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Research Article

Physicochemical analysis of the entire plant powder *Ludwigia perennis* L. by using different solvents

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Abstract

Physico-chemical analysis showed the details of extractive portion of the plant and ash composition. The entire plant powder of *Ludwigia perennis* shows that 1.98 % moisture, 13.45 % total ash, 56.7 % water soluble ash, 14.56 % sulphated ash and 10.32 % acid soluble ash.

Keywords: Physico, *perennis*, colour, ash, moisture.

1. Introduction

The herbal medicines occupy distinct position right from the olden days to present day. Medicinal herbs have been used as traditional primary healthcare agents, especially in Asian countries. The use of plants as a therapeutic material due to their chemical substances of medicinal value is very common in all over the world from ancient time [1-3]. The uses of herbal medicines is on the ascendency in recent years, being sought out as medicinal products, nutraceuticals and cosmetics and are available in health food shops and pharmacies [4].

Globally, a large number of people are returning to natural therapies and this may in part explain the increased attention in recent times [5]. Their use is very high in developing countries where about 80% of the population relies on them for their health care needs due to their availability, cost, purported safety and perceived side effects of synthetic drugs [6].

In the physicochemical analysis, the parameters studied are moisture content, loss on drying, total ash, acid-insoluble ash, alcohol and water soluble extractive values, petroleum ether soluble extractive value, ethyl acetate soluble extractive value, acetone soluble extractive value, etc. Ash value content can be used to be determining the quality and purity of crude drug. It indicates the presence of various impurities such as carbonate, oxalate, and silicate. Water soluble ash is used to estimate the amount of inorganic compound present in drugs while the acid insoluble ash includes mainly silica and indicate contamination with the earthy material. Minimal moisture content of drugs is crucial to discourage the growth of bacteria, yeast, or fungi during storage. The amount of the active constituents in a given amount of plant material when extracted with a particular solvent is determined by the estimation of extractive values. A solution containing different phytoconstituents is obtained by the extractions of any crude drug with a particular solvent. Whether the crude drug is exhausted or not is indicated by the compositions of these phytoconstituents which depend on the nature of the drug and the solvent used [7].

The proper functioning of vital organs in the body requires heavy metals as micronutrients. Their assimilation and accumulation in plants are obvious as a result of geo-climatic conditions, and environmental pollution heavy metals are widespread in soil. Heavy metals are discharged into the environment along with other pollutants, through industrial activity, automobile exhaust, heavy duty electric power generators, municipal wastes, refuse burning, and pesticides used in agriculture [8]. These metals from the environment through air and water are taken up by human beings, animals, and plants. Heavy metals accumulate in both plants and human organs. The sources for micronutrients for man are plants and animals; therefore, it becomes necessary to monitor the levels in biological materials that are required by man for both dietary and medicinal purposes. This is because deficiency or excess of micronutrients can be factors of disease generation. Recently, the toxicity of trace metals on human health and the environment have gained considerable attention. Plants are the main link in the transfer of heavy metals from the contaminated soil to humans. Damaging effects on humans even at very low concentrations will be seen since heavy metals have low excretion rates through the kidney. Metals such as zinc, copper, iron, manganese, and chromium are essential nutrients. An increase in their intake above certain limits can become toxic to health even though they are important for the physiological and biological functions of the human body [9,10].

Fluorescence is the phenomenon demonstrated by various chemical constituents existing in the plant material. When exposed to ultraviolet (UV) radiation or in the range of visible light, some constituents display fluorescence [11]. Identification of the powdered drug, extract or fractions of herbs can be carried out by utilizing the property of the organic molecules to absorb light over a specific range of wavelength and re-emit radiations [12].

Many physiochemical fluorescence are seen when suitably illuminated. The colour of fluorescence is specific for each compound [13]. Some crude drugs are often assessed qualitatively because non-fluorescent substances may often be converted into fluorescent derivatives after reacting with different reagents and thus this is an important parameter of pharmacognostical evaluation [14].

The present study is focused on the organoleptic characters, fluorescent behaviours, determination of ash, moisture content in the entire plant powder of *Ludwigia perennis* L.

2. Materials and methods

2.1 Collection of Plant materials

The entire plant parts of *Ludwigia perennis* L. were collected from Erode district, Tamil Nadu, India. Fresh plants were collected and air-dried at room temperature and then homogenized to obtain coarse powder. The powdered test plants was extracted [15] with the solvent ethanol, methanol, hexane and water by hot extraction using soxhlet apparatus, collected and stored in a vial for further analysis.

2.2 Physico-chemical studies

2.2.1 Organoleptic characters of plant powder

The organoleptic evaluation of entire plant powder and the extracts, such as colour, odour and taste were carried out as per Trease and Evans (1983) [16].

2.2.2 Behaviour of plant powder with different chemical reagents and Fluorescence analysis

The behaviour of powdered plant material was treated with different extracts such as ethanol, methanol, hexane, aqueous in visible light, day light, long UV and short UV. Chemical reagents such as concentrated HCl, concentrated H_2SO_4, concentrated HNO_3, ammonium solution, ferric chloride, picric acid, and was observed. Fluorescence behaviour of the powdered plant material with different chemical reagents like 1N NaOH in H_2O, 1N NaOH in ethanol, 1N hydrochloric acid, 50% sulphuric acid and 50% nitric acid was observed under visible light, day light and UV light at 254 nm and 365 nm [17].

2.2.3 Determination of moisture content (Loss on drying)

Two g of the powdered sample was taken in a tarred weighing bottle and weighed accurately. Dried at 105°C for 5 h and allowed to cool in desiccators and weighed. The drying was continued at 150°C and weighed at 1 h interval. When the weight of the sample became constant, the loss in weight and the percentage of loss on drying were calculated [18].

2.2.4 Ash values

The total ash, water soluble ash, sulphated ash, acid insoluble ash values were determined as per Trease and Evans (1983) [16].

3. Result

3.1 Physico-chemical analysis of entire plant parts of *Ludwigia perennis* L.

3.1.1 Organoleptic character

The plant powder showed that the colour, odour and taste (Table 1). The powder is brownish Yellow colour, odourless and tasteless.

Table 1: Organoleptic characters of entire plant powder of *Ludwigia perennis* L.

S. No.	Characters	Observation
1.	Colour	Brownish Yellow
2.	Odour	Odourless
3.	Taste	Tasteless

3.1.2 Fluorescence behavior of entire plant powder of *Ludwigia perennis* L. with chemical reagents

Fluorescence behavior of entire plant powder with chemical reagents under visible light, day light and ultra violet light (254 nm and 365 nm) has been resulted in the table 2. The behavior of plant powder (Pale brown; dark brown; black; black), powder with 1N NaOH in water and ethanol (reddish; brown; black; black), powder with 1N HCL (dark reddish; brown; black; pale green), powder with 50% H_2SO_4 (black colour under all lights), powder with 50% HNO_3 (pale brown; brown; brown; green), powder with picric acid (brow; brown; green; black), powder with ferric chloride (pale brown; pale green; pale green; dark green), powder with HNO_3 and NH_3 (dark green; dark green; dark green; black) were observed.

Table 2: Fluorescence behaviour of entire plant powder of *Ludwigia perennis* L. with chemical reagents

S. No.	Reagent + Chemical reagents used	Behaviour of plant powder			
		Visible Light	Day Light	Ultra Violet	
				254 nm	365 nm
1.	Powder	Pale Brown	Dark Brown	Black	Black
2.	Powder + 1N NaOH in water	Reddish	Brown	Black	Black
3.	Powder + 1N NaOH in ethanol	Reddish	Brown	Black	Black
4.	Powder + 1N HCL	Dark Reddish	Brown	Black	Pale Green
5.	Powder + 50% H_2SO_4	Black	Black	Black	Black
6.	Powder + 50% HNO_3	Pale Brown	Brown	Brown	Green
7.	Powder + Picric acid	Brown	Brown	Green	Black
8.	Powder + Ferric chloride	Pale Brown	Pale Green	Pale Green	Dark Green
9.	Powder + HNO_3 + NH_3	Dark Green	Dark Green	Dark Green	Black

3.1.3 Fluorescence of entire plant powder of *Ludwigia perennis* L. with extracts

Fluorescence of entire plant powder of *Ludwigia perennis* L. with different extracts under day light, short UV and long UV were resulted in table 3. The plant powder with ethanol extract (green; pale green; pale pink), powder with methanol (green; pale green; dark pink), powder with hexane extract (very pale green; green; dull green), powder with water extract (green; pale green; pale green) were observed.

Table3: Fluorescence of entire plant powder of *Ludwigia perennis* L. with extracts

S. No.	Extracts	Behaviour of plant powder		
		Day Light	Short UV	Long UV
1.	Ethanol	Green	Pale Green	Pale Pink
2.	Methanol	Green	Pale Green	Dark Pink
3.	Hexane	Very Pale Green	Green	Dull Green
4.	Water	Green	Pale Green	Pale Green

3.1.5 Physico- chemical values of entire plant powder of *Ludwigia perennis* L.

Physicochemical parameters of entire plant powder of *Ludwigia perennis* L. contain 1.98 % moisture, 13.45 % total ash, 56.7 % water soluble ash, 14.56 % sulphated ash and 10.32 % acid soluble ash shown in the table 4.

Table 4: Physico- chemical values of entire plant powder of *Ludwigia perennis* L.

S. No.	Parameters	Values obtained in percentage
1.	Moisture	1.98 %
2.	Total ash	13.45 %
3.	Water soluble ash	56.7 %
4.	Sulphated ash	14.56 %
5.	Acid soluble ash	10.32 %

4. Discussion

Similarly Sundar and Justin (2016) [19] selected the whole plant of *Solanum virginianum* for physicochemical. The physicochemical properties such as loss on drying (5.6%), total ash value (13.54%), acid insoluble ash value (4.25%), water soluble ash value (12.35%), alcohol soluble extractive value (8.5%), water soluble extractive value (23%) and petroleum ether soluble extractive value (4.2%) were carried out. The fluorescent analysis was carried out by using different chemicals powder of the plant is green; powder with 1N Sodium hydroxide in methanol (Deep Green); Powder with 1N Sodium hydroxide in water (Light Green); Powder with 50% Hydrochloric acid (Blackish green); Powder with 50% Sulfuric acid (Light green); Powder with 50% Nitric acid (Green); Powder with Petroleum ether (Deep green); Powder with Chloroform (Dark Green); Powder and Picric acid (Yellowish Green); Powder with 5% Ferric chloride solution (Brownish Green); Powder with 5% Iodine solution (Reddish Brown); Powder with Methanol (Deep Green); Powder with Nitric acid and ammonia (Light Green) respectively.

Ganesh and Fahim [19] evaluated physicochemical investigation of root bark of *Caesalpinia bonducella* results ash value determination as total ash 7.78 %; acid soluble ash 3.34 %; water soluble ash 6.16 %, extractive value determination revealed alcohol extractive value 8.78 %; water soluble extractive value 10.34 %, moisture content 8.53 to 10.96 % w/w. The physiochemical analysis of dried leaf powder of *Calotropis procera* showed the total ash, water soluble ash and acid insoluble ash as 13.44 %, 2.0 % and 0.86% w/w respectively [21].

5. Conclusion

The analysis on *Ludwigia perennis* revealed that the entire plant is rich Water soluble ash (56.7 %), and Moisture content.

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