



## MORPHOLOGICAL AND PHYTOCHEMICAL CHARACTERIZATION OF MUSA BALBISIANA COLLA AND MUSA ACUMINATA COLLA

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### ABSTRACT

*Musa balbisiana Colla* and *Musa acuminata Colla* are two different species of banana which is a popular plant found in India and other Asian nations. This plant's parts are known to have medicinal and traditional benefits. The present study attempts to study the morphological and anatomical characteristics of both *Musa balbisiana Colla* and *Musa acuminata Colla*. Several sections of the plant have been found to have pharmacological characteristics, including antidiabetic, antibacterial, anticancer, and hepatoprotective characteristics, among others. *Musa balbisiana Colla* antibacterial and anti-diabetic capabilities have been extensively explored among its many pharmacological qualities. The main objective of the research is to extensively study the inflorescence part of both the plant and to find out its preliminary Phytochemical screening along with its antioxidant activity.

### INTRODUCTION

Bananas and plantains are herbaceous monocotyledonous plants that belong to the Musaceae family. Traditional medicines frequently use various components of the banana plant. Anti-inflammatory, anti-hyperglycemic, and antidiabetic activities have been identified in several *Musa* species. Bananas are one of the world's most important fruit crops, with a global yearly production of around 118 million tonnes in 2015. In several countries, parts of the banana plant are employed in traditional medicine. Several research have been carried out to examine the biological properties of *Musa* spp., including antibacterial, antiulcerogenic, galactagogue, anti-inflammatory, anti-

hyperglycemic, and antidiabetic properties, inhibitory effects of glucosidase and amylase, and antioxidant properties. Natural products have an essential part in the treatment of a variety of ailments as well as the development of new drugs. Plants have been employed in ethnomedicine to treat a variety of ailments, including diabetes, since ancient times. Herbal medicine is recognised to contain a wide range of therapeutically active botanicals. Plants are abundant in pharmacologically active chemicals that can be used to develop therapeutically effective treatments for a variety of diseases. Phytochemicals, such as phenols or their oxygen-substituted derivatives, such as tannins,

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are biologically active and valuable in the treatment of diseases and the preservation of well-being in humans and animals.

*Musa balbisiana* Colla, commonly known as banana, is native to India and other parts of Asia and has been utilized in folk medicine since a long time by the tribal people of North-east India. The root, stem juice, and ash of banana leaves are also utilized in venereal diseases and blood disorders and as an anthelmintic. It is one of the ancestors of modern cultivated bananas, along with *Musa acuminata*. It was first scientifically described in 1820 by the Italian botanist Luigi Aloysius Colla. It grows lush leaves in clumps with a more upright habit than most cultivated bananas. Flowers grow in inflorescences coloured red to maroon. The fruit are between blue and green. They are considered inedible because of the seeds they contain. It may be assumed that wild bananas were cooked and eaten or agriculturalists would not have developed the cultivated banana.



**Fig 1: *Musa balbisiana* Colla**

#### Scientific classification

Scientific name: *Musa balbisiana*

Kingdom: Plantae

Division: Angiospermae

Class: Scitaminae

Order: Zingiberales

Family: Musaceae

Genus: *Musa*

Species: *M. Balbisiana Colla*

**Local names: Assamese: Athiyakol, bhimkol**

#### *Musa acuminata* COLLA

*Musa acuminata* Colla, also known as the wild banana, is a tropical and subtropical plant. The health advantages of *Musa acuminata* have found a lot of attention in recent decades. Fruits, peels, pseudostems, corms, flowers, leaves, sap, and roots are all elements of the plant that have been used in traditional medicine to treat a variety of ailments. *Musa acuminata* is a seeded wild banana that belongs to the *Eumusa* section. It's where the great majority of edible bananas, including *M. balbisiana*, come from.

Most edible cultivars developed from *M. acuminata* (A genome, 591–615 Mbp) and *M. balbisiana* (B genome, 537 Mbp) arose as a result of female infertility or parthenocarpy. As a result of breeding with wild *M. acuminata* subspecies, triploid AAA cultivars emerged from these diploids. Human selection and hybridization of these diploid and triploid cultivars (*M. acuminata* cultivars with *M. balbisiana*) resulted in hybrid progeny with the genomes AB, AAB, ABB, AAAB, and so on. *Musa acuminata* has a wide range of distribution, with Malaysia being the main source of *M. acuminata* (AA and AAA cultivars). It later moved to India and Burma, where *M. balbisiana* is native. Natural hybridization of both *M. acuminata* and *M. balbisiana* happened in the Indo-Burman peripheral area, resulting in triploid AAA banana cultivars, and India is thus regarded as the principal centre of origin for more than 300 varieties of banana cultivars out of 600 types of *Musa* germplasm.



**Fig 2: *Musa acuminata* colla**

#### Taxonomically classification

Subkingdom Viridiplantae,

Division Tracheophyta,

Subdivision Spermatophytina,

Order Zingiberales,

Family Musaceae

**Local name: Assamese: chenikol**

#### **MATERIALS AND METHOD**

The major requirement used to perform the experimental work includes Ethanol purchased from Vibgyor Chemical Industries, Mumbai - 400003, Maharashtra, India, Other important test kits were purchased from SD. Fine chemical limited.

**Collection of Plant:** The *Musa balbisiana* Colla and *Musa acuminata* Colla were collected from the local market of bamunimaidan Guwahati, Kamrup district of Assam, India in the month of October. All the inflorescence part of both the plants are washed nicely with clean water and allowed for shade drying process for 10 days till its moisture is completely removed.

### Morphological Characterization

Bracts and flowers were measured and quantified (length and breadth). The plant material was characterized using morphological descriptors for inflorescences, including some descriptors from the International Plant Genetic Resources Institute for *Musa* spp.

**Preparation of Plant Extracts:** Extraction was carried out by maceration using ethanol (95%) solvent. Around 150 gm of both the species' fine powdered materials are soaked in 400ml ethanol for 2 days in a rotary shaker then filtration is done. The filtrates obtained were evaporated to dryness under vacuum using rotary evaporator (Buchi). These extracts of both the species *Musa balbisiana* colla and *Musa acuminata* colla banana flowers were then analyzed for preliminary phytochemicals screening and quantitative estimation.

### PHYTOCHEMICALS SCREENING TESTS

Preliminary phytochemicals screening for major secondary metabolites of the flower parts were carried out using standard qualitative methods as described by various researchers (Edeoga, Okwu, & Mbaebie, 2005; Kokate, 1999; Raaman, 2006).

The samples extracts were screened for the presence of bioactive compounds such as alkaloids, steroids, terpenoids, saponin, flavanoids, tannin and glycosides. Following test like Detection of alkaloids (Mayer's test, Dragendroff's test, Wagner's test, Hagers test), Detection of carbohydrates (Molisch's test, Fehling's test), Detection of proteins and amino acids (Biuret test, Millon's test), Detection of glycosides {Keller-killiani test (test for deoxy sugars), Borntrager's test (anthraquinone glycoside), Legals test}, Detection of saponin glycoside (froth formation test), Detection of phenols (Ferric chloride test, Lead acetate test), Detection of flavonoids (Alkaline reagent test), Detection of fixed oil (Spot test), Detection of tannins (Lead acetate test, Gelatin test, Ferric chloride test) were performed.

### QUANTITATIVE ESTIMATION OF MUSA BALBISIANA COLLA AND MUSA ACUMINATA COLLA

#### Estimation of Total Phenolic Content in Banana Flower Extracts

Total polyphenol content of the flower extracts were determined by Folin-Ciocalteu colorimetric method. 1mL of extracts were taken, to which 1mL of Folin-Ciocalteu reagent and 3mL of

7.5% Na<sub>2</sub>CO<sub>3</sub> were added, then the volume was made up to 10 mL with methanol: water (6:4). After 1 hour of incubation at room temperature, the absorbance was measured at 740 nm. The results were expressed as gallic acid equivalents per gram of extract

#### Determination of Total Flavonoid Content

It was measured by aluminum chloride colorimetric assay. An aliquot of extracts and the standard solution of quercetin were added to a 10mL volumetric flask containing 4ml of distilled water. 0.3 mL 5% NaNO<sub>2</sub> was added. After 5 minutes 0.3 mL 10% AlCl<sub>3</sub> was added. After 6 minutes, 2mL 1M NaOH was added and the total volume was made upto 10mL with water. Mixed well and the absorbance was measured against prepared reagent blank at 510 nm.

### RESULTS AND DISCUSSION

#### Result

Comparative morphological characteristics of *M. balbisiana* Colla and *M. acuminata* is represented in table 1. The extracts were subjected to phytochemical analysis of *Musa balbisiana* colla and *Musa acuminata* colla and the results are represented in the table 2.



























Determination of Total Polyphenolic Content (TPC) was done by Folin-Ciocalteu colorimetric method. The results showed that all the extracts of banana flower contains polyphenolic compound in varying amount. More amounts of polyphenols were present in ethanol extract.

**Total Flavonoid Content (TFC)** was estimated by aluminium chloride colorimetric assay. The flavonoid content is high in ethanol extract of banana flower (0.67%). The results are shown in table 3.

The phenolic and flavonoid contents in the extracts depend on the polarity of solvents used in the preparation of extracts. Phenolic compounds are secondary metabolites which are extensively distributed in plants and natural antioxidants are generally derived from plants in the form of phenolic compounds.

Flavonoids are a group of phenolic compounds and act as free radical scavengers which prevent oxidative cell damage through their water soluble property and also possess antioxidant activities.

Table 1: Differentiating morphological characteristics of *Musa balbisiana* Colla and *Musa acuminata* Colla plant parts

Plant Parts	Structure of <i>Musa balbisiana</i> Colla	Characteristics of <i>Musa balbisiana</i> Colla	Structure of <i>Musa acuminata</i> Colla	Characteristic of <i>Musa acuminata</i> Colla
Pseudostem colour		Blotches very slight or absent		More or less heavily marked with black or brown blotches
Peduncle		Glabrous		Usually downy or hairy
Pedicels		Long		Short
Ovules		Four irregular rows in each loculus		Two regular rows in each loculus
Bract shoulder		Usually low (ratio>0.30)		Usually high (ratio<0.28)
Bract curling		Bracts do not reflex		Bracts reflex and roll back after opening
Bract shape		Broadly ovate, not tapering sharply		Lanceolate or narrowly ovate, tapering sharply from the shoulder
Bract colour		Distinctive brownish-purple outside; bright crimson inside		Red, dull purple or yellow, outside; pink, dull purple or yellow inside
Colour fading		Inside bract colour usually continuous to base		Inside bract colour usually fades to yellow towards the base
Bract scars		Scarcely prominent		Prominent
Free tepal of male flower		Rarely corrugated		Variably corrugated below tip
Male flower colour		Variably flushed with pink		Creamy white
Stigma colour		Cream, pale yellow or pale pink		Orange or rich yellow

**Table 2: Phytochemical Analysis of *Musa balbisiana* colla and *Musa acuminata* colla**

S No.	Phytochemical present	Test	Results	
			<i>Musa balbisiana</i> colla	<i>Musa acuminata</i> colla
1.	Detection of alkaloids	Dragendorffs Test	Positive	Negative
		Mayers Test	Positive	Negative
		Wagners Test	Positive	Negative
		Hagers Test	Positive	Negative
2.	Detection of glycosides	Bontragers test	Negative	Positive
		Legals test	Negative	Positive
		Killer killiani test	Negative	Positive
3.	Detection of carbohydrates	Molischs test	Positive	Negative
		Fehlings test	positive	Negative
4.	Detection of phenol	Lead acetate test	Positive	Positive
		Ferric chloride test	Positive	Positive
5.	Detection of proteins	Biuret test	Positive	Positive
		Millons test	Positive	Positive
6.	Detection of tannins	Lead acetate test	Positive	Positive
		Gelatin test	Positive	Positive
		Ferric chloride test	positive	Positive
7.	Detection of saponins	Froth formation test	Negative	Positive
8.	Detection of fixed oil and fats	Spot test	Positive	Positive
9.	Detection of flavanoids	Alkaline reagent test	Positive	Positive

**Table 3: Total Polyphenol Content and percentage yield of Banana flower extracts**

Species	Banana Flower extracts	Polyphenols content (Milligram of gallic acid equivalent/ gram of dry weight)	Percentage yield of extraction (gram/100 g of dry matter)
<i>Musa acuminata</i> colla	Ethanol Extract	1.92 ± 0.02	11.27%
<i>Musa balbisiana</i> colla	Ethanol extract	16.318 ± 0.544	28.76%

**Table 4: Total Flavonoid Content and Percentage yield of Banana flower extracts**

Species	Musa Flower extracts	Flavonoid content (Percentage of flavonoid in grams)	Percentage yield of extraction (gram/100 g of dry matter)
<i>Musa acuminata</i> colla	Ethanol Extract	0.669 ± 0.002	11.27%
<i>Musa balbisiana</i> colla	Ethanol extract	5.209 ± 0.428	24.64%

## DISCUSSION

The present work was mainly focused on the determination of preliminary phytochemical, morphological, and quantitative estimation of two different species of banana tree namely *Musa balbisiana* colla and *Musa acuminata* colla obtained from Assam the northeastern part of India. The morphological features of both the plant were performed and observed that features as uniseriate epidermis, fiber caps next to the phloem, and tetracytic stomata on both faces are helpful to characterize

the bracts. Besides that, the presences of papillose in bracts, difference in their arrangement were also noticed. Additionally, the main characteristics of tepals include the presence of multilayered epidermis and vascular bundles aligned next to abaxial face. As expected, tetra sporangiate anthers with single vascular bundle in male, flowers and trilocular ovary in female flowers with uniseriate epidermis were observed. The ethanol extracts of both the plants were subjected to preliminary phytochemical analysis. The presences of alkaloids, phenols,

glycosides, saponins, flavonoides, carbohydrates, proteins and fixed oil have been noticed. The quantitative estimation like total phenolic content and total flavonoids content were studied. It has been observed that the total phenolic content of *Musa balbisiana* colla was found to be 28.76% and *Musa acuminata* Colla is found to be 11.27%. Similarly, total estimation of flavanoid content was also carried out and found *Musa balbisiana* Colla contains 24.64% and *Musa acuminata* Colla contains 11.27%. Based on the result of quantitative estimation study it can be assumed that both plants may show good antioxidant properties.

### CONCLUSION

An attempt has been made to determine of preliminary phytochemical, morphological, and quantitative estimation of two different species of banana tree namely *Musa balbisiana* colla and *Musa acuminata* colla. Based on the obtained result it may be concluded that both plants content good source of phytochemicals like alkaloids, glycosides, saponins, flavonoides, carbohydrates, proteins, fixed oil and phenolic compounds, which are mainly responsible for wide range of medicinal value of both the plants. Further studies required to be carried out to explore various medicinal properties of the plant and utilized its benefit for society.

### FINANCIAL ASSISTANCE

Nil

### CONFLICT OF INTEREST

The authors declare no conflict of interest.

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