

Research Article

Pharmacognostical Screening of Flavouring Leaves *Pandanus amaryllifolius* Roxb

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ABSTRACT

The food industry uses various herbals as condiments to improve flavor and aroma. *Pandanus amaryllifolius* Roxb. is one such herbs. It is commonly known as 'Pandan' in French and 'Ambemohar' in Marathi. The Pandan belong to family Pandanaceae. The leaves are used in Southeast Asian cooking. Leaves of Pandan is diuretic, cures headache, fever, arthritis etc. The present investigation deals with the quantitative and qualitative microscopic evaluation of the seeds and establishment of its quality parameters, including physicochemical and phytochemical evaluation. Chief characters of transverse section of leaves include sclerenchymatous patches, parenchymatous mesophyll cells, bundle sheath cells. Physicochemical parameters were also established. Preliminary Phytochemical screening revealed the presence of phytoconstituents such as alkaloids, terpenoids, flavonoids, saponins, anthraquinone glycoside and cardiac glycoside. TLC was performed using standard marker Quercetin & β -sitosterol. To bring this plant in the main stream of crude drugs and in food industry, the current study is of utmost importance.

Keywords: Pharmacognosy, Pandanaceae, Pandan, *Pandanus amaryllifolius*

INTRODUCTION

Pandanus amaryllifolius Roxb. (Family - Pandanaceae) is commonly known as Pandan in French or Ambemohar in Marathi. It is an evergreen herb cultivated for its flavouring leaves. The plant is an herb with fan shaped sprays of long narrow blade like leaves. The leaves are used to flavour ordinary rice as a substitute for the expensive aromatic Basmati rice. Besides the culinary uses it has therapeutic potential too. The leaves are used in curing smallpox, headache, fever, arthritis dental problem headache etc¹⁰. The leaves are also used as cockroach repellent²⁰. To bring this plant in the main stream of crude drugs and food industry pharmacopeial standards are essential. Hence the present investigation includes macroscopic and microscopical evaluation, determination of physicochemical constants and preliminary phytochemical screening along with TLC for the above said leaves.

MATERIAL AND METHODS

Collection and authentication of plant material

The leaf samples were collected from Keshav Shristi Uttan, Bhayandar (Maharashtra) with prior permission. The sample was authenticated for its botanical identity from the standard herbaria at Blatter herbaria (Mumbai). A voucher specimen has been deposited in Botany Research Laboratory of Mithibai College, Mumbai, India (MIT 0078).

Pharmacognostic studies

The macroscopy and microscopy of the leaves of *Pandanus amaryllifolius* Roxb. was studied^{6,17}. Photomicrography of transverse sections of leaves was performed. Leaves were dried under shade and made into powder. The powder study was carried out using camera lucida and stage micrometer^{7,8,9,13,16}. Histochemical studies were also done by using various reagents¹² (Table 1).

Table 1 : Histochemical study

Plant constituent Test	Observations
Test for starch	+
Test for Lipids	+
Test for Proteins	+
Test for Tannins	+
Test for Alkaloids	-
Test for Saponins	+
Test for Glucosides	-
Test for Mucilage	+
Test for Calcium oxalate crystals	-

Physico-chemical evaluation

Physico-chemical values such as the percentage of ash values (total ash, water soluble and insoluble ash) and extractive values (water soluble and alcohol soluble extractives) were established using the powdered drug^{1,14} (Table 2).

Fluorescence study

The fluorescence response of powdered drug exposed to U.V. radiations were studied^{3,11} (Table 3)

Table 2 : Physicochemical evaluation

Ash values	Total ash	Not more than 14.9%
	Acid insoluble ash	Not more than 1%
	Water soluble ash	Not more than 1.1%
Extractive values	Ethanol	Not less than 19.2 %
	Water	Not less than 10.2 %

Table 3: Fluorescence analysis

Test	i	ii	iii	iv	v	vi	vii	viii	ix
Visible light	1Yg	1Yg	1Yg	1Yg	1Yg	1Yg	1Yg	1Yg	1Yg
256 λ	3G	3G	3G	3G	3Gy	3Gy	3G	3G	3G
365λ	3Gy	2Gy	2Gy	2Gp	3Gy	3Gy	3Gy	2Gp	3Gy

Keys to the letters and numbers used-

Predominant colours:	Modifying colours:	Quality of colours:
Y- Yellow	y- Yellowish	1 very light
G- Green	g- greenish	2 light
	p- purplish	3 dark

Table 4: Preliminary Phytochemical screening

Test for phytoconstituents	W	C	E
Test for Starch	+	-	-
Test for Terpenoids	+	+	+
Test for Proteins	+	+	+
Test for Mucilage	-	-	-
Test for Alkaloids	+	+	+
Test for Anthraquinone glycoside	+	+	+
Test for Cardiac glycoside	+	+	+
Test for Saponin	+	-	-
Test for Tannins	+	+	+
Test for Steroids	-	-	-
Test for Flavonoids	+	+	+

Key: W- water extract, C- Chloroform extract, E- Ethanol extract, + Present, - Absent

Table 5: Thin Layer Chromatography

Materials	Rf Value	Colour
Standard Quercetin	0.7	Yellow
<i>Pandanus amaryllifolius</i> leaf	0.7	Yellow
Standard β- sitosterol	0.8	Pinkish purple
<i>Pandanus amaryllifolius</i> leaf	0.8	Pinkish purple

Preliminary Phytochemical Screening

The powder was extracted with water, alcohol and chloroform. These extracts were tested for their respective phytoconstituents^{2,5} (Table 4).

Thin Layer Chromatography (TLC)

The leaf powders were extracted for Flavonoid (Quercetin) & β- Sitosterol and were subjected to TLC along with marker Quercetin & β- Sitosterol^{4,15,18,19} (Table 5); (Figures 6. G, H).

RESULTS

Macroscopy

The leaf is dark green above and light green below. The leaves are 16 – 19 – 24 – 27 cm in length 1.4 - 2.00 - 2.4 - 2.7 cm in breadth. It is simple, linear in shape with entire margin and slightly spiny margin at apex. The venation is parallel, convergent with prominent midrib and distinct twin lateral pleats. The apex is cuspidate with sheathing leaf base. The surface of leaf is coriaceous, texture fibrous,

characteristic taste and odour mildly aromatic when green in colour; strongly aromatic when the leaves turn yellow (Figures 1, 2).

Microscopy

Transverse section of the leaves show -

Upper epidermis: It is single layered with thick cuticle, cells are tangentially elongated, 2.6 – 5.5 μm in length and 8.2 – 15.3 μm in breadth interrupted with stomata.

Hypodermis: It consists of two layered tangentially elongated cells 0.1 – 0.3 – 0.45 μm in diameter, just below the upper epidermis and above the lower epidermis.

Mesophyll: Hypodermis is followed by 4 – 5 layers of chlorenchymatous cells. It is compactly arranged polygonal cells with chlorophyll pigments measuring 0.33 – 0.5 μm in diameter. This layer is continued with sclerenchymatous patches and ducts filled with brown content. Present adjacent to the chlorenchymatous layer are rounded parenchymatous cells with intercellular space, 0.6 – 0.8 μm in diameter, few cells contain prismatic and



Figure 1: Habit of *Pandanus amaryllifolius*



Figure 2: Entire leaves of *Pandanus amaryllifolius* (A, Upper surface B, Lower surface)

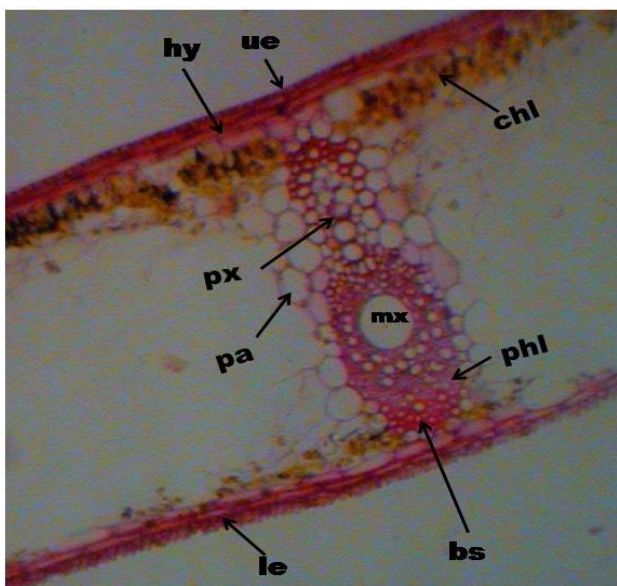


Figure 3: T.S. of *Pandanus amaryllifolius* leaf

Ue, upper epidermis; hy, hypodermis; chl, chlorenchymatous cells; pa, parenchyma cells; mx, metaxylem; px, protoxylem; phl, phloem; bs, bundle sheath cells, le, lower epidermis; yd, yellowish brown content

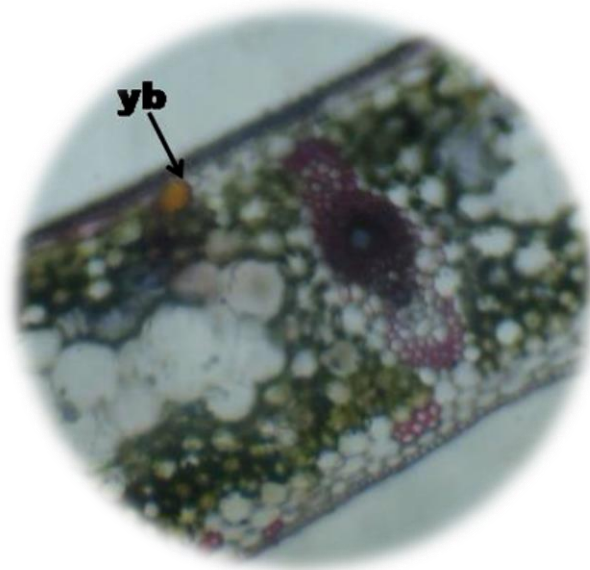


Figure 4: T.S. of *Pandanus amaryllifolius* leaf showing yellow brown content

acicular type of calcium oxalate crystals. Starch grains are also observed within the cells.

Vascular region: Bundle sheath cells are present on either sides of the collateral vascular bundle. Xylem consists of protoxylem towards the upper side and metaxylem at the bottom. The xylem is continued by the phloem and bundle sheath cells. In completely matured leaf the vascular region is separated by lacuna.

Lower epidermis: It is papillose compactly arranged filled with light brown content. Lower epidermis is interrupted with stomata fewer in numbers (Figures 3, 4).

Powder study

Powder is green to yellowish in colour; with fibrous texture, characteristic taste and strongly aromatic odour. Diagnostic microscopic features of the powder include

hypodermal cells, paracytic stomata, fibers, tannin filled cells, acicular and prismatic calcium oxalate crystals, starch grains, cells with parenchymatous cells. (Figures 5, A, B, C, D, E, F).

DISCUSSION

The macroscopical and microscopical studies will be useful in identifying the plant drug in whole form. The above powder study, physicochemical analysis and fluorescence test will prove the authenticity of the drugs in powder form. Histochemical and preliminary phytochemical screening will provide the general idea regarding the presence of primary and secondary metabolites. Thus the pharmacognostical standards put forth can add valuable information about the said plant. In

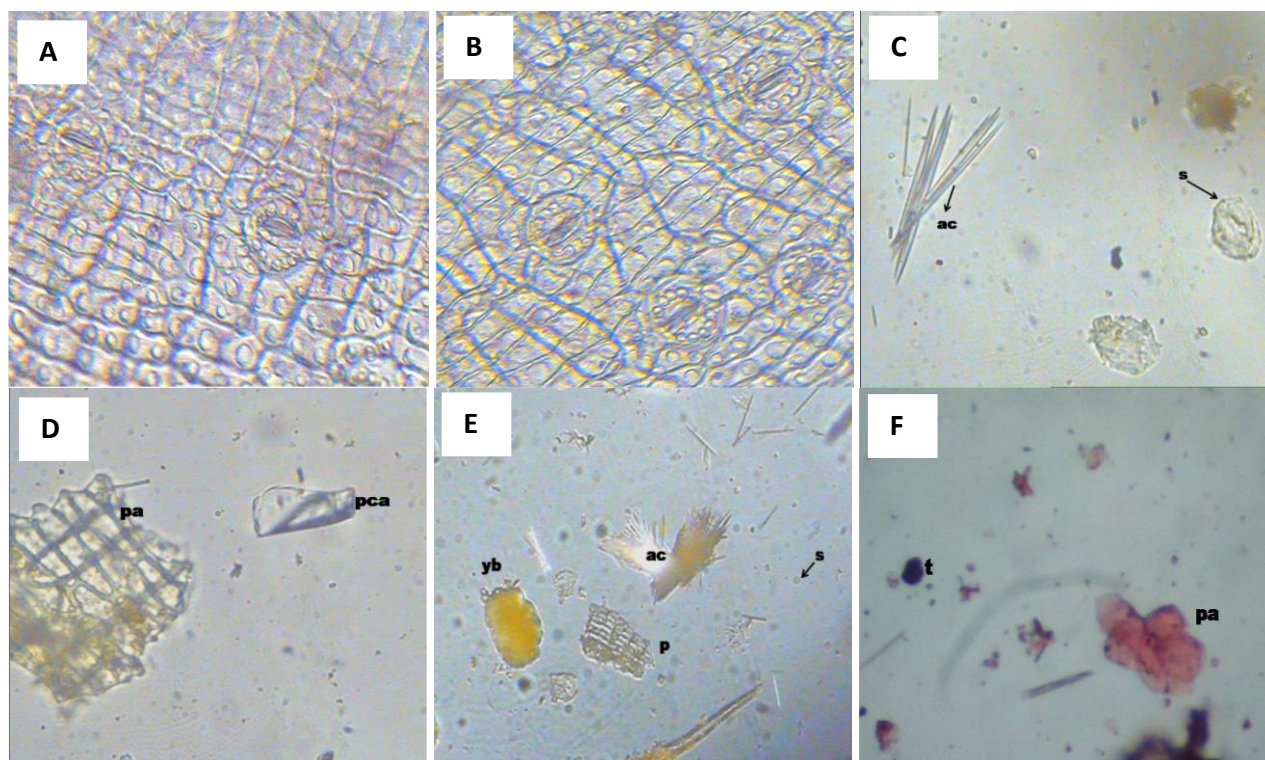


Figure 5: Stomata and Powder study of *Pandanus amaryllifolius* leaves
 A, stomata on uppermider (X 450); B, stomata on lower epidermis (X 450), C, D, E & F, powder study of Pandan leaf (ac, acicular calcium oxalate crystals; st, stomata; yb, yellowish brown content; pa, parenchyma cells; pca, prismatic calcium oxalate crystals; s, starch grain; t, tannin filled cell)

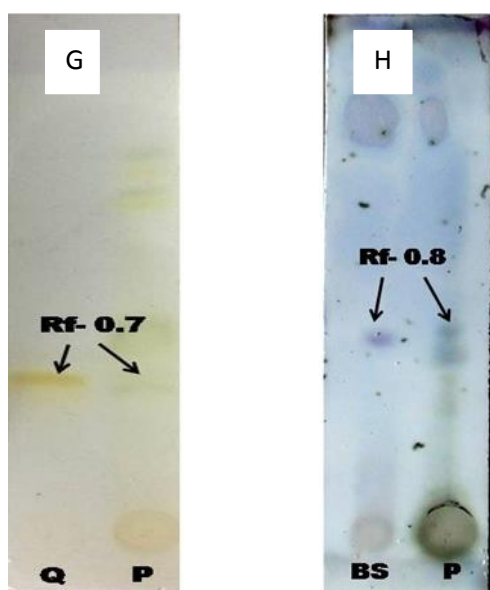


Figure 6: G, Thin Layer Chromatography for quinine (flavonoid) of Pandans leaf (Q, quinine a standard marker; P, leaf extract)
 H, Thin Layer Chromatography for Beta sitosterol of Pandans leaf (BS, beta sitosterol a standard marker; P, leaf extract)

TLC the leaf Quercetin and β - sitosterol has the same Rf value as the standard markers. Thus the presence of Quercetin and β - sitosterol in the Pandanus leaf is

confirmed. Appropriate pharmacological studies can bring this crude drug in the market as well as in food industry.

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