



Preliminary phytochemical screening and *in vitro* antioxidant activity of Banana flower (*Musa paradisiaca* AAB Nendran variety)

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ABSTRACT

Preliminary phytochemical screening, total polyphenol content, total flavonoid content and antioxidant activity of the extracts from banana flower (*Musa paradisiaca* AAB Nendran variety) were studied. Six different extracts using water, ethanol, methanol, chloroform, ethyl acetate and acetone were prepared by maceration process and evaporated using rotary evaporator. Total Polyphenol Content (TPC) and Total Flavonoid Content (TFC) in the extracts were determined by UV visible spectrophotometry and antioxidant activity was measured by *in vitro* DPPH assay method. The results showed that ethanol extract having more amount of flavonoid (0.67%) and polyphenol content (1.92 mg Eq of GA) than other extracts. In addition, the ethanol extract exhibited more antioxidant activity with IC₅₀ value 63 µg/ml. This study indicated that ethanol extract of banana flower (*Musa paradisiaca* AAB Nendran variety) exhibited more antioxidant property due to the presence of high content of polyphenols and flavonoids.

Key Words: *Musa paradisiaca*, flavonoid, antioxidant

INTRODUCTION:

Nowadays herbal medicinals has gained more acceptances and actually a herbal boom has been occurred in many countries because of the developments of modern phytochemical research. Recently the World Health Organization (WHO) estimate that 80% of people worldwide rely on herbal medicines for some part of their primary healthcare. Of 250000 to 300000 plant species, only 5000 have been studied exhaustively for possible medical application; hence our medicinal future is bright if the integrity of these plants and their growing conditions can be maintained. An evolution has taken place during the last decades with the gradual maturation of traditional herbalism into evidence based phytotherapy. The improvements in analysis and quality control along with advances in clinical research show the value of this herbal medicines and it becoming more mainstream today.^{1,2}

Banana, an antique fruit crop of the world is known as 'Apple of the Paradise' and botanically belonging to the family Musaceae in the order Zingiberales (formerly Scitaminae). The banana is an herbaceous (does not have woody components) plant with height varies form 2-8 meters. Banana plant is perennial (can live for more than 2 years) and monocarpic which means, the shoot can flower only once

and will die after the fruit is produced. Banana and plantains are continuously exhibiting a spectacular growth worldwide. Its year round availability, affordability, varietal range, taste, medicinal and nutritive value makes it a favorable fruit among all classes of people with good export potential.

Musa species can be divided into different groups according to chromosome numbers and ploidy as well as characteristics by two ancestors, *Musa acuminata* (genome type A) and *Musa balbisiana* (genome type B)³. The cultivated bananas are divided into 6 genetic types: the diploid (AA) and the triploid (AAA) of *Musa acuminata*, and the four types of hybrid (AB, AAB, ABB and ABBB) of *Musa balbisiana*. There are several hundreds of cultivars of banana spread throughout the world. Several Latin names have been used in banana nomenclature. Two of the commonly used names are *Musa paradisiaca* and *Musa sapientum*. The varieties with persistent bracts and male flowers with large fruits and eaten after cooking were grouped under plantains and assigned to *Musa paradisiaca*. All other types which had small fruits, held compact in a bunch with softening of the pulp when ripe, dropping of withered bracts and staminate flowers are belonging to *Musa sapientum*.^{4,5}

Nendran variety is an important group of banana peculiar to the west coast of Kerala and belongs to *Musa paradisiaca* AAB variety. Among several varieties of banana cultivated in Kerala and Tamil Nadu, Nendran variety occupies first choice among Keralites⁶. The inflores-

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Table 2. Total Polyphenol Content and percentage yield of Banana flower extracts

| Banana Flower extracts | Polyphenols content (Milligram of gallic acid equivalent/ gram of dry weight) | Percentage yield of extraction (gram/100 g of dry matter) |
|------------------------|---|---|
| Ethanol Extract | 1.92±0.02 | 11.27% |
| Methanol Extract | 1.07±0.01 | 10.87% |
| Acetone Extract | 0.76±0.04 | 7.67% |
| Ethyl acetate extract | 0.71±0.02 | 5.83% |
| Water extract | 0.66±0.05 | 5.41% |
| Chloroform Extract | 0.23±0.04 | 2.04% |

Total Flavonoid Content (TFC) was estimated by aluminium chloride colorimetric assay. The flavonoid content is high in ethanol extract of banana flower (0.67%). In chloroform extract it is (0.20%). The results are shown in table 3.

Table 3. Total Flavonoid Content and Percentage yield of Banana flower extracts

| Musa Flower extracts | Flavonoid content (Percentage of flavonoid in grams) | Percentage yield of extraction (gram/100 g of dry matter) |
|-----------------------|--|---|
| Ethanol Extract | 0.669±0.002 | 11.27% |
| Methanol Extract | 0.596±0.005 | 10.87% |
| Acetone Extract | 0.396±0.006 | 7.67% |
| Ethyl acetate Extract | 0.302±0.003 | 5.83% |
| Water Extract | 0.291±0.004 | 5.41% |
| Chloroform Extract | 0.208±0.005 | 2.04% |

In vitro antioxidant activity of banana flowers was carried out by DPPH free radical scavenging assay method. IC₅₀ values are calculated by graphical method by plotting absorbance on X-axis and % inhibition on Y-axis. The results showed that all the extracts exhibit antioxidant activity. More % inhibition was shown by ethanol extract with IC₅₀ value 63µg/mL. Results of DPPH assay is given in table 4 and fig 1.

Table 4. Free Radical Scavenging Activity of banana flower extracts and reference compound

| Musa flower extracts | % radical scavenging activity | | | | | IC ₅₀ value |
|-----------------------|-------------------------------|-----------|-----------|-----------|-----------|------------------------|
| | 50 µg/mL | 100 µg/mL | 150 µg/mL | 200 µg/mL | 250 µg/mL | |
| Ethanol extract | 44.04 ^a | 62.48 | 72.60 | 81.19 | 88.63 | 63µg/mL |
| Methanol extract | 40.91 | 58.72 | 68.57 | 77.43 | 85.40 | 67µg/mL |
| Acetone extract | 31.87 | 53.35 | 62.30 | 70.36 | 76.81 | 86µg/mL |
| Ethyl acetate extract | 21.03 | 41.18 | 54.79 | 60.78 | 66.42 | 132µg/mL |
| Water extract | 12.08 | 25.51 | 39.21 | 52.82 | 60.43 | 192µg/mL |
| Chloroform extract | 7.52 | 19.33 | 30.70 | 41.36 | 52.46 | 242µg/mL |
| Ascorbic acid | 48.43 | 64.43 | 76.22 | 88.65 | 96.06 | 55 µg/mL |

a- Values are means of three replicates and the standard deviations for all the figures were less than 1%.

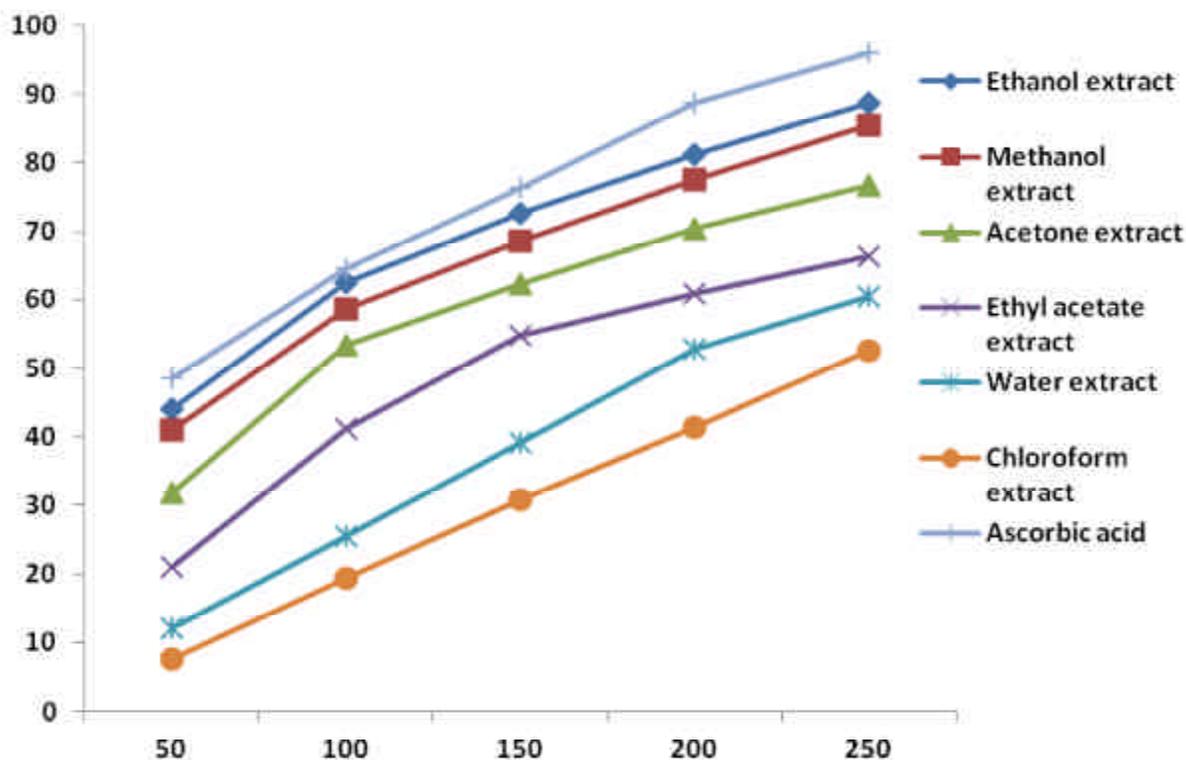


Fig.1. Free radical scavenging activity of Banana flower extracts

CONCLUSION

The results showed that ethanol extract of banana flower (*Musa paradisiaca* AAB Nendran variety) having more amount of polyphenols and flavonoid compared to other extracts. In addition, the ethanol extract exhibited more antioxidant activity with IC₅₀ value 63 µg/mL. This study concluded that more antioxidant activity shown by ethanol extract is due to the presence of more amount of polyphenols and flavonoids.

REFERENCES:

1. Edzard Ernst. Herbal Medicine – a concise overview for professionals, BH publications, Boston: 2-6.
2. Lucida G. Miller, Wallace J. Murray. Herbal Medicinals- A Clinician's Guide. The Haworth Press Publications, New York: .3-9.
3. Shanmugavelu K G, AravindakshanK, Sathyamurthy S. Banana Taxonomy, Breeding and Production technology. Metropolitan book co.Pvt.Ltd.Publication, New Delhi: 9-23.
4. Mohammad Zafar Imam and Saleha Akter. *Musa paradisiaca* L. and *Musa sapientum* L.: A Phytochemical and Pharmacological Review, Journal of Applied Pharmaceutical Science 2011, 01 (05): 14-20.
5. Sarma R, Prasad S, MohanBhimkal N K. Description and uses of a seeded edible banana of North Eastern India, Infomusa, 2006, Vol 4, N^o 1: 8-9
6. MadavaRao V N, Banana, published by Publication and information division ICAR(Indian Council for Agricultural Research): 8-16.
7. Evans W C, Trease and Evans Pharmacognosy, 15th edition, Harcourt publishers limited 2002 :221-229
8. Kokate C K, Purohit A P, Gokale S B. Pharmacognosy ,36th edition, NiraliPrakashan publications Pune 2006 :593-597.
9. Sumathy V, Jothy Lachumy S, Zuraini Zakaria, and Sasidharan S. In Vitro Bioactivity and Phytochemical Screening of *Musa Acuminata* Flower, Pharmacologyonline 2011 2: 118-127.
10. Zhan Wu Sheng, Wei Hong Ma, Jin he Gao, Yang Bi, Wei Min Zhang, Hua Ting Dou, Zhi Qiang Jin. Antioxidant properties of banana flower of two cultivars in China using 2,2-diphenyl-1-picrylhydrazyl (DPPH), reducing power, 2,2'-azinobis-(3-ethylbenzthiazoline)-6-sulphonate (ABTS) and inhibition of lipid peroxidation assays, African Journal of Biotechnology, 2011, 10(21): 4470-4477.
11. Ratna China, Sanjukta Dutta, Sauradip Sen, Rajarshi Chakrabarathi, Debajit Bhowmik, Santinath Ghosh, Pubali Dhar. In vitro Antioxidant Activity of Different Cultivars of Banana Flower (*Musa paradisiaca* L.) Extracts Available in India, Journal of Food Sciences 2011, 00: C1-C9.
12. Padam B S, Tin H S, Chye F Y and Abdullah M I. Antibacterial and Antioxidant Activities of the Various Solvent Extracts of Banana (*Musa paradisiaca* cv. Mysore) Inflorescences, Journal of biological Sciences 2012, 12(2) : 62-73.
13. Abdul Qayoom Laghari, Shahabuddin Memon, Aisha Nelofar, Abdul Hafeez Laghari. Extraction, Identification and Antioxidative Properties of the Flavonoid-Rich Fractions from Leaves and Flowers of *Cassia angustifolia*, American Journal of Analytical Chemistry, 2011, 12(2): 871-878.
14. Mohammed Fazil Ahmed, Srinivasa Rao A, Shaik Rasheed Ahemad, Mohammed Ibrahim. Phytochemical Studies and Antioxidant Activity of *Melia Azedarach* Linn Leaves by DPPH Scavenging Assay, International Journal of Pharmaceutical Applications, 2012 3(1):271
15. Nilima S. Rajurkar, Hande S M. Estimation of Phytochemical Content and Antioxidant Activity of Some Selected Traditional Indian Medicinal Plants, Indian Journal Pharmaceutical Sciences 2011, 73(2): 146-151.

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