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RESEARCH ARTICLE

Therapeutic Potential of *Musa balbisiana colla*: with Reference to Its Antioxidant Properties

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ABSTRACT

The present study was performed to determine the antioxidant activity of *Musa balbisiana colla* seed, peel, pulp and flower extract .In addition to antioxidants, phytochemical analysis revealed *Musa balbisiana colla* flower extract were rich in phenol and flavonoid content64.5 ± 1.2 mg equi./ Gallic acid/g dw152.42 ± 0.5 mg equi./Quer/g dw . The methanolic and petroleum ether extract of seed ,peel and flower were also evaluated for antioxidant assay using 1,1-diphenyl-2-picrl-hydrazyl(DPPH), ferric reducing antioxidant power(FRAP), 2,2-azino-bis(3-ethlbenzothiazoline-6-sulfonic acid)(ABTS), Nitric oxide(NO) assays, Hydrogen radical activity(HRA) which exhibited the metabolic seed extract posses highest scavenging activity in all the assays. Thus the result indicates that extracts of *Musa balbisiana colla* seed and flower posses potent antioxidant effect.

Keywords: Antioxidant, $IC_{50,}$ Total Phenolic Content,Total Flavonoid Content

INTRODUCTION

Musa balisiana colla belongs to *Musaceae* species classified as monocotyledons having number of seeds.It is commonly known as Bhimkol or Athiyakol in the state of Assam (Borborah *et al*.,2016). Bhimkol classified as triploid (BBB) is cultivated in every household of the people of Assam due to its medicinal and therapeutic uses (Uma *et*

*al.,*2000).Various reports illustrates the importance of different parts of *Musa balbisiana* colla which shown to possesses antioxidant activity, antihyperglycaemic, hepatoprotective effect. (Revadigar *et al.,*2017;Nofianti*et al.,* 2021;Arumugam *et al.,* 2021). Studies conducted however describes the potential of ethanolic extract of different parts of banana. Therefore in this study we have evaluated the antioxidative activity of methanolic extract of *Musa balbisiana* seed and flower.

METHODS

Collection of samples

Bulk number of samples were procured from local sellers of Guwahati. Different parts like fruit, peel, seed, edible flower and inedible part of banana were collected for the further studies.

Drying and extraction of different parts of banana

Drying of the samples was done in hot air oven at the temperature of 40ºC. After drying, the samples were ground to homogeneous powder. Continuous hot extraction was performed using a Soxhlet apparatus and allowed to stand at room temperature for a period of 3 days with frequent agitation until the soluble matter of the samples have dissolved. The solvents like Petroleum ether, Methanol were used in the extraction process.

Evaluation of the *In vitro* Antioxidant Activity

Different *In vitro* Antioxidant Assays includes

1. DPPH radical scavenging Activity
2. ABTS radical scavenging Activity
3. NO radical scavenging Activity
4. Hydrogen radical Activity
5. Ferric reducing antioxidant capacity

F All the *In vitro* Antioxidant Activities were performed by using standard protocol with some minor modifications. NO radical scavenging activity was carried out by using griesh reagent method. UV visible spectrophotometer was used for the analysis purposes for all assays. IC50 (μg/ml**)** value was calculated by plotting the standard graph using graph pad.

RESULTS

Analysis of total phenol and flavonoid

The Total Phenol Content (TPC) and Total Flavonoid Content(TFC) is depicted in Table 1.TPC quantified in seed , peel ,stem, flower,flowerinedibleextract were 33.88 ± 0.5 ,7.3 ± 1.0,13.51± 2.1,64.5.2 ,27.11 ± 1.15 mg equi./ Gallic acid/g dw respectively. TPC of methanolic extract of flower was significantly high compared to seed, peel, stem .The flower depicted high total phenol content of 64.5.2 mg equi./ Gallic acid/g dw .Total flavonoid content quantified in seed extract, peel extract ,stem extract and flower extract, flower inedible were 38.1±1.1, 10.15±0.78, 4.61±1.5,152.42±0.5 and 72.5±1.1mg equi./Quer/g dw respectively. Among all the extracts flower methanolic extract exhibited highest flavonoids content of 152.42±0.5mg equi./Quer/g dw.

Antioxidant capacity of the selected sample extracts

Fig 1,2,3,4,5.*In vitro* antioxidant assay of ethanolic extract of *Musa balbisiana.* Antioxidant effect of methanolic extract of *Musa balbisiana* determined by DPPH, ABTS, HRA, NO, FRAP assays expressed in IC_{50}.(1)DPPH activity (DRC) of methanolic extract of banana seeds and flower, (2)ABTS activity (DRC) of methanolic extract of banana seed and flower,(3) HRA activity of the methanolic extract of banana seed and flower,(4) Nitric oxide scavenging activity, and (5)FRAP assay of methanolic extract of banana flower and seed. The methanol and petroleum ether extracts of peel, flower and seeds of *Musa balbisiana* were screened for antioxidant activity at five different concentrations using 1,1-

diphenyl-2-picrylhydrazyl (DPPH),2,2'-azinobis-(3-ethylbenzthiazoline-6-sulphonate (ABTS), hydrogen peroxide (H_2O_2) and Nitric Oxide (NO) assays to determine free radical scavenging activity and ferric reducing antioxidant power (FRAP) to determine reducing power capacity. Ascorbic acid was used as the standard antioxidant i.e the positive control for the assays. The IC_{50} or EC_{50}values (the concentration of extract or standard that can inhibit 50% of the antioxidant capacity) were determined from regression analysis of a plot of percent inhibition against the extract concentration (μg/mL). The results indicate a dose-dependent increase in antioxidant scavenging activity. A comparison of the IC_{50} values (μg/mL) obtained from the DPPH,ABTS,NO,$H_2O_2$and FRAP assays for the different extracts and ascorbic acid is presented in Table 3.The highest DPPH, scavenging potency was recorded for the seed methanolic extracts with $IC_{50} = 1000\ \mu$g/mL. In ABTS and H_2O_2 assay the highest scavenging potency was recorded for the seed methanolic extracts with 190.47μg/mL, 2300 μg/mL respectively followed by the flower methanolic extracts with $IC_{50} = 371.72\ \mu$g/Ml and 3295μg/Ml respectively. Similarly EC_{50} value of 568.18μg/mL was recorded for seed methanolic extracts in nitric oxide (NO) assay. Highest reducing power in FRAP assay was recorded for seed methanolic extracts (60.27 Equivalent ascorbic acid /gm extract) followed by flower methanolic extracts (16.22 Equivalent ascorbic acid /gm extract) and peel methanolic extracts (13.53 Equivalent ascorbic acid /gm extract). The extract with highest percentage inhibition and IC 50 value for all the five assays has also been depicted in the figure 1, 2, 3, 4 and 5.Based on above results, it can be said that seeds of *Musa balbisiana* colla possess significant antioxidant capacity as compared to other part of the plant. The present study can also be compared with previous studies done by (Nghia 2016) which suggested that the seed ethanolic extract of *Musa balbisiana* colla showed a high antioxidant value with $IC_{50} = 301.8$ μg/m .Earlier various studies (Sheng *et al.,* 2011;Arya Krishnan and Sinija 2016; Thaweesang 2019) had reported the high antioxidant properties of flower part of different banana varieties. However limited reports have been found on the antioxidant activity of the seed part of *Musa balbisiana* colla.

DISCUSSIONS

The antioxidant data demonstrates that methanolic extract of *Musa balbisiana* colla seed and flower is a more potent antioxidant than methanolic extracts of other samples and this observation was further supported by total phenolic and total flavonoid content of methanolic extract of *Musa balbisiana* colla seed and flower.The higher antioxidant potential of *Musa balbisiana* colla seed and flower may be attributed to its flavonoid content. We performed multiple radical scavenging assays (DPPH,FRAP,ABTS,HRA,NO) to investigate the free radical scavenging activity of *Musa balbisiana* seed, flower, peel, stem .The results demonstrated high amount of oxidant radical scavenging power in Mb seed in all the assays .The antioxidant activity thus can prevent oxidative damage in normal cells (Lee *et al.,*2003).Further evaluation was done to investigate the relationship between antioxidant activity and polyphenolic compounds,therefore its phenolic and flavonoid content was established. The study showed MbC flower possess high amount of phenol and flavonoid content .Various literature showed the relationship of phenol and flavonoid and its effect in controlling antioxidants (Firuzi*et al.,* 2005). Phenols acts as antioxidant by transferring H atom to free radicals (Sakihama *et al.,* 2002) .This antioxidant activity of phenolic compound has ability to chelate metal ions involved in the generation of free radicals (Perron and Brumaghim 2009). Polyphenolic compounds are major compound of *Musa balbisiana* and thus has effective role in treating certain diseases such as diabetes mellitus (Kalita *et al.,* 2016).This inhibition mechanism was studied further by analysis of total phenol and flavonoid content and antioxidant activity of the extracted sample. The total phenolic content of stem, peel, flower,seed is presented in Table 1 where the good amount of total phenolic content and total flavonoid content was expressed by flower methanolic extract 64.5 ± 1.2 mg equi./ Gallic acid/g dw and 152.42 ± 0.5 mg equi./Quer/g dw respectively and seed methanolic extract 33.88 ± 0.5 mg equi./ Gallic acid/g dw and 38.1 ± 1.1 mg equi./Quer/g dw respectively. Good phenol content in extract can have significant role in inhibition of α-glucosidase (Mai and Chyen 2007) and α -amylase therefore such inhibitory activity of seed extract can have a potential role in dietary management in controlling postprandial blood glucose level (Wongsa, Chaiwarit, Zamaludien 2012). The results of the study showed that *Musa balbisiana* colla seed and flower is an potential antioxidant the methanolic extract exhibited high amount of phenol and flavonoid content which validates its potential. The *Musa balbisiana* colla seed and flower methanolic extract showed powerful free radical scavenging activity.

CONCLUSION

The study has illustrated the methanolic extract of *Musa balbisiana* colla seed and flower posses antioxidant activity. The antioxidant activity showed strong scavenging power against DPPH, ABTS, FRAP, HRA, NO assays. Therefore high antioxidant potential of *Musa balbisiana* colla seed and flower can be beneficial in preventing oxidative damage in cells and related diseases. Also phytochemical analysis exhibited the high amount of total phenolic content and total flavonoid content. Thus further investigations are required to establish its other therapeutic potential of different parts of the plant.

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Abbreviations

DPPH - 1,1-diphenyl-2-picrl-hydrazyl; FRAP-Ferric reducing antioxidant power ;ABTS- 2,2-azino-bis(3-ethlbenzothiazoline-6-sulfonic acid; NO- Nitric oxide; HRA-Hydrogen Radical Activity;TPC-Total phenol content; TFC-Total flavonoid content.

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Table no 1: Quantitative Analysis of total phenol and flavonoid

Sl.no	Name of the extract	Total Phenol (mg equi./ Gallic acid/g dw)	Total flavonoids (mg equi./Quer/g dw)
1	Seed methanolic extract	33.88 ± 0.5	38.1 ± 1.1
2	Peel methanolic extract	7.3 ± 1.0	10.15 ± 0.78
3	Stem methanolic extract	13.51± 2.1	4.61 ± 1.5
4	Flower methanolic extract	64.5 ± 1.2	152.42 ± 0.5
5	Flower inedible methanolic extract	27.11 ± 1.15	72.5 ± 1.1

Phytochemical analysis of methanolic extract of *Musa balbisiana*colla.Data represent means of triplicate determination ± S.D .Values of TPC and TFC is expressed in mg equi./ Gallic acid/g dw and mg equi./Quer/g dw.TPC=Total Phenol Content, TFC=Total Flavonoid Content.

Table no 2: Antioxidant assays of the selected hot extracted samples

Sl.no	Name of the extract	DPPH IC50 (μg/ml)	ABTS IC50 (μg/ml)	HRA IC50 (μg/ml)	NO assay (EC50)	FRAP(Equivalent ascorbic acid /gm extract)
1	Peel methanolic extract	>1mg/ml	>1mg/ml	>20mg/ml	>1mg/ml	13.53
2	Flower methanolic extract	>1mg/ml	371.72	3295	>1mg/ml	16.22
3	Seed methanolic extract	1000	190.47	2300	568.18	60.27
4	Peel Pet ether extract	>1mg/ml	>1mg/ml	>20mg/ml	>1mg/ml	7.31
5	Flower edible Pet ether extract	>1mg/ml	>1mg/ml	>20mg/ml	>1mg/ml	6.33
6	Flower inedible pet ether extract	>1mg/ml	>1mg/ml	>20mg/ml	>1mg/ml	6.97
7	Seed Pet ether extract	>1mg/ml	>1mg/ml	>20mg/ml	>1mg/ml	7.97
8	Ascorbic acid	129.17	45.34	445.54	307.23	-

Antioxidant activity of *Musa balbisiana*colla as measured by DPPH ,ABTS,HRA,NO,FRAP assays and compared with ascorbic acid .Values are expressed as Mean ±SD of triplicate experiments. DPPH=1,1-diphenyl-2-picrl-hydrazyl, ABTS=2,2-azino-bis(3-ethlbenzothiazoline-6-sulfonic acid, HRA= Hydrogen Radical Activity, NO=Nitric Oxide ,FRAP=ferric reducing antioxidant power.

In vitro Anti oxidant assays

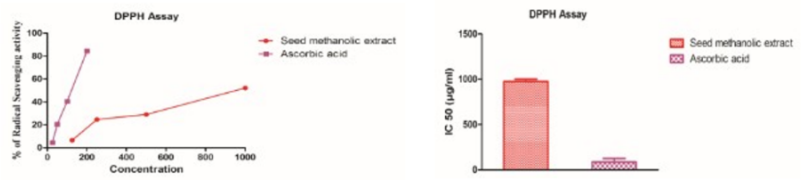

Fig 1: DPPH activity (DRC) of the Methanolic Extract of Banana Seeds

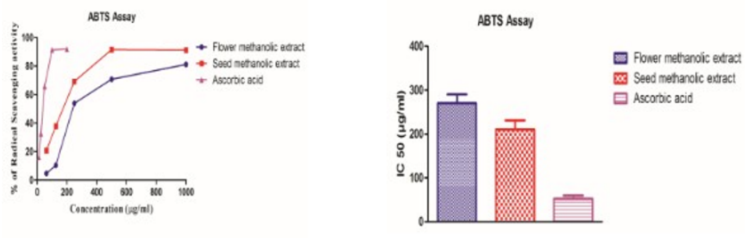

Fig 2: ABTS activity (DRC) of the Methanolic Extract of Banana Seeds

In vitro Anti oxidant assays

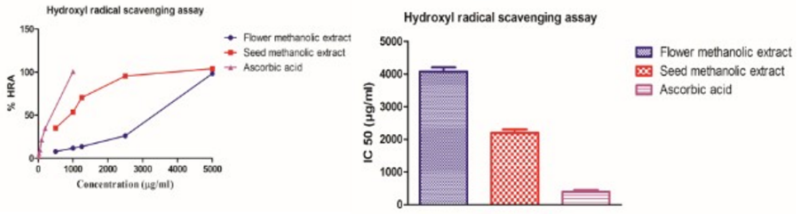

Fig 3: HRA activity of the Methanolic Extract of Banana Seeds

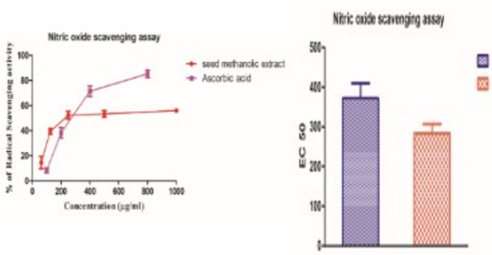

Fig 4: Nitric oxide scavenging activity of the Methanolic Extract of Banana Seeds

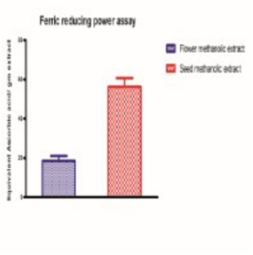

Fig 5: FRAP assays of the Methanolic Extract of Banana Flower & Seeds