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# Qualitative phytochemical screening and GC-MS analysis of *Musa sapientum* Spadix

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**Abstract**
Globally different species of banana have captured a unique niche in social, economic, ethno-pharmaceutical and culinary realms. In this context, the phytochemical content of aqueous and methanolic extracts of powdered samples of the spadix of *Musa sapientum* (Athiya kol) collected from Bajali area, Assam, India was analyzed. Analyses of the methanolic extracts showed the presence of Saponin, alkaloid, tannin, Coumarin, Phytosterol, flavonoid, sterols and steroids while that of the aqueous extract attested the presence of Saponin, alkaloid, phytosterol, phenol, sterols and steroids. All these secondary metabolites are envisaged to contribute to the therapeutic importance of spadix of *Musa sapientum* in various ways. The GC-MS analysis of the methanolic extract of the spadix showed the presence of phenols, Vitamins, Phytosterols etc. as the principal components. These constituents are known for their antimicrobial, anti-inflammatory, anti-arthritis, anti-rheumatoid, anti-auto-immune disease, anti-allergy, anti-platelet aggregation, anticancerous and antioxidant property could thus be extracted from the spadix of *Musa Sapientum*, a locally available bio resource.

**Keywords:** Spadix; *Musa sapientum;* phytochemical; GC-MS; antioxidant

## 1. Introduction
Banana is a familiar tropical fruit. Amongst others, a number of endeavors have been put forth to probe into the nutritional composition of spadix (inflorescence) of banana. In this backdrop, the previous phytochemical investigation had attested the compositional abundance of alkaloids, flavonoids, tannins, saponins, glycosides, resins, volatile oil in aqueous and organic solvent extracts of the fruit peel of *M. sapientum* [1]. These phytochemicals are known for their antioxidant and antimicrobial attributes [2, 3]. The analysis had also unmasked the presence of reducing sugars (glucose and fructose), and various mineral elements like iron, phosphorus, calcium, potassium, and sodium with higher content in the aqueous extract. The biological pertinence of these elements (*e.g.*, potassium for muscle construction and nerve impulse transmission; sodium for regulation of body fluids and blood; phosphorus for maintenance of acid-base balance and iron in the form of hemoglobin for the delivery of oxygen) is well documented.

In this report, we have tried to delve into the prospects of using *Musa sapientum*, for evaluation of Secondary metabolites and abundant compounds of pharmaceutical importance. It is a tree-like perennial herb that grows 5-9 m in height, with tuberous rhizome, hard, long pseudostem (Figure 1). The inflorescence is big with a reddish brown bract and is eaten as vegetable. The ripe fruits are sweet, juicy and full of seeds. The peel is thicker than other varieties of banana. The banana leaves (ashes) are used in eczema [4] as cool dressings for blister and burns [5]. Flowers and stem-juice of the fruited-plant find application in the treatment of diverse diseases including dysentery, otalgia, diarrhea, diabetes and menorrhagia. [5]. The root is used as an anthelmintic [6], as well as in the treatment of blood disorders, and venereal diseases [5]. The plant is also used to counteract inflammation, pain, and snakebite [7].


**Fig 1:** *Musa Sapientum* spadix, a) Before b) After de-peeling

## 2. Methods and Materials

### 2.1. Sample collection, authentication, and preparation of extracts

The banana-spadices were collected from home garden in October, 2017 from Bajali area, Assam, India and cut into small pieces and dried at room temperature. The dried samples were ground into a fine powder using a mixer grinder of Bajaj with 12000rpm, and then kept in an air-tight container and stored in a freezer (-20 ˚C) before extraction. In a Soxhlet apparatus, 30 g of dried powder was taken for serial extraction using methanol (10 g/300 mL), [Emplura, purity (GC) ≥99.0%]. The extracts were dried in a rotary evaporator. By diluting the stock, an extract was prepared to 1mg/mL and subjected to various analyses

### 2.2. Phytochemical-screening

The chemical tests were carried out using the aqueous extract and the powdered specimens. Standard procedures as described by Sofowara [8], Trease and Evans [9] and Harbone [10] were used to identify the constituents.

### 2.3. Gas chromatography-mass spectrometry

The GC-MS analysis was carried out at Biotech Park, IIT Guwahati, India. Perkin Elmer(USE) GCMS instrument, (Model: Clarus 680 GC/Clarus 60 $^0$C MS) comprising a liquid auto sampler ans using a capillary column (Elite-5MS, length: 60m, ID:0.25mm & df:0.25µm; composed of the phase 5% diphenyl 95% dimethyl polysiloxane), employing the following condition: operating in electron impact at 70ev; Helium gas was (99.99%) was used as carrier gas at a constant flow of 1mL/min and an injection volume of 1µl was employed. Injector temperature and ion-source temperature were 200 $^0$C and 180 respectively. The oven temperature was programmed from 45 $^0$C with an increase of 10 $^0$C /min, to 280 $^0$C (hold for 15min). Mass spectra was taken at 70ev; a scan interval of 0.1 seconds and fragments from 50 to 500 Da. Total GC running time is 39.9 min. The relative percentage amount of each component was calculated by compairing its average peak area to the total areas. Software used was a Turbo Mass ver 5.4.2 Library search software used is S/W Turbomass NIST 2008.

### 3.1. Phytochemical screening

The aqueous and methanolic extracts of banana spadix were prepared in this research work for qualitative analysis of the phytochemicals. In the studies on phytochemicals carried out by several researchers showed the presence of several phytochemicals in different parts of banana from different solvent extracts. The preliminary phytochemical screening of aqueous and methanolic extracts of the selected *Musa Sapientum* spadix showed different results indicated the presence of some secondary metabolites such as alkaloids, Phenol, saponins, flavonoids, tannins, coumarins, phytosterols, and sterols in Methanolic extract, whereas the aqueous extract revealed the presence of alkaloids, saponins, phytosterols, phenol, and sterols.

**Table 1:** Qualitative analysis of *Musa Sapientum* spadix's screened phytochemicals (+) present, (-) absent

| Sl. No | Test | Result (methanol extract) | Result (Water extract) |
|---|---|---|---|
| 1 | Saponin | + | + |
| 2 | Alkaloid | + | + |
| 3 | Tannin | + | - |
| 4 | Coumarin | + | - |
| 5 | Phytosterol | + | + |
| 6 | Phenol | + | + |
| 7 | Flavonoid | + | - |
| 8 | Sterols and steroids | + | + |

### 3.2. GC-MS analysis

The methanolic extract of the banana spadix powder showed ten peaks from the chromatograph of the extract. The peaks indicate the presence of ten major compounds in the extract. The compounds present in the extract showed the Peaks of 34.11, 36.90, 42.08, and 43.39 covering the highest area which was thought to be abundant and are identified.

**Table 2:** Major Bioactive compounds of *Musa Sapientum* spadix identified by GC-MS

| S. No. | RT (min) | Name of the Compound | Compound nature | Molecular Formula | MW | Therapeutic use |
|---|---|---|---|---|---|---|
| 1 | 42.08 | ERGOST-25-ENE-3, 5, 6, 12-TETROL, (3. BETA., 5. ALPHA., 6.BETA.,12.BETA) | Phytosterols | $C_{28}H_{48}O_4$ | 448 | Anti-oxidant activity, Anti-inflammatory activity, Anti-arthritis, Anti-rheumatoid, Anti-auto-immune disease, Anti-allergy, Anti-platelet aggregation, Hypoglycemic |
| 2 | 43.39 | PHENOL, 3,5-BIS(1,1-DIMETHYLETHYL)- | Phenol | $C_{14}H_{22}O$ | 206 | Antioxidants, Light-protection agents, Antimicrobial. |
| 3 | 36.90 | METHYL 10-TRANS,12-CIS-OCTADECADIENOATE | Carboxylic acid | $C_{19}H_{34}O_2$ | 294 | Anti-inflammatory, acne reductive, skin-lightening and moisture retentive |
| 4 | 34.11 | L-(+)-ASCORBIC ACID 2,6-DIHEXADECANOATE | Vitamin compound | $C_{38}H_{68}O_8$ | 652 | Antioxidant, cardio protective, cancer preventive, flavour and anti-infertility |

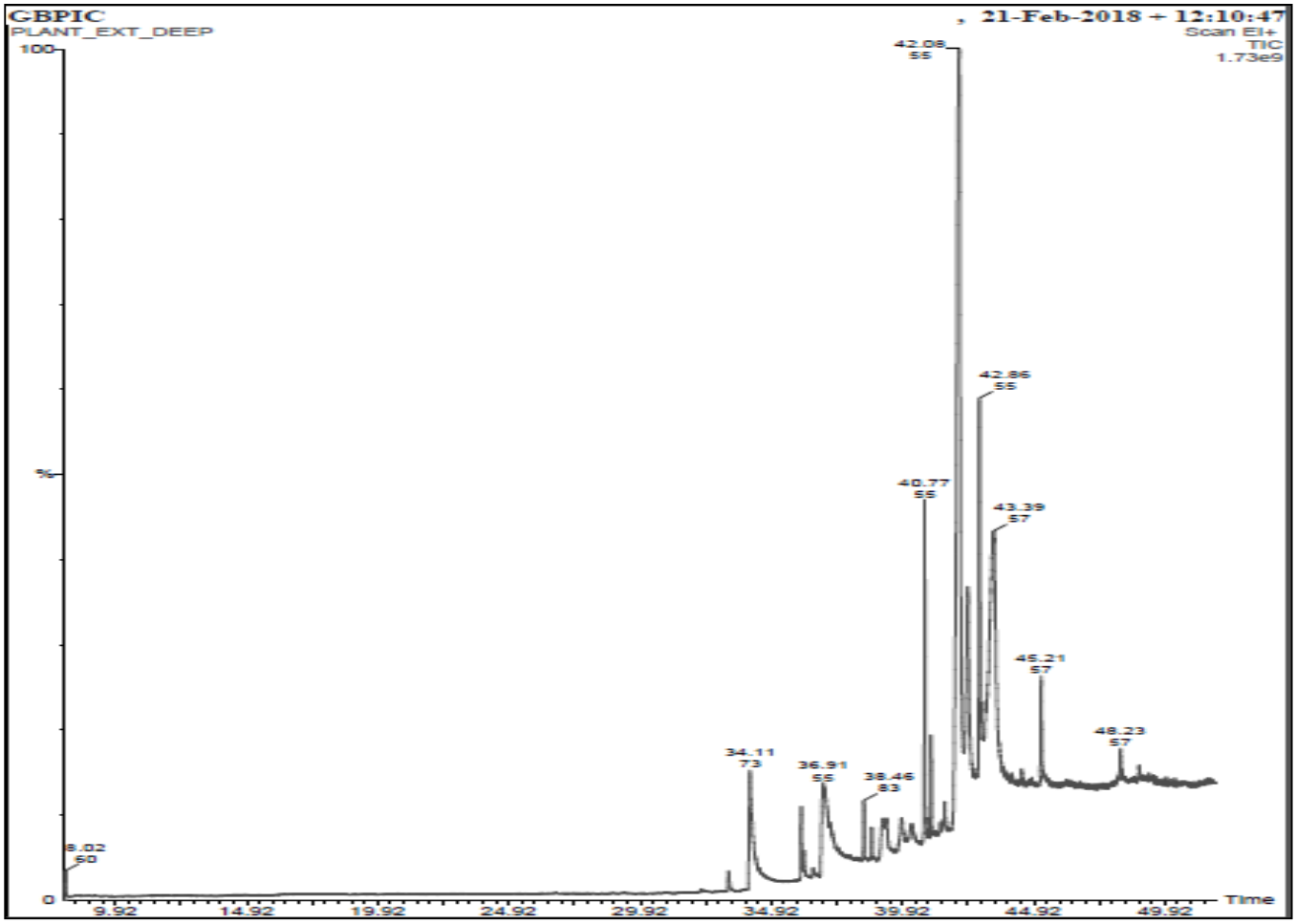


**Fig 2:** Chromatogram of *Musa Sapientum* spadix by GC-MS

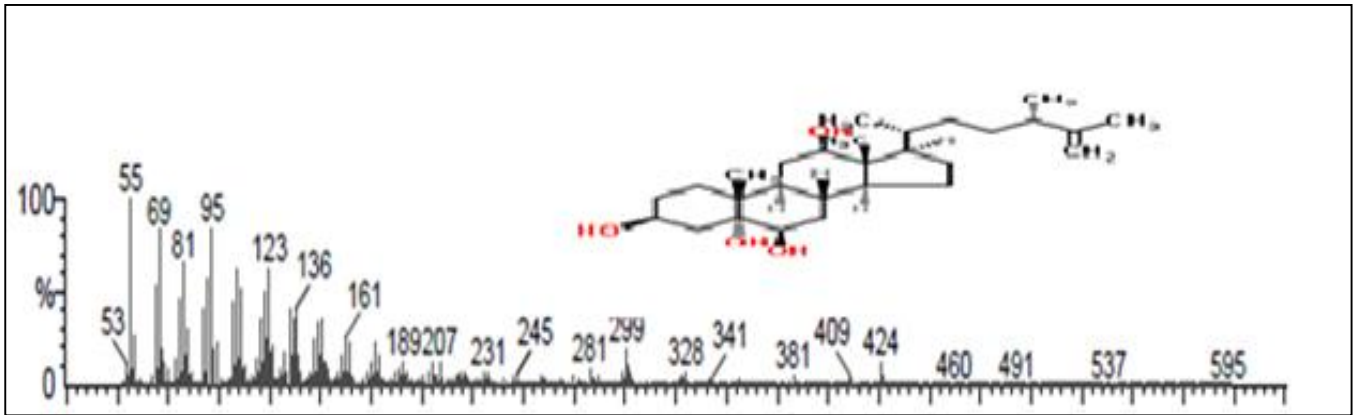


**Fig 3:** Mass spectrum of ERGOST-25-ENE-3,5,6,12-TETROL, (3.BETA.,5.ALPHA.,6.BETA.,

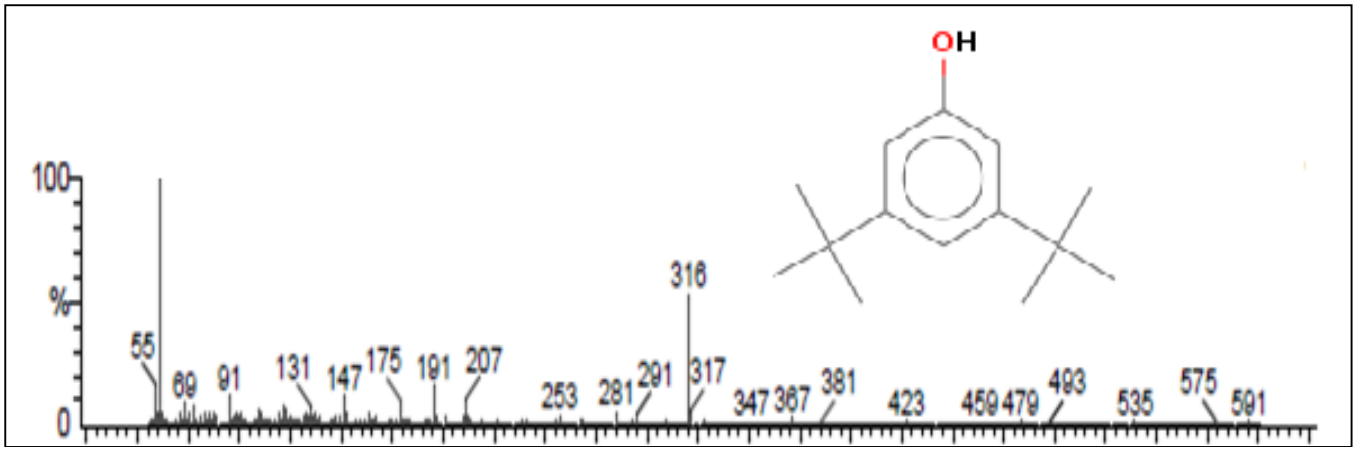


**Fig 4:** Mass spectrum of PHENOL, 3,5-BIS(1,1-DIMETHYLETHYL)

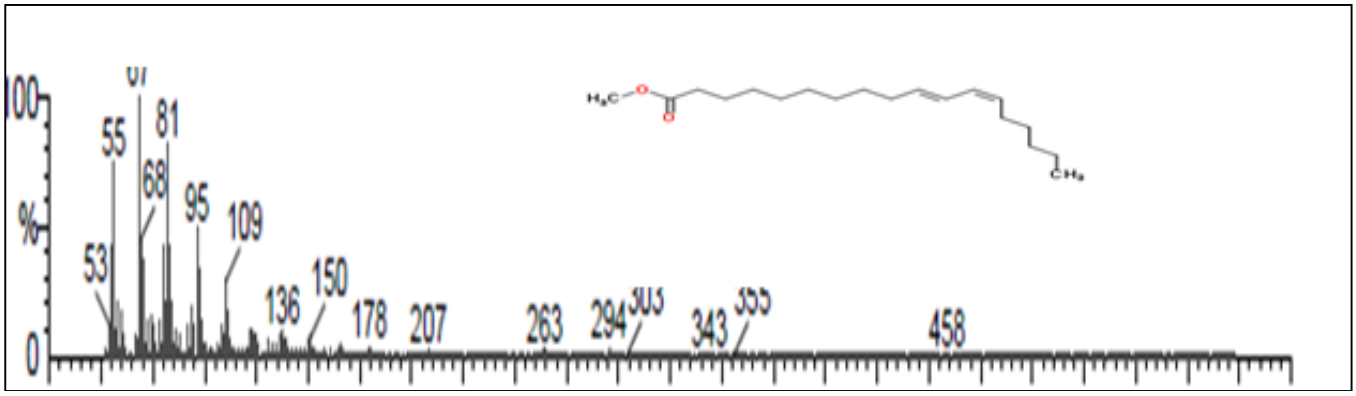


**Fig 5:** Mass spectrum of METHYL 10-TRANS,12-CIS-OCTADECADIENOATE

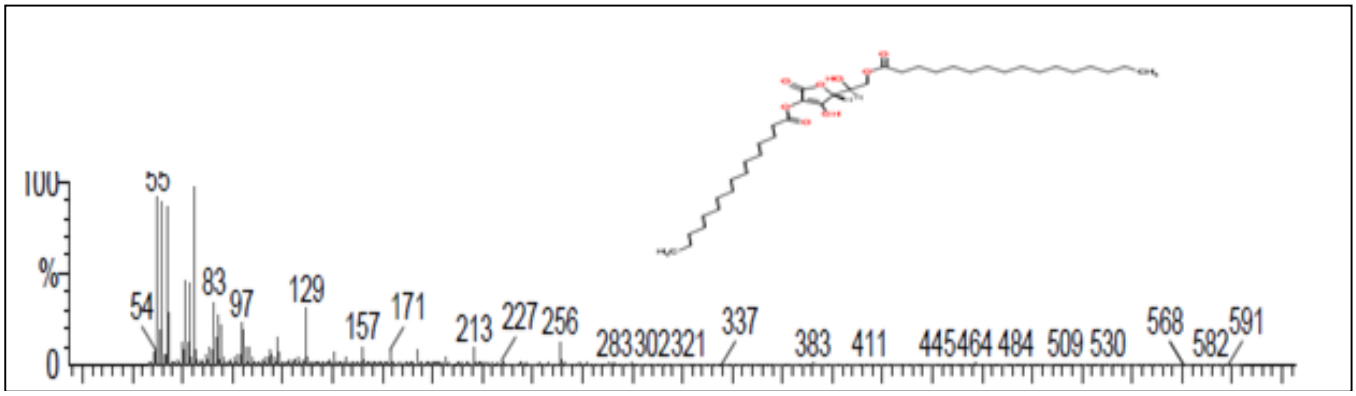


**Fig 6:** Mass spectrum of L-(+)-ASCORBIC ACID 2,6-DIHEXADECANOATE

In this study, presuming *Musa Sapientum* spadix as a major source of phytochemicals was screened and obtained results satisfied the assumption by confirming the presence of secondary metabolites like alkaloids, saponins, flavonoids, tannins etc. which are known to have medicinal property. Their presence in the spadix of banana, therefore, could suggest that the plant is of medicinal value.

Alkaloids are widely well known to have antidiabetic [11] and antimicrobial [12] activities. Plants with alkaloids may have a hypoglycemic effect via the mechanism of insulin-releasing and insulin-mimicking activity and thus improves postprandial hyperglycemia [8] and antimicrobial effects due to the action of intercalates into cell wall and DNA of organisms, inhibits release of autacoids and prostaglandins, possess anti-oxidating effects, thus reduces nitrate generation which is used for protein synthesis. Alkaloids also have pharmacological applications as anesthetics and CNS stimulants [13].

Flavonoids are recognized to possess antidiabetic [11, 14, 15] antioxidant [16, 17], antimicrobial [12, 17, 18, 19], fungicidal, natural antihistaminic [17, 18], anti-inflammatory, antiallergic and anticarcinogenic activities [20], Coumarins have shown some evidence of biological activity and have limited approval for few medical uses as pharmaceuticals, such as in the treatment of lymphedema and their ability to increase plasma antithrombin levels [21, 22].

Saponins are generally regarded an antinutrient but are also believed to be useful in the human diet for controlling cholesterols. Its presence in this plant, therefore, could suggest that the plant is of medicinal value. There is evidence of the presence of saponins in traditional medicine preparations [23, 24].

Phenol is used as a preservative in some vaccines [25]. Phenol spray is used medically to help a sore throat. It is the active ingredient in some oral analgesics such as Chloraseptic spray and Carmex, commonly used to temporarily treat pharyngitis [26].

Tannins are astringent, bitter plant polyphenols that either bind and precipitate or shrink proteins, tannins are distributed all over the plant kingdom. Tannins have traditionally been considered antinutritional but it may be employed medicinally in antidiarrheal, hemostatic, and antihemorrhoidal compounds. Its presence in the plant suggests it to be of medicinal value because tannins have shown potential antiviral [27], antibacterial and antiparasitic effects [28].

The abundantly present phytoconstituents in various herbs forms a basis for curative properties of medicinal plants [29]. The different parts of the plant significantly shows phytoconstituents with varied composition. Among the bioactive constituents obtained, four compounds of spadix were reported for their biological activities.

## 4. Conclusion

Nature being a resource for isolation of a remarkable number of recent and novel drug for hundreds of years. In the recent past, the incredible uses of plant-based health products in developing as well as in developed countries have led to ensure an exponential growth of herbal products worldwide. The therapeutic properties of plant products are mainly due to the existence of a complex of diverse chemical compounds which occur as secondary metabolites. The most significant of these bioactive constituents are alkaloids, tannins, flavonoids, phenolic compounds etc. Experimentalized work highlighted that spadix of *Musa Sapientum* serves as a natural store for various beneficial phytochemicals. The results evidently specify that methanolic spadix extract of *Musa Sapientum* contains various bioactive compounds having various medicinal properties that can be browbeaten for the treatment of many diseases. Traditionally, it is also proved to be very effective as a source of high iron. However, isolation of

individual phytochemical constituents and subjecting it to the biological activity will definitely give fruitful results. Therefore, it is recommended as a plant of Phytopharmaceuticals importance.

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