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PHYTOCHEMICAL ANALYSIS OF SOME SELECTED VEGETABLES OF CHITRAKOOT REAGION

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ABSTRACT

Phytochemicals are bioactive compounds obtained from the plants and are widely applied in the traditional herbal medicine. These herbal medicines are used by the local people to cure the various diseases which include the major diseases such as Diabetes Mellitus, Cancer, HIV etc. In this study the phytochemical screening of available parts (mainly leaves and fruit) of twelve medicinal plants of four different families found in Chitrakoot region. Test plants were extracted with methanol and water by cold and hot extraction methods and screened for the presence of carbohydrates, alkaloids, flavonoids, proteins, rasin, anthocynin and betacynin, saponin, steroids, starch, tannins, starch, glycosides, phenol, phlobatannins and terpenoids. We found that the selected plants are good source of various phytochemicals. This study revealed the presence of various biologically active secondary metabolites which could be helpful in the prevention of chronic diseases.

INTRODUCTION

Phytochemicals are bioactive compounds found in plants that work with nutrients and dietary fiber to protect against diseases. They are non-nutritive compounds. These phytochemicals are the secondary metabolities present in smaller quantities in higher plants and they include the alkaloids, Steroids, flavonoids, terpenoids, tannins and many others[1]. Phytochemicals generally originated from the plant source are nothing but the bioactive compounds also known as secondary metabolites. There are two types of metabolites produced in plants viz. Primary metabolites and Secondary metabolites. Primary metabolites are important for the plants regular metabolism such as growth and development. Secondary metabolites produced by plants may have little need for them. These are synthesize in almost all parts of the plant like bark, leaves, stem, root, flower, fruits, seeds, etc.[2] Due to presence of these bioactive phytochemicals, plants provide a source of medicine since historic times and now these are an important part of all the world's pharmaceuticals and serve as starting material for drug development[3]. Plant-produced chemical compounds or phytochemicals like alkaloids, glycosides, flavonoids, volatile oils, tannins, resins have been used in a wide range of commercial and industrial applications such as flavors, aromas and fragrances, enzymes, preservatives, cosmetics, bio based fuels and plastics, natural pigments and bioactive compounds.[4] Most phytochemicals function as antioxidants in vitro and they can reduce oxidative stress and inflammation which are involved in the progression of type II diabetes mellitus[5]. Polyphenolic compounds, immensely distributed throughout the plant kingdom, serve as antioxidants and neutrilize deleterious free radicals, quenching singlet or triplet oxygen, or decomposing peroxides, and regulate carbohydrate metabolism[6].Besides combating various afflictions, and possessing antidiabetic and antioxidative properties, phytochemicals could provide health benefits as- substrate for biological reactions, Co-factors for enzymetic reactions, inhibitors for enzymetic reactions, absorbants/sequestrants that bind to and eliminate undesirable constituents in the intestine, ligands that agonize or antagonize cell surface/ intracellular receptors, compounds that enhance the absorption or stability of essential nutrients, selective groeth factors for beneficial gastrointestinal bacteria and selective inhibitors of deleterious intestinal bacteria[7]. Chitrakoot situated in the northern region of Satna district of Madhya Pradesh, has a very rich wealth of medicinal plants which has also been described in our epics like Ramayana.[8] Chitrakoot (the 'Hill many wonders') is indeed a gift of nature and the gods and located on the bank of river Mandakini and falls in the northern Vindhyan range of mountains spread over the Uttar Pradesh and Madhya Pradesh. Chitrakoot Parvat Mala included Kamad Giri, Hanuman Dhara, Lakshman Pahari and Devangana are famous religious mountains.[9]The place is well known for its beautiful hill ranges, historical caves, perennial streams and diverse fauna and flora. Vast variety of herbs, shrubs, trees, climbers, having different flowers, fruits, roots are available[10]. Present work is aimed to screen different phytoconstituents found in some medicinal plants of Chitrakoot.

MATERIAL AND METHOD:

Twelve plants of family Lilliaceae, Cucurbitaceae, Fabaceae, Apiaceae were collected from different regions of Chitrakoot, and washed with 70% methanol. These were shade dried in room temperature and grinded using a grinder. Powdered sample was kept in air tight container.

Preparation of plant extracts-

Dried plant materials were extracted with water and methanol (hot extraction). Methods of extract preparation were adapted from Pandey S. (2014),[11]with some modifications.

Preparation of water and methanol extract: 10 gm of dried sample was taken for maceration and dissolved in 50ml of water (to prepare water extract), and 50ml (90%) of methanol (for methanol extract) and kept in rotary shaker for 1 h. Then it was filtered through whatman No. 1 filter paper and the filtrate was used for the screening.

All the obtained extracts were then subjected to different qualitative tests to find out the presence of specific phytochemicals.

(i) Test for Carbohydrates:

Molicsh test:

1 ml of sample is placed in a test tube and two dropes of Molisch reagent was added. 2ml solution of concentrated H_2SO_4 was added in test tube. Formation of Red violet ring in the interface gave the positive Molisch test.

Fehling test:

2ml solution of Fehling A and Fehling B were taken in a test tube then dropwise sample were added. The mixture was shaken well

and kept in a water bath for 10-15 minuts at 100 C. A rusty brown or brick red colour precipitate confirms the presense of carbohydrates in the sample.

Benedict test:
2ml of Benedict reagent was added to the 1 ml of plant extract. Then the mixture was shaken well and placed in a water bath for 10-15 minuts. Formation of reddish precipitate indicates the presence of sugars in the sample.

Anthron test:
2 ml of anthron reagent was added to 500 µl of extract. Formation of green blue colour gives a positive anthron test.

(ii) Test for Alkaloids:
Mayer's test:
1ml of sample was added to a few drops of Mayer's reagent. Formation of white or pale yellow precipitate indicates the presence of alkaloids in the sample.

Wagner's test:
1.5% of HCl was added in 1 ml of extract and a few drops of Wagner's reagent were added to it. Appearance of yellow/ brown precipitate indicates the presence of alkaloids.

Hager's test:
1ml of extract was taken in a test tube, and few drops of Hagers reagent was added to it. Yellow precipitate confirms the presence of alkaloids in the sample.

Dragondrof test:
5ml of distilled water was added to the the 2 ml of sample , then 2M HCl and 1 ml of Dragondrof's reagent was added. Orange / orange red precipitate indicates the presence of alkaloids.

(iii) Test for Flavonoids:
H_2SO_4 test:
A fraction of the extract was taken and treated with concentrated H_2SO_4 and observed for the formation of orange colour.

Shinoda test (HCl test):
Few fragments of Mg and dropwise HCl were added to 1 ml plant extract, which gives pink reddish/ brownish pink or green or blue colour in few minuts.

(iv) Test for Proteins:
Biuret test:
1% of NaoH was added to 1 ml of extract and few drops of 1% $CuSO_4$ were then added. Blue/ purple or violet/ pinkish colour indicates the presence of proteins.

Millon's test:
1 ml of test extract was mixed with H_2SO_4 then Millon's reagent was added dropwise. White/ yellow precipitate appears which turns into red colour precipitate, after heating the mixture. This indicates the presence of proteins.

Ninhydrin's test:
2 drops of freshly prepared Ninhydrin reagent (0.1% in n- butanol) is added to 1ml of extract and heat and observed for blue or red orange colour.

(v) Test for Rasins:
1ml of ethanolic extract was dissolved in acetone and then 1 ml of distilled water is added. Turbidity indicates the presence of rasin.

(vi) Test for Tannins:
To 1 ml of the extract, 2ml of 5% $FeCl_3$ is added which gives dark blue or greenish black colour and a positive tannin test.

(vii) Test for Steroids
Salvoski test:
1 ml of test sample was dissolved in 1 ml of chloroform and equal amount of concentrated H_2SO_4. Formation of Bluish red to cherry colour in chloroform layer shows the presence of steroids.

(viii) Test of Saponin:
Foam test:
A small amout of extract was shaken with water and observed for the presence of foam.

Sodium Bicarbonate test:
Few drops of Sodium bicarbonate was added to 1 ml of plant extract. If honeycomb like structure forms, it confirms saponin.

(ix) Test for Anthocyanin and Betacynin:
1 ml of plant extract was treated with 1 ml of 2N NaOH then heated. Formation of bluish –green colour indicated the presence of Anthocynin while yellow colour indicated the presence of betacynin.

(x) Test for Starch:
1 ml of I_2 solution is mixed in 1ml of extract, formation of blue colour indicated the presence of starch in the extract.

(xi) Test for Glycosides:
To 1 ml of plant extract, 1 ml $Fecl_3$ (5%), and equal amount of acetic acid is added, then few drops of H_2SO_4 is added to the mixture. Greenish blue colour indicates the presence of glycosides.

(xii) Test for phenols:
1ml of plant extract, when treated with few drops of $FeCl_3$ solution; it gives blue green colour and confirms the presence of phenols.

(xiii) Test for Phlobatannins:
1ml of plant extract was treated with 1 ml of 1% HCl and heat. Red colour precipitate indicates the presence of Phlobatannins in the sample.

(xiv) Test for Terpinoids:
To 1ml of plant extract, 2ml of chloroform and 3ml of conc. H_2SO_4 was added. Areddish brown precipitate at thr interface, confirmed the presence of terpenoids.

Determination of Total Polyphenolic content
Total polyphenolic content of plant leaves extracts was measured by using Folin-Ciocalteu reagent (Tripathi *et al.,* 2013). The 25 µl of plant extract diluted with 125 µl water followed by addition of 150 µl of Folin-Ciocalteu reagent (1N) & 25 µl of Na2CO3 (20%w/v) and incubated at 45oC for 60 min then absorbance was measured spectrophotometrically at 765nm (Bio TeksynergyH4 multi-mode micro plates reader, Bio Tek Instruments, Instruments, Inc Winooski, VT, USA). Absorbance was recorded triplicates. Quantification was performed with respect to the standard curve of Catechol (y= 0.004x+0.086;R2 =0.985). Result was expressed as milligram of Catechol equivalent per ml of extract.

Determination of Flavonoid content
Total flavonoid content in the plant extracts, in brief, 100µl of sample (100 times diluted the original sample with methanol) followed by 100µl 2% AlCl3.6H2O in ethanol and 150 µl sodium acetate (50g/L) solution were added. The absorbance at 420 nm monitored (Bio TeksynergyH4 multi-mode micro plates reader, Bio Tek Instruments, Instruments, Inc Winooski, VT, USA) after 2.5h of incubation at 200C. Total flavonoid content

was calculated with respect to the standard curve of the flavonoid quercetindihydrate. Quantification was performed with respect to the standard curve of Quercetin (y= 0.007x+0.096; R2 =0.997). Results were expressed as micrograms of quercetin dehydrated equivalents (QE) per ml of the extract.

RESULT AND DISCUSSION

Table 4.2: Phytochemical Screening of Lilliaceae family plants

S. No.	Phytochemical	A.cepa leaves		*A.cepa* bulb		*A.sativum* leaves		*A.sativum* bulb		*Aloevera* leaves	
		W	M	W	M	W	M	W	M	W	M
1.	Carbohydrate	-	+	+	+	-	-	-	-	-	+
2.	Alkaloid	+	-	-	-	-	-	-	-	++	++
3.	Flavonoid	+	++	+	++	+	+	+	++	+	++
4.	Protein	+	+	+	+	+	+	+	+	+	+
5.	Resin	+	+	+	+	+	-	+	+	+	+
6.	Anthocyanin	-	-	-	-	+	-	-	-	+	+
7.	Saponin	+	++	+	+	+	++	+	+	++	++
8.	Steroid	-	-	-	-	+	+	+	+	-	-
9.	Tannin	-	-	-	-	-	-	-	-	+	+
10.	Starch	-	-	-	-	-	-	-	-	-	-
11.	Glycoside	+	+	+	+	-	-	-	-	+	-
12.	Phenol	+	+	+	+	-	-	+	++	+	++
13.	Phlobatanin	+	+	+	+	-	-	+	-	-	-
14.	Terpenoid	+	+	+	+	-	-	+	+	+	+

W = water extract, M = Methanolic extract

Table 4.3: Phytochemical Screening of Cucurbitaceae family plants

S. No.	Phytochemical	*M.charantia* leaves		*M.charantia* fruits		*L.siceraria* leaves		*L.siceraria* fruits		*C.sativus* leaves		*C.sativus* fruits	
		W	M	W	M	W	M	W	M	W	M	W	M
1.	Carbohydrate	+	+	+	+	+	+	+	+	+	+	-	-
2.	Alkaloid	++	++	+	+	-	-	-	-	-	-	+	+
3.	Flavonoid	++	++	-	+	+	++	+	+	+	++	+	+
4.	Protein	++	++	+	+	+	+	+	+	+	+	+	+
5.	Resin	-	-	+	-	+	+	+	+	+	+	-	-
6.	Anthocyanin	-	-	-	-	-	-	-	-	+	+	-	-
7.	Saponin	+	+	+	+	+	+	+	+	+	+	+	-
8.	Steroid	+	-	-	-	+	+	+	+	+	+	+	-
9.	Tannin	+	+	+	+	+	++	+	++	+	+	-	-
10.	Starch	-	-	-	-	+	+	+	+	+	+	-	-
11.	Glycoside	++	++	+	+	+	+	+	+	+	+	+	+
12.	Phenol	+	+	+	+	+	+	+	+	+	+	+	+
13.	Phlobatanin	+	+	+	+	-	-	-	-	+	+	-	-
14.	Terpenoid	+	+	+	+	-	+	+	+	+	+	+	+

W = water extract, M = Methanolic extract

Table 4.4: Phytochemical Screening of Fabaceae family plants

S. No.	Phytochemical	*P.vulgaris* leaves		*P.vulgaris* seed		*P.sativum* leaves		*P.sativum* fruits		*T.foenum-graecum* leaves		*T.foenum-graecum* seed	
		W	M	W	M	W	M	W	M	W	M	W	M
1.	Carbohydrate	+	+	+	+	+	+	+	+	+	++	+	++
2.	Alkaloid	+	+	+	+	-	-	-	-	+	+	+	+
3.	Flavonoid	+	+	+	+	++	++	+	++	+	+	+	-
4.	Protein	+	++	+	++	+	+	+	+	+	+	++	++
5.	Resin	+	+	+	+	+	+	+	+	+	+	+	+
6.	Anthocyanin	+	+	+	+	+	+	+	+	+	+	+	+
7.	Saponin	+	+	+	+	+	+	-	-	-	-	-	-
8.	Steroid	-	+	+	+	-	+	-	+	-	-	-	-
9.	Tannin	+	+	+	+	+	+	+	+	+	+	+	-
10.	Starch	-	+	+	+	+	+	+	+	-	-	+	+
11.	Glycoside	++	++	+	+	+	+	+	+	+	+	+	+
12.	Phenol	+	+	+	+	-	-	-	-	+	+	-	-
13.	Phlobatanin	-	-	-	-	+	+	+	+	+	+	+	+
14.	Terpenoid	+	+	+	+	-	+	-	+	-	-	-	-

W = water extract, M = Methanolic extract

Table 4.5: Phytochemical Screening of Apiaceae family plants

S. No.	Phytochemical	*C.sativum* leaves		*C.sativum* seed		*D.carota* leaves		*D.carota* root		*T.ammi* leaves		*T.ammi* seeds	
		W	M	W	M	W	M	W	M	W	M	W	M
1.	Carbohydrate	+	+	+	+	+	+	+	+	+	+	+	+
2.	Alkaloid	-	-	-	-	+	+	+	+	+	+	+	+
3.	Flavonoid	+	+	-	-	+	++	+	++	+	+	+	+
4.	Protein	+	+	+	+	+	+	+	+	-	-	-	-
5.	Resin	+	+	+	+	+	+	+	+	+	+	+	+
6.	Anthocyanin	+	+	+	+	-	-	-	-	-	-	-	-
7.	Saponin	-	-	-	-	+	+	+	+	-	-	-	-
8.	Steroid	+	+	-	-	+	+	+	+	+	+	+	+
9.	Tannin	-	+	-	+	+	+	+	+	+	+	+	+

10.	Starch	+	+	+	+	+	+	+	+	-	-	-	-
11.	Glycoside	+	+	-	+	+	+	+	+	-	-	-	-
12.	Phenol	+	+	+	+	+	+	+	+	+	+	+	+
13.	Phlobatanin	+	+	+	+	+	+	+	+	-	-	-	-
14.	Terpenoid	+	+	+	+	++	++	++	++	-	-	-	-

W = water extract, M = Methanolic extract

RESULT AND DISCUSSION:

Table-1 to table-4 presents the result of phytochemical screening in all the selected plants. Screening results indicated that all the plants are rich in diverse advantageous phytoconstituents, like phenols, flavonoids, alkaloids, anthocyanins rasins, saponin, steroids, tannins, starch, glycosides, phlobatannins, terpenoids as well as proteins and carbohydrates.

Presence of phenolic compounds was observed in all the studied samples in the present work. All the members of family Lilliaceae, (Leaves, bulb), Cucurbitaceae (leaves, fruit), Fabaceae (leaves, fruit, seeds), Apiaceae (leaves, seed, root) exhibited polyphenolic compounds in our phytochemical screening.

Present investigation demonstrates the presence of flavonoid compounds in the studied samples. Aqueous and Methanolic extracts of the plants display flavonoids in phytochemical screening.

The alkaloids are one of the most diverse groups of secondary metabolites, found in living organisms and have an array of structure type, biosynthesis pathway and pharmacological activities. These are being used as drugs in potions, medicines, teas, poultices and poisons for 4000 years. These are pharmacologically active substances which possess various physiological activities in humans and animals.

Some samples were create to possess moderate or high amount of alkaloids, except *Aloevera (L.)* leaves in methanolic extracts, *M.charantia* leaves in methanolic extract and *D.carota* leaves in methanolic extract, in our investigation.

Terpenoids are also a class of secondary metabolites, widely distributed in plants. More than 40000 individual terpenoids are known to exist in nature with new compounds being discovered every year. Various classes of terpenoids have shown cytotoxicity against variety of tumor cells and anticancer properties in clinical animal models, These compounds have been reported in reduction of oxidative stress, suppression of inflammation, induction of apoptosis, regulation of cell cycle, inhibition of cell proliferation and modulation of multiple signal transduction pathways.[12]

Our findings indicated that terpenoids were present in all the extracts except *A.cepa* leaves and bulb in methanol extract, *C.sativus* leaf and fruit in methanolic extract, *D.carota* leaves in methanolic extract, *P.sativum* leaves and fruit and *C.sativum* seed in methanolic exract.

Plant steroids are a distinctive class of phytoconstituents found throughout the animal and plant kingdom, A specific class of steroids, glucocorticoids are widely used for the suppression of inflammation in chronic inflammatory diseases which are associated with increased expression of inflammation genes by binding to glucocorticoid receptors on multiple signalling pathways. However, some adverse effects are also associated with their prolong use such as immunosuppression, hypertension, osteoporosis and metabolic disturbance.[13]

In our investigation we found that steroids were absent in water extracts of *Aloevera (L.)* leaves, *A.sativum* leaves and bulb, *T.foenum-graecum* leaves, *P.sativum* leaves and *C.sativum* seeds. Remaining plant extract showed the present of steroids.

Saponins are high molecular weight compounds in which a sugar molecule is combined with triterpene or steroid aglycon, so there are two major groups of saponins; triterpene saponins and steroid saponins. These are therapeutically important as they show hypolipidemie and anticancer activity of cardiac glycosides[3].

Results of our preliminary screening shown that methanol and water extract of some plants did not show saponins *T.foenum-graecum* leaves and seeds, *P.sativum* fruits and *C.sativum* leaves and seeds.

Tannins are phenolie compounds of high molecular weight soluble in water and alcohol and found in root, bark, stem and other layers of plant tissues, due to presence of phenolic groups these are used as antiseptic[13]. In ayurvedic medicine system, tannin rich plant based formulations are used to treat leucorrhoea, rhinnorhoea and diarrhea.[14]

Tannins were shown to be present in all the samples. Except water and methanolic extract of *P. sativum* fruit and leaves and methanolic extract of *C. sativum* seed and leaves.

Anthocyanins are the members of the flavonoid group and are the most recognized visible members of bioflavonoid phytochemicals. Their free radical scavenging activity, antioxidant activity are well known but studies suggest that these phytochemicals posses other mechanisms of action which are responsible for other effects, beneficial for human health[15]. Anthocyanin rich bioflavonoid mixtures and antocyanin isolates may provide protection from DNA cleavage, estrogenic activitiy, enzyme inhibition, increased production of cytokines, anti-inflammatory activity lipid peroxidation, decreasing capillary permeability and fragility.[16-17]

Our results recommend that anthocyanins were present in methanolic and water extracts of *Aloevera* leaves, *P.sativum* fruits and leaves, *P.vulgaris* seed and leaves, *C.sativum* seed and leaves, *T. foenum-graecum* leaves and seed and *C.sativus* leaves in methanolic extracts.

Cardiac glycosides are the compounds used to treat congestive heart failure and cardiac arrhythmea. These compounds work by inhibiting the Na^+/K^+ pump.[5]

In our preliminary screening we found glycosides in *A.cepa* leaves and bulb were present in methanolic and water extracts, *Aloevera* leaves in water extract, *M. charantia* leaves and fruits in water and methanolic extract and *L.siceraria* leaves in water and methanol extracts.

Resins were absent in *M.charantia* leaves in methanolic extract, methanolic extract of *M.charantia* fruits and methanolic extract of *A.sativum leaves.*

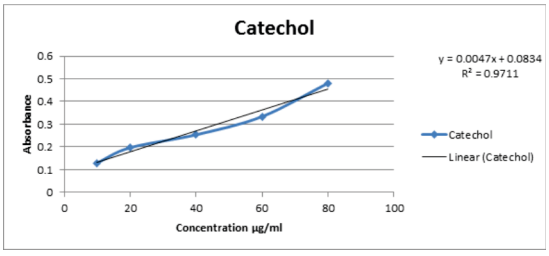
Starch were absent in *A.cepa* leaves and bulb in methanolic and water extract, ,*Aloevera* leaves, *A.sativum* bulb and leaves, *T.foenum-graecum* leaves, *M.charantia* fruits and leaves and *T.ammi* & seeds leaves.

Phlobatanins were absent in, *A.sativum* leaves, *Aloevera* leaves, *L.siceraria* leaves and fruits, *P.vulgaris* leaves and seeds and *T.ammi* leaves and seeds

Table-4.5- Concentration of polyphenolic contents :

Sl. No.	Plants	Parts	TPC in µg/ml equivalent to catechol
Family Lilliaceae			
1.	*A.cepa*	Leaves	2.50±0.003
2.	*A.cepa*	Bulb	18±0.002
3.	*A.sativum*	Leaves	23.25±0.008
4.	*A.sativum*	Bulb	18.50±0.002
5.	*Aloe vera (L.)*	Leaves	27.75±0.002
Family Cucurbitaceae			

6.	*M.charantia*	Leaves	90.25±0.002
7.	*M.charantia*	Fruit	24±0.003
8.	*L.siceraria*	Leaves	6.25±0.001
9.	*L.siceraria*	Fruit	2.25±0.001
10.	*C.sativum*	Leaves	11±0.010
11.	*C.sativum*	Fruit	4.75±0.002
Family Fabeaceae			
12.	*P.vulgaris*	Leaves	23.75±0.003
13.	*P.vulgaris*	Fruit	19.75±0.003
14.	*P.sativum*	Leaves	53.15±0.001
15.	*P.sativum*	Fruit	51±0.001
16.	*T.foenum-graecum*	Leaves	38.75±0.002
17.	*T.foenum-graecum*	Seed	23.25±0.003
Family Apiaceae			
18.	*C.sativum*	Leaves	2.25±0.001
19.	*C.sativum*	Seed	3.75±0.001
20.	*D.carota*	Leaves	3.5±0.002
21.	*D.carota*	Root	2.5±0.002
22.	*T.ammi*	Leaves	32.5±0.002
23.	*T.ammi*	Seed	41.75±0.002



Graph-1: Standard curve of catechol

In there study concentration of TPC of plants were ranged from 90.25 µg/ml to 2.5 µg/ml. Highest concentration of polyphenols was shown by Monordica charantia leaves (90.25 µg/ml), while in Monordica charantia fruit, it was found to 24 µg/ml. Presence of polyphenolic contents in all plants was observed in our preliminary phytochemical screening studies. All the plants give positive result the test for phenols.

Analysis of Flavonoid Contents

Flavonoid contents were evaluated by aluminium chloride method and Quercetin as standard. It was reported that Flavonoid contents were associated with antioxidant activity and play an important role in stabilizing lipid peroxidation. Total Flovonoid Content of selected medicinal plants is demonstrated in Table-2. Standard Curve of Quercetin for estimation of Total Flovonoid Content is showing in Graph-2, which is used as the standard curve for the quantification of Flavonoid content equivalent to Catechol µg/ml in methanolic extracts of selected plant leaves. In the present study we have estimated Onion Leaf, Onion Bulb, Garlic Leaf, Garlic Bulb and Aloe Vera it contain the 8.26 g/ml, 7.12 µg/ml, 8.5 µg/ml, 7.5 µg/ml and 6.75 µg/ml flovonoid contents respectively.

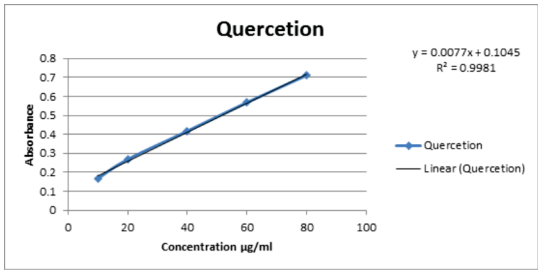
Analysis of Total Polyphenolic Contents

Polyphenolic compounds are commonly found in both edible and inedible plants, and reported for multiple biological effects, including antioxidant activity. The antioxidant effect of plant phenolics has been studied in relation to the prevention of coronary diseases and cancer, as well as age-related degenerative brain disorders. It was reported that phenolic compounds were associated with antioxidant activity and play an important role in stabilizing lipid peroxidation (Tripathi et al., 2013). Total polyphenolic content of selected medicinal plants were shown in table-5, and graphical representation of standard curve of Catechol for estimation of total polyphenolic content were shown in Graph-1.

Table-4.6: Concentration in total flavonoid contents

Sl. No.	Plants	Parts	TFC in µg/ml equivalent to quercetin
Family Lilliaceae			
1.	*A.cepa*	Leaves	1.42±0.001
2.	*A.cepa*	Bulb	14±0.002
3.	*A.sativum*	Leaves	1.28±0.001
4.	*A.sativum*	Bulb	15.71±0.002
5.	*Aloevera*	Leaves	11.28±0.001
Family Cucurbitaceae			
6.	*M.charantia*	Leaves	29.57±0.003
7.	*M.charantia*	Fruits	2.42±0.001
8.	*L.siceraria*	Leaves	9.85±0.001
9.	*L.siceraria*	Fruits	13.85±0.001
10.	*C.sativus*	Leaves	12.57±0.001
11.	*C.sativus*	Fruits	2.14±0.002
Family Fabeaceae			
12.	*P.vulgaris*	Leaves	3.14±0.002
13.	*P.vulgaris*	Seeds	1.71±0.002
14.	*P.sativum*	Leaves	2.57±0.001
15.	*P.sativum*	Fruits	14.28±0.001
16.	*T.foenum-graecum*	Leaves	3.57±0.002
17.	*T.foenum-graecum*	Seeds	1.14 ± 0.002
Family Apiaceae			
18.	*C.sativum*	Leaves	1.14±0.002
19.	*C.sativum*	Seed	13.28±0.001
20.	*D.carota*	Leaves	19.42±0.002
21.	*D.carota*	Root	20.14±0.007
22.	*T.ammi*	Leaves	2.42±0.003
23.	*T.ammi*	Seed	2.85±0.003

Graph- 2: Standard curve of quercetin



Highest flavonoid was found in Monoradica charantia leaves i.e. 29.57 µg/ml. While M.charantia seeds was 2.42 µg/ml. Like flavonoid contents, total polyphenolic contents in M.charantia leaves, while seeds exhibited moderate polyphenols in our study.

CONCLUSION

Based on the results in this research, it can be concluded that all the tested plants contain high enough levels of different phytoconstituents. Further work is needed to explore more information about these natural, non toxic and valuable compounds so that they can be used in drug formulation.

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