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ORIGINAL ARTICLE **OPEN ACCESS**

Pharmacobotanical, Physiochemical and Phytochemical Characterization of *Physalis helicacabum Crantz.* Leaves (Solanaceae)

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ABSTRACT
This study aims to provide basic knowledge about the medicinal plant, Physalis helicacabum crantz. Systemic study was carried out to determine pharmacognostic characteristics of Physalis helicacabum crantz which is plant species from Solanaceae family, found in western ghat of Maharashtra the present study, was made to evaluate the phytochemical substance and physicochemical analysis in the plant parts of P.minima (stem, leaf),phytochemical investigation exhibit the presence of Alkaloid, Glycosides, Flavonoid, Carbohydrates and Steroid by using the extract of pet ether, chloroform, methanol, and aqueous. Physicochemical parameters such ash value, extractive value, loss of drying and fluorescent characteristics of leaf and stem powder were also examined. Rich amount of phytochemical was observed in leaf extracts compared to stem. In present study we report the pharmacognostic data and presents of alkaloids indicates that this plant is highly potential which is used as medicine against various diseases.
Keywords: *Pharmacobotanical study, Pharmacognostic Study, Phytochemical investigation*

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INTRODUCTION

Medicinal plant is plant that have at least one of their parts (leaves, stem) used for therapeutic purposes. They play fundamental role in the maintaining the proper health as well as in managing various disease condition of both animal and human being. This plant is typically from western ghat of Maharashtra and are wide spread to other tropical regions. This plant can grow in the highlands, so it is easy to find [1].

Physalis helicacabum crantz is an annual plant species belonging to Solanaceae family, a yearly pantropical herb 20 – 50 cm high having short stem, yellow flowers and ovate fruits. Leaves are soft dark green, dorsal and light green ventral ovate leaves 9.8cm long and 8 cm broad. Leaves are single, stemmed, underside, scattered, above in pairs, leaf blade oval, elongated, lanceolate and pointed tip, unequal tip, blunt pointy, flat or wavy edge. Flowers are cream to yellowish. They are occurring in the leaf axis. The bell-shaped corolla is up to 2cm wide and is yellow with purplish markings around the centre of it. The fruit is globose berry ovoid in shape, juicy having diameter 1.25 – 2.50cm, fruit is protected inflated calyx or fruit basket and it protects the plant from insect, diseases, birds and the climatic conditions etc. Fruit is green in colour when it is unripe and edible yellowish and encapsulated in papery cover and it is good source of vit. C [2].

Scientific classification –
Kingdom – Plantae
Division – Spermatophyta
Subdivision – Dicotyledonae
Class – Angiosperms
Order – Solanales
Family – Solanaceae
Genus – Physalis
Species – *Physalis helicacabum* crantz
Binomical name – *Physalis helicacabum* crantz Linn.

Vernacular names –
Eng – Native gooseberry, Wild cape gooseberry

Mar – Dholamba, Chirboti, Dhan mori
Ben – Ban tipariya
Guj – Parpoti, Popti, Moti popti
Hin – Rassbhary, Thlati pati, Tipari
Kan – Gudde hannu
Mal – Njodi njotta
The decoction of the whole plant is taken orally to treat a cancer and leaves are used as poultice for ulcer. The leaves are crushed and applied over snake bite site and fruit is considered to be diuretics, purgatives and used to relive pain and cure spleen disorders. Based on this background, the present study was intended to screen the plant for the presence or absence of phytochemical constituents and physicochemical constituents [3].

MATERIAL AND METHODS

Plant Material and Authentication

Plant of P. minima was collected from A/p Ozar Tal- Junnar, Dist- Pune Authentication of collected plant material was carried out by HOD Department of Botany DR. Rahangadale , A. W. College, otur, Dist- pune , Voucher No :- 250 was deposited for further reference.

Morphological Evaluation

Morphological evaluation was carried as per WHO guidelines. Important characteristics of plant such as surface of leaves, colour, odour and test were evaluated.

Microscopic Evaluation

Transverse section (T.S.) of *Physalis helicacabum* crantz leaves section were taken using sharp blade. T.S. were kept in staining reagent (Phloroglucinol + conc. HCL) and then transferred into water for remove excessive staining. Then T.S. were mounted on glass slide with the help of soft brush. T.S. were observed under photographic microscope under normal and polarized lights. Transverse sections of leaves were studied for different microscopic characters such as midrib of leaf composed of upper and lower epidermis. 3 to 4 layers of collenchymatous cells present below the upper epidermis. Cortical parenchyma present throughout the midrib region, which surrounds the vascular bundles area and spread upto above lower epidermis. Vascular bundles were seen where xylem vessels covered by phloem cells. In phloroglucinol and HCL xylem was clearly stained violet. Pericyclic fibers were seen outside of vascular bundle covering the xylem and phloem. By dorsiventral arrangement of cells lamina were characterized which composed of upper epidermis, mesophyll, and lower epidermis. Upper epidermis is single layer rectangular parenchymatous cells contain multicellular glandular trichomes, anomocytic stomata surrounded by varying number of subsidiary cells. Mesophyll composed of palisade parenchyma just below upper epidermis and spongy parenchymatous cells above lower epidermis and in junction of these two spiral shaped xylem vessels were seen. Palisade parenchyma is compact, radially elongated cell. The similar lower epidermis also consists of single layer rectangular parenchymatous cell contains multicellular glandular trichomes, anomocytic stomata surrounded by varying number of subsidiary cells. The above cells have observed with different magnification under the photographic microscope. Photographs of all microscopic characters were captured, printed, labelled and stored for further referencing.

Powder Microscopic Study

The fine powder of *Physalis helicacabum* crantz (stem, leaves) were taken on the glass slide and observed under the photographic microscope which consists of trichomes xylem, phloem, calcium oxalate crystal etc. leaves and stem of *Physalis helicacabum* crantz were collected and shade dried. Dried leaves and stem were powdered using a mixer grinder (Sonata Ltd) and used further for microscopic evaluation.

Physicochemical analysis

Physicochemical parameter of *Physalis helicacabum* crantz leaves and stem powder such as ash values, extractive values, moisture content (loss on drying) were determined according to methods prescribed in official book such as Indian pharmacopoeia and WHO guidelines on quality control methods for medicinal plant materials. Extractive values of *Physalis helicacabum* crantz leaf and stem powder were determined by using different solvents viz. pet ether, chloroform, methanol, water etc. Five-gram dried powder of leaves and stem were placed in glass-stopper conical flasks containing different solvents. All flasks were placed in water bath shaker for 6 hours with frequent shaking, and allowed to stand for 18 hours. Each extract containing different solvents were filtered after 18 hrs and from each conical flasks 25 ml of filtrate was dried at 105^0C for 6hrs and extractable matter of air-dried material was calculated.
The total Ash value was determined by burning leaf and stem powder of *Physalis helicacabum* crantz accurately 2.0 gm of powder was weighed in a previously ignited by gradually increasing the heat to 500-

600 ^{0}C until it was red- white which indicate the absence of carbon. It was cooled in desiccators and weighed. The content of total ash in mg per gm of air-dried material was calculated. The acid insoluble ash was determined by adding 25 ml HCL (~70g/l) into silica crucible containing 2.0gm of total ash. The crucible was covered and boiled for 5min. the watch-glass was rinsed with 5.0ml of hot water and this liquid was added to crucible. The insoluble matter was collected on an ash less filter-paper and wash with hot water until the filtrate was neutral. The filter-paper containing the insoluble matter to the original crucible was dried on a hot-plate and ignited to constant weight. The residue was allowed to cool in suitable desiccators for 30 minutes and then weighed. The content of acid-insoluble ash in mg per gm of air-dried material was calculated. The water-soluble ash was determined by adding 25 ml of water into the crucible containing 2.0 gm of total ash and it was boiled for 5 minutes. Insoluble matter was collected on an ash-less filter-paper, washed with hot water and ignited in a crucible for 15 minutes at a temperature not exceeding 450 ^{0}C. The content of water-soluble ash in mg per gram of air-dried material was calculated by subtracting the weight of this residue in mg from the weight of total ash. The water-soluble ash value was calculated. Loss on drying study was carried out by using the hot air oven. The weight of empty porcelain dish was noted and then powder was taken into the porcelain dish. After that 1 gm of powder was taken and allowed for 2 hrs at 105 ^{0}C for drying. The loss on drying was calculated.

Extraction process

The extraction of dried powder of the leaf and stem of *Physalis helicacabum* crantz was performed using maceration and Soxhlet extraction process. 100 gm of coarsely powder air-dried leaf and stem powder was successively extracted with different solvent 250 ml of petroleum ether (40-50 ^{0}C) for 6 hrs, 250 ml of chloroform (40-50 ^{0}C) for 18 hrs, 250 ml of methanol (40-50 ^{0}C) for 6 hrs, and 250 ml of water at temperature (37 ^{0}C) for 18 hrs by maceration process. Separate the extract and solvent was recovered in rotary evaporator. Cool and store the extract in desiccator and calculate the percentage yield of extract.

Preliminary phytochemical screening of extracts

Extracts of *Physalis helicacabum* crantz were subjected to preliminary phytochemical screening detection of various phytoconstituents such as alkaloids, glycosides, carbohydrates, steroids, protein, saponins, flavonoids and amino acids, etc. This test was performed by using standard procedure.

RESULT AND DISCUSSION

Morphological evaluation

Morphological characteristics of *Physalis helicacabum* crantz are mentioned in

Table 1: Morphological characteristic of *Physalis helicacabum* crantz

Characteristics	Observation
Surface of leaf	Soft glabrous
Colour	Green
Odour	Pungent
Taste	Slight Bitter
Size	20-50 cm
Shape	Leaves are ovate in shape, the margin is dentate, apex is acute, 4-6 veins are reticulate present on each side of midrib.
Extra features	Base asymmetrical, petiole long, texture thine, midrib prominent on lower surface

Microscopical characterization

Transverse section of leaves of *Physalis helicacabum* crantz was found to have anomocytic type to stomata surrounded by various subsidiary cell i.e. Irregular celled stomata were present. microscopic evaluation was done by using microtome technique. 3-4 collenchymatous cells present below the upper epidermis. Cortical parenchyma present throughout the midrib region and spread upto above lower epidermis. Midrib of leaf composed of upper and lower epidermis. Vascular bundle were seen where xylem vessels covered by phloem cells. Pericyclic fibres were seen outside the vascular bundle. Both upper and lower epidermis is single layer rectangular parenchymatous cell contain multicellular glandular trichomes. Mesophyll composed of palisade parenchyma just below upper epidermis.

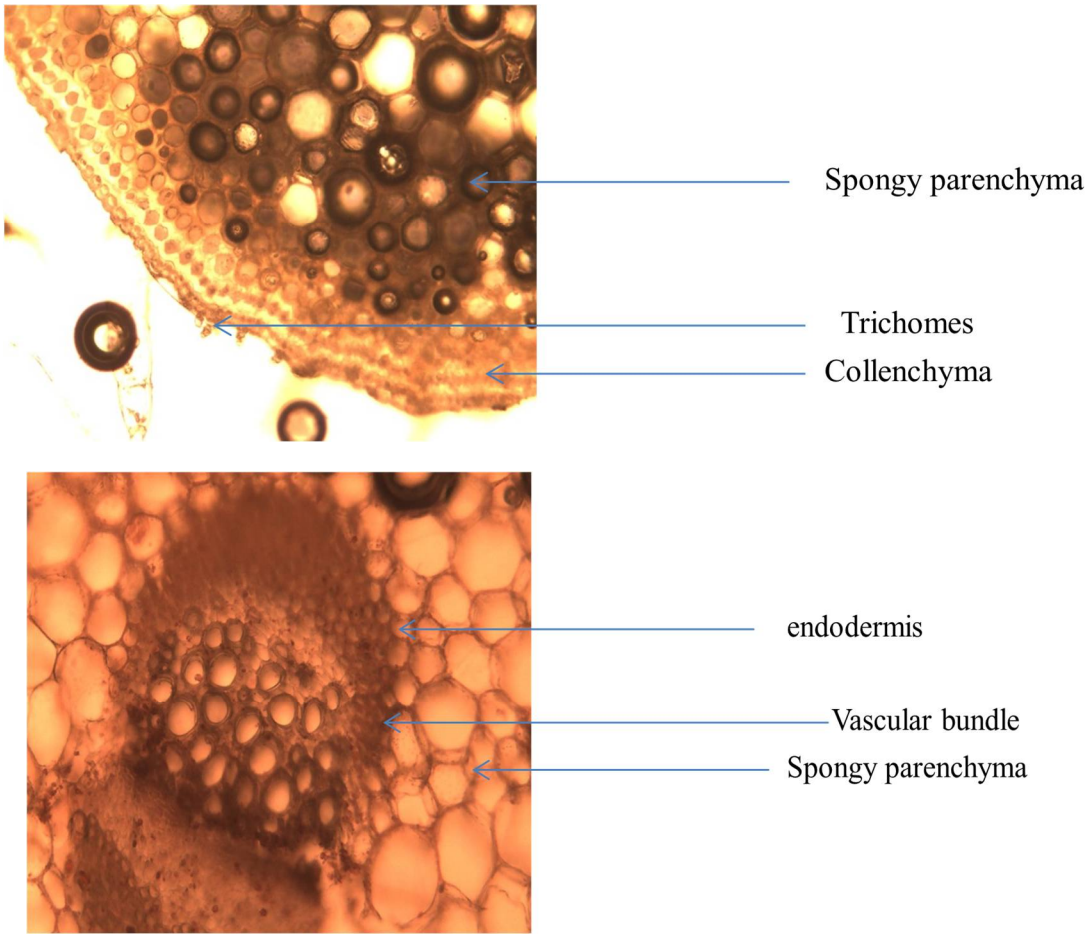

Fig 1. Microscopy of *Physalis helicacabum Crantz.* Leaves

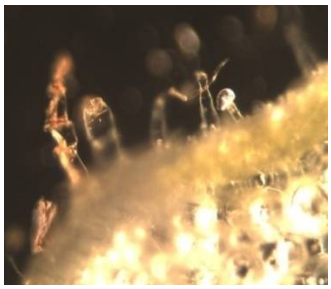

Fig 2. Multicellular and glandular trichomes

Powder microscopy

Powder analysis plays a important role in identification of crude drug. The microchemical test of leaf powder reveals the presence of multicellular trichomes, xylem vessels, fibres, calcium oxalate crystal and stem powder reveals the presence of medullary rays, starch, calcium oxalate prisms, wood fibres, stone cell.

Fig 3. Trichomes

Fig 4. Fibres

Fig 5. Starch grains

Physicochemical evaluation

Results of various physicochemical parameters viz. ash, extractive value and loss on drying are summarized in **Table 2.**

Table No. 2: Physicochemical Evaluation

Sr.No.	Parameter	Values in %w/w	
		leaves	stem
1.	Moisture content determination (LOD)	8.23%w/w	8%w/w
2.	Ash value		
	Total ash value	11.4%w/w	14%w/w
	Acid insoluble value	2.2%w/w	1.1%w/w
	Sulphated ash	2.4%w/w	-
	Water soluble ash value	6.1%w/w	6.2%w/w
3.	Extractive value		
	Water soluble extractive	9.5%w/w	14.65%w/w
	Alcohol soluble extractive	10.4%w/w	12%w/w
4.	Foreign organic matter	0.78%w/w	-

Preliminary phytochemical evaluation

Phytochemicals play an important role in the treatment of different types of diseases and disorders and are still used in the both traditional and modern medicine. Many of the secondary metabolites isolated from plants are used in the pharmaceutical industry. Pet ether, chloroform and methanolic extract showed presence of alkaloids, carbohydrates, flavonoids, steroids, glycosides and amino acids. Results are discussed in the table along with its colour, appearance and percentage yield [4].

Table 3 : Extraction with different solvents

Sr.no.	Solvents used for extraction	Colour		Appearance		% Yield w/w	
		leaves	Stem	Leaves	stem	leaves	stem
1.	Pet ether	Dark green	Pale yellow	Sticky	sticky	1.8 %	2.5%
2.	Chloroform	Dark green	Green	Sticky	sticky	4.2%	4.9%
3.	Methanol	Dark green	Dark green	semisolid	semisolid	10.4%	15%
4.	Water	Green	Green	semisolid	semisolid	10.6%	12.6%

Table 4 : Phytochemical Investigation of various extracts

Nature	Pet ether extract		Chloroform extract		Methanol extract		Aqueous extract	
	Leaves	Stem	Leaves	Stem	Leaves	Stem	Leaves	stem
1.Alkaloids Mayer's test	_	_	+	+	+	+	+	+
Wagner's test	+	+	+	+	+	+	+	+
Hager's test	+	+	+	+	+	+	+	+
Dragendroff's test	+	+	+	+	+	+	+	+
2.Carbohydrate								
Molish's test	+	+	+	+	+	+	+	+
Fehling's test								
Benedict's test	+	-	-	+	+	+	+	+
Barfoed's test	-	-	+	-	-	-	-	-
Bial's test								
Aniline acetate test								
Cobalt chloride test								
Iodine test	-	-	-	+	+	-	+	+
Tannic acid test	+	+	+	+	+	+	+	+
3.Flavonoids								
Ferric chloride test								
Shinoda test								
Alkaline reagent test								
Lead acetate solution test	+	+	-	+	+	+	+	+
Sodium hydroxide test	-	-	-	-	+	+	-	-
4.Amino acid								
Ninhydrin test	-	-	-	-	+	+	+	+
5.Steriods								
Salkowaski test	+	+	+	+	+	+	+	+
Libermann burchard test	+	-	+	+	+	+	+	+

CONCLUSION

Pharmacognostic and phytochemical investigation of *Physalis helicacabum* crantz. Leaves was carried out. The result obtained in this study will be useful to authenticate the medicinal important of the particular species of *Physalis helicacabum* crantz. Pharmacognostic parameter determined in present study will also be useful for establishing the pharmacopoeia standards for *Physalis helicacabum* crantz. Preliminary phytochemical analysis will surely be useful for further phytochemical studies and isolation of therapeutically important phytoconstituents.

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