PHYTOCHEMICAL EVALUATION AND ANTIDIABETIC POTENTIAL OF THE STEM OF *MUSA PARADISIACA* (Linn.)

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Abstract: This study proposed to chemical evaluation and invitro antidiabetic potential of the stem of *Musa paradisiaca* (linn.). *Musa paradisiacal,* commonly known banana. Its fruit is generally used as as a dietary source. Various pharmacological activities have been investigated in leaves, fruits, and pulp of this plant. But very few activities and research have been done on stem of *Musa paradisiaca*. Generally stem of *Musa paradisiaca* considered waste part of this plant. So we have used to this plant to investigate its phytochemical constituents and pharmacological activity and found various phytochemical constituents qualitatively and quantitatively like starch, sugar, flavanoids, phenolic compounds, proanthocynidine, glycosides, fat and alkaloids. And investigated antidiabetic potential by using alpha amylase and alpha glucosidase inhibition method and finally found that hydroalcoholic extract of *Musa paradisiaca* contain antidiabetic activity in large amount.

Key Words: *Musa paradisiaca,* alpha – amylase, alpha – glucosidase , antidiabetic potential.

1. INTRODUCTION:

Natural products are used to cure disease and illness with therapeutic properties from ancient time as human civilization and, for a long time. Mineral, plant and animal products were the main sources of drugs [1]. *Musa paradisiaca* (linn.), a member of family Musaceae is well known as Plantain or banana. *Musa paradisiaca* is a monoherbacious plant, belonging to family Musaceae, commonly known as plantain. Plantain refers in India to a coarse banana. The plants having two genera and 42 different species, 35 species are belongs to Musa species [2]. It is up to 9 m long Plant with a robust tree like pseudostem, a crown of large elongated oval deep-green leaves (up to 365 cm in length and 61 cm in width), with a prominent midrib, each plant produces a single inflorescence like drooping spike and large bracts opening in succession, ovate, 15-20 cm long, concave, dark red color and in somewhat fleshy. Fruits are oblong, fleshy, 5-7cm long in wild form and longer in the cultivated varieties [3]. Mostly in India and Burma (In India mostly found in Assam, Madhya Pradesh, Bihar, Gujarat, Andhra Pradesh, Karnataka, Jalgaon district in Maharashtra, West Bengal, Tamil nadu etc.) and it is also distributed in America, Australia and tropical Africa. Cultivation is limited to Florida, the Canary Islands, Egypt, Southern Japan and South Brazil The plant is widely distributed in the parts of West and East Africa, Nigeria, Malaysia, Camroon and southern parts of United States [4]. Pharmacological investigations revealed that banana fruits, Stem juice, flowers are screened for analgesics activity, [5] hair growth promoting activity, [6] anticonvulsant activity, [7] antimicrobial activity. Shoots - The juices of *Musa balbisiana* plantain shoots have been reported for dissolving pre-formed stones and in preventing the formation of stones in the urinary bladder of rats [8].

Figure no. 1 showing different parts of *Musa paradisiaca* at collection site

Flower consists of tannins, saponins, reducing and non reducing sugars, sterols and triterpenes. The structure of new tetracyclic triterpine isolated from the flowers of *Musa paradisiaca* Linn was determined as (24R)-4α-14α, 24-trimethyl-5-cholesta-8, 25 (27)-dien-3β-ol [9]. Banana bracts abundant edible residues of banana production were investigated as a potential source of natural colourant. Monomeric anthocyanin content was 32.30 mg/100gm. Other anthocyanins were 3- rutinoside derivatives of dephinidin, pelargonidin, peonidine and malvidin [10]. Fruit consists of carbohydrates, amino acids, sugar and starch. Foremost components of this starch are amylose and amylopectin, present in a ratio of around 1:5. About 1.3% of sugars are present in total dry matter in unripe plantains, but this rises to around 17% in the ripe. The skin of the fruit is rich in cellulose (10%), hemicelluloses (7%). The pulp protein was rich in arginine, aspartic acid, glutamic acid, methionine and tryptophan [11]. A new bicyclic diaryl heptanoid rel (3S-4Ar,10Br)-8-hydroxy-3-(4- hydroxy phenyl)-9-methoxy-4a,5,6,10b-tetrahydro-3H naphtho (2,1-b) pyran as well as four known compounds 1,2 dihydro 1,2,3 trihydroxy-9-(4-methoxy phenyl) phenalene (2)-hydroxy anigorufone (3), 2-(4-hydroxy phenyl) naphthalic anhydride(4) and 1,7 bis(4-hydroxy phenyl) hepta-4(E), 6 (E)- diene-3-one(5) were isolated from ethyl acetate soluble fraction of the methanolic extract of fruits [12]. Sucrose synthetase is present in the highest concentration in root stock and fruit pulp considerable variations exist in the content of glucose, fructose, sucrose, starch and protein. Sucrose phosphate synthetase in the pseudo stem. Acid invertase is present in leaves, leaf sheath and fruit pulp and root stock. The maximum activity of ATP/D-phosphoglucose pyrophosphorylase is found in root stock. Hexokinase is most active in root stock. Acid phosphotase and alkaline phosphatase activity is highest in fruit pulp and pseudo stem. Glucose phosphate isomerase is most active in the root stock and lowest in the leaves [13].

2. MATERIAL AND METHODS:

Musa paradisiaca stem were collected from Gudrich Vikasnagar Dehradun Uttrakhand. The stems were cut into horizontally circular pieces and then dried in shade. And then grind into powdered form and finally sieved to get uniform powdered drug. Pharmacognostical and physicochemical evaluation were carried out from shadedried plant powder. Physicochemical standardizationmethods including determination of moisture content (loss on drying), determination of total ash and acid insoluble ash, extractive values were carried out as per WHO recommendations and authentic procedures mention in Ayurvedic pharmacopoeia of India. Estimation of total Sugar and total starch in plant material was carried out with according to Mont Gomery, 1957 [Spectrophotometric method] taking dextrose and starch (soluble), respectively as a standard solution. Whereas total tannins were determined by using Tannic acid as standard and Gallic acid for the determination of total phenolics. In the determination of total flavonoids and total flavonols Rutin was taken as a standard. Proanthocynidines were estimated by using Catechin as a standard.

Inhibition of alpha-amylase enzyme - A starch solution (0.1% w/v) was obtained by stirring 0.1g of potato starch in 100 ml of 16 mM of sodium acetate buffer. The enzyme solution was prepared by mixing 27.5 mg of alpha-amylase in 100 ml of distilled water. The colorimetric reagent is prepared by mixing sodium potassium tartarate solution and 3, 5 di nitro salicylic acid solution 96 mM. Both control (Acarbose std. drug) and synthesized compound(s) were added with starch solution and left to react with alpha- amylase solution under alkaline conditions at 25ºC. The reaction was measured over 3 minutes. The generation of maltose was quantified by the reduction of 3,5 dinitro salicylic acid to 3-amino- 5- nitro salicylic acid. This reaction is detectable at 540 nm (Malik CP & Singh MB, 1980).

Inhibition of alpha-glucosidase enzyme - The inhibitory activity was determined by incubating a solution of starch substrate (2 % w/v maltose or sucrose) 1 ml with 0.2 M Tris buffer pH 8.0 and various concentration of control (Acarbose std. drug) and the synthesized compound(s) for 5 min at 37°C. The reaction was initiated by adding 1 ml of alpha glucosidase enzyme (1U/ml) to it followed by incubation for 40 min at 35°C. Then the reaction was terminated by the addition of 2 ml of 6N HCl. Then the intensity of the colour was measured at 540nm (Krishnaveni S, 1984).

Calculation of 50% Inhibitory Concentration (IC50)

The concentration of the synthesized compounds required to scavenge 50% of the radicals (IC50) was calculated by using the percentage scavenging activities at five different concentrations of the extract. Percentage inhibition (I %) was calculated by I % = (Ac-As)/Ac X 100 (Shai LJ, 2010). Here Ac = absorbance of the control and As = absorbance of the sample.

Table 1: Phytochemical screening of successive fraction from soxhlet, (+) shows presence, and (−) shows absence of content of stem.

S.No.	Compound	Test	Pet. ether	n-hexan	Chloroform	Ethyl acetate	Methanol	Water

1.	Carbohydrates	Molish' test	-	+	-	+	-	+
		Fehling's test	-	+	-	+	-	+
		Benedict's test	-	-	+	+	-	+
2.	Protein	Biuret test	+	+	+	+	-	+
		Millon test	-	+	-	+		+
3.	Amino acids	Ninhydrin test	+	+	+	+	-	+
4.	Fats and oils	Solubility test with chloroform	+	+	+	+	+	-
5.	Flavonoids	Alkaline test	-	+	-	-	++	++
		Zinc hydrochloride test	-	-	+	-	++	++
6.	Glycosides (saponin)	General test	-	+	-	+	-	+
		Froth test	-	+	-	+	-	+
7.	Alkaloids	Dragondorff's	+	-	+	+	-	+
		Mayer's	+	-	+	+	-	+
		Wagner's	+	-	+	+	-	+
		Hager's	+	-	+	+	-	+
		Tannic acid	-	-	+	+	-	+
8.	Phenolic compound (tannins)	Chlorgenic acid	++	+	+	+	++	+

Table 2 : Percent of different components in methanol extract of stem of *Musa paradisiaca*

Content sample	% content
Sugar	0.57
Starch	3.79
Tannin	1.29
Phenolic compound	4.5
Flavanoids	0.35
Flavonols	0.64
Proanthocynidine	7.0

IN VITRO – ALPHA AMYLASE INHIBITION METHOD

Table 3: shows % inhibition of alpha-amylase enzyme.

S.No.	**Extracts**	**% inhibition concentration of of sample (ml)**				
		0.2	**0.4**	**0.6**	**0.8**	**1.0**
1	Methanol	20.05	36.18	51.15	71.21	74.62
2	Hydroalcoholic	28.34	48.16	63.19	82.62	84.53

IN VITRO ALPHA-GLUCOCIDASE INHIBITION METHOD

Table 4: shows % inhibition of alpha glucocidase enzyme.

S.No.	**Extracts**	**% Inhibition concentration of of sample (ml)**				
		0.2	**0.4**	**0.6**	**0.8**	**1.0**
1	Methanol	24.30	33.43	56.26	63.81	78.17
2	Hydroalcoholic	32.84	54.43	66.26	78.81	84.17

3. CONCLUSION:

The present study attempts to investigate *in-vitro* antidiabetic activity of methanol and hydroalcoholic extract of stem of *Musa paradisiacal* and and tested for their *in vitro* antidiabetic potential. We also find that phenolic and flavanoids compounds are mostly present in stem of musa paradisiacal. The present findings divulge that both of extracts efficiently inhibits both alpha amylase and alpha glucosidase enzymes *in vitro* in a dose dependent manner. Data reveal that both of extracts have significant inhibitory activity, whereas hydroalcoholic (water + ethanol) extract found to be most active against both enzymes.

4. AKNOWLEDGEMENT: The authors would like to express their gratitude to Himalayan Institute Of Pharmacy and Research Rajawala Dehradun, Uttarakhand.

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