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Phytochemical screening from plant extracts of medicinal plant *Sterculia urens.* Roxb.

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ABSTRACT

The present study is carried out to identify the various phytochemicals present in the selected plant ***Sterculia urens.*** **Roxb.** (fam: Sterculiaceae) which is used by Gondu tribes at Seethagondi grampanchayath of Adilabad district, Telangana State, India to treat dog bites. The leaf, bark and root extracts were isolated from water, acetone, petroleum ether, chloroform and ethanol. In total of 14 phytochemicals, the maximum phytochemicals were observed in bark of the plant. Methanolic and Acetonic extracts have shown maximum presence of phytochemicals. After bark, the leaf extracts showed more number of phytochemicals in Acetonic extracts followed by root in Acetonic extracts. From the present study, it is evident that the phytochemicals present in the selected plant can be used to produce a potent drug to cure dog bites and gives a scope for further research in the pharmaceutical industry.

Key words : ***Sterculia urens,*** medicinal plants, phytochemicals, Gondu tribes, bioactive compound.

INTRODUCTION

Important medicinal plants make a big source of information for therapeutic uses even in developed countries which could be used to produce a potent drug. These plants act as reservoirs of variety of chemicals and can lead to develop a modern drug in pharmaceutical industry [1]. In general, these medicinal important plants contain phytochemicals like flavanoids, phenolic compounds, alkaloids, tannins [2]. To treat diseases and disorders of humans and animals, there is need for co-relational studies between bioactivity and the constituents of phytochemicals [3]. Many researchers around the world have reported their findings on phytochemical studies [4-6]. The role of phytochemicals is not only to treat diseases and disorders but also they help the plants in their secondary activities like aroma, flavor, self defense and their growth. [7]. Bioactive compounds extracted from plants naturally show less side effects when compared with anyother synthetic drugs [8]. An age old use of turmeric which contains cuucumin showed anticancerous properties [9]. And further,

ISSN PRINT 2319 1775 Online 2320 7876
 Volume 12, Iss 1, 2023

fruits which contain flavonoids as chief phytochemical constituents has shown chemopreventive property [10]. Cytotoxic effect was shown by those plants which has flavonoids, tannins, alkaloids [11]. The information from World Health Organization (WHO) says that about 80% of people use traditional medicines which are isolated from medicinal plants [12]. The phytochemicals extracted from the plants are organic in nature and shows a definite physiological action on human or animal [13, 14]. these phytochemicals are synthesized primarily or secondarily by the plants and are used in agriculture, veterinary, human therapy and in other scientific areas. [15]. Many of the phytochemicals isolated from the plants have shown their inhibitory effects on various types of micro-organisms [16, 17]. Such type of phytochemicals may be isolated from various parts of the plants like seeds, flowers, roots, barks, fruits, leaves [18, 19]. To isolate the desirable phytochemicals, there is an utmost important to have the knowledge of these plant constituents [20, 21, 22]. Medicinal plants gained a higher preference in recent years in the fields of drug discovery as they produce safe and easily degradable compounds which shows desired activity on biological organisms [23, 24]. The lab based studies revealed that, these phytochemicals have the antioxidant, anticancerous, antidiabetic and other important properties [25, 26]. The mechanism of action on many phytochemicals were still unknown but their diversity in structure makes them wide spread use in pharmacological uses [27, 28]. The most common phytochemicals which shows their bioactivity are saponins, terpenes, glycosides, flavonoids, alkaloids [29, 30].In some metabolic processes like insulin synthesis and cell proliferation, there is need of maintaining a homeostatic balance between antioxidants and oxidants [31, 32, 33, 34]. Phytochemicals are the compounds which occur naturally in plants that can show positive or negative signs on human beings as well as animals [35]. Medicinal plants acts as reservoirs of phytochemicals which can be used to treat various diseases or disorders, and the properties of the medicinal plants are determined by the constituents of phytochemicals [36]. Various parts of the plants contains different phytochemicals like steroids, terpenes, flavonoids, tannins etc [37]. Some of the metabolic compounds from the plants which are involved in their defense mechanisms are being now used as medicines by humans for treating different diseases and disorder [38, 39].

Need of the Study

From the pre-historic times till the discovery of synthetic drugs, the plants played a major role in treating various diseases and disorders [40]. The in-depth research to find the active natural products created a scope to discover new chemical entities [41]. Hence, there is a

ISSN PRINT 2319 1775 Online 2320 7876
 Volume 12, Iss 1, 2023

need to discover efficient, safe and economic bioactive compounds for a permanent cure for any disease. Under such situations, we can rely on plant communities for a better remedial measure. India as place of rich natural resources of flora and knowledge since un-remember able time but lacking scientific evidence, thus giving a scope for further research in drug discovery. The reason for choosing the plant ***Sterculia urens.*** **Roxb.** is that it contains flavonoids, glycosoids, alkaloids, quinones and other compounds which shown the anti-microbial properties.

Materials And Methods :

Collection and authentication of plant materials:

The plant materials i.e., leaf, stem and roots of the plant ***Sterculia urens.*** **Roxb.** were collected from the forest areas of Adilabad District, Telangana state, India with the help of local tribes. Thus the collected species was identified using published flora and literature [42, 43, 44, 45, 46].

Preparation of extracts:

150gm of each plant material is collected, dried at 700^0C for four hours and were ground to powder. The powdered material is soaked in 750 ml of methanol, acetone, chloroform, petroleum ether for 72 hours and then filtered. Using the rotary evaporator the filtrates were dried at 55^0C. Dried extracts were stored at 5^0C. For preparation of aqueous extraction, 50 gms of powdered plant material and 400 ml of distilled water was added and boiled using hot plate. The mixture was filtered using Whattman filter paper I. (W and R Balson Ltd, England). The filtrate was filtered through 0.45cm pore sized diameter (millipores corp, England). All the polar and non-polar extracts were concentrated by hot water bath at 80^0C for 5 hours. The extracts were decolorized by adding 0.5 gms of charcoal. Filtrates were stored at 5^0C till the use.

Phytochemical analysis:

Tests for various phytochemical constituents in the plant material was carried out using standard protocols[47, 48, 49].

Phytochemical screening for different compounds

1. Test for Flavonoids:

0.5 g of various extract was shaken with petroleum ether to remove the fatty materials (lipid layer). The defatted residue was dissolved in 20 ml of 80% ethanol and filtered. The

ISSN PRINT 2319 1775 Online 2320 7876
 Volume 12, Iss 1, 2023

filtrate was used for the following tests: (a) 3 ml of the filtrate was mixed with 4 ml of 1% aluminium chloride in methanol in a test tube and the colour was observed. Formation of yellow colour indicated the presence of flavonols, flavones and chalcones. (b) 3 ml of the filtrate was mixed with 4 ml of 1% potassium hydroxide in a test tube and the colour was observed. A dark yellow colour indicated the presence of Flavonoids. (c) 5 ml of the dilute ammonia solution was added to the portion of the aqueous filtrate of each plant extract followed by the addition of concentrated H_2SO_4. The appearance of the yellow colouration indicated the presence of flavonoids.

2. Test for alkaloids:

0.5 to 0.6 g of various extract was mixed in 8 ml of 1% HCl, warmed and filtered. 2 ml of the filtrate were treated separately with both reagents (Maeyer's and Dragendorff's), after which it was observed whether the alkaloids were present or absent in the turbidity or precipitate formation.

3. Test for Glycosides:

Five ml each of various extract were hydrolysed separately with 5 ml each of conc. HCl and boiled for few hours on a water bath and hydrolysates were subjected to the following test: A small amount of alcoholic extract of samples was dissolved in 1ml water and then aqueous 10% sodium hydroxide was added. Formation of a yellow colour indicated the presence of glycosides.

4. Test for steroids:

0.5 g of the various solvent extract fraction of each plant was mixed with 2 ml of acetic anhydride followed by 2 ml of sulphuric acid. The colour changed from violet to blue or green in some samples indicated the presence of steroids.

5. Test for Phenols:

To 1ml of various solvent extracts of sample, 2ml of distilled water followed by a few drops of 10% aqueous ferric chloride solution were added. Formation of blue or green colour indicated the presence of phenols.

ISSN PRINT 2319 1775 Online 2320 7876
 Volume 12, Iss 1, 2023

6. Test for Terpenoids (Salkowski test):

5 ml of various solvent extract was mixed in 2 ml of chloroform followed by the careful addition of 3 ml concentrated (H_2SO_4). A layer of the reddish brown colouration was formed at the interface thus indicating a positive result for the presence of terpenoids.

7. Test for saponins:

0.5 g of various solvent extract was dissolved in boiling water in a test tube. Test cooling aqueous extracts were mixed vigorously to froth and the height of the froth was measured to determine the saponin contents in the sample. 2.0 g of the powdered plant material was boiled in distilled water in a test tube in boiling water bath and filtered. 10 ml of the filtrate was mixed with 5 ml of distilled water and was shaken vigorously to the formation of stable persistent froth. The frothing was mixed with 3 drops of olive oil and shaken vigorously for the formation of emulsion thus a characteristic of saponins.

8. Test for Resins:

One ml of various solvent extract was treated with few drops of acetic anhydride solution followed by one ml of conc. H_2SO_4. Resins give coloration ranging from orange to yellow.

9. Test for tannins :

0.25 g of various solvent extract was dissolved in 10 ml distilled water and filtered. 1% aqueous Iron chloride ($FeCl_3$) solution was added to the filtrate. The appearance of intense green, purple, blue or black colour indicated the presence of tannins in the test samples.

10. Test for cardiac glycosides (Keller-Killani test) :

5 ml of various solvent extract was mixed with 2 ml of glacial acetic acid containing one drop of ferric chloride ($FeCl_3$) solution, followed by the addition of 1 ml concentrated sulphuric acid. Brown ring was formed at the interface which indicated the presence of deoxysugar of cardenoloides. A violet ring may appear beneath the brown ring, while in the acetic acid layer, a greenish ring may also form just gradually throughout the layer.

ISSN PRINT 2319 1775 Online 2320 7876
 Volume 12, Iss 1, 2023

11. Test for Carboxylic acid:

One ml of the various extracts was separately treated with a few ml of sodium bicarbonate solution. Effervescence (due to liberation of carbon dioxide) indicates the presence of carboxylic acid.

12. Test for coumarins:

0.5 g of the moistened various extracts was taken in a test tube. The mouth of the tube was covered with filter paper treated with 1 N NaOH solution. Test tube was placed for few minutes in boiling water and then the filter paper was removed and examined under the UV light for yellow fluorescence indicated the presence of coumarins.

13. Test for Quinones :

One ml of each of the various extracts was treated separately with alcoholic potassium hydroxide solution. Quinines give coloration ranging from red to blue.

14. Test for Xanthoproteins :

One ml each of the various extracts were treated separately with few drops of conc. HNO_3 and NH_3 solution. Formation of reddish orange precipitate indicates the presence of xanthoproteins.

Results and Discussions:

The present study on phytochemical analysis of leaf, bark and root powdered extracts of plant ***Sterculia urens.*** **Roxb.** in different solvents have revealed the presence of various phytochemical compounds in the above parts. A detailed study of phytochemcals in different solvents is given in tables. The study clearly shown that in the leaf extracts, alkaloids, glycosides, resins and quinones are maximum in acetonic extraction, whereas Phenols, terpenoids are minimum whereas the carboxylic acid, flavanoids, steroids, saponins, tannins, cardiac glycosides, coumarins, xanthophylls are completely absent (Table-1). In the bark powders, alkaloids, steroids, tannins, cardiac glycosides, quinones, xanthophylls are maximum in distilled water, methanolic and acetonic extractions, whereas flavonoids, glycosides, phenols, saponins, terpenoids, coumarins shown their minimum presence but carboxylic acid and resins are completely absent (Table-2). In the root extracts, alkaloids have shown their maximum presence in distilled water, methanolic and acetonic extractions, while glycosides, phenols, cardiac glycosides, coumarins, quinones, xanthophylls are

ISSN PRINT 2319 1775 Online 2320 7876
 Volume 12, Iss 1, 2023

minimum, but flavonoids, steroids, terpenoids, saponins, resins, tannins, carboxylic acids are completely absent (Table-3)

Conclusion And Future Work :

The extracts of leaf, bark and stem of the plant ***Sterculia urens.*** **Roxb.** has revealed the presence of various phytochemicals. The presence of phytochemical gives a chance to select a suitable plant for production of pure compound. The results obtained in the present study clearly tells that the selected plant can be further utilized to produce a potent drug. In the present study, it is revealed the bark of the plant contains more number of phytochemicals like alkaloids, phenols, Cardiac Glycosides, Quinones and Xanthoproteins in varying concentrations.

From the present research, it undoubtedly indicates that various plants which are natural origin can be used to produce and isolate a bioactive molecule to cure various diseases and ailments.

ISSN PRINT 2319 1775 Online 2320 7876

Research paper Volume 12, Iss 1, 2023

TABLE-1.PHYTOCHEMICAL SCREENING IN LEAF POWDER EXTRACTS OF PLANT *Sterculia urens. Roxb.*

S.No	PHYTOCHEMICAL CONSTITUENTS	DISTILLED WATER	METHANOL	ACETONE	PETROLEUM ETHER	CHLOROFORM
1	Flavonoids	++	+	-	-	-
2	Alkaloids	++	++	+++	++	++
3	Glycosides	+	+	+++	-	+
4	Steroids	++	+	++	+	-
5	Phenols	++	+++	+	-	-
6	Terpenoids	+	+	-	++	+
7	Saponins	+	-	-	++	++
8	Resins	+	+	+++	+	-
9	Tannins	+	++	-	-	-
10	Cardiac Glycosides	++	+	+	+	++
11	Carboxylic acid	-	-	-	+	-
12	Coumarins	+	++	++	-	-
13	Quionones	+++	+++	+++	-	-
14	Xanthoproteins	+	-	-	++	+

ISSN PRINT 2319 1775 Online 2320 7876

Research paper Volume 12, Iss 1, 2023

TABLE-2. PHYTOCHEMICAL SCREENING IN BARK POWDER EXTRACTS OF PLANT *Sterculia urens. Roxb.*

S.No	PHYTOCHEMICAL CONSTITUENTS	DISTILLED WATER	METHANOL	ACETONE	PETROLEUM ETHER	CHLOROFORM
1	Flavonoids	++	+++	++	++	+
2	Alkaloids	+++	+++	+++	+++	+++
3	Glycosides	++	+++	+	-	-
4	Steroids	++	+++	+++	-	-
5	Phenols	+++	+++	++	++	++
6	Terpenoids	++	+++	+++	+	+
7	Saponins	+	+	+	+++	++
8	Resins	-	-	-	-	-
9	Tannins	++	+++	++	++	+
10	Cardiac Glycosides	+	+++	+++	++	+++
11	Carboxylic acid	++	-	-	++	+
12	Coumarins	-	-	-	-	-
13	Quionones	+++	+++	+++	-	-
14	Xanthoproteins	++	+++	+++	-	-

ISSN PRINT 2319 1775 Online 2320 7876

Research paper Volume 12, Iss 1, 2023

TABLE-3. PHYTOCHEMICAL SCREENING IN ROOT POWDER EXTRACTS OF PLANT *Sterculia urens. Roxb.*

S.No	PHYTOCHEMICAL CONSTITUENTS	DISTILLED WATER	METHANOL	ACETONE	PETROLEUM ETHER	CHLOROFORM
1	Flavonoids	-	+	++	-	+
2	Alkaloids	+++	+++	+++	++	++
3	Glycosides	+++	+++	++	-	-
4	Steroids	-	+	++	-	-
5	Phenols	++	+++	+	+	+
6	Terpenoids	++	++	++	-	-
7	Saponins	+	+	+	+	+
8	Resins	-	-	+	-	-
9	Tannins	-	+	++	-	+
10	Cardiac Glycosides	+	++	+++	++	-
11	Carboxylic acid	-	-	-	-	-
12	Coumarins	++	+++	+++	-	+
13	Quionones	++	++	+++	-	+
14	Xanthoproteins	++	++	+++	-	+

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ISSN PRINT 2319 1775 Online 2320 7876
 Volume 12, Iss 1, 2023

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