International Journal of Phytopharmacy **Research Article**
Vol. 4 (2), pp.63-66, Mar-Apr 2014
ISSN: 2277-2928 (Online)
Journal DOI:10.7439/ijpp

www.ssjournals.com

Phytochemical and IR –Spectrum analysis of *Strychnos potatorum* linn

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Abstract
The present paper deals with the phytochemical characteristics of leaves and bark of an endangered medicinally important tree speices of *strychnos potatorum*. Preliminary phytochemical screening revealed the presence of alkaloids, flavonoids, saponins, carbohydrates, tannins, sterols, glycosides, oil and fats, phenolic compounds, protein and amino acids, gums and mucilage. The functional groups were identified through IR – spectrum.
Keywords: *Strychnos potatorum*, Phytochemical screening, IR – spectrum analysis

1. Introduction

According to World Health Organization (WHO), it was estimated that 80% of the population in developing countries rely mostly on traditional medicine like plant drugs, for their primary health care needs. Medicinal plants being natural, non-narcotic, having no side effects, cost of effective, preventive and curative therapies which could be useful in achieving the goal of "Health for all" in a cost effective manner. *Strychnos potatorum* belongs to the family Loganiaceae; it is commonly referred to as clearing nut tree or nirmali or thettham kottai. It is a medium sized glabrous deciduous tree having height of 6-12 meters. The plant leaves are simple, opposite, elliptic, acute, 15*6.25 cm, glabrous, shining and barks are cracked scaly black. The plant has been described as a common tree of medicinal importance in India this plant popularly used to purify water for drinking. In our traditional medicinal system like Ayurveda, Siddha, and Unani, the plant part used treating urinary tract infections and eye infections; gonorrhoea and kidney troubles, leucorrhoea, tuberculosis, diabetes, venereal diseases and acute diarrhoea. The present study preliminary phytochemical investigations have been carried out the leaves and bark of *strychnos potatorum*.[4,7,8]

2. Materials and Methods

2.1 Collection of Plant Material

Strychnos potatorum leaves and bark were collected from Velur near Viralimalai, Pudukottai district, Tamil Nadu India. The leaves and bark were separated from the plant and dried under shade. After drying, it was powdered and used for our studies.

2.2 Phytochemical Analysis[1,2]

2.2.1 Test for alkaloids

Mayer's test

To the little of extract few drops of Mayer's reagent formation of precipitate indicate the presence of alkaloids.

Mayer's Reagent

Mercuric chloride (1.358 g) and 60 ml of distilled water dissolved, potassium iodine (5 g) 10 ml of distilled water dissolved. The two solutions made up to 100 ml of distilled water.

2.2.2 Test for flovonoids

Ferric Chloride test

1 ml of extract was taken and a few drops of dilute ferric chloride solution were added. The colour changed to pale green or red brown colour which indicates the presence of flovanoids.

2.2.3 Test for saponins

Foam test

1 ml of extract was diluted separately with distilled water to 20 ml and shaken with graduated cylinder for 15 minutes. Formation of lather indicates the presence of saponins.

2.2.4 Test for carbohydrates

Molisch's test

Small quantity of extract was dissolved separately in 4 ml of distilled water and filtered, 2 ml of filtrate, 2 drops of alcoholic solution of napthol are added. The mixture is shaken well and 1 ml of concentrated sulphuric acid is added slowly along the sides of the test tube and allowed to stand. Formation of reddish brown ring or violet ring indicates the presence of carbohydrate.

2.2.5 Test for tannins

Lead acetate test

To 5 ml of extract solution and 1 ml of lead acetate solution was added. Flocculant brown precipitate indicates the presence of tannins.

2.2.5 Test for sterols

Libermann burchard reaction

A small amount of extract of sample and a few crystal of sodium nitrate were taken in a dry test tube and heated gently for a minute. It was cooled and added 0.5 ml of concentrated sulphuric acid. Orange colour indicates the presence of sterols.

2.2.6 Test for glycosides

A portion of the extract was hydrolysed with hydro chloric acid for few hours on a water bath and the hydrolysate was subjected to legal's test to detect the presence of different glycosides.

Legal's test

To the hydrolysate 1 ml of sodium nitro prusside solution was added and then it was made alkaline with sodium hydroxide solution. Ifthe extract produced pink to red colour, which indicates the presence of glycosides.

2.2.7 Test for oil and fats

Few drops of 0.5N alcoholic potassium hydroxide were added to small quantity of various extract along with a drop of phenolphthalein. The mixture was heated on a water bath for 1-2 hours. Formation of soaps or particle neutralization of alkali indicates the presence of fixed oil and fats.

2.2.8 Test for phenolic compounds

Few drops of extracts were taken separately in water tested for the presence of phenolic compounds with dilute ferric chloride solution (5%) which gives violet colour.

2.2.8 Test for protein and amino acids

Biuret test

A few drops of extract were taken in water and 1 ml of 4% copper sulphate was added to it. Violet or pink colour is formed proteins are present.

2.2.9 Test for gums and mucilage

About 10 ml of the extract was added to 25 ml of absolute alcohol with stirring and filtered. The precipitate was dried in air and examined for its swelling properties and for the presence of carbohydrates.

2.3 IR- Spectrum analysis

FTIR relies on the fact that the most molecules absorb light in the infra-red region of electromagnetic spectrum. This absorption corresponds specifically to the bonds present in the molecule. The frequency ranges are measured as wave numbers typically over the range 4000 – 400 cm-1.

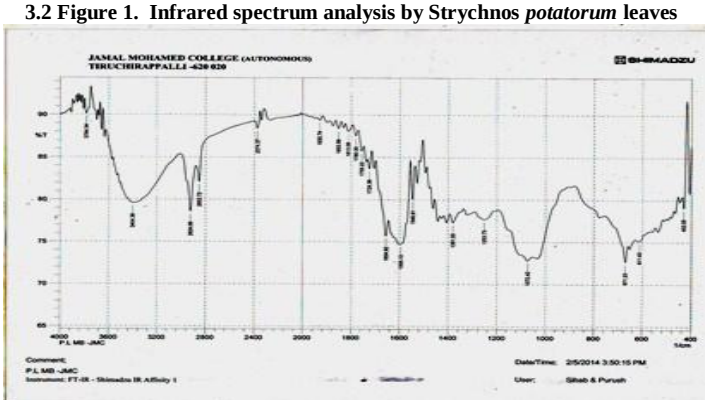
3. Results

Leaf and bark powder showed the characteristic fluorescence when treated with different reagents which supported results of phytochemical studies. Preliminary phytochemical investigations in leaf powder showed the presence of alkaloids, flavonoids, tannins, sterols, glycosides, oil and fats, phenolic compounds, protein and amino acids, gums and mucilage. Absence of saponins and carbohydrates. Bark powder showed the presence of alkaloids, flavonoids, carbohydrates, sterols, glycosides, oil and fats, protein and amino acids, gums and mucilage. Absence of saponins, phenolic compounds, tannins (Table-1). The different types of functional groups of leaves and bark were identified (Figure1 & 2) (Table-2,3).

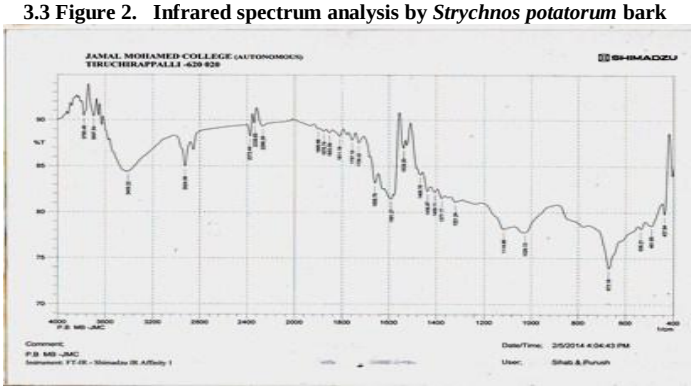
3.1 Table 1.Phytochemical Analysisof*Strychnos potatorum*leaves and bark

S.No	Phytochemical Constituents	Leaf Extract	Bark Extract
1	Alkaloids	Positive	Positive
2	Flavonoids	Positive	Positive
3	Saponins	Negative	Negative
4	Carbohydrates	Negative	Positive
5	Tannins	Positive	Negative
6	Sterols	Positive	Positive
7	Glycosides	Positive	Positive
8	Oil and Fats	Positive	Positive
9	Phenolic Compounds	Positive	Negative
10	Protein and Amino acids	Positive	Positive
11	Gums and mucilage	Positive	Positive

3.2 Figure 1. Infrared spectrum analysis by Strychnos *potatorum* leaves



3.3 Figure 2. Infrared spectrum analysis by *Strychnos potatorum* bark



3.4 Table 2. Infrared spectrum analysis by *Strychnos potatorum* leaves

S. No	Peak value	Stretching	Interpretation
1	432.05	N-O Stretching	Amines
2	611.48	C-H Stretching	Alkenes
3	671.23	C-X Stretching	Chloro alkenes
4	1072.42	C-O Stretching	Alcohols
5	1253.73	C-O Stretching	Esters
6	1381.03	S=O Stretching	Sulfate
7	1546.91	C=C Stretching	Aromatics
8	1595.13	C=C Stretching	Aromatics
9	1654.92	C=C Stretching	Alkenes
10	1724.36	C=O Stretching	Aldehydes
11	1755.22	C=O Stretching	Anhydrides
12	1780.30	C=O Stretching	Anhydrides
13	1813.09	C=O Stretching	Anhydrides
14	1853.59	C=O Stretching	Phenol
15	1930.74	C=C Stretching	Alkenes
16	2374.37	P-H Stretching	Phosphine
17	2852.72	C-H Stretching	Alkanes
18	2924.09	C-H Stretching	Alkanes
19	3404.36	N-H Stretching	Amines
20	3784.34	- N-H Rocking	Amines

3.5 Table 3. Infrared spectrum analysis by *Strychnos potatorum* bark

S. No	Peak value	Stretching	Interpretation
1	437.84	N-O Stretching	Amines
2	491.85	N-O Stretching	Amines
3	536.21	C-X Stretching	Chloro alkenes
4	673.16	C-X Stretching	Chloro alkenes
5	1026.13	C-O Stretching	Alcohols
6	1114.86	C-F Stretching	Fluorine
7	1321.24	S=O Stretching	Sulfate
8	1377.17	S=O Stretching	Sulfate
9	1406.11	S=O Stretching	Sulfate
10	1436.97	S=O Stretching	Sulfate
11	1469.76	C=C Stretching	Aromatics
12	1539.20	C=C Stretching	Aromatics
13	1591.27	C=C Stretching	Aromatics
14	1658.78	C=C Stretching	Alkenes
15	1728.22	C=O Stretching	Aldehydes
16	1757.15	C=O Stretching	Anhydrides
17	1811.16	C=O Stretching	Anhydrides
18	1853.59	C=O Stretching	Phenol
19	1876.94	C=O Stretching	Ester group
20	1899.88	C=O Stretching	Ester group
21	2268.29	P-H Stretching	Phosphine
22	2339.65	P-H Stretching	Phosphine
23	2372.44	P-H Stretching	Phosphine
24	2924.09	C-H Stretching	Alkanes
25	3408.22	N-H Stretching	Amines
26	3697.54	-N-H Rocking	Amines
27	3780.48	-N-H Rocking	Amines

4. Discussion

In earlier study Mallikharjuna *et al*[3], revealed that the seed, leaves, stemandbark of *strychnos potatorum* have the phytoconstituents such as alkaloids, flavonoids, glycosides, lignin, phenols, saponins, sterols and tannins. Previous research by Srikanth Kajithoju *et al*[6], studies leaves of *strychnos potatorum* showed the presence of alkaloids, glycosides, tannins, flavonoids, sterols, triterphenoids, phenols, quinones, saponins, and absence of fats and oils. In our studies leaves and bark showed the presence of alkaloids, flavonoids, sterols, glycosides, protein and aminoacids, gums and mucilage, and absence of saponins, phenolic compounds, and tannins. These phytochemical compounds were acting against pathogenic organisms.

5. Conclusion

In the present investigation, revealed the presence of various important of bioactive compounds and functional groups of this plant.These results may help in standardization, identification and in carrying out for further research in *Strychnos potatorum* leaf and bark.

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