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Detailed comparative pharmacognostical profile of *cucumis prophetarum* linn, and *trichosanthes palmata* roxb, Leaf: Source plants of *indravaruni*

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Abstract
As per API, official source of *Indravaruni* is *Citrullus colocynthis* Schard. *Cucumis prophetarum* Linn. and *Trichosanthes palmata* Roxb. are the other source plants of *Indravaruni* mentioned in classics as well as modern textbooks in the context of botany as well as its medicinally uses. Review shows the leaves of *C. prophetarum* used in biliousness, fever, purgative agent while the leaves of *T. palmata* are used in burns. The study is taken to fulfill the lacuna of these unexplored plants in the context of individual and comparative pharmacognosy aspects of leaf. The leaves of both the species are simple, petiolate, scabrous. T.S. of petiole shows epidermis, cortex, vascular system and ground tissue. T.S. of *C. prophetarum* midrib shows 3 vascular bundles while *T. palmata* possess 4 vascular bundles. Anomocytic stomata are present in both species. The common diagnostic powder characters are like multicellular covering trichome, cystoliths etc.

Keywords: *cucumis prophetarum*, *kantala indramana*, *mahakal*, pharmacognosy, *trichosanthes palmata*

1. Introduction
India is the world's 12th region having largest biodiversity; moreover it has one of the oldest, richest and most diverse traditional medicine cultures. One such traditional culture is Ayurveda [1]. The tribal belt of India is rich in plants and local tribes use these plants to treat various ailments [2].
According to Dr. Bapalal Vaidya, there are mainly four varieties of *Indravaruni* described in classics on the basis of their fruits size along with or without spines. As per Ayurvedic Pharmacopoeia of India (API), official source of *Indravaruni* is *Citrullus colocynthis* Schard. The other three source plants used are namely *Cucumis prophetarum* Linn. and *Trichosanthes palmata* Roxb. beloging to family Cucurbitaceae [3]. *Citrullus colocynthis* is well established plant from pharmacognostical and phytochemical aspects while *Cucumis prophetarum* and *Trichosanthes palmata* are two such medicinal plants, which are scientifically unexplored.
Review of literature revealed that many uses are reported on both the plants i.e. *C. prophetarum* and *T. palmata*. *Cucumis prophetarum* is vernacularly known as *Khari Indrayan* [4]. in Hindi as well as *Kantala Indrana* [5]. in Gujarati language. Leaves are used in biliousness, fever, antidote, vomiting and as a purgative [6]. The other plant *T. palmata* known as *Lal Indrayan* [7, 8]. in Gujarati. The leaves of this plant is used in burns and the roots in diarrhoea, fever, pneumonea, rheumatic arthritis, snake bite and vomiting [9]. The root of the plant is claimed as poisonous [5]. in nature.
Though the plant has been used ethno-medicinally, no work has been reported regarding its individual and comparative pharmacognosy of leaf anatomy. Hence in the present research article, an effort has been made to overcome this lacuna by studying detailed and comparative leaf anatomy of two source plants of *Indravaruni*.

2. Material and methods
2.1 Collection, preservation and authentication of plants
Selected plants species i.e. *Cucumis prophetarum* Linn. and *Trichosanthes palmata* Roxb. were collected from natural habitat following standard collection practice. Identification and authentication were done in the institute [10, 11]. Fresh samples were preserved under FAA (5:5:90 v/v) preservative solution [12].

2.2 Pharmcognostical study
Macroscopic observations were made with naked eyes and centimetre scale was used to measure the leaf length and width [13, 14]. Organoleptic evaluation of the raw drug samples were done by their various characters *i.e.* color, texture, odour, taste etc [10, 14]. Transverse sections were taken cleared with choral hydrate to observe the anatomy with help of Quasmo binocular compound microscope [14, 15, 16]. For histochemical tests, the thick transverse sections were exposed to Iodine, Phloroglucinol and HCl for observation of starch grain and lignified tissues [14, 17]. Surface study was done as per standard protocol [10, 13, 14].
For powder microscopy, to obtain powder, shaded dried leaves were grounded by mechanical grinder and sieved through 90# [14, 15].
For micrometry, triplicate reading were recorded and mean value was taken into consideration along with standard mean of deviation using Microsoft excel [15].

3. Observation and results
3.1 Collection, preservation & authentication
Fresh leaves of *Cucumis prophetarum* Linn. and *Trichosanthes palmata* Roxb. were collected from out skirts and from the edge of cultivated region which was free from pollution. *Cucumis prophetarum* Linn. Collected from

Surendranagar district, located between 22.73°N – 71.51°E in month of October, 2017 while *Trichosanthes palmata* Roxb. was collected from the Dang forest region, located between 27.9904° N - 82.3018° E in month of December, 2018. Pharmacognostical identification and authentication was done in pharmacognosy lab. I.P.G.T. & R.A. Healthy samples were made into herbarium Phm/6236/Oct. 2017 (Fig. 1: d) and Phm/6289/Dec. 2018 (Fig. 2: e) respectively and kept for future reference.

3.2 Morphology

Cucumis prophetarum is perennial trailing herb having hairs on stem, scabrid at on lower surface, greenish in color. Leaves simple, broadly ovate - palmate, deeply 3-5 lobbed, 1.5 cm – 4 cm long, petiolate.

Lower surface have more prominent midrib and hairs than the upper one. The flowers are yellow in color, axillary, dioecious.

Fruits are softly spinous, dark green and light green colored strips, ellipsoidal-oblong fleshy with many glabrous, pale-brown-black seeds. Flowering & fruiting occurs in July – Oct.

(Fig. 1: a) *Trichosanthes palmata* is large woody climber as well as creeping in nature. The leaves are palmate, petiolate, deeply lobbed and scabrous.

Stem is herbaceous woody. Flower is axillary, white colored. Fruits are large globose. Fruit rind is red-orange colored while mesocarp is black-grey colored with many black colored flattened seeds.

Flowering and fruiting occurs in the month of Aug. – Dec. (Fig. 2: a-c)

3.3 Leaf macroscopy

Leaves of both the species were simple, petiolate with alternate phyllotaxy (Fig. 1: b,c; Fig. 2: d). The other observed characters are depicted in table 1.

Table 1: Macroscopic characters of the leaf along with measurement

Characters	*C. prophetarum*	*T. palmata*
	cm=centimeter	cm=centimeter
Leaf type	Simple	Simple
Petiole	Petiolate	Petiolate
Phyllotaxy	Alternate	Alternate
Number of lobes	2-3 lobbed	2-3 lobbed
Leaf shape	Palmate	Palmate
Leaf margin	Lobate	Lobate
Leaf base	Auriculate	Auriculate
Leaf apex	Obtuse	Obtuse-acuminate
Leaf venation	Palmately reticulate	Palmately reticulate
Upper surface color	Green	Dark green
Lower surface color	Light parrot green	Light green
Touch of upper surface	Smooth hairy	Smooth glabrous
Touch of lower surface	Scabrous hairy	Hairy
Leaf size	1.5-4 cm	2-14 cm

3.4 Transverse section of petiole

Schematic outline of *C. prophetarum* petiole T.S. is crown shaped with 1.9 μm^2 radius (4×) while the transverse section of *T. palmata* was elongated pentangular in shape with the measurement of 5 µm × 4 µm (4×) from center (Fig. 3 and 7). The other microscopical characters along with measurements are mentioned in the table 2.

Table 2: Comparative transverse section of petiole along with micro-measurement

Characters	*C. prophetarum*	*T. palmata*
	µm=micrometer	µm=micrometer
Shape & size	Crown shape 1.9 μm^2 radius (4×)	Elongated pentangular from center = 5 µm × 4 µm (4×)
Epidermis	Single layer with cuticle; Base of unicellular stalk with multicellular glandular head trichome (1.1 × 0.9 µm, 40×), sessile glandular trichome (1 × 0.8 µm, 40×), multicellular warty trichome (8 × 0.7 µm, 40×) and multicellular stalk with multicellular glandular head trichome (1.6 × 0.5 µm, 40×)	Single layer with cuticle; Base of multi-cellular trichomes (5.3 × 0.8 µm, 40×) filled with yellowish content, sessile glandular trichome (0.8 μm^2, 40×), multicellular trichomes filled with cystoliths and multicellular stalk with multicellular glandular head trichome (1.3 × 0.5 µm, 40×)
Cortex	Patches of multilayered collenchyma and chlorenchyma alternatively arranged	Outer cortex: Multilayered collenchyma interrupted by cystoliths Inner cortex: Chlorophyll pigments present in some cells
Vascular bundle	Two primary and Five secondary open bi-collateral vascular bundles radially arranged	Centrally located nine primary open bicollateral vascular bundles and two meristeles located at the upper arms while one in center
Ground tissue	made up of parenchyma cells, loaded with oil globules and rarely loaded by simple starch grains	made up of parenchyma cells, loaded with oil globules and rarely loaded by simple starch grains

3.5 Transverse section of lamina

Transverse section of lamina of both the leaves showed different types of trichomes (Fig. 4 and 8). The other microscopic characters are shown along with their micro-measurements in the table 3.

Table 3: Comparative transverse section of lamina along with micro-measurements

Characters	*C. prophetarum*	*T. palmata*
	µm=micrometer	µm=micrometer
Measurement	5.9 µm (40×)	2.9 µm (10×)
Epidermis	Upper and lower epidermis single layer with cuticle	Upper and lower epidermis single layer with cuticle
Palisade layer	Beneath the upper epidermis, Double layer filled with chlorophyll Palisade cell: 1.8 × 0.3 µm (40×)	Beneath the upper epidermis, Double layer filled with chlorophyll Palisade cell: 1.2 × 0.2 µm (40×)
Spongy parenchyma	5-7 layers loaded with oil globules, chlorophyll pigments and cystoliths of calcium carbonate	Undifferentiated multi-layers loaded with oil globules, chlorophyll pigments and isolated cyst oliths of calcium carbonate
Trichomes	Biseriate multicellular warty trichome (5.9 × 0.7 µm, 40×)	Simple multicellular trichome (2.6 × 0.2 µm, 10×), sessile glandular trichome (0.9 μm^2, 40×)

3.6 Transverse section of midrib Upper and lower single layered epidermis covered with cuticle present in both the species (Fig. 4 and 8). The other microscopical characters are described in the table 4.

Table 4: Comparative transverse section of midrib along with micro-measurement

Characters	*C. prophetarum*	*T. palmata*
	µm=micrometer	µm=micrometer
Epidermis	Upper and lower epidermis with single layer covered with cuticle	Upper and lower epidermis with single layer covered with cuticle
Collenchyma	Present just beneath the upper epidermis with 7-8 layers. At the lower epidermis, 3-4 layers	Present just beneath the upper epidermis with 9-11 layers. At the lower epidermis, 4-6 layers with the irregularly distributed patches of cystoliths
Vascular bundle	Horizontally arranged three vascular bundles; Two major vascular bundles are open bicollateral while one is minor Shows anomalous growth	Four open bicollateral vascular bundles are circularly arranged while two meristeles situated just beneath the collenchyma of upper epidermis Shows anomalous growth
Ground tissue	Made up of parenchyma cells often filled with chlorophyll and yellowish brown content	Made up of parenchyma cells often filled with chlorophyll and some isolated starch grains
Trichomes	unicellular stalk with multicellular glandular head trichome (1.4 × 0.5 µm, head 1 µm, 40×)	multicellular covering trichomes (4.7 × 0.9 µm, 40×) bi-seriate multicellular trichome filled with yellowish brown content (2.7 × 0.3 µm, 40×) and multicellular sessile glandular trichome (0.8 × 0.7 µm, 40×)

3.7 Quantitative and micrometric evaluation
C. prophetarum and *T. palmata* bears 28.17 ± 0.57 mm sq. and 21.15 ± 0.80 mm sq. stomatal index of upper epidermis respectively (Fig. 5 and 9). The other micro-measurements obtained from surface study are depicted in table 5.

Table 5: Comparative quantitative and micrometric evaluation of leaf

Characters	*C. prophetarum*		*T. palmata*	
	Upper epidermis	**Lower epidermis**	**Upper epidermis**	**Lower epidermis**
l = length, *b* = breadth, µm=micrometer	µm=micrometer		µm=micrometer	
Anomocytic stomata *(l)*	0.7 µm ± 0.05	0.8µm ± 0.03	0.7µm ± 0.02	0.8 µm ± 0.03
Anomocytic stomata *(b)*	0.4 µm ± 0.02	0.4 µm ± 0.03	0.6 µm ± 0.03	0.7 µm ± 0.02
Stomatal number	14	16	11	13
Stomatal index (mm sq.)	28.17 ± 0.57	29.70 ± 1.01	21.15 ± 0.80	25.49 ± 1.03
Palisade ratio	1/4	--	1/4	--
Area of cystoliths (μm^2, 40×)	0.94 µm ± 0.43		0.74 µm ± 0.64	

3.8 Organoleptic powder characters of leaf
C. prophetarum leaf powder is light green in color while *T. palmata* leaf powder is dark green in color. Both the powder possesses same characteristic odor, bitter taste and smooth touch.

3.9 Diagnostic powder characters of leaf
Cystoliths are present in both the leaf powder along with different size (Fig. 6 and 10). The other distinguishing powder characters along with their micro-measurements are mentioned in table 6.

Table 6: Comparative powder characters along with micro-measurements

Characters	*C. prophetarum*	*T. palmata*
	µm=micrometer	µm=micrometer
Stomata along with epidermal cells	Present	Present
Cystolith	1.7 × 0.9 µm (40×)	0.9 × 0.6 µm (40×)
Simple starch grain	0.6 μm^2 (40×)	0.9 μm^2; 0.2 μm^2 (40×)
Shrinked trichome	2.4 × 0.3 µm (40×)	Absent
Multicellular covering trichome	4 × 0.5 µm (40×)	4.5 × 0.7 µm (40×)
Multicellular trichome	3.4 × 0.6 µm (40×)	Absent
Pleuricellular trichome	1.4 × 0.3 µm (40×)	1.4 × 0.5 µm (40×)
Warty trichome	2.7 × 0.5 µm (40×)	Absent
Stone cell	Absent	3 × 0.5 µm (40×)
Fragment of annular vessel	Present	Present
Fragment of spiral vessel	Present	Present
Fragment of pitted vessel	Not observed	Present
Fragment of bordered pitted vessel	Not observed	Present
Simple fiber	Not observed	Present
Oil globule	Present	Present
Aleurone grain	Present	Not observed
Greenish yellow content	Not observed	Present
Brown content	Present	Present

3.10 Histochemical evaluation of leaf T.S. and its powder
Transverse sections of individual leaf along with their individual Powders shows the presence of starch and calcium oxalate crystals. The other histochemical tests are depicted in table 7.

Table 7: Comparative histochemical evaluation of leaf T.S. and its powder

Reagent	Observation	Characteristics	Results	
			C. prophetarum	*T. palmata*
			+=present	+=present
Phloroglucinol + Conc. HCl	Red	Lignified cells	+	+
Iodine	Blue	Starch grains	+	+
Conc. HCl	Dissolved with effervescence	Calcium carbonate crystals	+	+
	Dissolved	Calcium oxalate crystals	+	+
$FeCl_3$ solution	Dark blue	Tannin cells	+	+

Fig 1: *Cucumis prophetarum* Linn. a: Plant in natural habitat, b: Measurement of leaves, c: Measurement of single leaf along with showing upper and lower surface, d: Herbarium of specimen

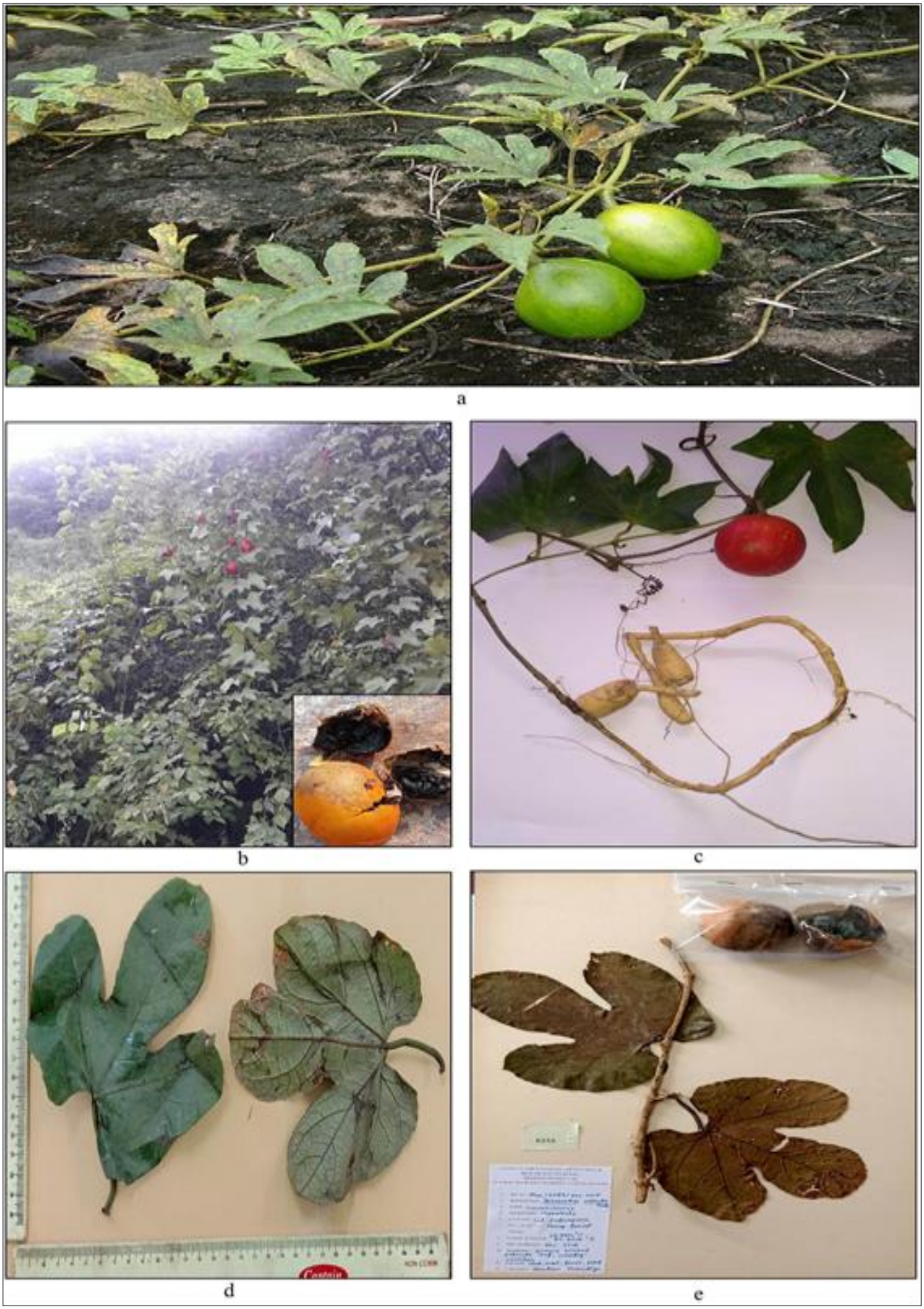

Fig 2: *Trichosanthes palmata* Roxb. a: Plant in natural habitat, b: Plant in natural habitat along with ripen open fruit, c: Plant twig with ripen fruit, d: Measurement of leaf showing both the surfaces, e: Herbarium of specimen

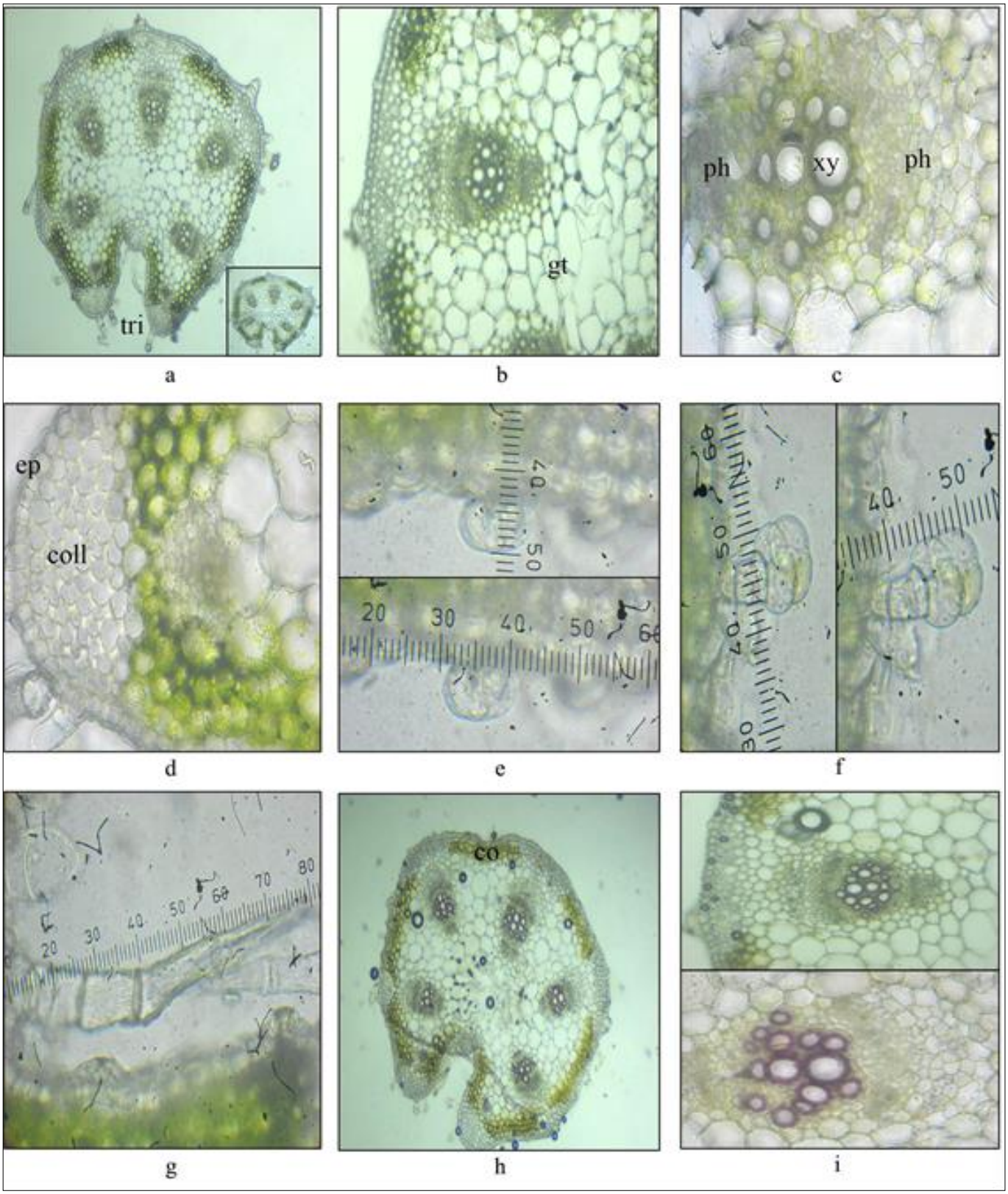

Fig 3: T.S. of *C. prophetarum* petiole. a: Diagrammatic section of petiole along with measurement (4×), b: Detailed section shows epidermis, cortex, vascular bundle and ground tissue (10×), c: Detailed section shows bicollateral vascular bundle (40×), d: Detailed section shows epidermis, collenchyma and cortex (40×), e: Measurement of sessile glandular trichome (40×), f: Measurement of multi-cellular stalk with multi-cellular glandular head trichome (40×), g: Measurement of multi-seriate multicellulae warty trichome (40×), h: Diagrammatic section stained with phloroglucinol + HCl (4×), i: Detailed stained section (10×) shows lignified vascular bundle (40×). tri = trichome; ep = epidermis; coll = collenchyma; co = cortex; ph = phloem, xy = xylem; gt = ground tissue

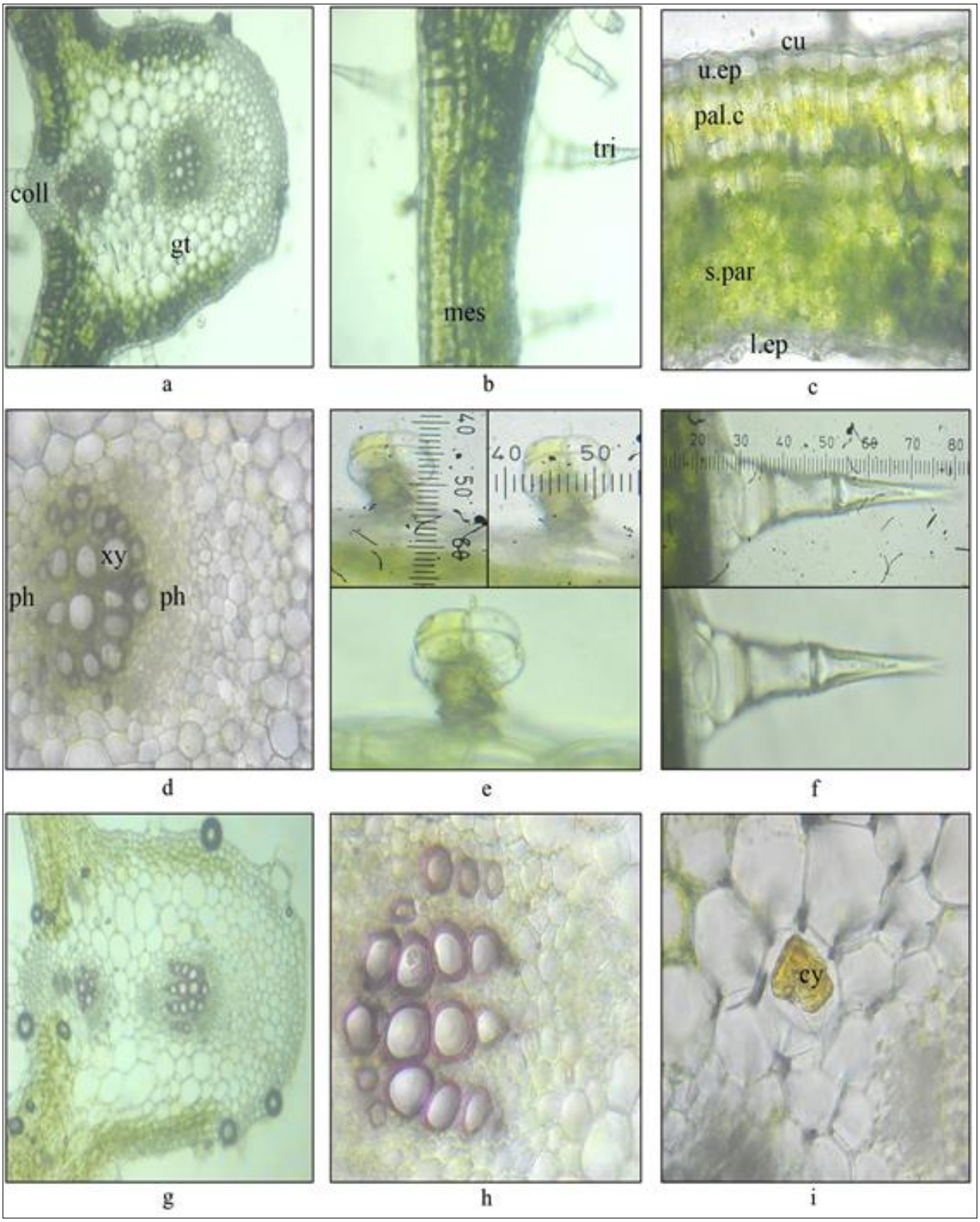

Fig. 4: T.S. of *C. prophetarum* leaf through midrib. a: Diagrammatic section of leaf passing through midrib (4×), b: Diagrammatic section shows mesophyll and trichome (4×), c: Detailed lamina section shows cuticle, upper and lower epidermis, palisade cell and spongy parenchyma (40×), d: Detailed section shows bicollateral vascular bundle (40×), e: Unicellular stalk with multicellular glandular head trichome along with measurement (40×), f: Multi-seriate multicellulae warty trichome along with measurement (40×), g: Diagrammatic section stained with phloroglucinol + HCl (40×), h: Lignified vascular bundle (40×), i: Cystolith (40×). tri = trichome; mes = mesophyll; cu = cuticle; u.ep = epidermis; l.ep = lower epidermis; s.par = spongy parenchyma; pal.c = palisade cells; coll = collenchyma; ph = phloem, xy = xylem; gt = ground tissue; cy = cystoliths

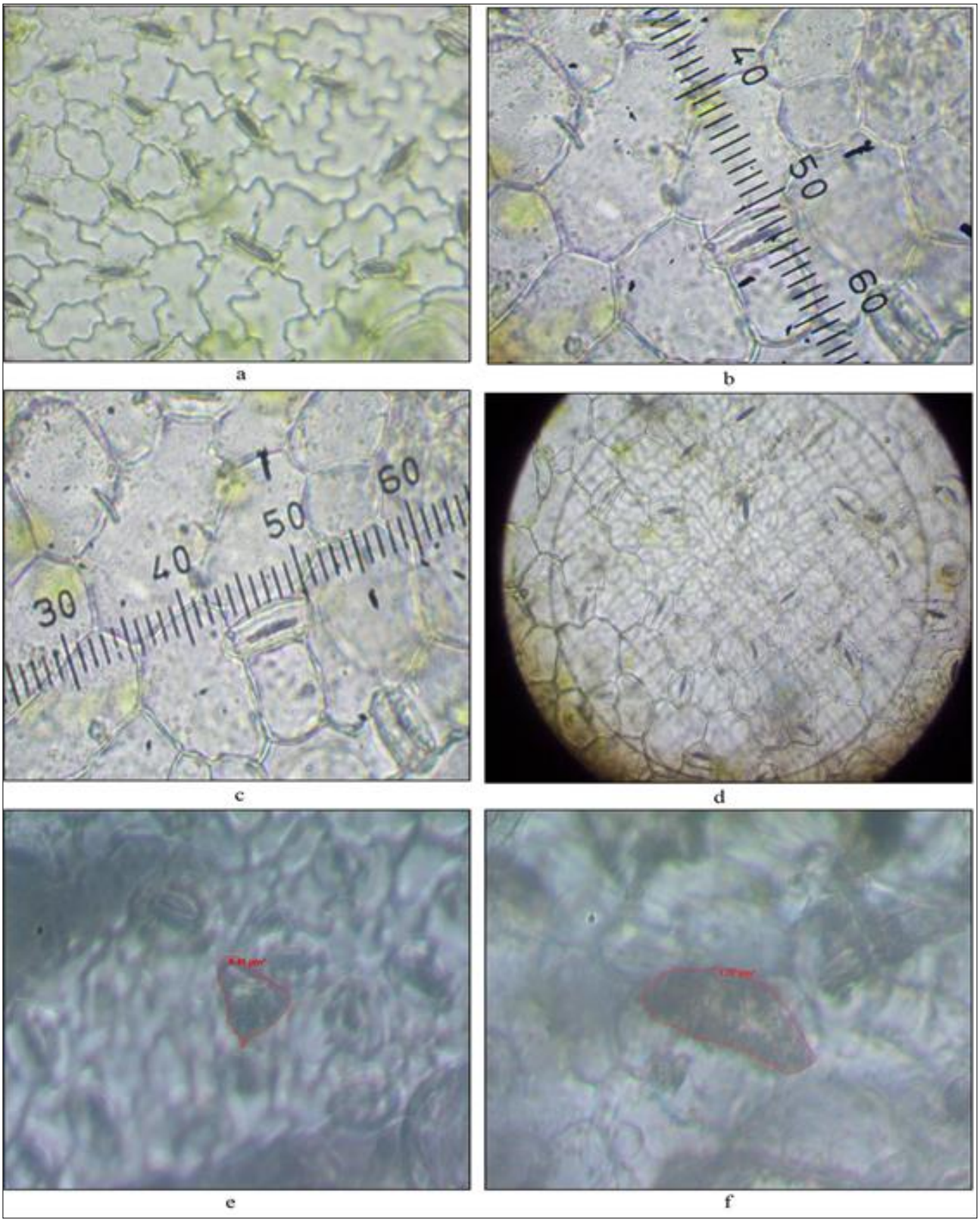

Fig 5: Surface study of *C. prophetarum* leaf. a: Anomocytic stomata (40×), b: Measurement of breadth of stomata (40×), c: Measurement of length of stomata (40×), d: Stomatal index (40×), e: Measurement of area of cystolith (40×), f: Measurement of area of cystolith (40×)

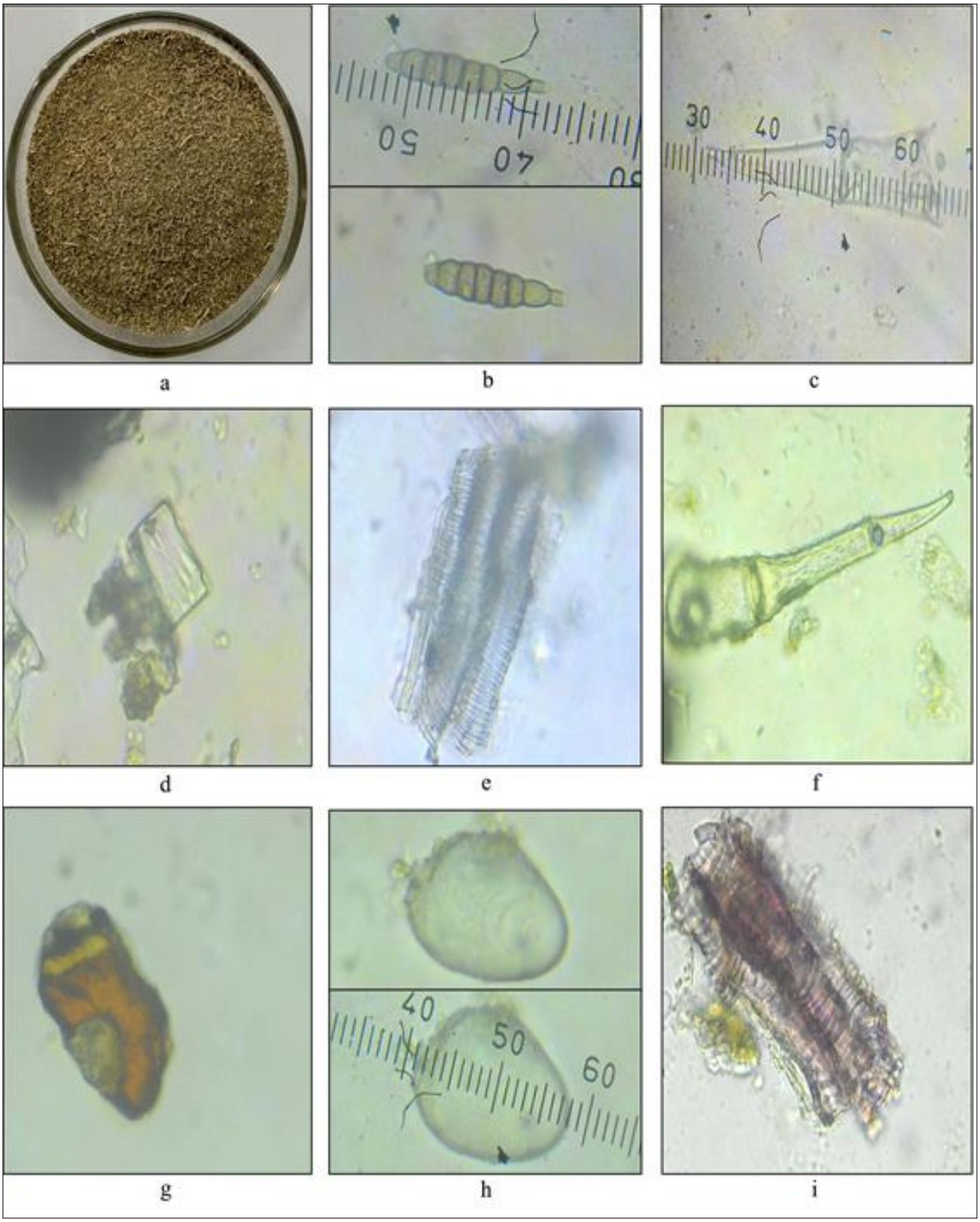

Fig. 6: Powder microscopy of *C. prophetarum* leaves. a: Sample powder, b: Pleuricellular trichome along with measurement (40×), c: Measurement of simple multicellular trichome (40×), d: Crystalline matter (40×), e: Fragment of group of vessels (40×), f: Multicellular warty trichome (40×), g: Brown content (40×), h: Simple starch grain with measurement (40×), i: Fragment of group of lignified vessel (40×)

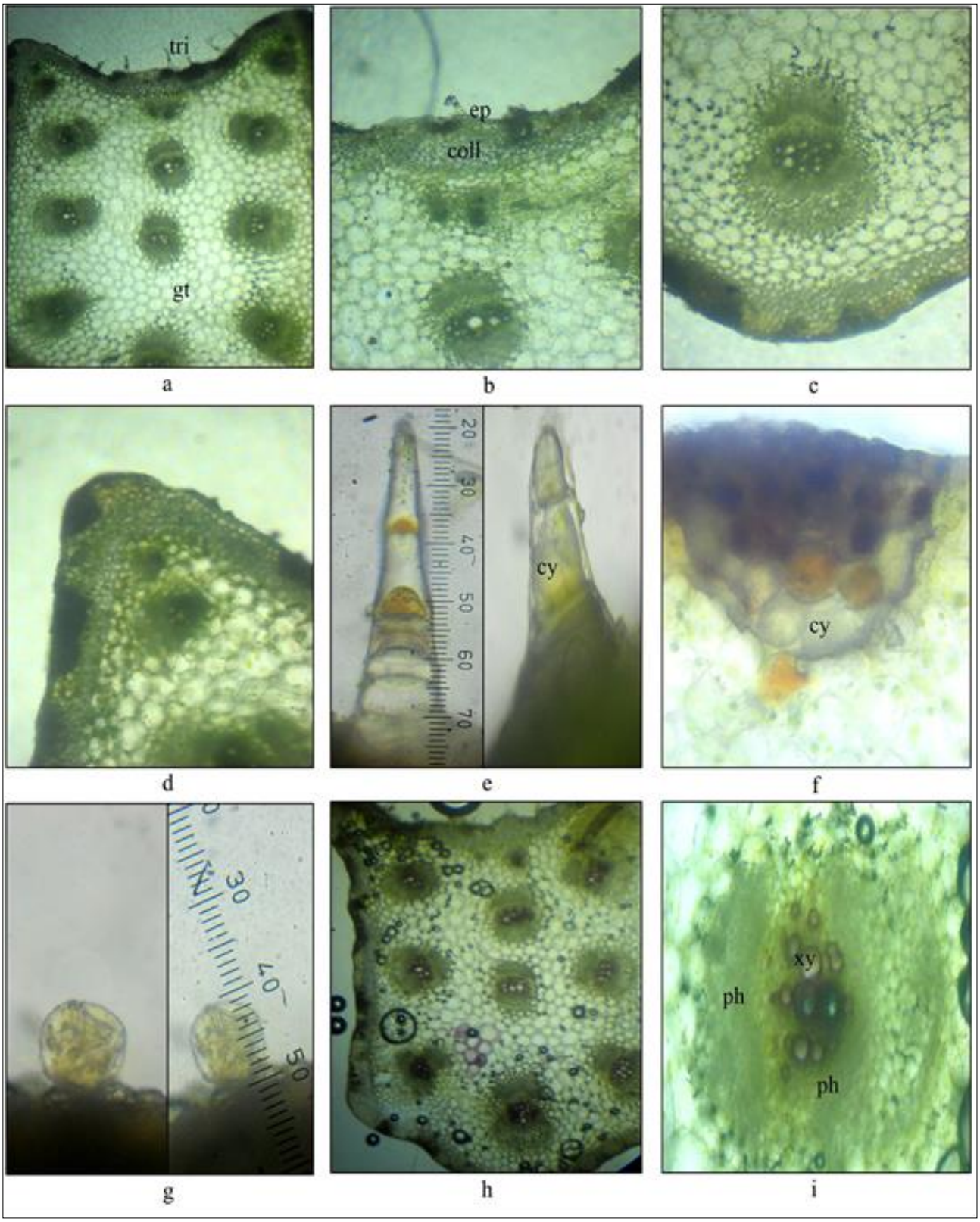

Fig 7: T.S. of *T. palmata* petiole. a: Diagrammatic section of petiole (4×), b: Detailed section shows epidermis and collenchyma (10×), c: Detailed section shows bicollateral vascular bundle (10×), d: Detailed section shows vascular bundle at the corner side of section (10×), e: Measurement of multicellular trichome filled with oil along with fragment of multicellular trichome filled with cystolith (40×), f: Group of cystolith (40×), g: Sessile glandular trichome along with measurement (40×), h: Diagrammatic section stained with phloroglucinol + HCl (4×), i: Detailed stained section shows lignified vascular bundle (40×). tri = trichome; ep = epidermis; coll = collenchyma; cy = cystolith; ph = phloem, xy = xylem; gt = ground tissue

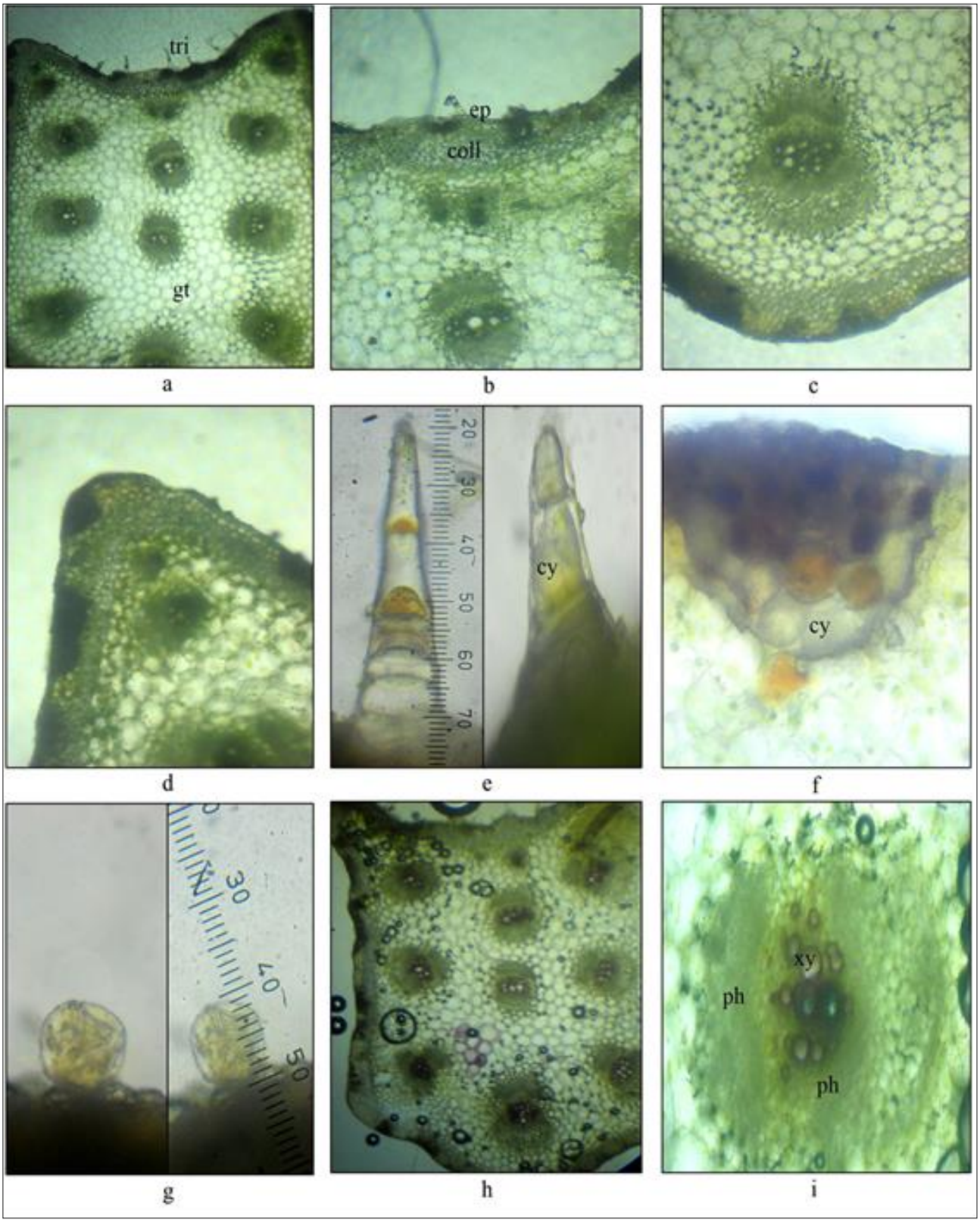

Fig 7: T.S. of *T. palmata* petiole. a: Diagrammatic section of petiole (4×), b: Detailed section shows epidermis and collenchyma (10×), c: Detailed section shows bicollateral vascular bundle (10×), d: Detailed section shows vascular bundle at the corner side of section (10×), e: Measurement of multicellular trichome filled with oil along with fragment of multicellular trichome filled with cystolith (40×), f: Group of cystolith (40×), g: Sessile glandular trichome along with measurement (40×), h: Diagrammatic section stained with phloroglucinol + HCl (4×), i: Detailed stained section shows lignified vascular bundle (40×). tri = trichome; ep = epidermis; coll = collenchyma; cy = cystolith; ph = phloem, xy = xylem; gt = ground tissue

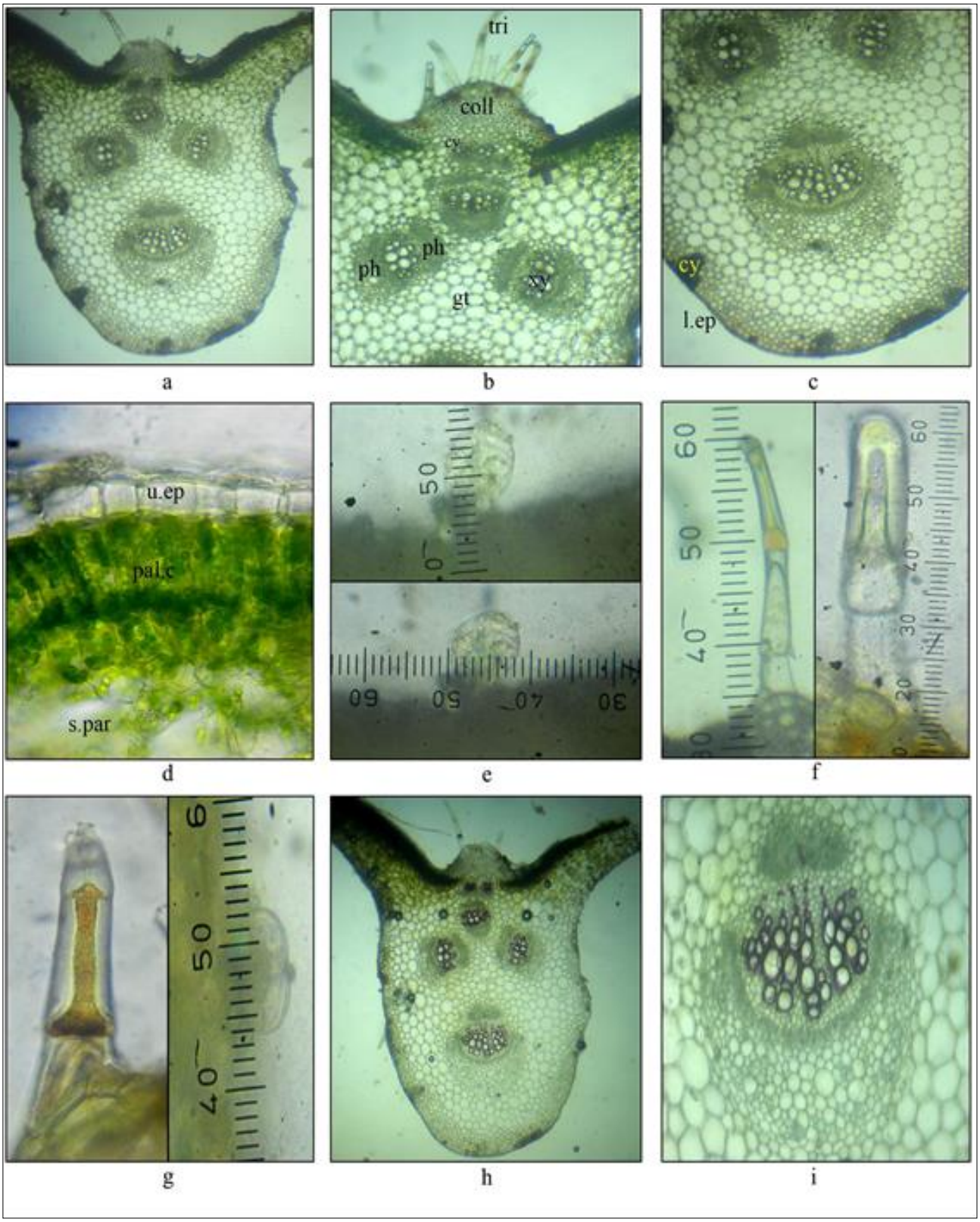

Fig 8: T.S. of *T. palmata* leaf through midrib. a: Diagrammatic section of leaf passing through midrib (4×), b: Detailed section shows trichome, cystolith, collenchyma, vascular bundle and ground tissue (10×), c: Detailed section shows lower epidermis, cystolith and main vascular bundle (10×), d: Detailed lamina section shows upper epidermis, palisade cell and spongy parenchyma (40×), e: Measurement of glandular trichome (40×), f: Measurement of covering trichome (40×), g: Multiseriate multicellular trichome filled with oil along with measurement of sessile glandular trichome (40×), h: Diagrammatic section stained with phloroglucinol + HCl (4×), i: Lignified vascular bundle (40×). tri = trichome; u.ep = epidermis; l.ep = lower epidermis; s.par = spongy parenchyma; pal.c = palisade cells; coll = collenchyma; ph = phloem, xy = xylem; gt = ground tissue; cy = cystoliths

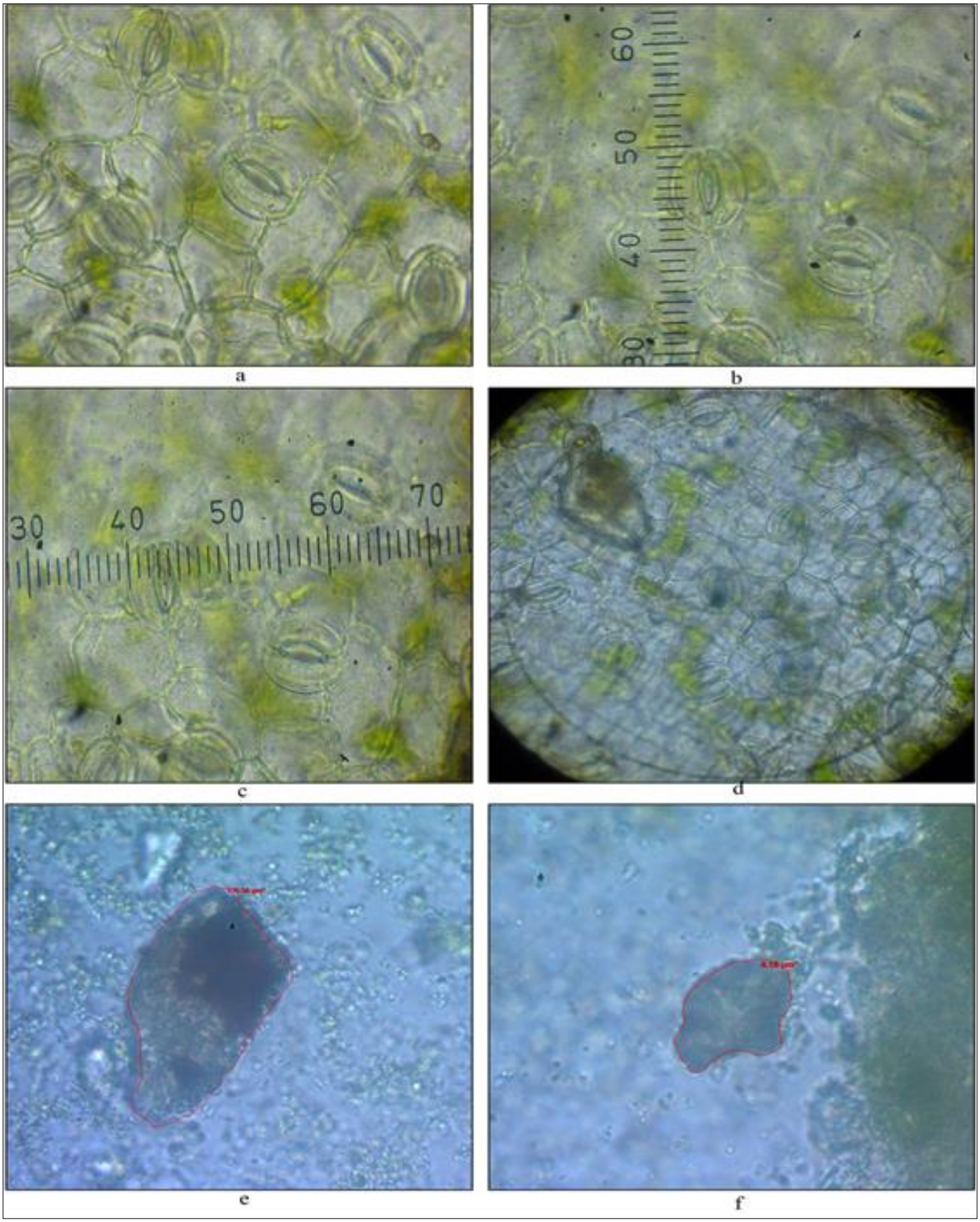

Fig 9: Surface study of *T. palmata* leaf. a: Anomocytic stomata (40×), b: Measurement of length of stomata (40×), c: Measurement of breadth of stomata (40×), d: Stomatal index (40×), e: Measurement of area of cystolith (40×), f: Measurement of area of cystolith (40×)

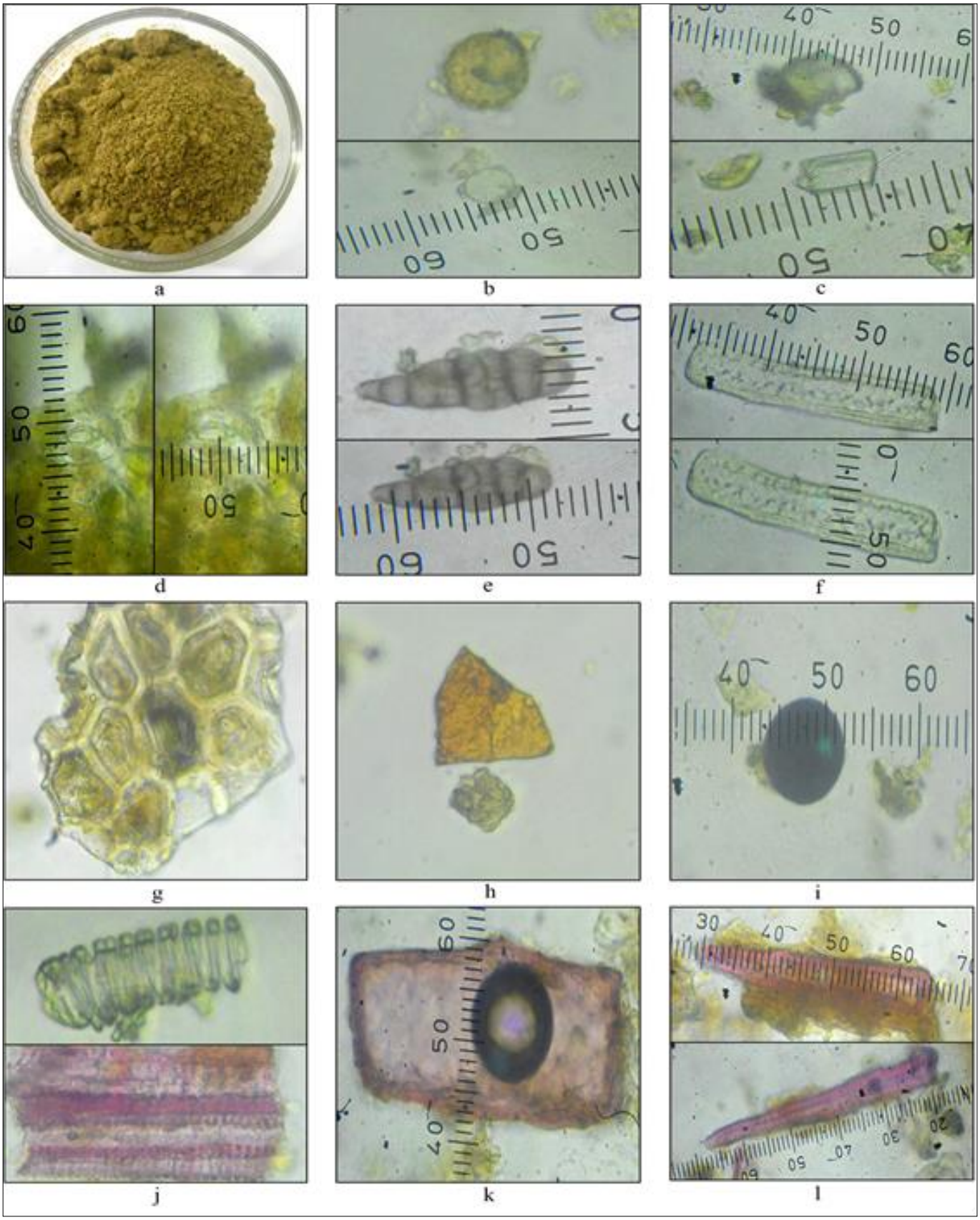

Fig 10: Powder microscopy of *T. palmata* leaves. a: Sample powder, b: Yellowish green content along with oil globule (40×), c: Measurement of cystolith along with rhomboidal crystal (40×), d: Measurement of fragment of stomata with epidermal cells (40×), e: Pleuricellular trichome along with measurement (40×), f: Measurement of pitted stone cell (40×), g: Epidermal cells filled with cystoliths (40×), h: Brown content (40×), i: Measurement of iodine stained simple starch grain (40×), j: Annular vessel along with group of lignified vessels (40×), k: Measurement of lignified pitted stone cell (40×), l: Measurement of lignified stone cells (40×)

Discussion

Cucumis prophetarum and *Trichosanthes palmata* were collected by following the good collection practice from the Surendranagar region and authenticated by the pharmacognosist along with the help of various floras and pharmacognosy text books. The herbarium was submitted at

the Pharmacognosy laboratory, Gujarat Ayurved University for the further reference.

The plant *C. prophetarum* in nature is a trailing herb and scabrous in nature. Brownish colored tap root hard in nature. Greenish stem with hairy surface. Simple, alternate, 3 lobbed leaves were hairy with the measurement of 1.5 cm – 4 cm in length. The plant bears yellow colored axillary, solitary flowers. Fruit softly spinous, dark green and light green colored strips, ellipsoidal-oblong fleshy with many glabrous, pale-brown-black seeds. Flowering and fruiting from July to October.

T. palmata is a trailing herb, sometimes woody climber and little scabrous in nature. Light brown colored tap root, hard in nature with bulb formation. Greenish stem was hard. Simple, alternate, 2-3 lobbed leaves were measured about 12 × 14 cm. Flower were axillary, white colored. Fruits were large globose. Fruit rind was red-orange colored while mesocarp black-grey colored with many black colored flattened seeds. Flowering and fruiting occurs in the month of Aug. – Dec.

C. prophetarum leaf simple, petiolate light green colored with tendril like structure at the base of petiole was measured about 1.5 cm – 4 cm in length. Leaf was 3 lobbed along with prominent midrib and the lower side was much scabrous than the upper surface. While *T. palmata* leaf was also simple, petiolate green colored with tendril like structure at the base of petiole and was measured about 12 - 14 cm in length. Leaf was 2-3 lobbed along with prominent midrib and the lower side scabrous.

Microscopy of *C. prophetarum* shows the internal characteristics of the petiole more or less resemble that of the stem. The vascular bundles arranged in the ring same like as stem and also having bi-collateral vascular bundles [18]. In leaf as well as petiole, the outer surfaces of the epidermis were frequently covered with a thin cuticle. This cuticular layer was formed of cutin. As the outer walls of the epidermis were thick and cutinized, water does not pass through them rapidly and the transpiration from the surface of the epidermis can greatly reduced and only small quantity of water can evaporate by transpiration. The epidermis also prevent the pathogens in to the interior of the leaf. The palisade cells of mesophyll contain chloroplast were perpendicular to the epidermis. They arranged near to the upper surface of the leaf where they receive sunlight and facilitate to carry the function of photosynthesis. Due to the presence of a large air space in the spongy parenchyma tissue they were more adaptable to the exchange of gases between the cells and atmosphere. The presence of the collenchyma tissue gives mechanical support to the leaf.[19] Presence of cystoliths in different size and shape at the base of the trichomes or in them, Glandular hairs with uniseriate stalks and warty trichomes were present which is the prominent characters of the Cucurbitaceae family [18].

Microscopy of *T. palmata* petiole shows that the transverse section possessed epidermis, hypodermis vascular bundles and ground tissue resembles more or less to the stem in internal structure.[18] The number of vascular bundles and its arrangement was not similar to the stem anatomy [20]. The presence of epidermis gives protection to the internal tissues from excessive loss of moisture. Mesophyll help in photosynthesis. The palisade parenchyma has more number of chloroplasts than the spongy parenchyma cells. The loose structure of the spongy parenchyma enables the leaf to have easy gaseous exchange [21]. Presence of cystoliths in different size and shape at the base of the trichomes or in them as well as in the hypodermis, glandular hairs with uniseriate stalks and warty trichomes were present which the prominent characters of the Cucurbitaceae family [18].

The results obtained in surface study, showed the presence of Anomocytic (Ranunculaceous) stomata in Cucurbitaceae family, supporting the reference for both the species [22]. Stomatal index of the *C. prophetarum* is 28.17±0.57 mm sq. of upper epidermis and 29.70±1.01 mm sq. of lower epidermis, palisade ratio is 1/4 and length of upper epidermal stomata is 0.7 µm ± 0.05 and breadth is 0.4 µm ± 0.02 while length of lower epidermal stomata is 0.8 µm ± 0.03 and breadth is 0.4 µm ± 0.03. While stomatal index of the *T. palmata* is 21.15±0.80 mm sq. of upper epidermis and 25.49±1.03 mm sq. of lower epidermis, palisade ratio is 1/4 and length of upper epidermal stomata is 0.7µm ± 0.02 and breadth is 0.6 µm ± 0.03 while length of lower epidermal stomata is 0.8 µm ± 0.03 and breadth is 0.7 µm ± 0.02. These values are always constant even in different environmental condition, and hence they play very significant role in the identification of plant even up to the species level.

Cystoliths of various size and shape were observed in leaf. The different size of cystoliths showed the developing nature of the plant.

Leaf powder of *C. prophetarum* was light green in color while *T. palmata* leaf powder was dark green in color. Both the powders were bitter in taste. The common diagnostic powder characters are pleuricellular trichome, multicellular covering trichome, brown content, oil globule, fragment of stomata, cystolith, fragment of spiral and annular vessel. *C. prophetarum* powder can be differentiated by the presence of multicellular trichome, crystalline material of calcium carbonate, multicellular shrinked trichome, multicellular warty trichome and aleurone grain while *T. palmata* powder can be distinguished by the presence of rhomboidal crystal, rod shaped starch grain, fragment of pitted and bordered pitted vessel, sclerides, stone cell and simple starch grain

The histochemical tests shows the lignified cells, tannin cells and cystoliths were present in both the species but the amount of starch and calcium carbonate crystals were more in the *T. palmata* leaf.

6. Conclusion

Morphologically both the plants understudy are prostrate herbs with herbaceous stem and simple, alternate, long petiolate, deeply lobed palmate leaves along with tendrils which represents the key characters of Cucurbitaceae family.

Leaf microscopy of both plants reveals that upper and lower epidermis possess cuticle, mesophyll is differentiated into two layers of palisade cells and spongy parenchyma embedded with cystoliths and oil globules. Anomocytic stomata are present in all the three plants understudy. Presence of various size of stomata, stomatal index as well as type of trichomes helps in identification of the *Cucumis prophetarum* and *Trichosanthes palmata.*

3. References

1. Retnam KR, Martin P. Ethanomedicinal Plants. Agrobios, Jodhpur, 2006, 2.
2. WHO, Research guidelines for evaluating the safety and efficacy of herbal medicines.

http://www.apps.who.int/medicinedocs/en/d/jh29. 2019; 6:7.
3. Vaidya B. Some controversial drugs in Indian Medicine. 2nd ed, Chaukhambha orientalia, Varanasi. 2005; 144:146.
4. Chopra RN, Nayar SL, Chopra IC. Glossary of Indian medicinal plants. NISCIR, New Delhi. 2002; 67:83.
5. Indraji JK. Vanaspatishastra Kathiyavad na Barda Dungar ni jadibuti. Pravin Pustak Bhandar, Rajkot. 1906; 345:359.
6. Pandey CN, Raval BR, Seema M, Harshad S. Medicinal Plants of Gujarat. Gujarat Ecological Education and Research Foundation, Gandhinagar, 2012, 166.
7. Joshi MC. Handbook of Indian Medicinal Plants. Scientific Publishers, Jodhpur. 2007; 37:38.
8. Bhandari C. Vanaushadhi chandrodaya. Chaukhambha Publication, Varanasi. 2003; 140-143.
9. Jain SK. Dictionary of Indian Folk Medicine and Ethnobotany. Deep publications, New Delhi. 1991; 54:182.
10. Khandelwal KR. Practical Pharmacognosy. 19th ed, Nirali Prakashan, Pune. 2008; 24(51-147)162-164.
11. Anonymous. WHO guidelines on good agricultural and collection practices for medicinal plants. WHO, Geneva, 2003, 13-16.
12. Bendre A. Practical Botany. 1st ed, Rastogi publications, Meerut. 2006; 7:9.
13. Trease GE, Evans WC. Pharmacognosy. 16th ed, Sunders Elsevier, London. 2009; 569:537-563.
14. Anonymous. Quality control methods for medicinal plant materials. e-book. WHO, Geneva. 1998; 1(16-19):21-27.
15. Wallis TE. Text book of Pharmacognosy. 5th ed, CBS Publishers & Distributors, New Delhi. 2002; (123-132):210-215.
16. Lohar DR. Protocol for testing, Ayurvedic, Siddha, Unani medicines, government of India. Appendix-2, Department of AYUSH, Ministry of Health & Family Welfare, Pharmacopoeial Laboratory for Indian Medicines, Ghaziabad, 2007, 142.
17. Krishnamurty KV. Methods in the plant histochemistry. Vishwanandan Pvt. Limited, Madras, 1988, 1-74.
18. Metcalfe CR, Chalk L. Anatomy of the Dicotyledons. Vol. I, Oxford at the Clarendon Press, London. 1950; (684-689):685-687.
19. Pandey BP. Plant Anatomy. S. Chand & Company Ltd., New Delhi. 1978; (175-181):296-299.
20. Tayal MS. Plant Anatomy. Rastogi publications, Meerut. 2004; 170(132-135):150-156.
21. John JPE. A textbook of Plant Anatomy. Emkay publications, Delhi. 2006; 191:183-186.
22. Metcalfe CR, Chalk L. Anatomy of the Dicotyledons. Oxford at the Clarendon Press, London. 1950; 1:1332.