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Anila VS
MD Scholar, Department of Dravyaguna vijnana, V.P.S.V. Ayurveda College, Kottakkal, Kerala, India

Dr. Madhu KP
Associate Professor, Department of Dravyaguna vijnana, V.P.S.V. Ayurveda College, Kottakkal, Kerala, India

Dr. Jyolsna G Krishna
Assistant Professor, Department of Dravyaguna vijnana, V.P.S.V. Ayurveda College, Kottakkal, Kerala, India

Correspondence
Anila VS
MD Scholar, Department of Dravyaguna vijnana, V.P.S.V. Ayurveda College, Kottakkal, Kerala, India

Preliminary pharmacognostical and phytochemical evaluation of *Physalis minima* Linn. (*Ṭankārī*)

Anila VS, Dr. Madhu KP and Dr. Jyolsna G Krishna

Abstract
Background: Physalis *minima* Linn. Belonging to Solanaceae family is a common drug seen in Kerala. It is traditionally used as diuretic, purgative, analgesic, anthelmentic and febrifuge. Previous researches on this drug proved that it has Antioxidant action, Free radical scavenging action, Diuretic action, hypoglycemic action, Anti-cancer action, Anti-inflammatory action and Anti-ulcer action.
Aim: To determine the authenticity of the plant using pharmacognostical and phytochemical analysis.
Methods: Macroscopy, powder analysis (organoleptic and powder microscopy), physicochemical properties like ash value, extractive values and HPTLC profiles of whole plant were done.
Results and Conclusion: Microscopy of root, stem and leaves showed all typical features of the species Physalis *minima* Linn. The phytochemical study showed the highest extractive value with cold water extract. Results indicate presence of Flavanoids, Phenol, Saponins, glycosides, Steroids and Tannins in various extracts.

Keywords: Preliminary pharmacognostical, *Physalis minima* Linn, *Ṭankārī*

Introduction
Herbal drugs are traditionally used in various parts of the world to cure different diseases. The diverse culture of our country and its folklore is another rich source of traditional medicines. Providing with scientific data to validate the claims made on them is important for further extending their therapeutic utilization. The trend of using natural products has increased globally and the active plant extracts are frequently screened as part of new drug discovery programmes. Hence an attempt has been made to document a similar knowledge based on proper scientific footing [1].
Physalis minima Linn. Belonging solanaceae family, commonly known as Ground cherry or Sun berry is abundant in kerala [2].
The plant is known by different names in Ayurvedic samhitas, like in the names of *ṭankāri*, *kākatiktā*, *mdukuñjikā* and *cirapotha*. But its precise identity is contested. A critical analysis of literature showed that the name *"ṭaṅkārī"* is not found in Vedas. In Saṃhitās, it is mentioned in Bhāvaprakāśa. Reference of the drug *"śārṅgeṣṭhā"* is found in Bṛhattrayī, Bheḍa, Kāśyapa, Cakradatta and Vaṅgasena. It is variously named as *cirapoṭikā*, *kākatiktā*, and *vāyasī* by Ḍalhaṇa and he describes it as *gaura* (pale), *vartula* (round), and as having *avaguṇṭhita/veṣṭhita* (covered) fruit which matches the description of *ṭaṅkārī* (*P. minima* Linn). A search for terms *kākatikta* and *vāyasī* showed *kākatikta* to be synonymous to *śārṅgeṣṭhā* and *vāyasī* to be synonymous to both *kākatikta* and *kākamācī* (*Solanum nigrum*). Madanapāla and Śāligrāma Nighaṇṭus have mentioned the name *cirapoṭikā* to be synonymous with *ṭaṅkārī* [3].
References are available about the pharmacological properties of *Physalis minima* Linn. It is explained that the plant is having *madhura, tikta rasa, Rūkṣa guṇa* and *Śīta vīrya* [4].
It is traditionally used as diuretic, purgative, analgesic, anthelmentic, febrifuge, vermifuge, and abortificient [5]. Previous researches on this drug proved that it is having antioxidant action, free radical scavenging action, diuretic action, hypoglycemic action, anti-cancer action, anti-inflammatory action and anti-ulcer action.

Materials and Methods
The plant specimen for the study was collected from the natural habitat of Kerala. It was authentified by Department of Dravyagunavijnana, VPSV Ayurveda College Kottakkal.

Plant part- Whole plant
Botanical Name-*Physalis minima* Linn.
Family- Solanaceae.

Macroscopy
Macroscopical evaluation was done by observing the, leaf stem and root under simple microscope and with naked eyes and taking note of the colour, size, odour, and other diagnostic parameters. Different macroscopic features of the leaf, stem and root were noted.

Microscopy
Fresh green, full-grown and healthy stem, root and leaves of *Physalis minima* Linn. is collected from its natural habitat. The Plant is washed in pure water to remove all the impurities. A cylindrical portion of almost straight and sufficient length to hold the sample is selected. Enough number of sections were taken. The sections were stained. Stained section was carefully transferred on a clean glass micro slide and the slide was placed on a compound microscope for histological examination. The Photographs of the sections were taken using digital camera.

Powder Microscopy
The coarsely powdered whole plant of *Physalis minima* was studied under the microscope. The powder was macerated chloral hydrate reagent. The macerated powder was then stained with Phloroglucinol, Iodine reagents separately. Small quantities of various stained powders were mounted on a slide with glycerine. Photomicrographs of the different cellular structures and inclusions were taken.

HPTLC Profile
Sample Details
1. Sample -1- Hot water extract of *Physalis minima* Linn.
2. Sample -2 –Methanol extract of *Physalis minima* Linn
3. Sample -3 – Hot Alcohol extract of *Physalis minima* Linn.

A. Test solution
1. 1 g *Physalis minima* sample is weighed. Add 20ml water and boil well. Then it is filtered, evaporated to dryness, extracted with 10ml methanol, and spotted as 15 microlitre.
2. 1 g *Physalis minima* sample is weighed, extracted with 10ml methanol, and spotted as 15 microlitre.
3. 1 g *Physalis minima* sample is weighed. Add 20ml alcohol and boil well. Then it is filtered, evaporated to dryness, extracted with 10ml methanol, and spotted as 15 microlitre.

B. Stationary phase
Merk, 1.05554.0007, TLC Silica gel 60 $F_{254,}$ 10x10 cm Aluminium sheet.

C. Mobile phase
Toluene: Ethyl acetate: Formic acid: Methanol (7:5:1:0.5)

D. Development
CAMAG 10 x 10 cm Twin trough chamber.

E. HPTLC Instrumentation
CAMAG Linomat 5, CAMAG TLC Scanner 3, CAMAG Reprostar 3.

F. Derivatization
Iodine vapour.

Preliminary Phytochemical Analysis
The preliminary Phytochemical analysis included Total ash, water soluble ash, acid insoluble ash, moisture content, volatile oil content, sugar content, Fibre content. Water soluble extractives and Successive solvent extractives were also done.

Results
Macroscopy investigation showed small erect pubescent herb, leaves pubescent dark green on the dorsal surface, ventral surface light green 9.1 cm long and 8.1 cm broad their leaves are alternate, often in unequal pairs. They are rarely clustered, nerve opposite; entire, lobed or pinnate; stipules 0. Their pedicels are usually solitary or clustered; bracts and bracteoles 0.Their flowers regular. Calyx inferior,5-rarely 3-7 merous. In fruit usually persistent, often much enlarged. Corolla funnel shaped campanulate, or rotate, often plaited; lobes 5 or limb sub entire. Stamens 5 on the corolla tube; anthers ovate or oblong, dehiscing by apical pores or longitudinally ovary 2-celled, or imperfectly 1 or 4 celled. Their Style linear, stigma capitate or very shortly lobed. Their ovules many on prominent peltate placenta. Fruit baccate or capsular, indehiscent, circumsciss or valvular, usually 2- celled many seeded. Seeds compressed discoid or subreni form, embryo peripheric. Seeds scarcely compressed, embryo straight.

- **Microscopy**

The following characters were observed.fig.1
Microscopic features of T.S. of *Physalis minima* Linn. Leaves

Leaf shows all the typical characters of leaf. Lamina part shows – epidermis, upper palisade and middle spongy parenchyma. Laminar portion consists of cluster crystals of calcium oxalate and vascular strands are present. Mid rib shows upper and lower epidermis, Lower epidermal cells of mid rib region is collenchymatous and stomata is present in the lower side. Upper epidermis –Unicellular and glandular trichomes are present. Centrally vascular bundles as phloem above and below the xylem.
Microscopic features of T.S. of *Physalis minima* Linn. Stem:
Outline of stem was quadrangular. Epidermis was single layered and chlorenchymatous hypodermis. Cortex was 3-4 layered collenchymas cells and then parenchyma tous cells.
Some cells were filled with chloroplasts. Vascular bundles were clearly visible in the quadrangular ends of the stem. Phloem cells were found as condensed cells above the xylem.
Pith region was wide with parenchyma cells, cells are larger in size and are loosely arranged.
Microscopic features of T.S. of *Physalis minima* Linn. Root*:*
Outer epidermis consists of 3- 4 layers of parenchyma cells. The transverse section of root is circular with outer cortex, stelar regions. Xylem vessels of varying size are scattered throughout the stelar region. Xylem vessels were seen as solitary or groups of 2- 4.
Phloem cells consists of 2-4. Layers.

- **Powder analysis**

Organoleptic study; coarselp powdered with greenish grey colour bitter in taste and having unpleasant odour.
Powder microscopy; the following characters were observed.fig.2

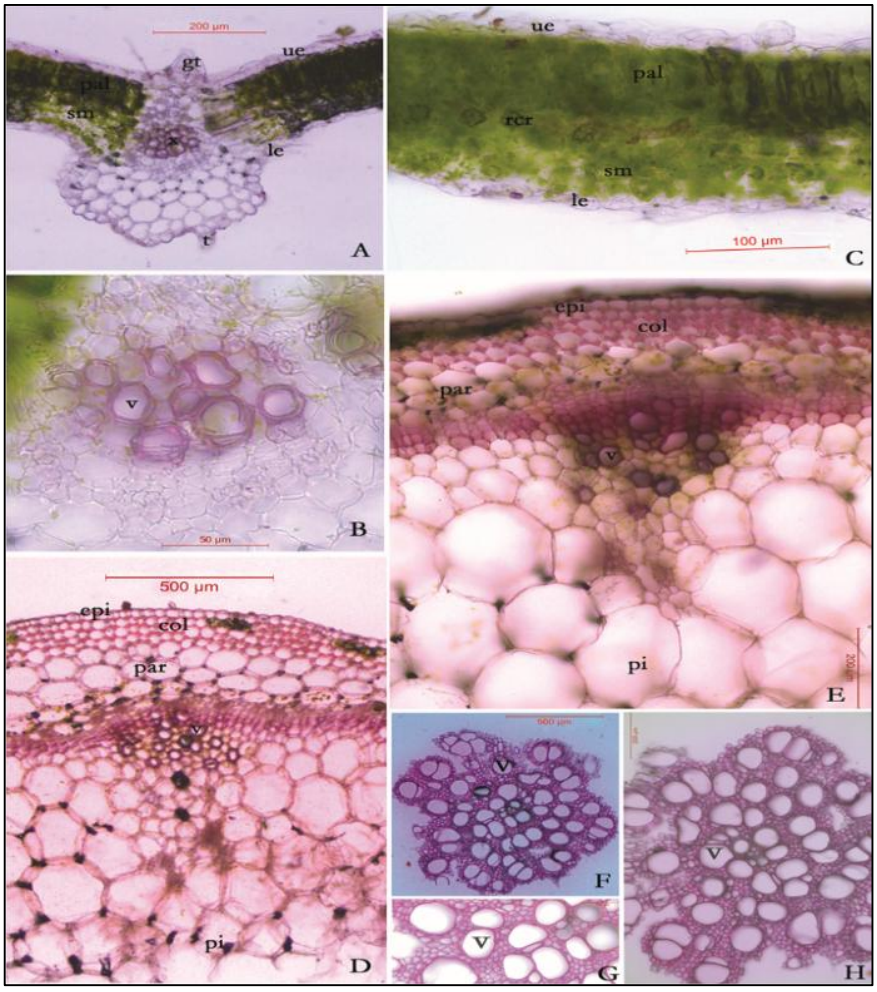


Fig 1: Microscopy of *Physalis minima* Linn. whole plant. A, Leaf TS entire; B, TS of mid rib portion; C, TS of lamina portion; D, TS Stem; E, TS Stem portion enlarged; F, TS root; G, TS root stelar region; H, TS root Stele portion enlarged. epi, epidermis; col, collenchyma; gt, glandular trichome; pal, palisade; par, parenchyma; pi, pith; sm, spongy mesophyll; t, trichome; v, vessels; x

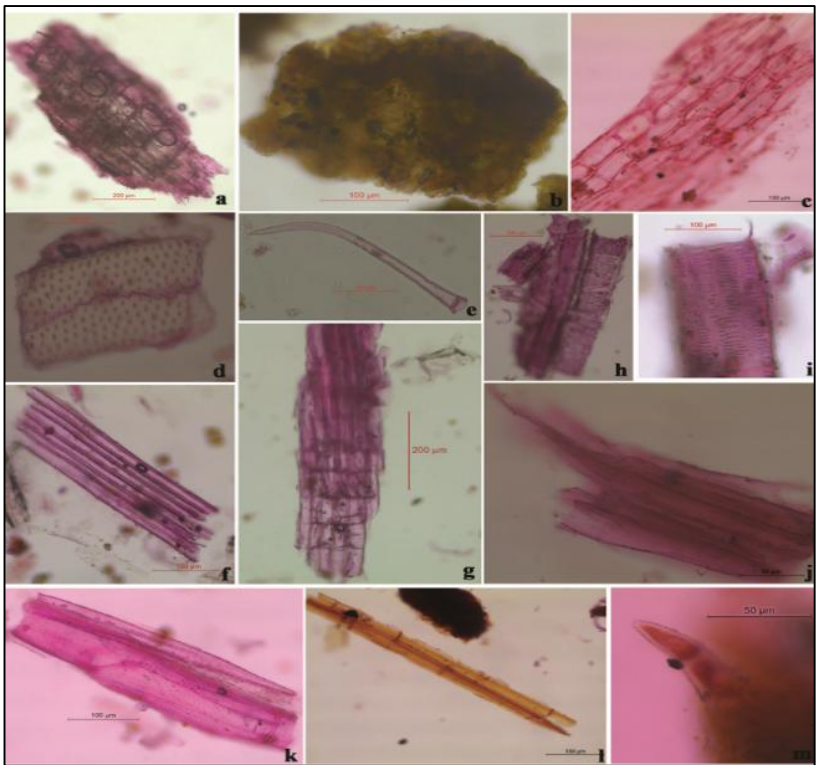


Fig 2: Powder Microscopy of *Physalis minima* Linn. Whole plant. Fibres associated with parenchyma cells a; fragment of leaf epidermis lower side view b; cells, fragment of epidermis c; fragment of bordered pitted vessel d; trichome e; fragment of fibres f; view of cork cell from root g; vessel fragments h,I; fragment of reticulate cell j; Frag of pitted vessel tracheid k; sectional view of cork cell from root g; septate fibres I; fragment of trichome m.

HPTLC Result

RF Value &% Area of sample 1. at 254nm.. RF VALUE &% AREA OF *Physalis minima* SAMPLE - 1 AT 254nm

Peak No	Rf Value	Area (AU)	% Area (AU)
1	0.11	747.3	5.77
2	0.25	2644.8	20.40
3	0.30	684.9	5.29
4	0.33	1109.8	8.56
5	0.37	342.5	2.64
6	0041	3169.4	24.46
7	0.47	1936.5	14.94
8	0.80	2324.4	17.94

Total Peak NO – 08 Total Arzea –12959.6 (AU).

Rf VALUE &% AREA OF *Physalis minima* SAMPLE - 2 AT 254nm

Peak No	Rf Value	Area (AU)	% Area (AU)
1	0.12	308.7	2.21
2	0.14	77.5	0.55
3	0.24	83.5	0.60
4	0.26	322.7	2.31
5	0.30	415.0	2.97
6	0.34	911.0	6.51
7	0.37	645.8	4.62
8	0.42	3793.7	27.12
9	0.47	2298.5	16.43
10	0.63	221.2	1.58
11	0.72	1416.7	10.13
12	0.78	3492.7	24.97

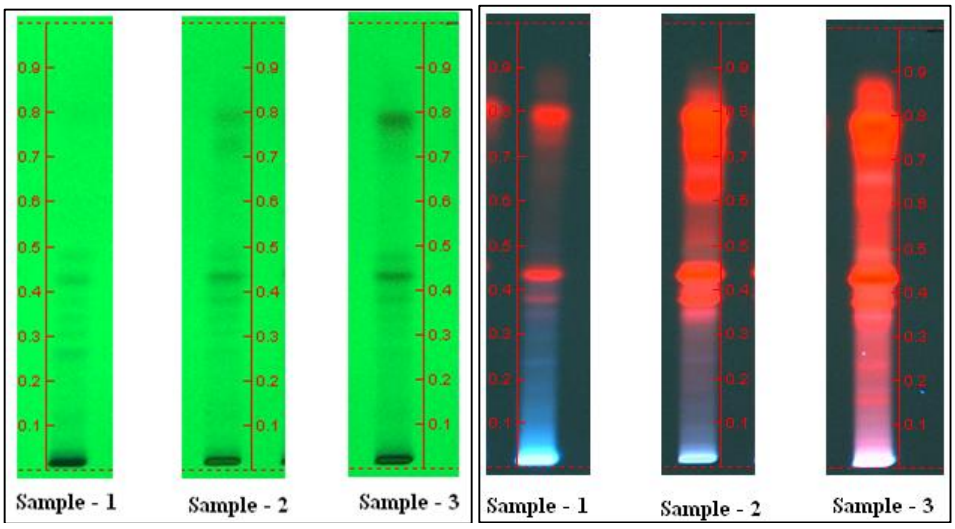
Total Peak No – 12 Total Area –13987.0 (AU)

07. Rf Value &% Area of PhysaliSs Minima Sample - 3 AT 254nm

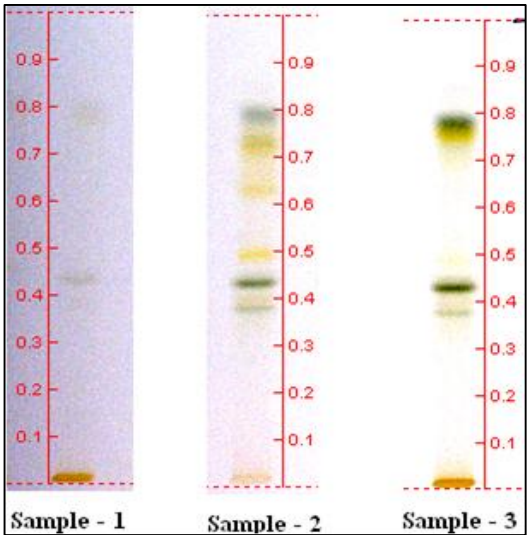
Peak No	Rf Value	AREA (AU)	% AREA(AU)
1	0.12	656.5	1.92
2	0.24	137.8	0.40
3	0.26	247.0	0.72
4	0.30	290.0	0.85
5	0.34	804.0	2.35
6	0.38	938.0	2.74
7	0.43	3789.3	11.06
8	0.47	1871.5	5.46
9	0.78	25513.8	74.50

Total Peak No – 09 Total Area– 34247.9 (AU)

TLC Plate Views of *Physalis minima* Linn. SAMPLES

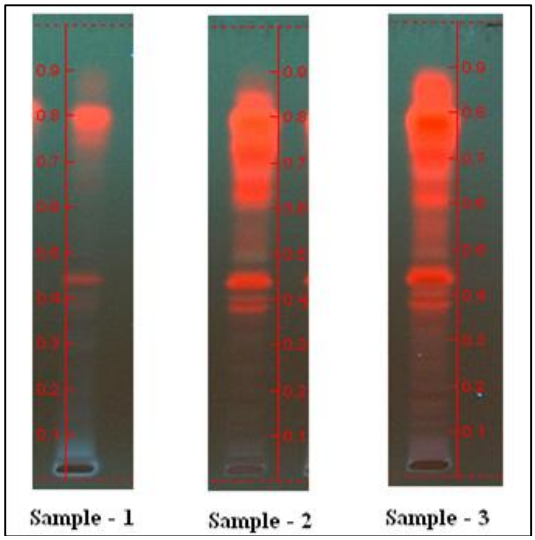


254nm **366nm**

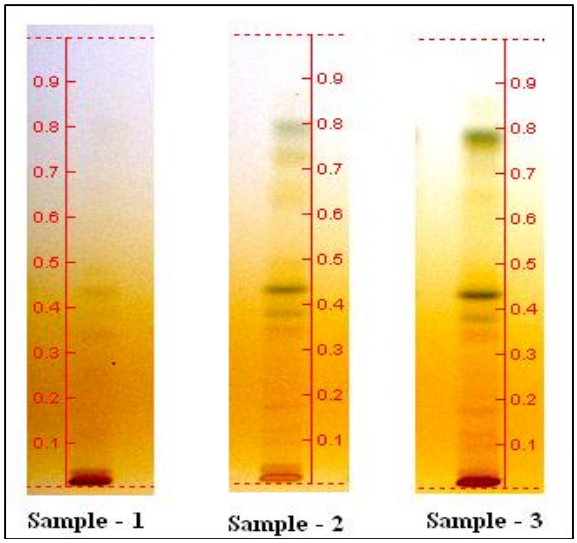


At White Light

4. Derivatized TLC Plate Views of *Physalis minima* Linn. Samples



At 366nm



AT White Light

Photochemistry

Table 1: Physicochemical parameters of the plant *Physalis minima* Linn.

S. No	Experiments	Percentage
1	Total ash	14%
2	Water insoluble ash	6.2%
3	Acid insoluble ash	1.1%
±	Moisture content	8%
5	Volatile oil content	0%
6	Sugar content	
	a. Total Sugar b. Reducing Sugar	3.83% 2.53%
7	Fibre content	54.34%

Table 2: Percentage of water soluble and alcohol soluble extractives

No.	Name of extract	Percentage of extract
1.	Hot water soluble	14.65%
2.	Cold alcohol soluble	12%
3.	Cold water soluble	19.6%

Table 3: Successive solvent extractives

No.	Experiments	Percentage
1.	Petroleum ether	2.5%
2.	Cyclohexane	1.4%
3.	Acetone	5.1%
4.	Ethanol	3%

Table 3: Qualitative Phytochemical analysis of the extractives

	Alkaloids	Flavanoids	Phenol	Tannin	Saponin	Steroids	Anthraquinons	Glycosides
Petroleum ether	-	+	-	+	+	+	-	-
Cylohexane	-	-	+	-	+	+	-	+
Acetone	-	-	-	+	-	+	-	-
Alcohol		+	-	+	-	+	-	-
Hot water extract	-	-	-	-	-	+	-	-
Cold water extract	-	+	-	+	+	+	-	+
Cold alcohol extract	+	+	+	+	+	+	-	-

Discussion

Microscopy

Microscopy shows normal structures of root, stem and leaves.

HPTLC

HPTLC analysis of three extract of the drug Hot water extact, methanol extract and alcohol extact was done. The maximum number of peak is observed in the methanol extract and maximum area is observed in the alcohol extracts suggests the presence of more chemical constituents in the extract.

Phytochemical analysis

Physicochemical parameters of *Physalis minima* Linn. whole plant are tabulated in respective section. The *cūrṇa* of the shade dried drug was subjected to physicochemical analysis. No foreign matter was detected. No foreign matter was detected. Deterioration time of the plant material depends upon the amount of water present in plant material. If water content is high, the plant can be easily deteriorated due to contamination by microbes[142]. In present study moisture content was 0.4% in dried sample showing it can be stored for a period of time without spoilage and it will be less susceptible to microbial growth.

Fiber content was found to be 54.34%, which suggests that this drug is good source of fibers. The percentage of total ash, acid insoluble ash, and water insoluble ash was determined and results were tabulated. Ash value is the general criterion to ascertain the purity of the drug. Total ash value of the drug was found to be 14%.%. Water insoluble ash mainly gives the percentage of organic matter present in the ash and this was found to be 6.2%. Acid insoluble ash, which mainly gives the percentage of the sand and impurities that remain insoluble in HCl and it was found to be 1.1%. Extractive values were also determined. Water soluble extract was found to be 19.6%, highest among all the extracts, which show high water soluble contents in plant in present study. Water soluble extracts of the drug mainly represents the percentage of organic constituents such as tannins, sugars, plant acids, mucilage and glycosides. Alcohol soluble extracts mainly represents the percentage of organic constituents such as alkaloids, phenols, flavanoids, steroids, sugars etc. present in the drug.

The whole plant powder were collected and extracts were prepared separately thus prepared extracts were subjected to preliminary phytochemical studies. Results indicate presence of Flavanoids, Phenol, Saponins, and Tannins in various extracts.

Conclusion

Preliminary pharmacognostic and phytochemical analysis of *Physalis minima* Linn. was conducted. In HPTLC analysis the maximum number of peak is observed in the methanol extract and maximum area is observed in the alcohol extracts suggests the presence of more chemical constituents in the extract. Qualitative phytochemical analysis showed the presence of alkaloids, flavanoids, tannins, saponins, steroids, phenols and glycosides.

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