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Extraction of Anthocyanin from Banana (*Musa paradisiaca*) Flower Bract and Analysis of Phytochemicals, Antioxidant Activities and Anthocyanin Content

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ABSTRACT

Value for anthocyanin based pigments are increasing now-a-days because of its health benefits, which includes rich in antioxidants, antiviral, anticancer properties, antibacterial, anti-inflammatory, etc. Anthocyanin's are also responsible for attractive colour like violet, orange, blue, and red and which are available in flowers, vegetables and fruits. Banana (*Musa paradisiaca)* flower bract, edible waste of banana production, was investigated as best origin of anthocyanin and natural colorant. The main goal of this present work is to spot out the qualitative and quantative phytochemicals, antioxidant activities and anthocyanin content. The extract from banana bract was extracted using four different solvents: petroleum ether, chloroform, ethanol and water and the extracts were analysed for the qualitative phytochemicals. Quantative analysis was also detected by using spectrometric method and gravimetric method and the outcomes were determined. The anthocyanin content was determined to be 32.14 mg/100g of bract. Antioxidant activities were found by DPPH (1, 1-diphenyl-2-picrylhydrazyl) free radical scavenging assay and was determined to be 1.32 ± 0.16 mg/ml.

KEY WORDS: Anthocyanin, Antioxidant activity, Bract, phytochemicals, Health benefits.

1. INTRODUCTION

Bananas from genus Musa belongs to the family Musaeae were originated in South East Asia and have been cultivated for over 6,000 years (Denham, 2003). Banana plants have been used in ancient medicine since 100 years to cure health problems and diseases. Musaceae family has 2 genera and 42 different species. Musa species is a well-known herbaceous flowering plant in the world. It includes banana and plantains. Banana, an ancient fruit crop has played interesting and potential roles in the history of human civilizations (Gunavathy, 2014). Atindehou (2002), reported that the important bioactive components include alkaloids, flavonoids, tannins and phenolic compounds. According to Saeed (2005), it is determined that there are more than 8000 phenolics, 25000 terpenoids and 12000 alkaloids.

Anthocyanin is one of the main sources for the attractive blue-violet-red-orange colour of flowers and fruits which are water-soluble and have high colour intensities. In the last decade only, anthocyanin pigments in banana bracts were discovered as biological food colorants. Finally came to a conclusion that the bracts are abundant source of anthocyanins with the presence of all six most common anthocyanins (Chandra S Iyer and Soni Tilara, 2016).

Jenshi (2011), concluded that banana bracts have anthocyanin content in the range of 14-32 mg anthocyanin/100 g bracts, mainly comprising of cyanidin-3-rutinoside. However, there are few studies only regarding the extraction banana flower bracts. In this context, the existence of primary phytochemicals and their quantitative investigation in the extract of M. paradisiaca flowers bracts are reported. Anthocyanin content and DPPH free radical scavenging activities (IC50) are also reported to indicate antioxidant activity in the extracts.

2. MATERIALS AND METHODS

Preparation of Sample for extraction: Fresh banana (Musa acuminate) flowers were collected from a local wholesale market in Coimbatore. The whorls of bracts were separated from the flower, washed, dried, chopped and weighed. The chopped pieces were then finely grounded using a food processor.

Extraction was carried out using the following solvents namely: petroleum ether, chloroform, ethanol and water. 10 g of banana flower bract was extracted in 100 ml solvents for 24 hours at atmospheric temperature and continuously agitated using mechanical agitator (Azizah Mohamood, 2011). In aqueous extraction, the samples were continuously circulated in a water bath at 60^0C for 2 hours and filtered. The filtrates obtained were evaporated to dryness under vacuum using rotary evaporator at a temperature of 40°C (Arueya and Akomolfe, 2014). These extracts of banana flowers bract were then analysed for preliminary phytochemicals screening.

Phytochemical screening: Phytochemical screening was done according to the standard protocol for detection of carbohydrates, reducing sugar, alkaloids, saponin, tannin, flavonoids, terpenoids, phlobotannins, Coumarins, cycloglycosides, total phenol, quinones, anthraquinones, steroids (Kokate, 2010).

Determination of Quantitative Analysis of Phytochemicals, Antioxidant Activity, Anthocyanin content: The methods used to determine the qualitative analysis of phytochemical**,** antioxidant activity, anthocyanin content are given Table.1.

Table.1. Methods used to determine the qualitative analysis of phytochemical

Phytochemicals	Method Employed	Reference
Total Phenolic Content	Folin-Ciocalteu Method	Azizah Mohamood (2011)
Flavonoid Content	Modified Colorimetric Method	Azizah Mohamood (2011)
Tannin content	AOAC Method	Azizah Mohamood (2011)
Alkaloid Content	Gravimetric Method	Harborne (1973)
Saponin Content	AOAC Method	Obdoni (2001)
Antioxidant Activity	DPPH free radical scavenging assay	Ripa FA and Haque (2009)
Anthocyanin content	Spectrometric method	Du and Francis (1973)

3. RESULTS AND DISCUSSION

In this present study on investigation on banana flower bract extract the following solvents namely petroleum ether, chloroform, ethanol and water are used. The solvents polarity may highly influence extraction rate and the bioactive components obtained from biological source. The yield of plant material obtained after the extraction using different solvents are given in Table.2.

Table.2. Yield of plant materials obtained in different solvents

Solvent	Bract extract (milligrams)
Petroleum ether	0.163
Chloroform	0.184
Ethanol	0.914
Water	1.04

Qualitative Phytochemical Analysis: The preliminary qualitative analysis of phytochemicals showed the presence of alkaloids, saponins, tannins, flavonoids, terpenoids, coumarins, cyclogylcosides, total phenols and steroids. The petroleum ether extract bract revealed the presence of alkaloids and glycosides and chloroform extract revealed the absence of phytochemical constituents. The ethanol extract revealed the presence of alkaloids, saponins, flavonoids, terpenoids, coumarins, glycosides, phenols and steroids. Aqueous extract revealed the presence of coumarins and phenol only. It is evident from the tabulation that the other phyto constituents like quinones, steroids and phlobotannins were absent in all the extracts. The phytochemicals present in bract of are shown in Table.3.

Table.3. Phytochemical constituents present in extract of different solvents

Phytochemical constituents	Petroleum ether extract	Chloroform extract	Ethanol extract	Aqueous extract
Carbohydrates	-	-	-	-
Reducing sugar	-	-	-	-
Alkaloids	+	-	+	-
Saponins	-	-	+	-
Tannins	-	-	++	+
Flavonoids	-	-	++	-
Terpenoids	-	-	+	-
Phlobotannins	-	-	-	-
Coumarins	-	-	+	+
Cycloglycosides	+	-	+	-
Total phenols	-	-	+	+
Quinones	-	-	-	-
Anthraquinones	-	-	-	-
Steroids	-	-	+	-

Quantitative Phytochemicals Analysis: The amount of phytochemicals present in the ethanol extract of bract includes alkaloid, saponin, total phenolic, tannin and flavanoid are summarised in Table.4.

Table.4. Total phytochemicals content of banana flower bract

Phytochemical Constituents	Mean Concentration
Alkaloid (g/100 g)	1.16 ± 0.22
Saponin (g/100 g)	1.13 ± 0.14
Total phenolic (g/100g)	4.62 ± 0.78
Tannin (mg/100 g)	68.37 ± 4.53
Flavanoid (mg/100 g)	4.08 ± 0.15

Antioxidant Activities: The presence of antioxidant activities in Ethanol extract (mg/ml) of bract was determined to be 1.32±0.16mg/ml.

Anthocyanin content: In the present investigation, ethanol extract was used, which is reported to be a more effective way of anthocyanin extraction. On analysis, the anthocyanin content of the Musa acuminate bracts was 32.14 mg/ 100 g of bracts. This value is in corresponding with the value of 32.97 mg/100 g bracts reported by Chandra Iyer (2016).

4. CONCLUSION

The present investigation confirms that *Musa acuminata* bracts have excellent source bioactive compounds with the availability of preliminary quantative and qualitative phytochemicals. The extracts were also determined for the antioxidant activity and anthocyanin content and which proved to be a better source of bio food colorant. The above findings confirmed that the banana flower bract may have potential use in pharmaceutical, cosmetic, and food products. Further investigation can be made to exploit the pharmacological properties which in turn may help in the invention of new bio products. Based on the present research, it was determined that introducing banana bract into the daily diet in any form could have significant nutritive impact.

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