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Physico-chemical and Pharmacognostic Investigation of Fruit Pulp of *Mangifera Indica* Linn.

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ABSTRACT:

Fruit pulp of *Mangifera indica* Linn. is an important Ayurvedic medicine which is useful in gastric disorders, dyspepsia, loss of appetite, urine incontinence, uterine diseases, heat apoplexy, pharyngitis, ulcer, dysentery, sun stroke etc. The present study for the first time attempts to investigate physico-chemical and pharmacognostic properties as per WHO guidelines of this drug. Detailed account of physico-chemical and microscopic analysis have been given in the paper.

Key words: Physico-chemical, pharmacognostic and Ayurveda

INTRODUCTION

Mangifera indica Linn (Sank-Amra, Eng-Mango) belongs to family Anacardiaceae. Mango is a plant of Ayuredic as well as economic importance. It's unripe fruit is sour, acrid, refrigerant, digestive, carminative, appetizer and it is used in gastric disorder, dyspepsia, loss of appetite, urine incontinence, uterine diseases, heat apoplexy, pharyngitis, ulcer, dysentery and sun stroke (Sharma et al., 2001).

Reported literature on the chemical composition of fruit pulp shoes the presence of Mangiferin (1,3,6,7 tetrahydroxyxanthone – 2 – glucopyranoside), amino acids, gallotanin, gallic and m-digallic acids, ethyl gallate, isoquercetin, quercetin and β sitosterol,(+) and (±) epicatechin, β – carotene and α-xanthophyll, citric, ellagic, malic and m-trigallic acids, β – glucogallin, meso-inositol, polysaccharides, riboflavin and vitamin C, isoamyl alcohol, α and β-pinenes, myrcene, limonene and fenchone, carophyllene epoxide (Chatterjee and Pakrashi, 1994).

As per our knowledge no reports are available on systematic physico-chemical properties as per WHO guide lines and pharmacognostic studies of *M. indica* fruit pulp. However, Wealth of India (1962) had reported few physical constants. Therefore, present study attempts to fill this void. Moreover, physico-chemical and pharmacognostic investigation of this drug may help in the identification and establishing the pharmacopoeial standards.

MATERIAL AND METHOD

The unripe fruits of *M. indica* were collected from the garden of RRI (Ay), Pune. The

material was macerated and powdered for physico-chemical tests. These tests were performed as per WHO (1998) guidelines. Powdered drug was successively extracted with petroleum ether, acetone and ethyl alcohol using soxhlet apparatus. Obtained extracts were used for preliminary phytochemical tests and fluorescence analysis.

Free hand sections were cut, stained with phloroglucinol followed by concentrated HCI and iodine solution and mounted in glycerine as per the method described by Khandelwal(1998). The line drawing related to anatomical structures and cellular elements in powder were drawn with help of Camera Lucida mirror type under pathological microscope (GETNER-BIOLUX-CXT 1).

RESULTS AND DISCUSSION

PHYSICO-CHEMICAL STUDY

Powder of *M. indica* (fruit pulp was analysed for determining the physico-chemical standards, which are given in Table 1. Qualitative inorganic analysis of ash reveals the presence of potassium, calcium, iron, copper, chloride, phosphate and sulfite. Solubility of the drug in water is higher than alcohol. Successive extraction of 10g drug with petroleum ether, acetone and alcohol gave 1.7%, 11.8% and 7.2% extractives, respectively.

Thin Layer Chromatographic (TLC) study

The above successive extracts were loaded on silica plate (MERCK- Aluminum sheet-silica gel 60 F_{254}). Separation was achieved using upper layer of Butanol-Aceticacid-Water (4:1:5) as solvent system. Alcoholic and acetone, each extract gave five spots while only one sport was seen in petroleum ether extract. The TLC plate was kept in iodine chamber for 10 minutes and observed R_f values and color were noted immediately. The R_f values (R_f*100) and their color under UV light is given in Table 2.

Preliminary Phytochemical tests

Characteristic phytochemical tests indicate the presence of terpenoids, fatty acids, tannin and other phenolic compounds, carbohydrate and amino acids in the obtained extracts.

Fluorescence Analysis

The fluorescence analysis of petroleum ether, acetone and alcoholic extracts was carried out under short (254nm) and long (360 nm) ultraviolet light. The obtained results are given in Table 3.

PHARAMACOGNOSTIC STUDY

Microscopic study of fruit Pulp

Transverse section of the pericarp shows the outer most epicarp (Fig 1A), wide mesocarp (Fig.1A') and hard woody endocarp. The epicarp is composed of outer most single layer comprising of rounded tin walled epidermal cells having thick cuticle externally. Below it, there are 10-15 layer of compactly arranged rounded to oval shaped chlorenchymatous cells. Many resin canals arranged in ring are present in chlorenchymatous region only; these canals are rounded to oval shaped possessing 3-4 layers of thin walled epithelial cells. Next to the region of chlorenchyma, there is a wide zone constituting the pulp of the fruit or mesocarp comprising of 20-25 layers of oval to round parenchymatous cells containing abundant simple as well as compound starch grains. Simple grains are mostly spherical while compound starch grains consist of 2-5 components. Many

vascular bundles are found to be scattered throughout the mesocarp, most of which are longitudinally cut and show groups of spiral as well as annular vessels with lignified narrow fibres. Phloem elements are few. Resin canals are absent in the inner and middle mesocarp region. The endocarp (Fig.1B) is quite woody and consists of lignified elongated thick walled longitudinally cut fibres and groups of lignified sclerenchymatous cells with patches of rounded to rectangular sclereids at some places. The fibres extend towards the periphery making the fibrous outer most region of the endocarp. Few conducting elements are also present in this region.

Microscopic Study of Powder

Fine powder of the fruit pulp is yellowish white in color, characteristic and pleasant in odour and sour or acidic in taste. It shows the following characters in microscopy (Fig2.):-

I Group of parenchymatous cells containing few sphaeraphides of calcium oxalate.

II Many loose simple starch grains which are round to oblong in shape measuring 10.8to28.8 μ dia.

III Large number of compounds starch grains loose as well as in groups of parenchymatous cells.

IV Isolated pitted round, oval rectangular shaped stone cells measuring 7.2-21.6 μ in length and 10.8 – 25.2 μ in width.

V Groups of fragmented vessel elements bearing spiral as well as annular thickening.

VI Group of fragmented phloem elements associated with sclerenchymatous fibres.

CONCLUSION

Physico – chemical analysis reveals that solubility of the drug in water is higher than alcohol. Ash analysis confirmed the presence of K, Ca.Cu, Fe, Cl, I, PO4 and SO3. TLC study shows the presence of number of compounds with their specific R_f values and color in UV light. Transverse section of the pericarp shows the outer most epicarp, wide mesocarp and hard woody endocarp. Many resin canals are present in chlorenchymatous region of epicarp but absent in the inner and middle mesocarp region. Most of the vascular bundles in mesocarp are longitudinally cut and show groups of spiral as well as annular vessels with lignified narrow fibres. The fibres extending towards the periphery make the fibrous outer most region of the endocarp. Few conducting elements are also present in this region. Observed results may help in the identification and establishing the pharmacopoeial standards of this drug.

Table 1. Physico-chemical constants of Mangifera indica (Fruit pulp)

Parameters	Average values in % with standard deviation
Ash content	2.35 ± 0.11
Water soluble ash	1.37 ± 0.06
Acid insoluble ash	0.07±0.02
Loss on heating	10.31 ±0.9
Fibre content	24.70±3.2
Foaming index	<100
Swelling index	3mm/g
Volatile oil	10.0±0.8
Water extract	31.6±7.2
Alcohol extract	17.8±3.1
pHvalue (2%w/v)	3.2
Successive extractives values-	
Pertroleum ether 40-60oC	1.7±1.1
Acetone	11.8±1.5
Alcohol	7.2±1.0
Total bacterial count	$64x10^4$ CFU/g
Total fungal count	$31x10^3$ CFU/g

Table 2. TLC data, Solvent system –Upper layer of Butanol-Acetic acid –water (4:1:5).

Extractives	No.of spot	Rf x100	Day light	Long UV	Short UV
Petroleum ether	One	81	Grey	Greenish yellow	Light citrine
Acetone	Five	23	Brown	Citrine green	Light olivaceous
		37	Grey	Yellowish	Yellowish green
		59	Grey	Yellowish	Yellowish green
		66	Grey	Yellowish	Yellowish green
		80	Green	Yellowish green	Greenish Olivaceous
Alcoholic	Five	22	Yellowish	Citrine green	Light olivaceous
		51	Grey	Yellowish	Yellowish green
		67	Grey	Yellowish	Yellowish green
		73	Grey	Yellowish	Greenish Olivaceous
		88	Grey	Yellowish	Yellowish green

Table 3. Fluorescence behaviour of different extracts

Extracts	Day light	Short UV	Long UV
Petroleum ether	Green	Green	Scarlet
Acetone	Brown	Brown	Yellowish green
Alcohol	Greenish	Green	Yellowish green

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REFERENCES

1. Sharma, P.C., Yelne, M.B. and Dennis, T.J, Data base on medicinal plants used in Ayurveda, CCRAS, New Delhi. 2: 8-28, **(2001).**

2. Chatterjee, Asima and Pakrashi, S.C., The treastise on Indian medicinal plants. CSIR, new Delhi. 3: 152-153, **(1994).**

3. Wealth of India, A dictionary of Indian Raw material and Industrial products, CSIR, New Delhi.VI: 265-285**, (1962).**

4. WHO (World Health Organization), Quality control methods for medicinal plants materials, Geneva, **(1998).**

5. Khandelwal, K.R., Practical pharmacognosy, Nirali Prakashan, Pune, **(1998).**