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## Research Article

### PHARMACOGNOSTIC AND PRELIMINARY PHYTOCHEMICAL EVALUATION OF *NELAMUCHCHALA (GYMNOSTACHYUM FEBRIFUGUM BENTH.)*

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#### ABSTRACT

Folklore medicine is an integral part of Ayurveda. *Nelamuchchala (Gymnostachyum febrifugum Benth)* is one such drug which is traditionally used for fever, ulcers, Cough and metrorrhagia. **Aim:** The present study deals with Pharmacognostic, determination of Taste and preliminary Phytochemical investigations of root. **Materials and Methods:** The study includes microscopy, Physical analysis, determination of taste and preliminary phytochemical evaluation using methods given in Indian Ayurvedic Pharmacopoeia and Pharmacognosy by Dr. Khandelwal K.R. **Results and Discussion:** The microscopic structure of root shows as Polyarch vascular bundles, central large thick walled parenchymal pith and presence of calcium oxalate crystals in parenchymal cell of cortex. The preliminary phytochemical analysis revealed the presence of carbohydrates, flavanoids, phenol and steroids in various solvent extracts. The pH of the drug was 6.50. The ash analysis revealed the presence of fluoride, sulphate, chromate and aluminium. *Tikta* and *Kashaya rasa* determined by taste with tongue followed by 'blind method'. Thin Layer Chromatography (TLC) was carried out after organising the appropriate solvent system, in which three spots of phenols were distinguished. The Rf value are 0.1702, 0.2638 and 0.5361. **Conclusion:** The result of the present study can be useful for the identification and preparation of a monograph of the plant. Observations could be considered to be the reference standards in future studies.

#### INTRODUCTION

The use of plants in medicine is as old as mankind itself. Many drugs invented by sages have their therapeutic uses since long ago. Ethenotherapeutics is gaining much important in recent days. The knowledge about plants has been exchanged with neighbouring peoples. So medicinal plant play an important role in drug development.

*Nelamuchchala (Gymnostachyum febrifugum Benth* Family: Acanthaceae, ) is a herb widely used in the ethnomedical practices. The root of this herb is still used by folklore practitioners of Dakshina kannada district if Karnataka for fever, indigestion, headache, Metrorrhagia, Purpureal fever etc.

The drug *Nelamuchchala (Gymnostachyum febrifugum Benth)* is a steles herb .

**Root:** is tap-root, 2inch long. Leaf- is sub radical, 16.5 by 7.5 ovate, decurrent on the petiole.

**Inflorescence:** is terminal spike 15-30cms long; **Flowers:** are sub sessile and zygomorphic bisexual, petals-5, sepals-5, Androecium -2 Stamens free, gynoecium - bicarpellary, placentation – axile, **fruit** – capsule 2.5cms long.

The references of this herb are not available in Samhitha and Nighantu but available in modern books like Indian Medicinal Plants<sup>[1]</sup>, Indian Materia medica<sup>[2]</sup> and Wealth of India<sup>[3]</sup>. These book only document the *Antipyretic* and wound healing action but not on Pharmacognostical and phytochemical parameters. Hence this drug *Nelamuchchala (Gymnostachyum febrifugum Benth)* is taken for the present study.

**MATERIALS AND METHODS**

- **Collection of plant material**

Botanically identified authentic sample of roots of *Nelamuchchala* (*Gymnostachyum febrifugum Benth*) were collected locally from Sullia Taluk, Dakshina Kannada, District in Karnataka<sup>[4]</sup>. Pharmacognostical study was carried out in department of Dravya Guna vijnan of Alva's Ayurveda Medical College, Moodabidri, D.K.

- **Microscopic study**

The root of the plant was subjected for microscopic study. Free hand transverse section of root was taken and cleared with chloral hydrate solution and water, stained with fluouclacinal HCL (1:1) and Iodine.<sup>[5]</sup>

- **Determination of taste**

The taste with tongue method was followed.<sup>30</sup> Healthy volunteers from Ayurvedic faculty who may not make mistakes in expressing the rasa they perceive were selected. They were asked to wash and clean their mouth. After five minutes gap 5 grams of powder was served to these volunteers and asked to taste the powder and to record the pradhana rasa (primary taste) and anu rasa (Secondary taste) they feel<sup>[6]</sup>. The taste which is perceived immediately considered as pradhana rasa and later as anurasa.<sup>[7]</sup>

- **Physico- chemical analysis**

The dried roots of *Nelamuchala* (*Gymnostachyum febrifugum Benth*) was powdered and subjected to various analysis. Physico-chemical and Phytochemical screening were carried out as per the guldens given in Pharmacopoeia of India. Physico-chemical parameters such as Moisture contents (loss on drying at 105<sup>0</sup>), Total ash value, Acid insoluble ash, Water soluble ash, pH values were determined.

The extracts obtained from various solvent like Aqueous, Methanol, Petroleum ether and Chloroform. For total extracts value of these extracts evaporated to dryness on a water bath. After cooling the contents of the extractable matter is calculated in percentage w/w per gm. of air dried material. Preliminary chemical tests were carried out of Aqueous, Methanol, Petroleum ether and Chloroform extracts for detection of phytochemical constituents. Inorganic analysis of ash carried out and determines the various inorganic contents<sup>[8]</sup>.

The Methonolic extract of the drug was subjected to thin layer chromatographic analysis. The solvent system employed for resolution of Phenol on thin layer chromatographs are solvents media- Butonal: Acitic acid: Water-[4:1:5] ratio and developing reagent used was phenol reagent (FCR). The qualitative evaluation of the plate was done by determining the Rf value of different spots visualised under U.V light<sup>[9]</sup>



1. Root of *Nelamuchchala*



2 . Whole Plant



3. Flower and Fruit

Results

Table No. 1 Determination of taste

Rasa	Pradhana rasa	Anurasa
Tikta	29	1
Kashaya	-	23
Madhura	-	6
Katu	1	-

Fig 1 The observation of taste determination

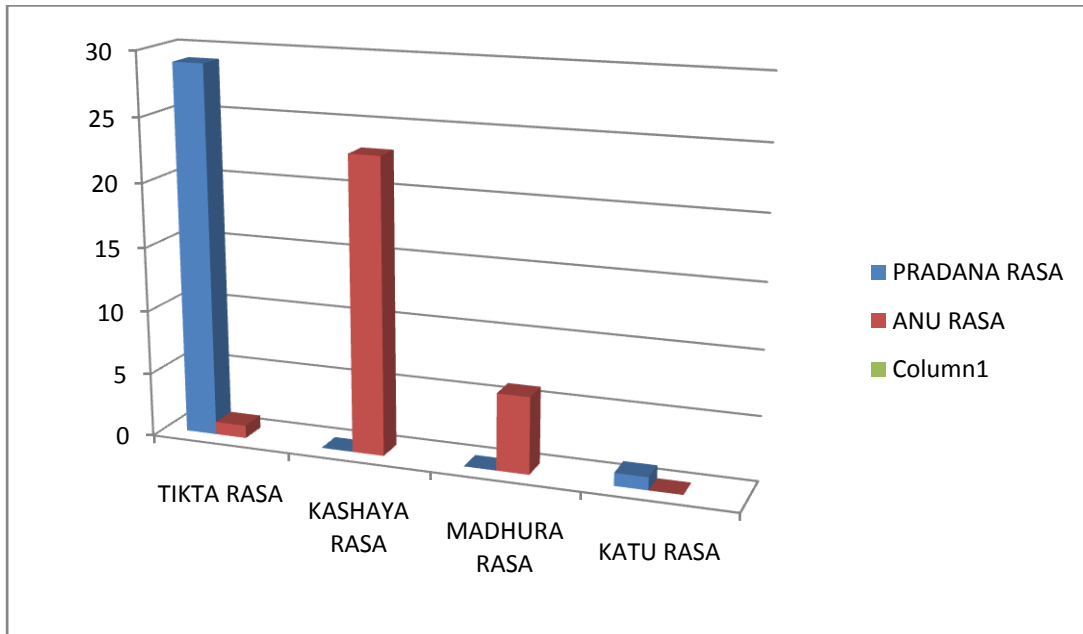
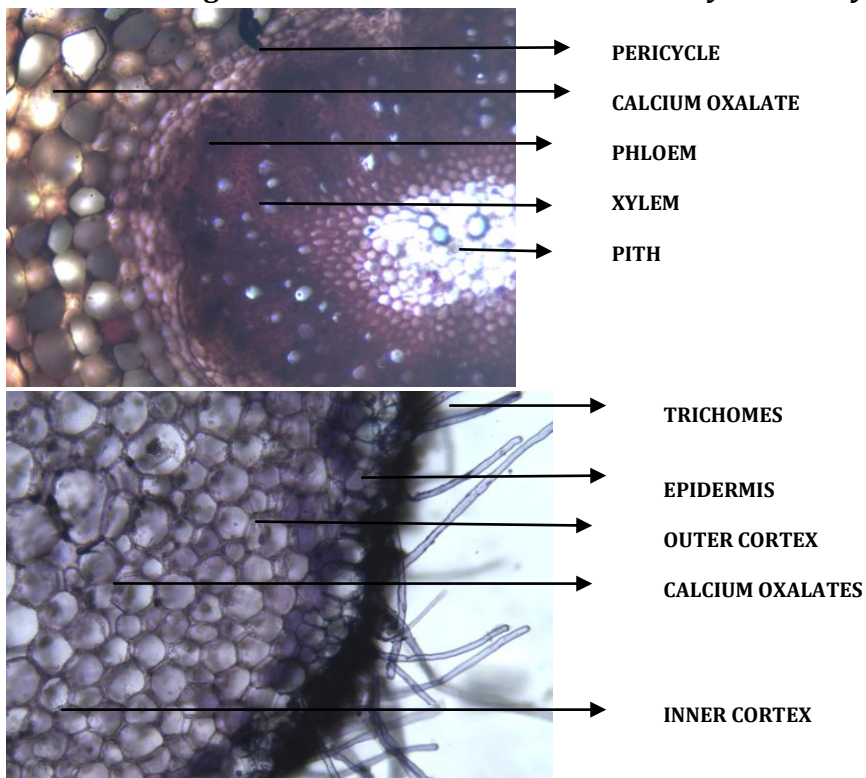


Fig 2 Transverse section of the root of *Gymnostachyum febrifugum* (Benth).



## Observations & Results

### Microscopy Structure

The T.S of fresh root shows a zone of Epidermis which is outer most layers of thin walled tangentially rectangular cells. Some cells of epidermis prolong out into a unicellular hairs. Cortex: Cortex is differentiated into outer cortex and inner cortex. Outer cortex consists of many layers of thin walled, uniformly, rounded parenchyma cells with intercellular spaces between them. Some cells contain calcium oxalate crystals. Inner cortex Consists of 5-6 layers of radially and uniformly arranged rectangular cell. Endodermis is a single ring like layer of cells which are Barrel shaped. Pericycle is a layer of small and thin walled cells. Vascular bundles are radial, polyarch and exarch. It contains nine protoxylem points arranged alternate to phloem. Pith is in the centre is large and thick walled.

### Phytochemical analysis

**Table No. 2 Physical Analysis Parameters**

Sl.No.	Parameter	Sample- Root (% w/w)
1.	Moisture	9.00%
2.	Total ash	6.00%
3.	Acid insoluble ash	1.500%
4.	Water soluble ash	4.00%
5.	pH Value	6.50%

**Table No.3 The physical characters of the extracts**

Sl no.	Solvent extracts	Colour	Consistency	Odour	%w/w
1.	Aqueous	Deep green	Waxy	characteristic	5.00%
2.	Methonal	yellowish	Semisolid	characteristic	0.25%
3.	Petroleum ether	Slight yellow	Solid	characteristic	0.08%
4.	Chloroform	Slight yellowish green	Semisolid	characteristic	0.017%

**Table No.4 The results of the preliminary chemical analysis**

Sl. No.	Name of the tests	Results in various extracts			
		A	M	C	P
1.	Proteins test a) Biuret test	-	-	-	-
2.	Carbohydrate test a) Benedicts test (Reducing sugar) b) Benedicts test (Non- reducing sugar)	+ - -	- - -	- + -	- - -
3.	Tannins test a) 3% FeCl <sub>3</sub> solution b) Lead acetate solution	+ +	+ +	- -	- -
4.	Saponin (foam test)	-	-	-	-
5.	Flavanoids (Shinoda test)	+	+	+	+
6.	Phenols	-	+	-	-
7.	Steroids (Salkwiski's test)	+	+	+	+
8.	Alkaloids a) Mayers test b) Hagers test	- -	- -	- -	- -

A- Aqueous, M-methanol, C-Chloroform, P- Petroleum,  
Present - (+), Absent - (-)

Table No. 5 Results of ash analysis

Sl. No.	Components	Result
1.	Carbonates	Absent
2.	Fluorides	Present
3.	Chlorides	Absent
4.	Sulphate	Present
5.	Chromate	Present
6.	Phosphate	Absent
7.	Potassium	Absent
8.	Sodium	Absent
9.	Aluminium	Present
10.	Calcium	Absent

### TLC Profiles

Table No. 6 TLC: RF value of Different Spots Visualized Under U.V. light

Solvent media	Type of Extract	Number of spots	Rf value
Butanol : Acetic acid : water - 4:1:5	Methanol	S1	0.1702
		S2	0.2638
		S3	0.5361

Solvent media -Butanol: Acetic acid : water - 4:1:5

Developing reagent used was phenol reagent (FCR). It shows three types of phenol compounds.

### DISCUSSION

The evaluation of a crude drug is an integral part of establishing its correct identity. Before using any medicinal herb, Pharmacognostical parameters and standards must be established. Therefore some diagnostic features have been evaluated for identifying root of *Nelamuchchala* (*Gymnostachyum febrifugum* Benth).

The important microscopic features of root shows some special characters are epidermis with unicellular hairs, cortex is differentiated into outer and inner cortex, polyarch vascular bundles, central large pith and calcium oxalate crystals in parenchyma cells of cortex.

The voluntary trail for assessment of Taste reveals presence of *Tikta* and *Kashaya rasa*. This drug has *Pradhana rasa* as *Tikta* and *Kashaya* as *Anurasa*. As per general rule the qualities of *Nelamuchchala* (*Gymnostachyum febrifugum* Benth) can be *Laghu* and *Ruksha*. Because Acharya Charaka state that of *Laghu*, *Ruksha* are the qualities of *Tikta rasa*.<sup>[10]</sup>

It has a pH of 6.50. The preliminary phytochemical analysis carried out by using different solvents like Methonal, Aqueous, Petroleum ether and Chloroform. Study revealed that, the presence of carbohydrates, flavonoids, phenols and steroids in

the root. T.L.C Profile of methanol extract showed three groups of phenolic compounds and Rf values are 0.1702, 0.2638, 0.535. The ash analysis was done for the detection of minerals it showed presents of sulphate, aluminium, fluorides and chromate. Thus Pharmacognostical and phytochemical screening can serve as a basis for proper identification, collection and investigation of plants.

### CONCLUSION

The available textual information regarding the herb *Nelamuchchala Gymnostachyum febrifugum* (Benth) is very minimum and inadequate. It is essential to do pharmacognostical and phytochemical analysis for standardization. The macroscopic, microscopic standards and physico chemical screening which are obtained can be used for the identification of this herb. The current study and facts obtained may act as stepping stones for further research in the field of medicine.

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