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Phytochemical Screening of *Drynaria quercifolia* (L.) J. Sm.

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***Abstract*—** *The drug Drynaria quercifolia (L.) J. Sm. is a pteridophyte belongs to the family Polypodiaceae. Its rhizome is an ingredient in some formulations mentioned in regional traditional medicinal books of Kerala with the name Thudinthappala. Folklore system also utilizing its rhizomes and fronds in the form of food as well as medicine. For validating its traditional uses preliminary phytochemical analysis of its powdered rhizome was done in this study. In preliminary phytochemical analysis of ash, qualitative and quantitative analysis of extracts, estimation of phenol, tannin, volatile oil, fibre, sugar were done. Presence of alkaloids, saponins, flavonoids, tannins, steroids, phenols, carbohydrates, and proteins were revealed through this study. These phytochemicals may contributes to the therapeutic potency of this drug.*

***Keywords*—** *Drynaria quecifolia; rhizome; pteridophyte; phytochemical;traditional.*

I. INTRODUCTION

Medicinal plants plays important role in preventive as well as curative aspects of diseases. In countries like India, immense knowledge of medicinal plants is veiled in traditional and folk lore systems. Some such information are available in literature and others were passed from one generation to the next orally. Scientific validation of these knowledge is essential for incorporating them to the main stream medical system.

Drynaria quercifolia (L.) J. Sm. is a medicinal fern generally known as *pannalkizhangu* and is widely used by the traditional Ayurvedic practitioners in Northern parts of Kerala with the name *Thudinthappala*. Documented evidence regarding the medicinal use of its rhizome is available from the renowned medicinal text books in Kerala namely *Chikitsamanjari*[1] and *Yogamrutam*.[2] Botanical identity of the plant is available from the description given in *Hortus malabaricus*, a compilated work on the traditional uses of plant wealth in *Malabar* region of Kerala in 17th century.[3]

Even though there exists many regional traditional practices using the rhizome of this plant, only limited data is available about its phytoconstituents and pharmacological activities. In order to prove its medicinal values scientifically, its phytochemical picture should be revealed. The present study was done for preliminary phytochemical screening of powdered rhizome of *Drynaria quercifolia* (L.) J. Sm. to validate its therapeutic potential.

II. MATERIALS AND METHODS

A. Collection and preparation of the drug

The plant *Drynaria quercifolia* (L.) J. Sm. was positively identified and collected from Vadakara village of Ernakulam district, Kerala during the month of July. After removing debris and fronds its rhizome was washed thoroughly in water. Hairs on its outer surface were removed using sterile knife and it was then cut into small pieces and dried under the shade. Dried rhizome was then powdered and passed through sieve of 120 mesh size to get it in fine powder.

Phytochemical analysis was done at drug standardization unit of Department of Dravyaguna vijananam, Government Ayurveda College, Tripunithura, Eranakulam.

B. Reagents used

Dilute and concentrate sulphuric acid, dilute and concentrate hydrochloric acid, dilute and concentrate nitric acid, xylene, potassium permanganate solution, sodium hydroxide solution, lead acetate solution, ammonium molybdite solution, gelatin solution, sodium bicarbonate, sodium oxalate crystal, copper sulphate, methylene blue reagent, indigo carmine reagent, Drangendroff's reagent, Meyer's reagent, Benedict's reagent, Folin-cio-calteu reagent, Fehling solution A and B, picric acid, and magnesium ribbon.

C. Apparatus used

Silica crucible, round bottom flask, conical flasks, standard flasks, Soxhlet apparatus, Dean and Stark's apparatus, Clevenger apparatus, pH meter, Bunsen burner, hot air oven, muffle furnace, heating mantle, measuring jars, glass beakers, pipette, burets, glass rods, test tubes, watch glass, petri dishes, glass lids, glass beads, and Whatman filter paper.

D. Procedure

Physicochemical parameters

The powdered rhizome of *Drynaria quercifolia* (L.) J. Sm. was studied for the quantitative estimation of physicochemical parameters such as foreign matter, total ash, acid insoluble and water insoluble ash, moisture content, volatile oil, fibre, tannin, phenol, total and reducing sugar, and pH.

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Qualitative analysis of ash

The ash obtained from the rhizome powder of the plant was subjected to qualitative analysis to check the presence or absence of acid radicals such as carbonate, phosphate, sulphate and chloride and basic radical of potassium.

Determination of Extractive values

The cold water soluble, hot water soluble, cold alcohol soluble, and hot alcohol soluble extractive values of the powdered rhizome of *Drynaria quercifolia* (L.) J. Sm. was estimated in the study. Petroleum ether, cyclohexane, acetone, and alcohol were the solvents used for successive solvent extraction of the powdered rhizome of the drug.

Phytochemical parameters

Phytochemical constituents namely alkaloids, saponins, flavonoids, tannins, steroids, phenols, carbohydrates, and proteins were screened to detect the presence or absence of them in the powdered rhizome of *Drynaria quercifolia* (L.) J. Sm.

Presence or absence of alkaloids, flavonoids, steroids and phenols were also determined in the extracts obtained from solvents such as petroleum ether, cyclohexane, acetone and alcohol.

III. RESULTS

Results of the preliminary phytochemical study on powdered rhizome of *Drynaria quercifolia* (L.) J. Sm. are tabulated below.

TABLE I. Physicochemical parameters of powdered rhizome of *Drynaria quercifolia* (L.) J. Sm.

Sl no	Parameter	Rhizome of *Drynaria quercifolia* (L.) J. Sm.
1.	Foreign matter	0
2.	Total ash	6.4 %
3.	Acid insoluble ash	2.5 %
4.	Water insoluble ash	1.55 %
5.	Moisture content	15.98 %
6.	Volatile oil	0
7.	Fibre	37.30%
8.	Tannin	28.5 %
9.	Phenol	63.13 %
10.	Total sugar	12.92 %
11.	Reducing sugar	4.18 %
12.	pH	5.97

TABLE II. Qualitative analysis of ash of powdered rhizome of *Drynaria quercifolia* (L.) J. Sm.

Sl No	Experiment	Ash of powdered rhizome of *Drynaria quercifolia* (L.) J. Sm.
Acid radicals		
1.	Carbonate	+
2.	Phosphate	+
3.	Sulphate	+
4.	Chloride	-
Basic radical		
5.	Potassium	-

TABLE III. Extractive values (water soluble and alcohol) of powdered rhizome of *Drynaria quercifolia* (L.) J. Sm.

Sl No.	Type of extractive	Powdered rhizome of *Drynaria quercifolia* (L.) J. Sm.
1.	Cold water soluble extractive	5.36 %
2.	Hot water soluble extractive	12.20 %
3.	Cold alcohol soluble extractive	4.26 %
4.	Hot alcohol soluble extractive	6.20 %

TABLE IV. Extractive values (in different solvents) of rhizome of *Drynaria quercifolia* (L.) J. Sm.

Sl No.	Solvent	Powdered rhizome of *Drynaria quercifolia* (L.) J. Sm.
1.	Petroleum ether	3.82 %
2.	Cyclohexane	5.98 %
3.	Acetone	3.72 %
4.	Alcohol	15.38 %

TABLE V. Qualitative phytochemical analysis of rhizome of *Drynaria quercifolia* (L.) J. Sm.

Sl No.	Experiment	Powdered rhizome of *Drynaria quercifolia* (L.) J. Sm.
1.	Alkaloids	
	a. Dragendroff's test	+
	b. Meyer's test	+
2.	Saponins	+
3.	Flavonoids	+
4.	Tannins	
	a. Ferric chloride test	+
	b. Lead acetate test	+
5.	Steroids	+
6.	Phenols	
	a. Ferric chloride test	+
	b. Lead acetate test	+
7.	Carbohydrates	
	a. Fehling's test	+
	b. Benedict's test	+
8.	Proteins	+

TABLE VI. Qualitative phytochemical analysis of extracts of powdered rhizome of *Drynaria quercifolia* (L.) J. Sm.

Sl no	Extracts	Alkaloids	Flavonoids	Steroids	Phenols
1.	Petroleum ether	-	-	-	+
2.	Cyclohexane	+	+	+	+
3.	Acetone	+	+	+	+
4.	Alcohol	-	+	+	+

IV. DISCUSSIONS

Phytochemical evaluation helps in the determination of quality and purity of any drug. In this determination of foreign matter and ash value gives us an idea about earthy matter or inorganic composition and other impurities present along with the drug, whereas acid insoluble ash value specifically indicates siliceous impurities in the sample.[4]In the present study no foreign matter were found on analysis of the drug. The percentage of total ash, acid insoluble and water insoluble ash were 6.4 %, 2.5% and 1.55 % respectively. The moisture content of a drug is the factor responsible for decomposition of the drugs, either by producing chemical change or by microbial growth.[5]So the moisture content of the drug was determined and the value was 15.98 %. The result of total ash, acid insoluble ash and moisture content were comparable with results of Vikas Vaidya et al.[6] Qualitative analysis of ash obtained from the powdered drug performed in this study showed the presence of carbonates, phosphates, sulphates and absence of chloride and potassium. But as of now there is no data available on assessment of these parameters to compare this results.

Quantitative estimation of phytochemicals such as flavonoids, saponins, phenols, tannin and alkaloids were done by B Padma Selvi et al using the methanolic extract of the rhizome.[7]In our study quantitative estimation of powdered

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drug for phenol and tannin were done and the result was 63.13 % and 28.5% respectively. These results found were less as compared to the previous research works. This may be due to the changes in secondary metabolites of plants according to seasonal and geographical variations.[8]In this study the quantitative estimation of flavonoids, saponins and alkaloids were not performed. In the present study the results of quantitative estimation of volatile oil, fibre content, total sugar and reducing sugar were 0, 37.3%, 12.92% and 4.18% respectively. There is no available previous research works that determined these parameters quantitatively. The present study also have done the pH determination of the powdered drug which helps to determine the acid content in the drug and the result obtained was 5.97 which shows the acidic nature of this rhizome powder.

Extractive values by different solvents are used to assess quality, purity and to detect adulteration due to exhausted and incorrectly processed drugs.[8] Drugs contain a number of constituents and they have selective solubility in different solvents. Four research works quantitatively determined the cold alcohol soluble and cold water soluble extractives. In the present study these two were analyzed and the results were 4.26% and 5.36 % respectively and were comparable with the results of previous research work by Vikas Vaidya et al.[6] In addition to this hot alcohol and hot water soluble extractives were determined in this study and the result were 6.20 % and 12.20 % respectively.

For successive solvent extraction petroleum ether, chloroform, methanol, ethyl acetate, ethanol and water were the solvents used in previous available research works. In the present study petroleum ether, cyclohexane, acetone and alcohol were the solvent used and the result obtained were 3.82 %, 5.98%, 3.72% and 15.38 % respectively. Out of the three researches on successive solvent extraction the results in the present study was comparable with results of Prakash G Korwar et al.[9] A comparison of extraction yield in different extraction solvents showed that solvent type had a significant effect on the extraction yield, where acetone maintained the lowest percentage of extract (3.72%) and alcohol maintained the highest (15.38%). There is no available data to compare the results of extractive value obtained from solvents such as cyclohexane and acetone.

For qualitative analysis previous researchers used petroleum ether, chloroform, ethyl acetate, ethanol, methanol, and water extracts of rhizome. They determined the presence or absence of alkaloids, flavonoids, saponins, carbohydrate, proteins, phenol, steroids, tannins, terpenoids, fixed oil and fat, gum and mucilage, coumarins, glycosides, lignins, and cholinergic acids. In present study alcoholic extract of powdered drug was used to determine the presence of alkaloids, flavonoids, phenol, and steroids and aqueous extract was used to determine the presence of saponins, carbohydrates, proteins, and tannins. All the results obtained were same as that of the previous research work done by Janardhanan L et al.[10] The qualitative evaluation of successive solvent extractives were done using solvents such as petroleum ether, cyclohexane, acetone, and alcohol. Result revealed the presence of steroids and flavonoids in all except petroleum ether extract and alkaloids in cyclohexane and acetone extracts. Phenol was present in all the four types of extract of the powdered drug. There is no available previous works to compare these results.

V. CONCLUSION

Rhizome of *Drynaria quercifolia* (L.) J. Sm. is an ingredient in some traditional and popular *Ayurvedic* formulations like *Ellumnisadi choorna*. Folk lore practitioners also uses this drug in various diseases. The phytochemical evaluation of this drug helps to reveal the presence of valuable phytoconstituents that substantiates its therapeutic potency.

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