IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 6, Issue 7, April 2026
Impact Factor: 8.2

Phytochemical Profiling of Plants: Essential Steps Towards Drug Industry

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Abstract: *India has been known for its rich biological biodiversity. Phytochemicals are bioactive compounds extracted from the plant are an excellent source of medications to treat various ailments. The qualitative analysis is extremely valuable step in detecting bioactive compounds. The continued and extensive usage of medicinal herbs across the world has raised concerns about their safety, effectiveness, and purity. Thus, accurate understanding of plant phytochemical constituents is essential, since this information will be useful in the synthesis of novel medicinal products. In present study, phytochemical study of Beta vulgaris (beet root) and Curcuma longa (turmeric) has been carried out which may lead to the identification of new drugs. The alkaloids, carbohydrates, steroids, proteins, anthroquinones, flavnoides, steroids, phenols, tannins and glycosides, were detected in different solvents using established procedures. Further studies are needed with these plants to evaluate their pharmacological potentials, isolate, characterize and elucidate the structures of the bioactive compounds responsible for their activities and other medicinal values. It was concluded that the plants studied were rich in photochemical with significant medicinal and pharmocalogical applications.*

Keywords: Phytochemical analysis, bioactive, Beta vulgaris (beet root), Curcuma longa (turmeric)

I. INTRODUCTION

In order to extract, measure, and identify bioactive compounds from a wide variety of fruits and vegetables, researchers use multiple techniques and methods. The plant extract suggested that they might be used as an important natural antioxidant source due to its high levels of phenolic, flavonoids and proline. [1, 2]

Curcuma longa (Turmeric)L. (Family: Zingiberaceae) and as a rhizomatous perennial plant belonging to family Zingiberaceae is widely used as a food additive and as traditional medicine for treating various ailments. It has anti-inflammatory, antifungal, antimicrobial, virucidal, anti-mutagenic and antioxidant properties. In view of this phytochemical analysis I was use two solvents of Ethanolic extract and Chloroform extract was done [3-7]

Beetroot [Beta vulgaris, Amaranthaceous family]. is botanically classified as an herbaceous biennial from Chenopodiaceae family and has several varieties with bulb colors ranging from yellow to red. Deep red-coloured beet roots are the most popular for human consumption, both cooked and raw as salad or juice.[8,9]

Beetroots (Beta vulgaris) are rich in valuable, active compounds such as carbohydrates, protein, steroid, phlobatannins, tannins, alkaloid, saponins, flavonoid, terpenoid and cardiac glycosides, betacyanines, folates, betanin, polyphenols and flavonoids[10.-16] .Therefore, beetroot ingestion can be considered a factor in dried beetroots can be consumed directly in the form of chips as a substitute of traditional snacks. 5g of powdered beetroot was extracted with 100ml ethanol in the R.B flask and reflux extractor for 1hours. Same procedure was appliedfor another solvent.

Material and Methods:

Chemicals and reagents: All the chemicals and reagents used for phytochemical analysis were AR grade. Turmeric and beet root plant collected from local market of Gondia and was processed in the laboratory. Turmeric powder and beet root powder was prepared in laboratory by used of grinder machine and was dried in an oven.

DOI: 10.48175/IJARSCT-33031

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Collection and processing of plant material

Fresh rhizomes of turmeric and beet root were collected from malhi village of amgaon taluka of Gondia District, Maharashtra (India) in the month of December. The collected rhizomes and beet root were wash with boiled water and then dried under sunlight.The dried rhizomes and beet root were size reduced and shifted through mesh of fine size.They were sun-dried for six days and pulverized using an electric blender into a fine powder mesh sieve size. The powdered material was stored in air tight jars in a refrigerator at 4 °C until used for analysis.

Extraction process:

The purpose of the study was to do preliminary phytochemical screening of the Ethanolic extract and Chloroform extract of the turmeric rhizome. 5g of powdered turmeric rhizome was extracted with 100ml chloroform in the R.B flask and reflux extractor for 1hours. Same procedure for another solvent. For turmeric and beet root, two solvent were used i.e. chloroform and ethanol, first time turmeric rhizome powder was extracted with 95% chloroform and second time 95% ethanol were used.same procedure were followed for beet root and colouring matter is extracted. The obtained crude extract was concentrated to semisolid brown coloured mass by evaporating chloroform and ethanol.

Procedure for phytochemical test

Preliminary phytochemical evaluation of crude extract; The crude extract was evaluated for the presence of various phytoconstituents such as carbohydrates, proteins, Alkaloids, glycosides, terpenes, steroids, flavanoids, tannins and saponins using commonly employed precipitation and coloration reactions reported in standard reference books.

1] Test for Carbohydrates: The extract was dissolved in 10 ml of distilled water and filtered through Whatmann No.1 filter paper and the filtrate is subjected to tests for carbohydrates.

a) Molish test: 2 ml solution was placed in a test tube. 1 drop of Molish Reagent (a solution of alpha-napthol in ethanol) was added. 2 ml of conc. HCL was added from the sides of the test tube. The test tube was obsereved for formation of a violet ring. A Violet ring at the junction of the two liquids indicates presence of carbohydrates [1].

2] Test for Protein; the extract was dissolved in 10 ml of distilled water and filtered through Whatmann No.1 filter paper and the filtrate is subjected to tests for proteins and amino acids.

a) Millons test: To 2 ml of filtrate, few drops of Millon's reagent are added. The result was observed. A white precipitates indicated presences of proteins.

b) Biuret test: An aliquot of 2 ml of filtrate was treated with drop of 2% copper sulphate solution. To this, 1 ml of ethanol (95%) was added, followed by excess of potassium hydroxide pellets. The pink colour in ethanol layer indicated presences of proteins.

3] Test for Alkaloid;

Solvent free extract was stirred with 3 ml of dilute hydrochloric acid and then filtered thoroughly. The filtrate was tested carefully with various alkaloid reagents as follows:

a) Mayer's test: To a 1 ml of filtrate, few drops of Mayer's reagent [potassium mercuric iodide] are added by the side of the test tube. The white or creamy precipitate indicated test as positive.

b) Wagner's test: To a 1 ml of filtrate, few drops of Wagner's reagent are added by the side of the test tube. The colour change was observed. A reddish-brown precipitates confirms the test as positive for alkaloid.

c) Dragendorff's test: To 1 ml of filtrate, 2 ml of Dragendorff's reagent are added and the result was observed carefully. A prominent yellow precipitate confirms the test as positive [2].

4] Test for Glycosides;

a) Borntrager's Test: Extract was boiled with dilute sulphuric acid, filtered and to the filtrate chloroform was added and shaken well.

The organic layer was separated to which ammonia is added slowly. Presence of glycoside is denoted by pink to red colour in the ammonical layer.

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b) Legal Test: The test is employed for digitoxose containing glycosides. The extract was dissolved in pyridine, sodium nitroprusside solution was added to it and made alkaline. Pink or red colourindicates presence of glycosides.

4] Test for Terpenoid;

Salkowaski'stest: Four milligrams of extract was treated with 0.5 ml of acetic anhydride and 0.5 ml of chloroform. Then concentrated solution of sulphuric acid was added slowly and red violet color was observed for terpenoid.

6] Tests for steroids; (i) A red colour produced in the lower chloroform layer When 2 ml of the extract dissolved in 2 ml of chloroform And 2 ml concentrate sulphuric acid added in test tube Indicates the presence of steroids.

7] Test for flavonoids: To 1ml of aqueous extract, 1ml of 10% lead acetatesolution was added. The formation of a yellow precipitatewas taken as a positive test for flavonoids.

7] Test for Tannins;

To 0.5 ml of extract solution 1 ml of water and 1-2 drops of ferric chloride [FeCl3] solution was added. Blue colour was observed for gallic tannins and green black for catecholic tannins [4].

9] Test for Saponins; 5ml of aqueous extract was shaken vigorously with 5ml of distilled water in a test tube and warmed. The formation of stable foam, honey comb in shapes, was taken as an indication for presence of saponins

10] Test for phlobatannins:About 2ml of aqueous extract was added to 2ml of 1% HCl and the mixture were boiled. Deposition of a red precipitate was taken as an evidence for the presence of phlobatannins.

11] Tests for anthraquinones;

(a) Borntrager's test: 3ml of aqueous extract was shaken with 3 ml of benzene, filtered and 5 ml of 10% ammonia solution was added to the filtrate. The mixture was shaken and the presence of a pink, red or violet colour in the ammonical (lower) phase indicates the presence of free anthraquinones.

(b) 3 ml of the aqueous extract was boiled with 3ml of aqueous sulphuric acid and filtered while hot. 3 ml of benzene was added to the filtered and shaken. The benzene layer was separated and 3 ml of 10% HNO3 added. A pink, red or violet colouration in the ammonical(lower) phase indicates the presence of anthraquinonederivatives.

II. RESULT AND DISCUSSION

The results of the preliminary phytochemical screening of extract of Turmeric and beet root showed the presence of alkaloids, tannins,phytosterols, saponins and flavonoids. Phlobatannins,Anthraquinone. All the results are presented in Table 1 and 2 for turmeric and Table 3, 4 for beet root. Solvents used todetermine the phyto-chemical constituents are ethanol and chloroform. More polar solvents have lesser components compared to the least polar.Further Phytochemical analysis of successive extraction using solvents of different polarity is essential. These phytoconstituents have important pharmacological activities like anti mutagenic, anti-inflammatory, antibacterial, antiprotozoal, and antioxidant properties. Some representative Positive test are shown in fig. 1to fig 4for carbohydrate, flavonoid, protein and phlobatannin respectively, showed the presence of phytochemical in plants

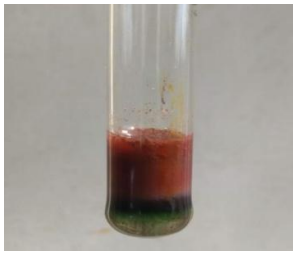

Fig:1

Fig:2

Fig:3

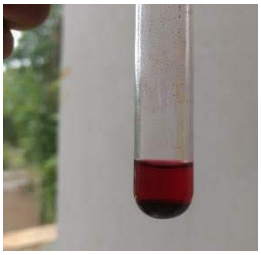

Fig:4

Fig.1 Test for carbohydrates
Fig. 2 Test for flavonoids
Fig.3 Test for Protein
Fig.4Test for phlobatannins

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Table no.1: Results of phytochemical analysis of the chloroform extract of turmeric

Phytochemical	Test	Observation	Inference
1] Carbohydrates	Molish test	**A Violet ring at the junction of the two liquids**	+
2] Protein	Biuret test	**The pink color in ethanol layer**	+
3] Alkaloid	Wagner's test	**A reddish-brown precipitates**	+
4] Glycosides	Borntrager's Test	**Pink to red color in the ammonical layer.**	+
5] Terpenoid	Salkowaski's test	**Red violet color**	–
6] Steroids	Chloroform layer test	**A red color produced in the lower chloroform layer**	+
7] Flavonoids	10% lead acetate test	**The formation of a yellow precipitate**	+
8] Tannins	Ferric chloride	**Blue color / green black**	–
9] Saponins:	Foam, honey comb test	**The formation of stable foam, honey comb**	–
10]Phlobatannins	1% HCl test	**Deposition of a red Precipitate.**	+
11]Anthraquinones	Borntrager's test:	**A pink, red or violet colouration in the ammonical (lower) phase**	+

Table no.2: Results of phytochemical analysis of the ethanol extractof turmeric

Phytochemical	Test	Observation	Inference
1] Carbohydrates	Molish test	**A Violet ring at the junction of the two liquids**	+
2] Protein	Biuret test	**The pink color in ethanol layer**	+
3] Alkaloid	Wagner's test	**A reddish-brown precipitates**	+
4] Glycosides	Borntrager's Test	**Pink to red color in the ammonical layer.**	–
5] Terpenoid	Salkowaski's test	**Red violet color**	+
6] Steroids	Chloroform layer test	**A red color produced in the lower chloroform layer**	–
7] Flavonoids	10% lead acetate test	**The formation of a yellow precipitate**	+

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8] Tannins	Ferric chloride	**Blue color / green black**	–
9] Saponins	Foam, honey comb test	**The formation of stable foam, honey comb**	–
10]Phlobatannins	1% HCl test	**Deposition of a redPrecipitate.**	+
11]Anthraquinones	Borntrager's test	**A pink, red or violet colouration in the ammonical (lower) phase**	+

Presence (+), Absence (-)

Table no.3: Results of phytochemical analysis of the Chloroform extract of beet root

Phytochemical	Test	Observation	Inference
1] Carbohydrates	Molish test	**A Violet ring at the junction of the two liquids**	+
2] Protein	Biuret test	**The pink color in ethanol layer**	+
3] Alkaloid	Wagner's test	**A reddish-brown precipitates**	+
4] Glycosides	Borntrager's Test	**Pink to red color in the ammonical layer.**	–
5] Terpenoid	Salkowaski's test	**Red violet color**	–
6] Steroids	Chloroform layer test	**A red color produced in the lower chloroform layer**	+
7] Flavonoids	10% lead acetate test	**The formation of a yellow precipitate**	+
8] Tannins	Ferric chloride	**Blue color / green black**	–
9] Saponins	Foam, honey comb test	**The formation of stable foam, honey comb**	–
10]Phlobatannins	1% HCl test	**Deposition of a red Precipitate.**	+
11]Anthraquinones	Borntrager's test	**A pink, red or violet coloration in the ammonical (lower) phase**	+

Presence (+), Absence (-)

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Table no.4 Results of phytochemical analysis of the ethanol extract of beet root

Phytochemical	Test	Observation	Inference
1] Carbohydrates	Molish test	**A Violet ring at the junction of the two liquids**	+
2] Protein	Biuret test	**The pink color in ethanol layer**	+
3] Alkaloid	Wagner's test	**A reddish-brown precipitates**	+
4] Glycosides	Borntrager's Test	**Pink to red color in the ammonical layer.**	+
5] Terpenoid	Salkowaski's test	**Red violet color**	–
6] Steroids	Chloroform layer test	**A red color produced in the lower chloroform layer**	+
7] Flavonoids	10% lead acetate test	**The formation of a yellow precipitate**	+
8] Tannins	Ferric chloride	**Blue color / green black**	–
9] Saponins	Foam, honey comb test	**The formation of stable foam, honey comb**	–
10]Phlobatannins	1% HCl test	**Deposition of a redPrecipitate.**	+
11]Anthraquinones	Borntrager's test	**A pink, red or violet coloration in the ammonical (lower) phase**	–

Presence (+), Absence (-)

III. CONCLUSION

In this study, we evaluated the phytochemicals of dried turmeric powder and red beetroot peel extract in different solvents. The preliminary phytochemical analysisindicated that the Ethanolic and chloroform extracts of turmeric and beet root showed the presence of carbohydrates, protein, steroid, phlobatannins, tannins, alkaloid, saponins, flavonoid, terpenoidand glycosidesanthraquinones.These results are similar to references in different extract. The some differences are probably due to discrepancy between geographical areas and climatic conditions .It could be finally concluded that beetroot is good source of protein, carbohydrate and dietary fiber.The beetroot is good source of betalain, which makes it potential source for exploration and value addition in food beverages in combination with various fruit juices.The turmeric powder is also a good source of, proteins,carbohydrates, glycosides,terpenoids**,** steroids,flavonoids**,**anthraquinones. Further studies is required to assess the important constituents quantitatively and to study their medicinal values.

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