



Qualitative and Quantitative Analysis of Fruits of *Neolamarckia Cadamba* (Roxb.)

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ABSTRACT

Cadamba is an important medicinal plant used to treat various diseases like fever, anemia, diabetes and many others. *Neolamarckia cadamba* (Roxb.) is a medium sized plant which belongs to the family of Rubiaceae and found everywhere in India. The present study deals with the comparative phytochemical analysis of ripe and unripe fruits of cadamba, where qualitative analysis was done to know the presence of various compounds whereas the quantitative analysis was done to evaluate the concentration of them. Experiments were carried out by using four solvents for the extractions i.e. chloroform, ethanol, methanol and distilled water and showed presence of carbohydrates, proteins, alkaloids, flavonoids, saponins and anthracene glycosides. Generally, most of the phenolic compounds are linked to other compounds like proteins, cellulose, lignin and etc. and responsible for many biological activities such as antioxidant, anti-microbial, anti-inflammatory, anti-tumor and many others, hence the study undergone for quantitative analysis in terms of phenol. Result for phenolic content revealed that methanol extract contains higher phenol level. The concentration of phenol in ripe and unripe fruits remains in between the range 0.0109-0.004086 and 0.009637-0.003535 mgGAE/g respectively. The order of the total phenol content was chloroform < distilled water < ethanol < methanol.

Keywords: *Neolamarckia Cadamba*, *Cadamba*, Qualitative Analysis, Quantitative Analysis.

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INTRODUCTION

Neolamarckia cadamba (Roxb.) is one of the important medicinal plants found in all parts of India. It is also known as wild cinchona in English. *Cadamba* is a medium sized plant belongs to Rubiaceae family mainly found at low levels in wet places [1,2]. It takes 6-8 years for flowering and grows upto 45 cm in height. The trunk has diameter of 100-160 cm. Leaves are 13-32 cm long, glossy green, opposite and simple. They are more or less sessile to petiolate, oval to elliptical. Flowers are bisexual and funnel shaped, sweetly fragrant and red to orange in color. Fruits are less numerous with their upper parts containing 4 hollow or solid structures [3,4]. Seeds are trigonal and irregular shaped. Bark is grey, smooth in young trees and rough in old ones. Phenolics in plants are mostly synthesized from phenylalanine via the action of phenylalanine ammonia lyase. They are classified into phenolic acid, flavonoid polyphenolics (flavones, flavonones, xanthones and catechin) and non-flavonoid polyphenols. Phenolics are largest found and most widely distributed phytochemical, which act as a defence provider, natural antioxidants, anti-inflammatory agent to the plants [5,6]. It is commonly known as *Cadamba*. *Cadamba* is a large tree with broad umbrella-shaped crown and straight cylindrical ball. Phytochemical investigation of different parts of *Neolamarckia cadamba* (Roxb.) showed presence of Alkaloid, Saponins, Flavonoids, Glycosides Traditionally used as: Anti-diuretic, Anti-anemic, Anti-diabetic [7,8]. The aim of the study was to investigate comparative phytochemical analysis of ripe and unripe fruits of *Neolamarckia cadamba* (Roxb.) [9].

MATERIAL AND METHODS

Plant Material:

Fresh ripe and unripe fruits of *Neolamarckia cadamba* (Roxb.) were collected from the local botanical garden. The plant was authenticated from St. Xavier's College with the Blatter Herbarium Specimen Number 116 of Y. A. Merchant.



Figure No. 01: Fresh Unripe and Ripe fruit of *Neolamarckia cadamba* (Roxb.)

Preparation of *Neolamarckia cadamba* (Roxb.) extract:

1. Collected ripe and unripe fruits were washed with water and crushed for the further use of extraction with solvents having different polarities.
2. Four different solvents such as chloroform, ethanol, methanol and distilled water were used for the extraction using Maceration method. The different extracts were concentrated with electric water bath at temperature at 45°C [10,11].

QUALITATIVE ANALYSIS

Phytochemical Analysis:

Basic phytochemical screening was carried out using simple chemical test to detect the presence of secondary plant constituents such as alkaloids, tannins, flavonoids, saponins, and glycoside etc [12].

QUANTITATIVE ANALYSIS

Analysis of Total Phenolic Content, Total Tannin Content, Total Flavonoid Content by standard methods.

RESULTS AND DISCUSSION

RESULTS OF QUALITATIVE ANALYSIS

Phytochemical analysis

Table No.01: Preliminary Phytochemical screening

	Methanol Extract		Ethanol Extract		Chloroform Extract		Water Extract	
	Ripe	Unripe	Ripe	Unripe	Ripe	Unripe	Ripe	Unripe
Carbohydrate								
Molisch's test	+	-	+	-	-	-	-	-
Fehling test	+	-	+	-	-	-	-	-
Protein								
Biuret test	+	+	+	+	-	-	-	-
Millon test	+	+	+	+	-	-	-	-
Anthraquinone Glycoside	+	+	+	+	-	-	-	-
Flavonoids								
Shinoda test	+	+	+	+	-	-	-	-
Alkaline test	+	+	+	+	-	-	-	-
Alkaloid								
Dragendorff's test	+	+	+	+	-	-	+	+
Mayer's test	+	+	+	+	-	-	+	+
Tannins								
FeCl ₃ test	+	+	+	+	+	+	+	+
Lead Acetate test	+	+	+	+	+	+	+	+
Volatile Oil								
Vanillin Sulphuric Acid test	+	+	+	+	+	+	-	-
Saponins								
Lieberman Burchard test	+	+	+	+	+	+	-	-
Salvoski test	+	+	+	+	+	+	-	-
Foam Test	-	-	-	-	-	-	-	-

RESULTS OF QUANTITATIVE ANALYSIS

Estimation of total Phenolic content:

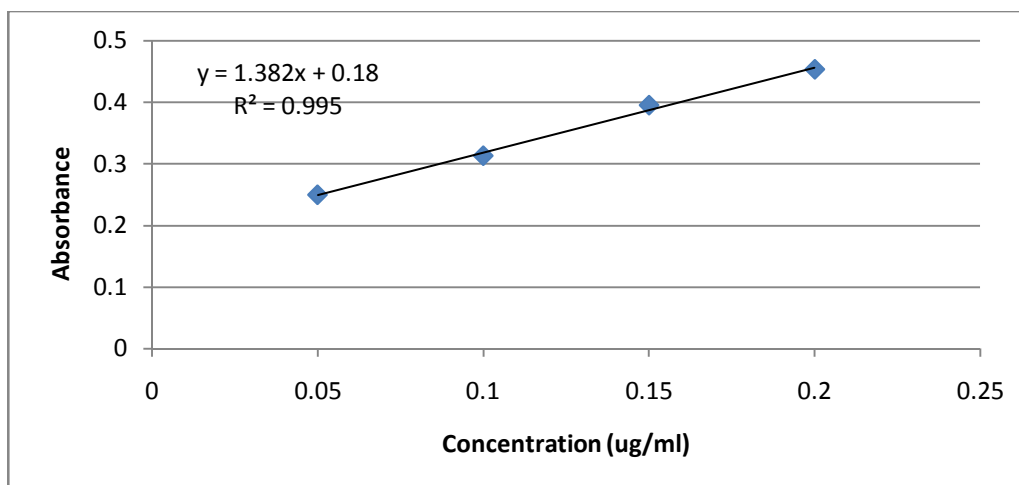
Quantitative analysis for phenol

Table No.02: Absorbance of standard gallic acid at 760nm

Sr No.	Concentration (µg/ml)	Absorbance
Standard Gallic acid		
1	0.05	0.216
2	0.1	0.313
3	0.15	0.395
4	0.2	0.453

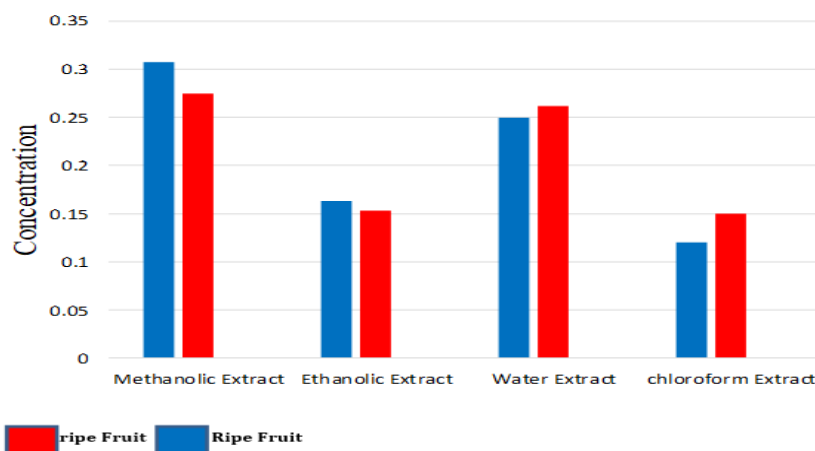
Table No.03: Absorbance of Different Sample Extract at 760nm

Sr No.	Sample		Total Phenolic Content (mg/g Gallic acid equivalent)
1	Ethanol Extract	Ripe	11.02
		Unripe	11.10
2	Methanol Extract	Ripe	19.25
		Unripe	18.033
3	Water Extract	Ripe	11.57
		Unripe	11.2
4	Chloroform Extract	Ripe	10.89
		Unripe	10.05



Graph No.01: Standard curve of Gallic acid

Total Phenolic Content of different extracts of *Neolamarckia cadamba*.



Graph No.02: Comparative analysis of phenol content of different extract of *Neolamarckia cadamba*

Data shows the total phenolic contents of methanol extracts of *Neolamarckia cadamba* fruits. Total phenolic compounds were reported as Gallic acid equivalents by reference to a standard curve ($y=1.586x + 0.146$, $R^2 = 0.9879$). The concentration of phenol in ripe and unripe fruits remains in between the range of 10.89-19.25 and 10.5-18.033 mgGAE/g respectively. The order of the phenol content was chloroform < ethanol < distilled water < methanol. The results of total phenolic contents suggest that the plant may possess good antioxidant activity.

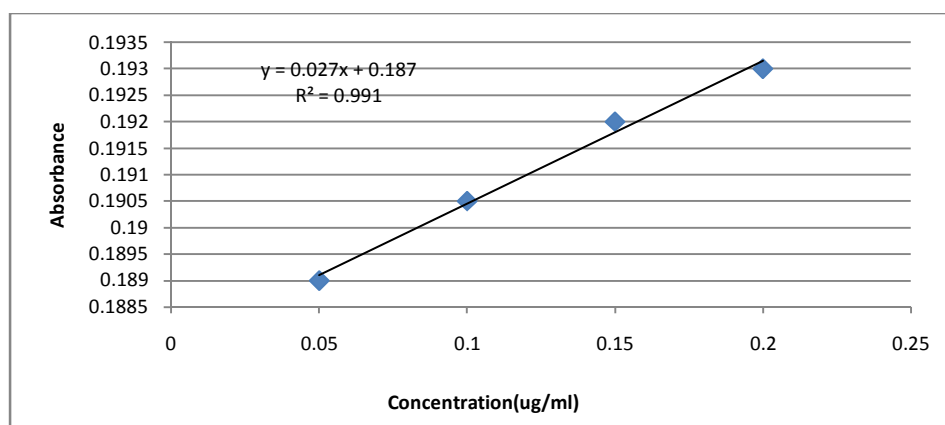
Estimation of Total Tannins Content:

Table No.04: Absorbance of different extract of fruits of *Neolamarckia cadamba* at 760nm

Sr No.		Concentration ($\mu\text{g/ml}$)	Absorbance
Standard			
1	Tannic acid	0.05	0.189
		0.1	0.191
		0.15	0.192
		0.2	0.194
Sample			
1	Ethanol	0.05	0.289
2	Methanol	0.05	0.247
3	Water	0.05	0.276
4	Chloroform	0.05	0.198

Table No.05: Total tannin content of different extract of fruits of *Neolamarckia cadamba* at 760nm

Sr No.	Extract	Concentration ($\mu\text{g/ml}$)	Tannin content- Tannic Acid Equivalent (mcg/ml)
1	Ethanol	0.05	3.17
2	Methanol	0.05	1.85
3	Water	0.05	2.76
4	Chloroform	0.05	0.32



Graph No.03: Standard curve of Tannic Acid

Quantitative analysis for Tannin revealed that chloroform extract contains higher flavonoid level. The concentration of tannins in leaves remains in between the range of 0.32 – 3.17 mcg/ml respectively. The order of the phenol content was **chloroform < Methanol < distilled water < Ethanol**.

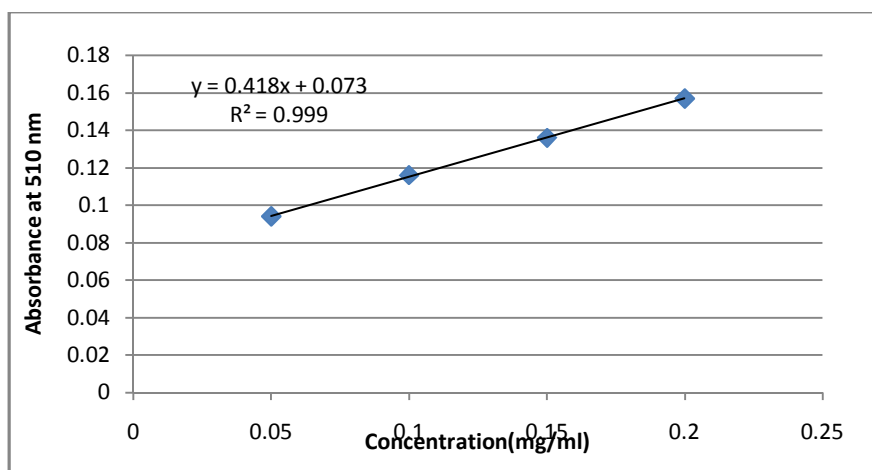
Estimation of Total Flavonoid Content:

Table No.06: Absorbance of Standard and different extract of fruits of *Neolamarckia cadamba* at 510 nm

Sr No.		Concentration ($\mu\text{g/ml}$)	Absorbance
Standard			
1	Quercetin	0.05	0.094
		0.1	0.116
		0.15	0.136
		0.2	0.157
Sample			
1	Ethanol	0.5	0.256
2	Methanol	0.5	0.239
3	Water	0.5	0.346
4	Chloroform	0.5	0.178

Table No.07: Total Flavonoid content of different extract of fruits of *N. cadamba* at 510 nm

Sr No.	Extract	Concentration ($\mu\text{g/ml}$)	Total Flavonoid content flavonoid equivalent (mcg/ml)
1	Ethanol	0.05	14.75
2	Methanol	0.05	15.4
3	Water	0.05	15.8
4	Chloroform	0.05	14.23

**Graph No.04: Standard curve of Quercetin**

Qualitative analysis revealed presence of carbohydrates, proteins, alkaloids, anthracene glycoside, flavonoids and saponin glycosides. Quantitative analysis for phenol revealed that methanol extract of ripe cadamba fruits contains higher phenol level. The concentration of phenol in ripe and unripe fruits remains in between the range of 0.0109-0.004086 and 0.009637-0.003535 mgGAE/g respectively. The order of the phenol content was Chloroform < Ethanol < Distilled water < Methanol. The Tannin Content ranges between 0.32-3.17 mcg/ml in order of Chloroform < Methanol < Distilled water < Ethanol. On the basis of present study we can conclude that *Neolamarckia Cadamba (Roxb.)* can efficiently utilized in the future evolving new dosage form as a Nutraceutical supplement having efficient and markable activity.

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