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Physicochemical and phytochemical investigation of the roots of *Ixora Coccinea* linn

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ABSTRACT

The present study was undertaken for the development of physicochemical and phytochemical parameters of the roots of I. Coccinea linn, belonging to the family Rubiaceae. The plant is known in Sanskrit as Paranti, in English as Jungle Flame Ixora, in Hindi as Rangan and in Konkani asPatkali. The physicochemical and phytochemical investigation confirms the purity and authenticity of I. Coccinearoots by using standard methods. Physicochemical studies revealed the presence of moisture content as 7.5%w/w, swelling index as 1.42cm, foaming index as 142.85, alcohol soluble extractive as 0.6% w/w, water soluble extractive as 0.4% w/w, and ether soluble extractive as 0.2% w/w.The total ash was found to be 2.8% w/w, acid insoluble ash 0.3% w/w and water soluble ash as 1.15% w/w. The fluorescence analysis in short wavelength, long wavelength and day light is also reported, which is a tool to determine the chemical nature of the crude drug. Whereas preliminary phytochemical screening revealed the presence of alkaloids, carbohydrates, flavonoids, triterpenoids, steroids, tannins, resins and saponins from the ethanolic extract of the roots of I. Coccinea. All these methods will help in setting down pharmacopoeial standards in determining the quality and purity of the roots of I. Coccinea.

Keywords: *Ixora Coccinea* linn, Rubiaceae, physicochemical, phytochemical screening, triterpenoids

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INTRODUCTION

Natural products including plants, animals and minerals have been the basis of the treatments of human diseases. Modern medicine or allopathy has gradually developed over the years due to the scientific and observational efforts of scientists- however the basis for its development remains in the roots of traditional medicine and therapies.[1] Today the field of Pharmacognosy has undergone vast changes. Many crude drugs which were once generally categorized as herbal remedies are now, in accordance with Continental European Practice, described in the British Pharmacopoeia (BP). Chromatographic, chemical and physical test, together with assay procedures, are given for many drugs for which previously there was no quantitative evaluation of the chemical constituents available. The importance of the quality control is paramount, as the demand and the possibility of substitution has increased.[2] *I. Coccinea* is a glabrous shrub which grows to a height of about 0.6-0.9 m, belonging to the family Rubiaceae.[3] The word “Ixora” is a Portuguese version of Iswari, name of Goddess Parvati to which the flowers of *I. Coccinea*are offered, while the word “Coccinea” is a Latin word meaning Scarlet coloured.[4] It bears flowers which are numerous having bright scarlet colour in dense, senssile corymbiform cymes. The plant *I. Coccinea*is native to India and is mostly found in Konkan region.It is cultivated throughout India as an ornamental plant. [5] The roots of the plant *I. Coccinea* are mostly used as an astringent, antiseptic, stomachic, sedative etc. Traditionally roots are also used in diarrhoea, dysentery, gonorrhoea, in loss of appetite, hiccups, fever, sores and chronic ulcers. Flowers are mostly used in dysmenorrhoea, leucorrhoea, haemoptysis, dysentery and catarrhal bronchitis. Decoction of flowers or bark is used as a lotion for eye troubles.[6] Preclinical studies have shown that the plant possess anti-inflammatory, anti-microbial, anti-oxidant, anti-ulcerogenic, anti-diarrheal, anti-nociceptive, anti-mutagenicity, hepatoprotective and hypolipidaemic activities.[7]From the literature survey it was revealed that the roots of *I.*

Coccinea contains Δ 9,11 Octadecadienoic acid, Palmitic acid, stearic acid, oleic acid, linoleic acid and mannitol.[8] Since no substantial work on the roots of *I. Coccinea*was carried out,an effort was made to carry out the Physicochemical and Preliminary Phytochemical investigation of the roots of *I. Coccinea*.

MATERIALS AND METHODS

Collection of sample

The roots of *I. Coccinea* were collected during October 2012 from Verna and Savordem, Goa, India. The plant sample was identified and authenticated by Prof.G.I.Hukkeri, Associate Professor in Botany, Dhempe College of Arts and Science, Miramar,Panaji, Goa, India. [9] The dried root powder was used for physicochemical characterisation.

Preparation of ethanolic extract

The dried root powder (500gm) was exhaustively extracted by maceration with ethanol for three days. After three days ethanol layer was decanted off. The process was repeated three times. The solvent was then distilled off and the concentrate was evaporated to a syrupy consistency using rotary vacuum evaporator (25 rpm; 68 ^{O}C) and finally evaporated to dryness.The total yield of the ethanolic extract was 60gms. [10]This extract was subjected to preliminary phytochemical screening.

Physicochemical Evaluation

Analysis of the physicochemical constants of the root powder was done to evaluate the quality and purity of the drug. Various physicochemical parameters like moisture content, swelling index, foaming index, extractive values and ash values were calculated as per WHO guidelines. The information collected from these test were useful for standardisation and obtaining quality standards. [11-13]

Florescence analysis

Powdered roots of the plant *I. Coccinea*were subjected to florescence analysis under visible light and ultra violet light (254nm and 366nm), after treatment with various chemical and organic reagents. [14-16]

Phytochemical Investigation

The ethanolic extract of the root powder was subjected to preliminary phytochemical screening, for evaluation of major phytochemical constituents such as alkaloids, glycoside, flavonoids, steroids, triterpenoids, tannins, saponins, resins etc. [17, 18]

RESULTS AND DISCUSSION

Physicochemical Parameters:

The results of the physicochemical constants of raw material are expressed in the Table 1; from the results it is known that the quality and purity of the raw material was good enough. Moisture triggers the enzymatic activity or facilitates growth of microbes which leads to its deterioration. [19] Therefore, limit for the amount of water should be set for every given plant material. This is especially important for materials which absorbs moisture easily or deteriorates quickly in the presence of water. [11] The moisture content of the powdered root was found to be 7.5%, which signifies that the drug was properly dried and stored. The swelling index and the foaming index of the powdered root were found to be 1.47cm and 142.85, which indicates the presence of gums, mucilage, pectin, hemicellulose and saponins respectively.[12] The crude drugs owe their biological activity mainly due to active chemical constituents. These constituents may be soluble in different polar, semi polar or nonpolar solvents.The extent of solubility of these constituents is found by determining the extractive value. [19] Water soluble extractive value indicates the presence of sugar, acid and inorganic compounds, and it was found to be 0.4%w/w. The alcohol soluble extractive value indicates the presence of polar constituents like phenols, alkaloids, steroids, glycosides, flavonoids etc.[15] This was found to be 0.6%w/w, while the ether soluble extractive value was found to be 0.2%w/w.Remnants of the drugs after incineration contains mostly inorganic salts known as ash. It varies in cases of many crude drugs and its study gives an idea about the quality and purity of the drugs during evaluation. [19] The total ash determines both the physiological ash and non-physiological ash, it was found to be 2.8%w/w. The amount of acid insoluble ash present was 0.3%w/w, which proved that the sand and other siliceous earth matter was present to a very less extent.[20] An analytical result of the water soluble ash was found to be 1.15%w/w.

Table 1: Physicochemical Parameters of *I. Coccinea* root powder

Sr.No.	Physicochemical Test	Results
1	Determination of Swelling Index	1.47cm
2	Determination of Foaming Index	142.85
3	Determination of Extractive Value Alcohol soluble extractive of sample Water soluble extractive of Sample Ether soluble extractive of sample	 0.6%w/w 0.4 %.w/w 0.2 %w/w
4	Determination of Moisture Content	7.5 %.w/w
5	Determination of Ash Values Total ash Acid insoluble ash Water soluble ash	 2.8% w/w 0.3 %w/w 1.15 % w/w

Fluorescence analysis

The results of the fluorescence analysis are expressed in Table 2. The fluorescence analysis of the drug helps to identify the drug with specific fluorescent colours, and also to find out the fluorescent impurities. Thus the study of fluorescence analysis can be used as a diagnostic tool for testing adulteration.

Table 2: Fluorescence Analysis of the root Powder

Sr No.	Drug +reagent	Day light	Short wavelength 254nm	Long wavelength 366nm
1	Powder	Brown	Dark brown	Brown
2	Powder+50%NaOH (aq)	Brown	Dark brown	Greenish brown
3	Powder+50%NaOH (alc)	Greenish brown	Brown	Bluish green
4	Powder +Ammonia	Reddish brown	Dark brown	Green
5	Powder+ Picric acid	Yellow	Pale yellow	Pale yellow
6	Powder+ 10%HCL	Brown	Brown	Transparent
7	Powder+ 10%H_2SO_4	Brown	Brown	Pale green
8	Powder+ Conc HCL	Brownish black	Black	Greenish blue
9	Powder+ Conc H_2SO_4	Black	Black	Black
10	Powder+ Conc HNO_3	Yellowish brown	Yellowish brown	Yellowish brown
11	Powder+ 10% NaOH	Dark brown	Brownish black	Dark green
12	Powder+ dist. H_20	Brown	Pale brown	Green
13	Powder+ Methanol	Light brown	Dark green	Light blue
14	Powder+ Pet. Ether	Transparent	Brown	Transparent
15	Powder+ $CHCl_3$	Brown	Brown	Pale brown

Preliminary Phytochemical screening

The preliminary phytochemical investigation of the ethanolic extract of powdered root was performed which showed the presence of alkaloids, carbohydrates, flavonoids, tannins, resins, saponins, triterpenoids and steroids. The results of the screening are expressed in Table 3.

Table 3: Preliminary Phytochemical Screening of ethanolic extract

Sr.no.	Preliminary phytochemical test	Result
1	Alkaloid	+ ve
2	Glycoside	- ve
3	Carbohydrates	+ ve
4	Flavonoids	+ ve
5	Proteins	- ve
6	Tannins	+ ve
7	Resins	+ ve
8	Saponins	+ ve
9	Triterpenoids	+ ve
10	Steroids	+ ve
11	Starch	- ve

CONCLUSION

In recent years there has been rapid increase in the standardisation of selected medicinal plants having potential therapeutic significance. Despite the modern techniques, identification of the plant drug by pharmacognostic methodsis more reliable. Standardisation is essential measure for quality, purity, and sample identification. Physicochemical and preliminary phytochemical analysis of the roots confirmed the quality, purity andidentity of the plant*I. Coccinea*. Here the information collected will be useful for standardisation of the plant material.

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