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## **Study On Phytochemicals and Nutritional Composition Of Banana Flowers Of Two Cultivars (Phee kyan and Thee hmwe)**

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### **Abstract**

In this research work, the phytochemical constituents of banana flowers of two cultivars (Phee kyan and Thee hmwe) were investigated. Phytochemical investigation on banana flowers extracts showed the presence of alkaloids, glycosides, steroids, saponins, tannins, flavonoids and terpenoids. The pH levels of these sample flowers were determined. Samples (banana flowers) were also analyzed for proximate composition of moisture, ash, fiber, oil, protein and soluble carbohydrate. In these determination, moisture content and oil content were found to be higher in Phee kyan flowers than Thee hmwe flowers. The contents of ash, fiber, protein and water soluble carbohydrate of Thee hmwe flowers were higher than that of Phee kyan. Moreover, mineral composition of these samples (banana flowers) was determined by Energy Dispersive X-ray Fluorescence (EDXRF) spectroscopy. This elemental analysis indicated that potassium is the highest amount in both two cultivars.

**Key words :** phytochemical, proximate composition, mineral, banana flowers

### **Introduction**

*Musa* species is one of the well known plants of the musaceae family that have been used in traditional medicine since hundred years to alleviate various diseases and health problems. Active constituents present in the plants materials might be responsible to the beneficial of human health. The most important of these bioactive compounds of plants are alkaloids, flavonoids, tannins and phenolic compounds. These compounds were known to possess various bioactivities such as the antioxidant, antimicrobial, antiviral and anticancer. Due to their potential to overcome health problems, plant based products have been produced in industries as botanical drugs, dietary supplements and functional foods. Recently, most scientists have focused to investigate bioactive secondary metabolites in order to discover new medicinally and commercially plant drugs.

The banana plant is the largest herbaceous flowering plant and mainly grows in tropical and subtropical regions. In commercial situation after collecting the single bunch of bananas, lots of banana flowers are produced. Banana flower, also known as banana blossom or heart or bud, is the splendid looking male, sterile flower of the banana plant. The banana plant is the largest of the herbaceous plants and its flowers are large, pointed and often a crimson color, although some varieties are yellow and others are pink. The banana flower is a component in the inflorescence of the banana plant. The male and female flowers of the plant are both present but come out of the plant separately. The female flowers are the first to come out which then develops into fruits. The first 5-15 basal nodes or hands produce female flowers and the upper digital nodes produce male flowers (Del Rosario 1990 as cited by Villa 1993). The banana male flowers are waste material produced during crop production with less economic value. It is converted into high value added product by making pickle. Banana is grown commercially for its fruits. The various parts of the plant other than the fruit are also used for food, packaging, and other purposes.

Banana flower has tremendous nutritional value and can be consumed as food additive in many Asian countries such as Sri Lanka, Indonesia, Thailand and Myanmar. In Myanmar, it is consumed as a curry as well as a boiled or deep fried salad with rice and wheat or pickle. In Sri Lanka, banana flower can also be made into various products such as dehydrated vegetable, pickle and canned food (Wickramarachchi et al., 2005; Yunchalad et al., 1995).

Ethnomedicinal survey around the world revealed that the flowers of *Musa* species (banana) have been used to treat many illnesses. *Musa* flowers have been traditionally used to alleviate menorrhagia, dysentery, diabetes mellitus (Singh, 1986), heart pain, diarrhea, stomach cramps and infantile malnutrition (Leonard, 1998). It was reported that the extract of flowers possess medicinal properties for illness such as diabetes mellitus (Alarcon-Aguilar, Roman-Romos, Perez-Gutierrez, Aguilar-Contreras, Contreras-Weber & Flores-Saenz, 1998; Pari & Uma Maheswari, 1999) and anaemia (Pari & Uma Maheswari, 1999) and malaria (Bagavan, Rahuman, Kaushik, & Sahal, 2010).

Recently, more attention has been focused on the utilization of agricultural by-products. Banana flower has<sup>1</sup> a huge nutritional value and healthy benefits. Therefore, the aim of present study was to investigate the bioactive compound (phytochemicals) and the basic nutritional composition of banana flowers of two cultivars grown in Khutoekang village, Ahyartaw Township, Monywa District, Sagaing Region.

### Botanical Description

Family name - Musaceae  
 Scientific name - *Musa paradisiaca* L.  
 English name - Banana, Plantain  
 Myanmar name - Phee kyan

Family name - Musaceae  
 Scientific name - *Musa chiliocarpa* Bark  
 English name - Banana, Fragrant banana  
 Myanmar name - Thee hmwe

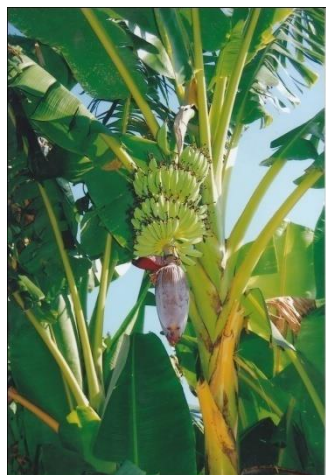


Figure . Banana plant (Phee kyan)



Figure . Banana plant (Thee hmwe)

### Health Benefits of Banana Flowers

Banana flowers, similarly to bananas are an excellent source of potassium, plus the vitamin's A, C and E. Banana flowers have tremendous nutritional value. They are a good source of fibre and protein. The flowers contain a class of phytochemicals known as saponins. Saponins lower bad cholesterol, boost our immunity against infection and are through to inhibit the growth of cancer cells. They also have antioxidant activity and so can reduce our risk of chronic disease such as cardiovascular disease. Banana flowers are also an excellent source of flavonoids. These phytochemicals found in many plant based foods help prevent damage to DNA cells by neutralizing free radicals. They also help lower cholesterol, are anti-inflammatory, anticancer and anti-aging.

### Material and Methods

#### Collection and Preparation of Plant Materials

The banana flowers of two cultivars (Phee kyan and Thee hmwe) were collected from Khutoekang village, Ahyartaw Township, Monwya District, Sagaing Region. The banana flowers were dried in air for two weeks. These pieces were made to powder form and stored in an air-tight bottle and used throughout the experiment.

Extraction was carried out by maceration using various solvents such as hydrochloric acid (1%), ethanol (95%), chloroform, petroleum ether and water. These extracts of banana flowers were then analyzed for preliminary phytochemicals screening.

#### Preliminary Phytochemicals Screening

Preliminary phytochemicals screening for major secondary metabolites of the banana flowers was carried out by usual method (Harbone, 1984). The sample extracts were screened for the presence of bioactive compounds such as alkaloids, steroids, terpenoids, saponins, flavonoids, tannins, glycosides and for the absence of cyanogenic glycosides.

#### Determination of pH

Each sample (1.0 g) was placed in 250 cm<sup>3</sup> beakers and 100 cm<sup>3</sup> of distilled water was added in these beakers. Then these samples were boiled for 30 minutes and then cooled. After cooling, the water insoluble precipitate was filtered and the pH of the filtrate was determined by using pH meter.

### Determination of Nutritional Composition

Samples of banana flower were analyzed for proximate composition (moisture, protein, fat, ash and total dietary fiber) following the standard methods published by Association of Official Analytical Chemists (AOAC, 1995). Moisture content was estimated by gravimetric measurement of weight loss after drying the sample in an oven at 105<sup>0</sup>C until constant weight was obtained. Protein was determined by Kjeldahl method (Kjeldahl, 1883), and thereafter a conversion factor of 6.25 was used to calculate the total nitrogen to crude protein. Crude fat was analyzed by the Soxhlet extraction method. The content of ash was measured by gravimetric measurement of the sample in the furnace at 550<sup>0</sup>C until the constant weight was achieved. Total dietary fiber was determined by using sulphuric acid solution(1.25%) and sodium hydroxide solution (1.25%).

### Determination of Mineral Contents

Mineral contents in banana flowers were determined by using SPECTROXEPOS EDXRF spectrometer at Department of Physics, University of Mandalay.

## Results and Discussion

### Preliminary Phytochemicals Screening

Preliminary phytochemical analysis was performed in order to know different types of compounds present in the banana flowers of two cultivars (Phee kyan and Thee hmwe). The results of phytochemical tests are shown in Table (1).

**Table (1) The Results of Phytochemical Tests of Sample flowers**

No.	Constituents	Extracts	Reagents Used	Observation	Remarks	
					I	II
1.	Alkaloids	1% HCl	Dragendroff's reagent	Orange ppt	+	+
2.	Glycosides	Distilled water	10% lead acetate	White ppt	+	+
3.	Steroids	Pet-ether	Acetic anhydride Conc: H <sub>2</sub> SO <sub>4</sub>	Blue colour	+	+
4.	Saponins	Distilled water	NaHCO <sub>3</sub>	Frothing	+	+
5.	Tannins	95% ethanol	10% lead acetate	Yellow ppt	+	+
6.	Flavonoids	95% ethanol	Conc:HCl, Mg turning	Pink colour	+	+
7.	Terpenoids	CHCl <sub>3</sub>	Acetic anhydride, Conc: H <sub>2</sub> SO <sub>4</sub>	Brick red colour	+	+
8.	Cyanogenic glycosides	Distilled water	Conc: H <sub>2</sub> SO <sub>4</sub>	No brick red colour	-	-

(+) = Presence of constituents

(-) = Absence of constituents

I = *Musa paradisiaca* L. (Phee kyan)

II = *Musa chiliocarpa* Bark (Thee hmwe)

According to Table (1), the banana flowers of two cultivars (Phee kyan and Thee hmwe) gave the positive tests for alkaloids, glycosides, steroids, saponins, tannins, flavonoids, and terpenoids respectively. Therefore, the banana flowers of two cultivars (Phee kyan and Thee hmwe) contains valuable phytochemical constituents which have health benefits to humans. Cyanogenic glycosides which generally possess toxic property were absent in the plant sample flowers of both cultivars.

### Determination of pH

The pH values of banana flowers of two cultivars (Phee kyan and Thee hmwe) were measured by using pH meter. The pH values of these sample flowers were found to be 5.8 and 6 (Phee kyan and Thee hmwe).

### Determination of Nutritional Composition

The main nutritional compositions of banana flowers of two cultivars (Phee kyan and Thee hmwe) were determined by AOAC method. The result are presented in Table (2).

**Table (2) The Results of Nutritional Composition of Sample flowers**

No.	Nutritional Composition	<i>Musa paradisiaca</i> L. (Phee kyan)	<i>Musa chiliocarpa</i> Bark (Thee hmwe)
1.	Moisture (%)	9.37 %	7.36 %
2.	Ash (%)	6.37 %	7.2 %
3.	Fiber (%)	0.084 %	1.15 %
4.	Crude fats (%)	0.6 %	0.4 %
5.	Crude protein (%)	13.28 %	15.82 %
6.	Soluble Carbohydrate (%)	5.14 %	5.89 %

Moisture content is the quantity of water containing in the sample. The higher water content of flowers give elasticity, whereas lower water content of flowers show brittle. Moisture content of flowers of *Musa paradisiaca* (Phee kyan) is higher than that of *Musa chiliocarpa* (Thee hmwe).

The ash content is a measure of the total amount of minerals or inorganic components present in a food such as Ca, Na and K. Ash is the organic residue remaining after the water and organic matter have been removed by heating in the presence of oxidizing agents. The ash content of flowers of *Musa chiliocarpa* (Thee hmwe) is higher than that of *Musa paradisiaca* (Phee kyan).

Fiber is a class minerals that are continuous filaments or are ion discrete elongated pieces, similar to lengths of thread. Fiber content measure the storage of water. Fiber is essentially a carbohydrate and is found soley in plants. It is found in the wall of the plant's cells and is the only part of the plant that cannot be digested by the human body. Crude fiber content of flowers of *Musa paradisiaca* (Phee kyan) is lower than that of *Musa chiliocarpa* (Thee hmwe). A higher content of fibers in banana flowers indicates that the flowers can be consumed as dietary fiber supplements.

The crude fat content of flowers of *Musa paradisiaca* (Phee kyan) was found to be higher than that of *Musa chiliocarpa* (Thee hmwe). Crude fat contents were generally low (0.6% in Phee kyan and 0.4 % in Thee hmwe) in both cultivars. Proteins are nutrients that are required for human body. The crude protein content of flowers of *Musa paradisiaca* (Phee kyan) was found to be lower than that of *Musa chiliocarpa* (Thee hmwe).

The amount of total soluble carbohydrate present in flowers of *Musa chiliocarpa* (Thee hmwe) is higher than that of *Musa paradisiaca* (Phee kyan).

### Mineral Contents of Banana Flowers

The mineral contents of banana flowers of two cultivars (Phee kyan and Thee hmwe) are listed in Table (3).

**Table (3) Mineral Contents of Flowers of Phee kyan and Thee hmwe**

No.	Element	Symbols	<i>Musa paradisiaca</i> (Phee kyan)	<i>Musa chiliocarpa</i> (Thee hmwe)
1	Aluminium	Al	0.1307 %	0.1183 %
2	Silicon	Si	0.1120 %	0.1652 %
3	Phosphorus	P	0.3569 %	0.2256 %
4	Sulfur	S	0.6860 %	0.05550 %
5	Chlorine	Cl	0.9821 %	1.485 %
<b>6</b>	<b>Potassium</b>	<b>K</b>	<b>5.138 %</b>	<b>5.390 %</b>
7	Calcium	Ca	0.5667 %	0.4667 %
8	Manganese	Mn	0.01067 %	0.01072 %
9	Iron	Fe	0.01547 %	0.02023 %
10	Zinc	Zn	0.00419 %	0.00307 %
11	Barium	Ba	0.00736 %	0.0000 %
12	Copper	Cu	0.00065 %	0.00105 %

All the major elements evaluated in this study were found in both samples, with potassium being the highest, especially in the Thee hmwe flower. These results revealed that a variation was observed in the quantitative composition of mineral in flowers from different banana cultivars. This could be due to their growing environmental conditions and genetic variations of each cultivar.

### Conclusion

This research has comprehensively investigated on the phytochemical constituents and the nutritional composition of banana flowers of two cultivars, *Musa paradisiaca* (Phee kyan) and *Musa chiloearpa* (Thee hmwe). The results indicated that these sample flowers contain the most important bioactive compounds such as alkaloids, glycosides, steroids, saponins, tannins, flavonoids, and terpenoids which have health benefits to human. The pH values of these flowers solution were found to be 5.8 and 6 (Phee kyan and Thee hmwe) which is slightly acidic. These sample flowers have tremendous nutritional values (moisture, ash, fiber, protein and carbohydrate). According to the elemental analysis, these sample flowers contain macro (Ca, K, Cl, S) and micro (Mn, Zn, Cu) elements that are necessary for health benefits. These flowers are good sources of the minerals, especially potassium.

Therefore, the utilization of banana flowers could provide additional benefits in reducing the banana waste and increasing the use in food science.

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