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Research Article

Methanolic Extract of Ripen *Musa sapientum* Lowers Fasting Blood Glucose of Non Diabetic Swiss Albino Mice

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Abstract: *Musa sapientum* (*M. sapientum*) commonly known as 'banana' is widely used folk medicine for the treatment of various ailments including diarrhea, wounds, stomach ulcer, diabetes, heart burn, inflammation and others. The medicinal use of this study focuses on the potential of ripen whole banana fruits in lowering blood sugar. Banana fruits were dried and turned into powder form to administer to Albino rats. Thirty Swiss Albino rats served as experimental animals. They were randomly assigned in six groups. The first group (5 animals) served as controls were fasted and only fed a glucose solution of 4 g/kg. The second group served as the experimental animals where Glibenclamide (10mg/kg) solution with 4g/kg glucose solution was administered orally. Initial fasting blood sugar levels of both treatments showed significant glucose absorption. Fasting blood sugar for other treatment groups with 50, 100, 200 and 400mg/kg ripen *Musa sapientum* extract with 4g/kg glucose solution showed significant results. The result revealed that banana extract has the potential for lowering blood glucose in Swiss Albino Rats. This implies that banana fruit can be used as herbal medicine to lower blood glucose.
Keywords: *Musa sapientum*, Fasting Blood Glucose, folk medicine.

Introduction

Banana (*Musa* genera) fruits are one of the most common plants which have been frequently cultivated in more than 100 tropical and sub-tropical countries. Although, banana is commonly taken as a source of energy and nutritious diet in humid tropical regions [1,2], traditional medicinal practitioners claimed that it also has beneficial effects in reducing the blood sugar [5]. In recent days, type 2 diabetes mellitus, has become one of the fast-spreading diseases worldwide. It has been reported that, in the South Asian region, Bangladesh has the highest number of adults with diabetes [4]. As glucose homeostasis is disrupted in this disorder, elevated level of blood glucose may cause cardiovascular disorders, as well as diabetic neuropathy, nephropathy and retinopathy if hyperglycemia is left untreated for long [3].

The treatment cost for diabetes and related disorder creates a huge health care hazards, which become a serious burden on the patients. In addition, most of the allopathic anti-diabetic medicines are costly and are not easily available in rural areas. Moreover, most of the synthetic hypoglycemic

agents can produce serious health issues due to side effects which includes disturbances of liver and kidney [5]. In addition, these drugs are not safe during pregnancy [5]. Therefore, scientists are looking for a readily available and affordable option which would be safe and more effective.

Actually, it is now widely believed that, plants contain a complex mixture of phytochemical constituents which are more effective than one individual component to prevent a disorder due to both of its additive and synergistic effect [7]. As the side effects of anti-diabetic drug and the burden of financial costs are the main hurdle for the diabetic patients, edible phytochemicals offer an available, acceptable and approachable option for diabetes management for mass people.

Several reports found that banana's peel and pulp extracts are rich in fatty acids, sterols and steryl ester, in addition to linoleic, linolenic and oleic acids [6]. Various parts of *Musa sapientum* L. (Family: Musaceae) have been used for various medicinal purposes including the treatment of diabetes mellitus [8]. It has been reported that, methanol extracts of fruit peels of *Musa seminifera*, *Musa sapientum*, and *Musa textilis* results effective improvement of glucose tolerance [9-11].

In recent years various monoherbal and polyherbal formulations and plant extracts are taken under experiment for their blood glucose lowering efficacies [12-16]. The oral glucose tolerance test (OGTT) is the gold standard to determine glucose homeostasis in a living organism. So, OGTT in glucose loaded mice can be a way of determining whether a substance can keep glucose homeostasis in an effective manner. Since phytochemicals present in banana pulp and banana peel may differ and therefore, their efficacy can vary in the same species of plant. Therefore, in the present study, it was of interest to determine oral glucose tolerance efficacy of *Musa sapientum* (banana) peel and pulp in non-diabetic rats.

Materials and Methods

Animal model

30 Swiss albino mice were collected from animal resource Branch of icddr, b Mohakhali Dhaka. The mice were stored in steel cage (15 mice/cage) and given corn and normal water. During experiment they were labeled on their tail for identification using red, black and blue colored permanent markers. The animals were selected according to their body weight so that the average body weight of all the groups remains approximately same.

Preparation of *Musa sapientum* powder

Ripen *Musa sapientum* was collected from local market of Dhaka. Then it was taken and dried in direct sunlight. Then the dried of *Musa sapientum* was grinded using a kitchen blender to make powder and preserved in an air tight container at room temperature until extraction.

Preparation of extract powder of *Musa sapientum*

100gram dried powder was put into a glass beaker and added 500 ml methanol. Slow stirring was continued with a glass rod for one hour to mix up methanol and fine dried powder. The beaker was covered with aluminum foil and left for 48 hours. The mixture was filtered with thin cloth (white color) and the extract was taken to the water bath till dried extracts (crude drug) were obtained. The Temperature was always maintained at 40^0C and finally the extract was collected by spatula in a marked glass vial. A total of 7gram dry powder extract was found and put into glass vial. The extract vial was kept in a refrigerator at 4-8^0C temperature.

Experimental design

At First 30 adult mice (male : female = 4 : 1) were taken, divided into 6 groups and named Control, Standard, Group-1, Group-2, Group-3, and Group-4. Then 0.4 gm of the *Musa sapientum* methanol extract was taken in two different vials and dissolved in DMSO (net volume 1 ml for each suspension) and 10gm glucose was dissolved in 10ml distilled water in a beaker. Meanwhile a 5gm tablet of Glibenclamide was taken in vial and dissolved in 1ml DMSO. After overnight fasting, at

first mice from standard group was administered Glibenclamide at a dose of 10mg /kg body weight by gavaging. Then mice from group-1 (Low dose) to Group-4 (highest dose) were administered methanol extract of *Musa sapientum* at a dose of 50mg/kg, 100mg/kg, 200mg/kg and 400mg/kg body weight respectively. After one hour all the mice including the control group were administered glucose by gavaging at a dose of 2 mg/kg body weight. After 120 minutes of glucose gavaging all the mice were subjected to blood collection by puncturing their tail and glucose level analysis by glucometer and reading of the glucometer was taken in mmol/L to measure the blood glucose level.

Statistical Analysis

The statistical analyses were conducted with the following software programs: Excel 2013 and IBM SPSS 18.

Results

Glucose test results were presented in the table-1. Six groups of mice were used here. Control group was used for glucose. Here administered glucose concentration was 4gram/kg. For this group mean result for blood glucose was 7.96mmol/L (p=0.00). Standard group mice was selected for Glibenclamide (10mg/kg) and mean blood glucose level was found 4.00mmol/L (p=0.0005). Group 1,2,3 and 4 were dedicated for the treatment of *Musa sapientum* extract. Mean blood glucose level for group-1 mice was 6.44mmol/L (p=0.005), 5.04mmol/L was for group-2 (p=0.0005), 4.70mmol/L was for group-3 mice (p=0.0005) and finally 4.24mmol/L was for group-4 mice (p=0.0005).

Table 1. A preliminary pharmacological study on hypoglycemic effects of methonol extract of *Musa sapientum* Fruit, in Swiss Albino mice

Serial	Control	Standard	Group-1	Group-2	Group-3	Group-4
	Glucose 4g/kg	Glibenclamide 10mg/kg	50mg/kg	100mg/kg	200mg/kg	400mg/kg
01	7.9	5.2	7.2	5.7	6.4	5.3
02	7.4	3.2	6.9	4.1	3.0	3.6
03	8.3	3.3	6.1	5.5	4.8	3.7
04	8.0	3.9	6.6	5.8	4.4	4.0
05	8.2	4.4	5.4	4.1	4.9	4.6
Sum	39.8	20.0	32.2	25.2	23.5	21.2
Mean	7.96	4.00	6.44	5.04	4.70	4.24
SD	0.350714	0.827647	0.709225	0.86487	1.216553	0.709225
SE	0.156844	0.370135	0.317175	0.386782	0.544059	0.317175
t-value	2.015036	9.850868	4.295774	6.996145	5.757525	10.51334
p-value	0.000	0.0005	0.005	0.0005	0.0005	0.0005
Significance level	0.05%	0.05%	0.05%	0.05%	0.05%	0.05%
5% Significance Level	Significant	Significant	Significant	Significant	Significant	Significant

Discussion

Bangladesh considers to be a host for the diversity of bananas that occupy different ecological niches. On the other hand, the economic burden of type 2 diabetes has been put a huge load in many low-and lower middle-income families in Bangladesh. The present article represents that, methanol extract of various types of banana skins has the ability to lower blood glucose in glucose-challenged mice. This not only opens a door for a new natural drug for controlling glucose level in blood but also this discovery paves a way to reach this easily affordable and available natural remedy to the rural and remote area patients to keep glucose homeostasis. Over the years, many studies have been reported to identify some compounds in *Musa* spp. having capacity to control blood glucose level.

These compounds include anthocyanins, [17] phenolic acids, [17, 18] flavanones [19] and terpenoids [19]. It has been found that compounds belonging to these classes have antidiabetic effects. Anthocyanins such as delphinidin-3-rutinoside, cyanidin-3-rutinoside, petunidin-3-rutinoside, pelargonidin-3-rutinoside, peonidin-3-rutinoside and malvidin-3-rutinoside were identified in the bracts of *Musa* spp. [17], which have been considered to be potent α-glucosidase inhibitors [20]. In addition, anthocyanins are associated in mechanisms that grant to elevate insulin sensitivity and accordingly keep balanced glucose level. It also keeps away the complications related to diabetes [21].

As a whole, the promising results from this study regarding antidiabetic activity of the skin part of *Musa* spp., indicating that, this could be a natural alternative therapy for treating diabetes mellitus type 2.

Conclusion

The results suggest that methanolic extract of ripen *Musa sapientum* can be used for lowering of blood glucose.

Conflicts of interest: The authors declare no conflicts of interest.

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