

DRUG STANDARDIZATION

Standardisation of homoeopathic drug: *Pastinaca sativa* Linn.

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Pastinaca sativa Linn. a herb belonging to family Apiaceae is a potential drug in homoeopathy. The fleshy root is used in delirium tremens, loquacity and intolerance to milk. The fleshy taproot is up to 30 cm long, whitish, tapering with unpleasant odour. Transverse Section shows 2-3 layered corky tissue enclosing the cortex. Phloem and xylary bundles are dispersed in the cortex. Starch is present in cortical parenchyma. The histology reveals anomalous growth. Physico-chemical parameters of raw drug viz., extractive values, ash values, formulation, besides wt. per ml, total solids, alcohol content along with Thin Layer Chromatography (TLC) and Ultra Violet (UV) studies have been undertaken for mother tincture.

Keywords: *Pastinaca sativa* L.; fleshy roots; homoeopathy; standardisation; pharmacognosy

Introduction

Pastinaca sativa L. (syn. *Peucedanum sativum*, Benth. & Hook. f.), popularly known as Parsnip in English, is a herb that belongs to family Apiaceae. It is an aromatic biennial herb, stem erect, 0.3-1.7 m in height, arising from a white fleshy taproot, 25-30 cm or more in length. Leaves pinnate, leaflets 2-5 pairs, often 3-lobed to 3-partite, irregularly crenate; flowers in terminal compound umbels, yellow; fruit broad, elliptic, ridged, consisting of 2 mericarps.¹ Widely cultivated in Europe, America and other countries and used for edible purpose. In India, it is occasionally grown especially in hilly regions.¹ The fleshy roots (fresh) are used in delirium tremens, loquacity and intolerance of milk in homoeopathy.²

Its history and authority has been mentioned by 1. Dr. Unger, Gaz. Des Hop., September 1846 (London Med. Gaz.), the effects of eating the old roots, cooked in a family of four. 2. Same in a neighbour; 3. Dr. Pupcke, Pharm. Jour., 1848., p184. the effects of cooked wild roots in seven children.³ Four furocoumarins viz., xanthotoxin, imperatorin, bergapten and pastinacin were isolated from fruits and leaves.^{1,4,11} Myristicin was found as a main component of essential oil of roots⁵ besides octyl butyrate and octyl propionate.^{1,12}

Literature survey reveals lack of earlier studies related to pharmacognosy and physico-chemical parameters on *P. sativa*. Hence, present standardisation studies have been undertaken to outline the diagnostic features.

Material and Methods

The fresh roots of *Pastinaca sativa* L. was supplied by Survey of Medicinal Plants and Collection Unit, Nilgiris, Tamil Nadu. The drug is assigned to Drug Standardisation Unit, Hyderabad for undertaking Pharmacognostic and physico-chemical studies for the year 2008-09 and work is carried out as per the protocols set by C.C.R.H. The roots were cut and fixed in F.A.A. (formaldehyde-acetic acid-alcohol), processed for microtomy (paraffin method), stained and permanent slides prepared following microtechnique method Johansen.⁶ The powder microscopy was undertaken by boiling the powdered drug in distilled water, stained with safranin and mounted with glycerine. Photomicrography was done with Olympus CH – 2 trinocular microscope.

For physico-chemical studies, fresh root tubers of the drug was cut into small pieces and was subjected to determination of moisture content (Loss on drying at 105°C), total ash, acid insoluble ash, water soluble ash and extractability in different solvents following official methods.^{7,8} Alcohol content for preparation of mother tincture was followed as per HPUS.⁹ Maceration method⁷(HPI) was used for the preparation of mother tincture.

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Observations and Results

Macroscopic : Root tubers greenish white, up to 30 cm long, tapering, narrow, covered by few root hairs; white on exposure, turning to pale brown. Odour unpleasant.

Microscopic: T.S. shows externally the epidermis is replaced by 2-3 layered corky tissue (Fig.1.1), undulated with grooves in between. Cells tangentially long, in radial rows.

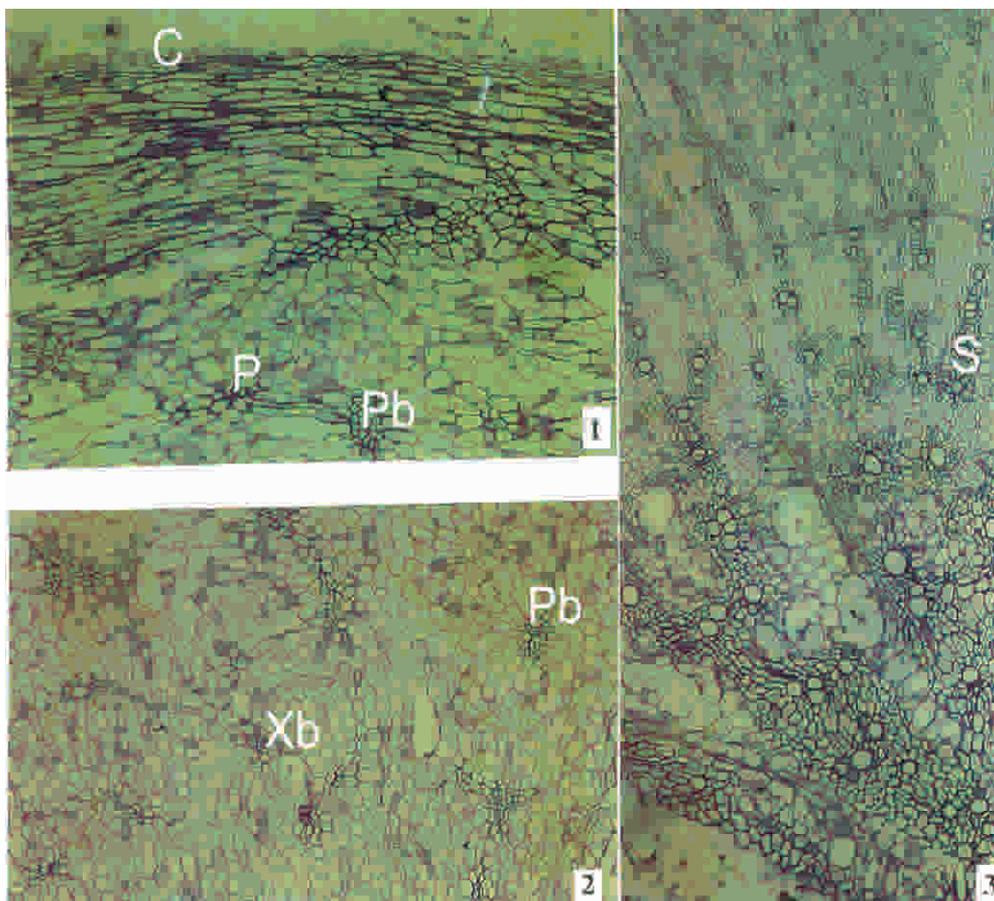


Figure 1-*Pastinaca sativa* L. sections seen under microscope

1. T.S. of root tuber at periphery X 59
 2. T.S. of root tuber at median (cortex) X 70
 3. T.S. of root tuber at central vascular region X 35
- C - cork tissue ; P – primary xylem ; Pb – phloem bundle
S – secondary xylem ; Xb – xylem bundle

Cortex is extensive with outer layers in tangential bands, cells tabular to rectangular, elongated and polygonal, walls thin, contents dense and in few with starch grains. Inner layers irregular, cells larger, polygonal, oblong to elliptic, often filled with starch grains (Fig.1.1,2; 2.2,3) and interspersed with schizolysigenous cavities (Fig. 2.2). Phloem bundles

are many in radial rows with thick walled phloem fibers, parenchyma and sieve cells (Fig.1.2). Few xylary bundles with 2-3 xylem elements are present in the cortex (Fig.1.2). The inner cortex is made of smaller polygonal to rounded cells containing starch grains (Fig.2.3).

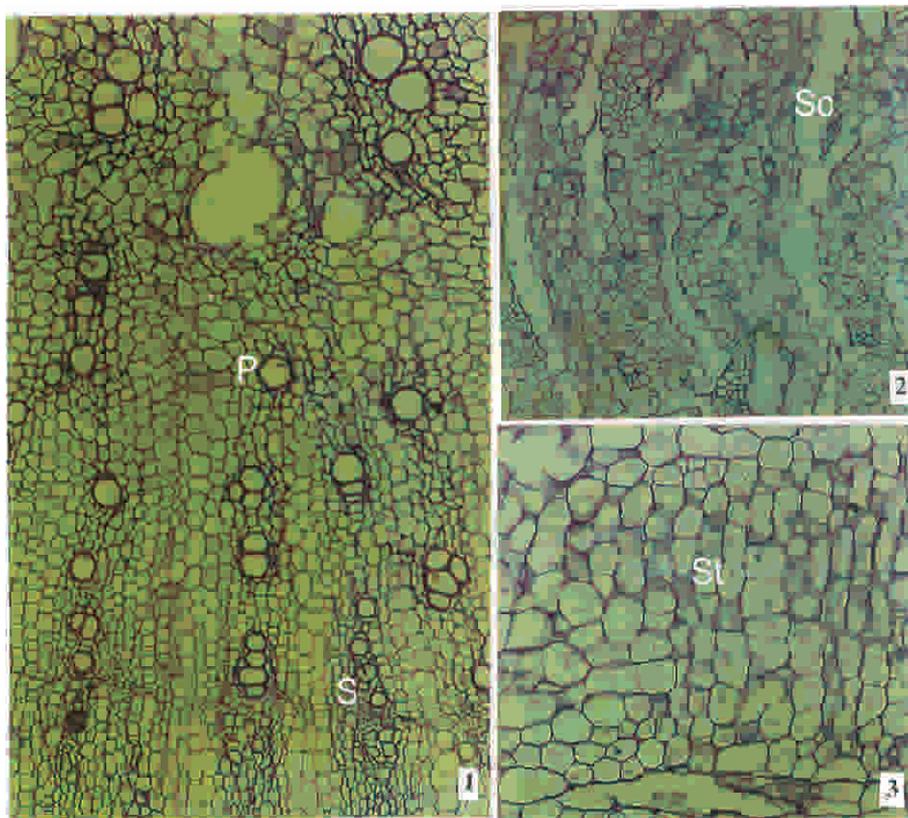


Figure 2-*Pastinaca sativa* L. sections seen under microscope

1. T.S. of root tuber at centre, enlarged X 85
 2. T.S. of root tuber with schizolysigenous cavities X 92
 3. L.S. of root tuber with starch grains X 120
- P – primary xylem; S – secondary xylem; Sc – schizolysigenous cavity
St – starch grains

The secondary xylem is scanty in the form of radial strands towards inside alternating with cortical parenchyma (Fig.1.3). T.S. of roots shows cells of secondary xylem are polygonal to spherical, arranged in radial rows along with fibers and xylem parenchyma. Centrally schizolysigenous cavities are present (Fig.2.2). Primary xylem in discrete patches with 1 or 2 metaxylem elements along with fibers and parenchyma is present at the centre (Fig.1.3; 2.1). Secondary walls of tracheary elements consists of helical, scalariform and annular thickenings and few bordered pitted. The cortex possess vascular cambium zones in concentric circles. The histology shows typical anomalous growth.

Powder microscopy

Pieces of parenchyma with starch grains. Isolated oil droplets. Starch grains, simple of assorted sizes and shapes, numerous. Pieces of tracheary tissue with

tracheids/vessels with helical and scalariform thickenings and few transverse bordered pits. Isolated phloem fibers, long, slightly thick walled. Few prismatic crystals, rectangular, squarish and rhomboid.

Organoleptic Characters

Colour : creamish yellow
Touch : smooth
Odour : slightly pungent
Taste : bitter, tingling

Physico-chemical

The determined data under physico-chemical study for the raw drug is summarised in Table 1 and that of mother tincture preparation and its standardisation in Table 2 & 3 respectively. The results of TLC studies are presented in Table 4.

Table 1-Standardisation of raw drug

S.No.	Parameters	Quantitative values
1.	Moisture content (L.O.D. at 105°C)	17.35 % w/w
2.	Total ash	3.25 % w/w
3.	Acid insoluble ash	0.55 % w/w
4.	Water soluble ash	1.75% w/w
5.	Extractive values in	
	A) Hexane	1.75 % w/w
	B) Alcohol	11.25 % w/w
	C) Chloroform	1.50% w/w
	D) Methanol	28.75 % w/w
	E) Purified water	12.50 % w/w

Table 2-Preparation of mother tincture

Alcohol	:	45% v/v
Drug strength	:	1/10
Maceration technique was used ^{7,9}		
Preparation :		
Pastinaca sativa L. moist magma containing solids 100g and plant moisture approx. 208 ml		308g
Strong alcohol	:	473 ml
purified water	:	400 ml
To make one thousand millilitres of the mother tincture		

Table 3-Standardisation of mother tincture

S.No.	Parameters	Observations
1.	Organoleptic profile a) Appearance b) Colour c) Odour	clear, non-viscous pale yellow strong and pleasant
2.	Sediments	absent
3.	Wt. per ml.	0.91 g
4.	Total solids	2.16 % w/v
5.	Alcohol content	42 - 44 % v/v
6.	pH	3.0 - 3.5
7.	λ-max (MeOH)	212 nm
8.	Refractive index at R.T.	1.423

Table 4-Thin Layer Chromatographic results of *Pastinaca sativa* Q^{7,10}

Extract : Chloroform extract of the mother tincture
Adsorbent : Silica gel 'G'
Layer thickness : 0.35 mm in wet condition (0.24 mm on drying and activation)

Solvent system	Detecting agent	No. of spots	R _f values & Color of spots
Methanol: chloroform (1 :9, v/v)	Vanillin – Sulfuric acid	7	0.09 0.25 0.46 0.62 0.73 0.84 0.94 all purple

Discussion

Pharmacognosy

Pastinaca sativa L., commonly known as Parsnip, is a herb belonging to family Apiaceae. The fleshy taproot is 25 – 30 cm long, narrow; creamish white; on exposure changing to pale whitish brown with unpleasant odour.

In T.S. covered externally by 2-3 layered corky tissue (Fig. 1.1). Cortex is extensive with outer layers in tangential bands and inner layers with larger polygonal cells often filled with starch grains (Fig.1.2;2.3). The cortex is interspersed with schizolysigenous cavities (Fig.2.2). Phloem bundles are dispersed in the cortex. Xylary bundles with 2-3 xylem elements are present in the median region. The secondary xylem in the form of radial strands (Fig. 1.3) alternating with cortical parenchyma occur towards inside. Primary xylem converging in discrete patches is present at the centre (Fig.1.3). The secondary walls of xylary elements possess mainly helical, scalariform thickenings besides few bordered pitted elements. The histology of root tuber shows anomalous growth due to activity of discrete vascular cambium in the cortex. The powder microscopic features and organoleptic characters are provided (l.c.).

Physico-chemical

The observed physico-chemical data for the raw drug and finished products are summarised in Tables 1-3. The results of TLC studies are presented in Table 4 and reveal 7 distinct purple colored spots in 9:1 (Chloroform-methanol) solvent system when sprayed with vanillin-sulphuric acid.

Conclusion

The presented pharmacognostical and physico-chemical data and methodology employed in the study

will serve as pharmacopoeial standards for the drug *Pastinaca sativa* L.

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