ Decoction or infusions of roots are given in fever, to treat diabetes and piles. ➤ Decoction of roots is cooled and filtered through a muslin cloth and used as nasal drops in cold. ➤ Roots are chewed to cure mouth & tongue ulcers. ➤ Decoction of the roots after cooling down is applied on cuts to stop bleeding and itching. ➤ Young twigs are scrubbed. Juice is applied on eyes to clean them and over the sty. ➤ Leaf paste is applied on forehead in headache. ➤ Leaves are given to chew in acidity, leucorrhoea and urinary troubles. ➤ Paste of leaves is given to cattles in stomach problems. ➤ Paste of young leaves and flowers are given to small children for easy emergence of teeth and to cure dysentery. ➤ Fruits are eaten in dysentery due to heat stroke.
6.	<i>Carica papaya</i> L. (Caricaceae, 20388)	Papita	<ul style="list-style-type: none"> ➤ Leaves decoction is given in dengue. ➤ Fruit is eaten in constipation, diabetes and typhoid. ➤ Decoction of unripened fruit is given in dysentery. ➤ Latex is applied in toothache.
7.	<i>Centratherum anthelminticum</i> (L.) Kuntze (Asteraceae, 20389)	Brahmjiri	<ul style="list-style-type: none"> ➤ Seeds are pounded with fruits of <i>Piper nigrum</i>, honey and given to eat in itching and abscess formation problem. ➤ Seeds are made into tablets by crushing with water and given as an anthelmintic. ➤ Seed paste is applied with mustard oil in itching. ➤ Seeds are pounded well, dissolved in water and given to cure throat problem. ➤ Seed paste is applied on mouth & tongue sores. ➤ Decoction of seeds is given in stomachache. ➤ Pounded seeds are given to eat with honey in dysentery. ➤ Seeds are pounded with the seeds of <i>Vigna mungo</i> and given to cattles to cure indigestion. ➤ Smoke of seeds is taken in headache.
8.	<i>Cirsium wallichii</i> DC. (Asteraceae, 20390)	Bhursa	<ul style="list-style-type: none"> ➤ Roots are pounded with the roots of <i>Asparagus racemosus</i> and juice is taken in leucorrhoea. ➤ Juice of fresh roots is given in nose bleeding, heat stroke and dysentery. ➤ Roots are eaten with butter in leucorrhoea. ➤ Juice of roots is given with sugar in piles. ➤ Crushed roots are mixed with mustard oil and used for long and black hairs. ➤ Roots are pounded with wheat flour and given to cattles in heat stroke.

9.	<i>Colebrookea oppositifolia</i> Smith. (Lamiaceae, 20391)	Gadoos	<ul style="list-style-type: none"> ➤ Roots are made into decoction with jaggery and fruits of <i>Phoenix sylvestris</i> and given as an abortifacient. ➤ Juice of pounded leaves is applied on cuts to stop bleeding. ➤ Leaves are pounded and filtered through muslin cloth, juice is used as an eye drop to clean the eyes of human and cattles. ➤ Leaves are well pounded and filtered through a muslin cloth and used as drops in problem of secretion from ear. ➤ Leaves are warmed in boiling water and applied on the sprains. ➤ Leaves are given to cattles to eat in anthrax. ➤ Leaves compresses are applied in toothache. ➤ Paste of leaves is applied over the fractured bone and also in mouth & tongue sores. ➤ Paste of leaves is applied in urticaria. ➤ Young twigs are used as toothbrush.
10.	<i>Ficus religiosa</i> L. (Moraceae, 20392)	Peepal	<ul style="list-style-type: none"> ➤ Roots are used as toothbrush. ➤ Juice of young leaves is used as drops in problem of secretion from ear. ➤ Juice of leaves is used as drops in nose bleeding. ➤ Dried leaves are burn to ash and one spoon is eaten with honey in asthma. ➤ Latex is applied on toothache. ➤ Latex is useful in leprosy. ➤ Bark powder is given to eat in vomiting. ➤ Paste of bark is applied with jaggery on abscesses to drain them.
11.	<i>Fumaria parviflora</i> Lam. (Fumariaceae, 20393)	Pitpapra	<ul style="list-style-type: none"> ➤ Paste of whole plant is applied on swelling. ➤ Leaves are chewed as blood purifier. ➤ Decoction is prepared from whole plant mixed with fruits of <i>Terminalia bellirica</i>, <i>Terminalia chebula</i>, flower of <i>Viola serpens</i>, <i>Centella asiatica</i> and given in fever.
12.	<i>Gonostegia hirta</i> (Blume ex Hassk.) Miq. (Urticaceae, 20394)	Kurand	<ul style="list-style-type: none"> ➤ If leaves are not available then the roots of the plant is pounded into paste which is applied and tied over abscesses with a muslin cloth to drain them. ➤ Leaves are pounded with the seeds of <i>Linum usitatissimum</i> and jaggery into paste and applied on the abscesses to drain them.
13.	<i>Lepidagathis cuspidata</i> Nees. (Acanthaceae, 20395)	Baralu kanda	<ul style="list-style-type: none"> ➤ Fresh roots are pounded with fruits of <i>Piper nigrum</i> and paste is applied on the painful inflammations of fingers.
14.	<i>Mallotus philippensis</i> (Lam.) Muell. Arg. (Euphorbiaceae, 20396)	Kamahl	<ul style="list-style-type: none"> ➤ Juice of leaves is applied on allergy or itching due to <i>Mucuna pruriens</i>. ➤ Fruits are shaken well in curd or water so that glandular hairs get separated which is given to children to drink as an antihelminthic. ➤ Fruit is given to cattles to eat as an antihelminthic. ➤ Glandular hairs of fruits are kept in the eyes of cattles to remove foreign bodies. ➤ Glandular hairs are filled in the wounds formed by infection due to spine. ➤ Glandular hairs are applied on itching or over the scalp in itching problem.
15.	<i>Pogostemon benghalensis</i> (Burm. F.) O. Kuntze (Lamiaceae, 20397)	Kaali bansuti, Bharmayara	<ul style="list-style-type: none"> ➤ Decoction of roots is given in asthma. ➤ Dry fruits of <i>Phoenix sylvestris</i> are filled with the latex of <i>Ficus auriculata</i>, roasted and powdered. Burnt ashes of roots of <i>Pogostemon benghalensis</i> mixed with this powder and given in whooping cough. ➤ Roots are pounded with leaves and fruits of <i>Solanum nigrum</i>, 2-3 fruits of <i>Piper nigrum</i> and the paste is applied on abscesses in herpes zoster and other skin diseases. ➤ Paste of leaves is applied on cuts to stop bleeding.

			<ul style="list-style-type: none"> ➤ Leaves are crushed with fruits of <i>Piper nigrum</i> and applied on painful inflammations of fingers. ➤ Paste of leaves is applied over fungal infection on toes. ➤ Warm leaves are kept on the chest for the treatment of pneumonia. ➤ Warm leaves are kept on the stomach of small children in indigestion. ➤ Oil is applied over the leaves and warmed leaves are applied over the stomach in urinary troubles. ➤ Leaf paste is applied in psoriasis and insect bite. ➤ Decoction of leaves is given in joint pain and whooping cough. ➤ Decoction of leaves is prepared and after cooling, given to children in stomachache. ➤ Aerial parts are given to cattles to eat in anthrax. ➤ Whole plant is burnt, powdered and given with jaggery in asthma.
16.	<i>Prunus cerasoides</i> D. Don. (Rosaceae, 20398)	Pajja	<ul style="list-style-type: none"> ➤ Young twigs are used as toothbrush. ➤ Flowers are pounded and paste is applied with curd on burnt skin ➤ Fruits are given to eat in constipation. ➤ Bark is pounded with the bark of <i>Litsea chinensis</i> and leaves of <i>Vitex negundo</i> to make decoction. Debris is removed, decoction after getting concentrated is allowed to cool and form 'Pajel'. It is applied over the bone fractured region and fixed with sticks of <i>Bambusa bambos</i> or cloth.
17.	<i>Reinwardtia indica</i> Dum. (Linaceae, 20399)	Piyen-re- phool	<ul style="list-style-type: none"> ➤ Paste of roots with the fruits of <i>Piper nigrum</i> is given to eat in measles. ➤ Roots are used as an abortifacient. ➤ Aerial parts are pounded into paste and applied on cuts to stop bleeding. ➤ Paste of whole plant is applied in backache.
18.	<i>Rhododendron arboreum</i> Sm. Linn. (Ericaceae, 20400)	Buraas	<ul style="list-style-type: none"> ➤ Juice of petals is taken in heat stroke and anaemia. ➤ Juice of petals is filtered through a muslin cloth, a decoction is made with old clarified butter (desi ghee). Drops are used in nose bleeding. ➤ Decoction is made from its petals and petals of <i>Woodfordia fruticosa</i>, jaggery, clarified butter (desi ghee) and given in blood dysentery. ➤ Dry powder of petals is made into 'chutney' with bulb of <i>Allium cepa</i>, leaves of <i>Mentha</i> sp. and fruits of <i>Punica granatum</i> and eaten in heat stroke.
19.	<i>Solanum aculeatissimum</i> Jacq. (Solanaceae, 20401)	Kanteri	<ul style="list-style-type: none"> ➤ Decoction of fruits is used as mouthwash in toothache and gums problem. ➤ Fruit paste is applied to drain the abscess. ➤ Fruits with seeds are given to cattles in stomach problem (constipation). ➤ Dry seeds are eaten as such in piles. ➤ Dry powder of fruit with seeds is given to eat in leucorrhoea. ➤ Decoction of whole plant is given to improve reproductive system of women.
20.	<i>Tinospora cordifolia</i> Willd. (Menispermaceae, 20402)	Giloe	<ul style="list-style-type: none"> ➤ Stem is pounded well and made into 'halwa' which is given during bone fracture. ➤ Semolina is made from the stem and mixed with wheat semolina, it is cooked and given to eat in stomach problem. ➤ Stem is eaten as fresh or dry powder in gout and diabetes. ➤ Stem is eaten as such in leucorrhoea. ➤ Juice of stem is given in typhoid.

Table 2: Phytochemical constituents of aqueous and ethanol extracts of ethnomedicinally important plant species

Plant Name (Part used)	Solvents	Phytochemicals											
		A	B	C	D	E	F	G	H	I	J	K	L
<i>Achyranthes aspera</i> (Root)	Aq.	+	++	-	+	+	+++	++	+	+++	-	+++	+
	Eth.	-	+	+	++	-	++	-	+	-	+++	+	+
<i>Acorus calamus</i> (Rhizome)	Aq.	-	+++	+	+++	++	-	-	+++	-	+++	-	+++
	Eth.	±	++	+	+	-	-	++	++	-	+++	+++	++
<i>Adhatoda vasica</i> (Root)	Aq.	±	+	+	+	+	-	-	+	±	±	+	+
	Eth.	±	++	+	++	-	-	-	-	-	+	+	+
<i>Azadirachta indica</i> (Leaf)	Aq.	+	+++	++	+	+	-	-	+++	+	+	++	++
	Eth.	+	+++	±	++	-	+	-	+++	-	+++	+++	+++
<i>Berberis aristata</i> (Root)	Aq.	+++	++	+++	+++	±	-	-	++	+++	+	+++	++
	Eth.	+++	+	+	+	±	++	-	±	-	++	++	±
<i>Carica papaya</i> (Leaf)	Aq.	+	+++	+++	-	+	+++	-	+	++	-	+++	+++
	Eth.	+++	+++	-	-	-	++	±	±	-	-	+++	++
<i>Centratherum anthelminticum</i> (Seed)	Aq.	++	++	++	+++	+++	+++	+++	++	±	+++	-	+
	Eth.	++	++	-	++	-	-	++	±	-	+++	±	+
<i>Cirsium wallichii</i> (Root)	Aq.	+	++	+	+++	++	-	-	+++	+	+	-	+++
	Eth.	±	++	++	++	-	+++	±	+++	-	+++	++	+
<i>Colebrookea oppositifolia</i> (Leaf)	Aq.	-	++	-	±	+++	+++	+++	+	+	+	++	±
	Eth.	-	++	-	±	-	+++	-	±	-	-	+	++
<i>Ficus religiosa</i> (Bark)	Aq.	-	++	-	+++	-	-	+++	±	+	++	-	++
	Eth.	-	+	-	-	-	-	+	-	-	+++	++	+
<i>Fumaria parviflora</i> (Whole plant)	Aq.	+++	+++	+++	+	+++	+++	++	+	+++	+	+++	-
	Eth.	+++	+	+	+++	-	++	+	-	-	+++	+++	+++
<i>Gonostegia hirta</i> (Whole plant)	Aq.	±	±	+	+	+++	+++	-	±	±	-	+++	±
	Eth.	±	++	±	±	-	+++	++	++	-	-	+++	+
<i>Lepidagathis cuspidata</i> (Root)	Aq.	-	+	++	++	+++	-	++	++	++	+	-	+
	Eth.	++	++	++	+++	-	+++	+++	++	-	+++	++	±
<i>Mallotus philippensis</i> (Glandular hairs on fruit)	Aq.	-	+	++	+++	+++	+++	-	++	+++	+++	+++	++
	Eth.	+	±	+++	-	-	+++	-	+	-	+++	±	++
<i>Pogostemon benghalensis</i> (Root)	Aq.	-	+	++	+	+	-	-	+	++	±	±	±
	Eth.	-	+	+++	+++	-	++	-	±	-	++	++	±
<i>Prunus cerasoides</i> (Bark)	Aq.	++	+	-	++	-	-	-	++	+	+	-	++
	Eth.	+	++	±	+	-	-	-	++	-	+++	+++	++
<i>Reinwardtia indica</i> (Aerial parts)	Aq.	-	+	-	+	+++	-	-	++	±	++	-	+
	Eth.	+	++	+	++	+	-	-	++	-	++	-	++
<i>Rhododendron arboreum</i> (Petal)	Aq.	-	+++	-	+++	+	-	-	++	+	+++	±	++
	Eth.	-	+++	-	+	-	++	-	+++	-	+++	++	+
<i>Solanum aculeatissimum</i> (Fruit with seed)	Aq.	++	++	++	+++	+	-	-	++	+++	++	-	+
	Eth.	-	+	+++	-	-	+++	±	-	-	+++	+	++
<i>Tinospora cordifolia</i> (Stem)	Aq.	+	++	+++	-	++	-	-	+	++	++	-	+++
	Eth.	+	+++	-	+++	-	++	-	-	-	+++	+++	+++

Phytochemicals: A=Alkaloids; B=Carbohydrates; C=Flavonoids; D=Glycosides; E=Gums & Mucilages; F=Phenolics; G=Phlobatannins; H=Reducing sugars; I=Saponins; J=Steroids; K=Tannins; L=Terpenoids

DISCUSSION

It has been observed that the natives are well aware of traditional use of medicinal plant species. They still prefer to use these remedies for their as well as livestock health related problems. The phytochemical study has indicated the presence of carbohydrates, reducing sugars, terpenoids and saponins in majority of aqueous extracts whereas tannins

and terpenoids were found in most of ethanol extracts. According to Sharma et al., [18] aqueous and ethanol extracts of roots of *Achyranthes aspera* indicated the presence of alkaloids, tannins, cardiac glycosides, steroids, flavonoids and saponins. But during present study, in addition to these phytoconstituents carbohydrates and phenolics have also been observed. Flavonoids and steroids were absent in aqueous extract of roots. Gums and mucilages, phlobatannins are present in aqueous extract only. Similarly, phytochemical analysis of roots of *Berberis aristata* [15] and flowers of *Rhododendron arboreum* Sm. ssp. *nilagiricum* (Zenker) Tagg [12] had shown different phytochemicals in aqueous and ethanol extracts. Present study has shown glycosides, gums and mucilages, reducing sugars, tannins and terpenoids in both extracts of *Berberis aristata*. Alkaloids and phenolics have been found in aqueous and ethanol extracts respectively. The aqueous extract of petals of *Rhododendron arboreum* possess phenolics, reducing sugars, saponins, steroids and terpenoids whereas glycosides, reducing sugars and terpenoids are absent in ethanol extract. Joselin et al., [11] studied the phytochemicals in flowers of four plant species belonging to family Apocynaceae and compared the phytochemicals in these extracts since they were prepared in five different solvents. They found that the extraction of different phyto-constituents largely depends upon the type of solvent used. Doss [4] investigated the distribution of eight phytochemicals in five medicinal plants from different families of Western Ghats, Nilgiris and Coimbatore and suggested the importance of these chemical constituents with respect to their role in India. Earlier studies had designated flavonoids as anti-inflammatory agents, oestrogenic, effective against micro-organisms, allergy and tumors [8, 9]. Similarly, other constituents such as phenolics, tannins alongwith flavonoids were known for their antioxidant and anti-diarrheal activities [1, 24]. Steroidal compounds affect sex hormones, therefore used in pharmaceutical preparations [16]. Hence the presence of phytochemicals in plant extracts authenticated their medicinal potential. Thus plant species having these types of phytoconstituents can be used to cure health related problems. Therefore, ethnomedicinal documentation and preliminary phytochemical screening of plant species may provide raw materials for the synthesis of medicines for various diseases.

CONCLUSION

Preliminary phytochemical studies have indicated the presence of some chemical constituents in species under investigation. The role of different phyto-constituents to the pharmaceutical industries is well established in literature. Hence the phytochemical details of these species are useful to the pharma sector. Further, these phytochemicals can be separated using different techniques to study their effect individually or in combinations. The better quantity or quality of any chemical compound reported in these species may affect the cost, availability and potential of medicines.

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