INVESTIGATION OF ANTI-MICROBIAL ACTIVITY OF LEAF AND UNRIPE PEEL OF *MUSA PARADISICA* LINN.

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Abstract

The present study was designated to investigate the anti-microbial activities of alcoholic and aqueous extract from leaves and unripe peel of *Musa paradisica* Linn. using the paper disc diffusion method. All the extract showed considerable activity against all the four tested strains viz., *Pseudomonas aeroginosa*, *Escherichia coli*, *Candida albican* and *Candida non-albican*. Leaves extract showed more activity than unripe peel extracts and it was comparable to the standard drug.

Key words: Banana, Leaves, unripe peel, Antimicrobial activity.

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Introduction

Musa paradisica Linn. (Musaceae) commonly know as banana is the herbaceous plants that grow for its fruit. Bananas have a *false stem* (called *pseudostem*), which is made by the lower part of the leaves. This pseudostem can grow to be two to eight metres tall. Each pseudostem grows from a corm. A pseudostem is able to produce a single bunch of bananas. After fruiting, the pseudostem dies and is replaced. When most bananas are ripe, they turn yellow or, sometimes, red. Leaves are arranged as a spiral and may grow 2.7 metres (8.9 ft) long and 60 cm (2.0 ft) wide. The banana fruit grow in hanging clusters. There are up to 20 fruit to a tier. (called a *hand*). The total of the hanging clusters is known as a bunch, or commercially as a banana stem. There are between three and twenty tiers to a bunch.[1]

Fig. 1 Whole plant of *Musa paradisica* Linn.

A single fruit is about 125 grams on average; about three quarters of this is water. Each banana (or *finger*) has a protective outer layer (called *peel* or *skin*). There is a fleshy part inside. Both the skin and inner part can be eaten. Western cultures generally eat the inside raw and throw away the skin while some Asian cultures generally eat both the skin and inside cooked. The plant contains tannic acid, gallic acid, vitamin C and B, volatile components. Fruits are very rich in chromium, acyl steryl glycoside and sitaondoside. Bananas have a lot of vitamin B_6, vitamin C, and potassium. The various part of plants are used medicinally in the treatment of various disease and disorder by the tribal and rural people of our country and various uses such as laxative, demulscent, emollient, antiulcerrogenic, in treatment of burns etc. are also mentioned in Wealth of India. Several authors had work to investigate the antibacterial, antifungal and antioxidant

activities of the plant[2-4], but till yet no work was done to investigate the anti-microbial activity of leaves and unripe peel of banana therefore, the present work was conceived by us.

Material and methods

Collection and authentication of plant material

The leaf and unripe peel of the selected *Musa paradisica* Linn. were collected in the months of August 2010 from the home gardens of Ujjain District of Madhya Pradesh and authenticated by Dr. S. N. Dwivedi, Prof. and Head, Department of Botany, Janata PG College, APS, University, Rewa, M.P-India and a voucher specimen MP/05/133 were deposited in our department. The leaves and unripe peel were later air-dried, powdered and stored in an air-tight container for further use.

Pharmacognostical evaluation

Macroscopic characters

Various morphological studies of the leaf and unripe peel were studied and result was reported in table 1.[5]

Physico-chemical evaluation

The dried leaves and peel of *Musa paradisica* were subjected to standard procedure for the determination of various physicochemical parameters.[5]

Extraction of Plant Material

The extraction of plant material (leaves and unripe peel) was carried out by maceration. 50 gm dried leaf powder was taken and dissolved in 500 ml of distilled water/ethanol and was left for 48 hours, then was filtered and concentrated. Similarly, 50 gm dried peel powder was taken and dissolved in 500 ml of distilled water/ethanol and was left for 48 hours, then was filtered and concentrated to get the aqueous and ethanolic extracts.[5]

Prelimary Phytochemical screening

The aqueous and ethanolic extract obtained after maceration of both leaves and unripe peel was subjected to various phytochemical screening as per the standard procedure to reveals the presence of various active phytoconstituents.[6]

Antimicrobial activity[7]

All the microorganisms were obtained from from Chotiram Hospital and Research Centre, Indore, M.P. Two bacteria strain *Pseudomonas aeroginosa* and *Escherichia coli* & two fungi strain *Candida albican* and *Candida non-albican* were used for present investigation. Nutrient agar media was used for bacteria whereas salburauds agar media was used for fungi.

Preparation and application of disks for experiment[8]

Different concentration of the extracts (20-100 µg/ml) was prepared by reconstituting with Water. The test microorganisms were streak to agar medium by streaking plate method. After streaking the autoclaved filter paper discs (5 mm in diameter) impregnated with the extracts were placed on plates using flame-sterilized forceps. The antimicrobial assay plates were incubated at 37°C for 24hr. For positive control Ampicilline and Fluconazole (60µg/ml) and for negative control solvent was used.

Observation of results

Results were recorded as presence or absence of zone of inhibition. The inhibitory zone around test paper disks indicated absence of microbial growth and it was reported as positive (growth inhibition observed) and absence of zone as negative. The test was repeated thrice in interday interval to insure reliability of the results. The diameters of the inhibition zones were measured in mm (after subtraction the diameter of disc i.e 5mm), shown in table 5.

Results and conclusions

The present study was taken up to screen the pharmacognostical, phytochemical and anti-microbial activity of leaves and unripe peel of the plant *Musa paradisica.* The macroscopical studies of leaves of *Musa paradisica* was carried out and the results are presented in Table 1.The physicochemical analysis of leaves and unripe peel powder of *Musa paradisica* was carried out. In this study ash values (total ash, acid insoluble ash and water soluble ash) were determined, Swelling index, LOD, Foaming index, Foreign organic matter (F.O.M.) was determined (Table 2) and the extractive values were determined with powdered (Table 3). Exhaustive extraction of the plant material (unripe peel and leaves) was done with ethanol and water by maceration and the extracts were screened for the presence of medicinally active phyto constituents (Table 4). The antimicrobial activity of both the extract was performed and reported. In this study the results of the investigations show that all the extracts from the unripe peel and leaves shows remarkable anti-bacterial and anti-fungal activity when compared to standard, whereas the leaves showed more potent activity than the leaves in both the cases. The zone of inhibition was shown in Table 5. Thus, these studies provided a scientific support to the selected medicinal plants which claims its use in folk lore medicine.

Table 1: Morphological features of leaves of *Musa paradisica* Linn.

S.N.	Character	Observations
1	Colour	upper green , lower light green
2	Odour	characteriatic
3	Taste	tasteless
4	Size	Width 20.5 cm , Long 38 cm
5	Texture	Upper Smooth , Lowe Smooth
6	Shape of lamina	Ovate
7	Margin	Entire
8	Apex	Acute
9	Venation	Unicostate paraller
10	Petiole	Absent
11	Midrid	Stronge
12	Surface appearance	Glabrous
13	Nature of leaf	Simple
14	Duration of leaf	Persistents

Table 2: Physicochemical Parameters of leaves and unripe peel of *Musa paradisica* Linn.

Physicochemical Parameters	Result (%w/w)	
	Leaves	Unripe Peel
Total Ash Value	4.5	5.2
Acid Insoluble Ash Value	2	2.9
Water Soluble ash Value	0.9	1.4
Moisture Content (LOD)	0.76	0.8 %
Swelling index	0.2	0.8
Foreign organic matter (FOM)	2.9	1.1

Table 3: Extractive values of leaves and unripe peel of *Musa paradisica* Linn.

S./No.	Parameters	Estimated percentage(w/w)
1	Aqueous extract of leaves	10%
2	Ethanolic extract of leaves	12.5%
3	Aqueous extract of unripe peel	15%
4	Ethanolic extract of unripe peel	17%

Table 4: Preliminary phytochemical screening of extracts of *Musa paradisica* Linn.

Constituents	Test	AEL	EEL	EEUP	AEUP
Alkaloids	Mayer's test	-	-	+	+
	Dragendroff' test	-	-	+	+
	Hager's test	-	-	+	+
	Wagner's test	-	-	+	+
Carbohydrates	Molisch's test	+	+	-	-
	Fehling's test	+	+	-	-
Glycosides	Brontrager's test	-	-	-	-
	Legal's test	-	-	-	-
Fixed oil and fats	Spot test	-	-	-	-
	Soap formation test	-	-	-	-
Tannins	Fecl3	-	-	-	-
	Vanillin HCL	-	-	-	-
	Alkaline reagent	-	-	-	-
Protein and amino acid	Million's test	-	-	+	+
	Ninhydrin test	-	-	+	+
	Biuret test	-	-	+	+
Flavanoids	With NaOH	-	-	-	-
	With H_2SO_4	-	-	-	-
Steroids and triterpenoids	Libermann's Burchard test	+	+	+	+
	Salkowski's test	+	+	+	+
Mucilage and gum	With 90% alcohol	-	-	-	-
Waxes	With alc. KOH	-	-	-	-

Abbr.: +: Present, - : Absent, AEL: Aqueous extract of leaves, EEL: Ethanolic extract of leaves, EEUP: Ethanolic extract of unripe peel, AEUP: Aqueous extract of unripe peel

Table 5: Antimicrobial activity of aqueous and ethanolic extract of leaves and unripe peel of *Musa paradisica* Linn.

	EC					PA					CA					CNA				
Conc. (ug/ml)	**20**	**40**	**60**	**80**	**100**	**20**	**40**	**60**	**80**	**100**	**20**	**40**	**60**	**80**	**100**	**20**	**40**	**60**	**80**	**100**
AEL	-	10	12	15	19	4	13	21	22	26	-	-	-	7	13	-	-	-	-	2
EEL	-	12	17	19	20	4	13	21	22	26	-	-	10	14	15	-	-	8	12	13
AEUP	-	-	4	6	11	-	-	2	4	5	-	-	-	5	7	-	-	-	-	7
EEUP	-	-	7	11	15	-	2	8	11	14	-	-	6	11	13	-	-	-	11	14
SD (60 ug/ml)	20.5 (A)					28.0 (A)					16.7 (F)					19.2 (F)				
CT	-					-					-					-				

Abbr.: EC = *Escherichia coli,* PA= *Pseudomonas aeruginosa,* CA= *Candida albican,* CAN= *Candida non-albican,* SD= standard drug, A- Ampiciline, F= Fluconazole, CT= Control, AEL: Aqueous extract of leaves, EEL: Ethanolic extract of leaves, EEUP: Ethanolic extract of unripe peel, AEUP: Aqueous extract of unripe peel

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