Research Article

ISSN: 2454-5023
J. Ayu. Herb. Med.
2017; 3(1): 15-26
January- March

www.ayurvedjournal.com
Received: 09-11-2016
Accepted: 17-03-2017

Pharmacognostic and preliminary physicochemical study of vidangadilouham- an ayurvedic antidiabetic herbomineral preparation

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ABSTRACT

Vidangadilouham is a very famous ayurvedic herbo-mineral compound formulation generally prescribed in powder form and directed to take with some vehicle like water, honey, jiggery, milk etc. It is indicated in various ayurvedic treatises for various disorders like prameha (diabetes), sotha (inflammation), pandu (anaemia), halimak (advanced or neglected stage of anemia), medoroga (hyperlipidaemia), kamla (jaundice) etc. The ingredients of vidangadilouham are vidanga (*Embelia ribes*), amla (*Emblica officinalis*), haritaki (*Terminalia chebula*), bahera (*Terminalia bahera*), krishnajeeraka (*Nigella sativa*), swetajiraka (*Cuminum cyminum*), sunthi (*Zingiber officinale*), mustaka (*Cyperus rotundus*), pippali (*Piper longum*) and Louhabhasma (Incinerated iron).In the present study the pharmacognostic and basic physicochemical study of the plant drugs including phytochemical screenings had been performed. The samples were collected from authentic suppliers in dried and crude form and the macroscopic study was performed first. Then these were subjected for powdering in pulveriser and sieved through 80 #. The powdered material was subjected for microscopic study and the identification characters for each sample were noted carefully with proper illustrations. All the powdered drugs were mixed carefully with louhabhasma and thoroughly triturated well. The microscopic study and physicochemical tests of the finished product was also carried out. The data obtained from this study further may be used as a source of standard monograph for vidangadilouham.

Keywords: Vidangadilouham, Physicochemical analysis, Pharmacognosy.

INTRODUCTION

Ayurvedic classical formulations place an important signature to establish their clinical efficacy when they are tested through modern parameters. But still sometimes it found to be toxic or not to be efficacious enough. The main reason behind this happening is lack of standardization. Standardization is an important tool to estimate the degree of purity and quality control of the product. In this study a classical formulation named Vidangadilouham is selected for the evaluation of its physicochemical and pharmacognostic parameters and setup standards for future reference.

Vidangadilouham is another classical ayurvedic formulation which is mainly indicated for the management of kamla (jaundice), pandu (anaemia), prameha (diabetes) etc. Vidangadilouham presents a combination of number of plants (Like, vidanga: *Embelia ribes* Burm; amla: *Emblica officinalis* Gaertn., haritaki: *Terminalia chebula* Retz.; bahera: *Terminalia bahera* (Gaertn.) Roxb.) etc.) and minerals (mainly *Louhabhasma*: iron calyx). In ayurvedic contexts various formulations are known by the name of vidangadi louham. Among them the authors have chosen the reference of Rasendrasarasamgraha of Gopalkrishna Bhatta, as no significant study was found on this yoga (formulation).[1-3]

Details macroscopy with microscopic illustrations have been performed. Physicochemical study of individual ingredient as well as the final product was also done. The standard procedure was followed during performance of each test and the data found are noted carefully. The physicochemical and pharmacognostic parameters which are found after completion of the study set up a standard for vidangadi louham formulation, which will help further to attain the quality of the product and obtain a reproducible therapeutic efficacy.

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MATERIALS AND METHOD[4-7]

Collection and preparation of drug: All the crude drugs were collected from the authentic suppliers in dry form and necessary identifications tests were performed for species conformation. All the drugs were pulverised to 80# and subjected for powder microscopy.

Organoleptic parameters: Various organoleptic properties such as colour, odour, taste of the crude drugs were observed and recorded.

Microscopic evaluation: All drugs were dissolved in small amount of distilled water for a while and then mounted in glycerine. Microscopic examination was carried out with and without staining. By powder microscopy, observe the characters, determine the chemical nature of the cell wall along the form and chemical nature of the cell contents. Microphotographs were taken by using microscope attached with camera. The microscopic features of each powder were studied very minutely under 10X and 40X resolution under light field microscope and the supportive pictures were taken by adjacent camera.

Preparation of vidangadilouham: All the plant drugs were pulverised up to 80 #. They were weighed in equal quantity of each. Louha bhasma of established company (Shree Dhootpapeswar Limited) was taken of the total amount of powdered drug and were mixed thoroughly.

The finally prepared vidangadiloham was subjected for further physicochemical test and phytochemical screening through the application of various reagents.

Table 1: Ingredients of Vidangadilouham

S. No.	Drug name	Botanical name	Parts used	Parts
1	Vidanga	*Embelia ribes*	Fruit	1 part
2	Amla	*Emblica officinalis*	Fruit rind	1 part
3	Haritaki	*Terminalia chebula*	Fruit rind	1 part
4	Bahera	*Terminalia bahera*	Fruit rind	1 part
5	Krishna jeeraka	*Nigella sativa*	Fruit	1 part
6	Swetajirak	*Cuminum cyminum*	Fruit	1 part
7	Sunthi	*Zingiber officinale*	Rhizome	1 part
8	Mustaka	*Cyperus rotundus*	Rhizome	1 part
9	Pippali	*Piper longum*	Fruit	1 part
10	Louhabhasma		Powder	9 part

RESULT AND DISCUSSION

The macroscopic and microscopic features which were studied minutely are summarised under table 2 and table 3 respectively. The elaborate description of microscopic features with illustrations was depicted afterward.

Organoleptic features of the finished product

Organoleptic evaluation was used for identification of sensory characteristics powder like colour, odour (smell), touch and taste.

Colour - Brownish black
Taste- Pungent
Odour - Aromatic
Texture- Smooth

Table 2: Macroscopic features

S. No.	Drug name	Colour	Odour	Taste
1	Vidanga	Brownish-black	Aromatic	Astringent
2	Amla	Grey to black	Characteristics	Sour & astringent
3	Haritaki	Yellowish brown	Characteristics	Astringent
4	Bahera	Greyish brown	Characteristics	Astringent
5	Krishna jeeraka	Greenish brown	Aromatic	Characteristics
6	Swetajiraka	brown	Characteristics	Spicy
7	Sunthi	Buff	Agreeable	Pungent
8	Mustaka	Dark brown	Pleasent	Characteristics
9	Pippali	Greenish black	Characteristics	Pungent

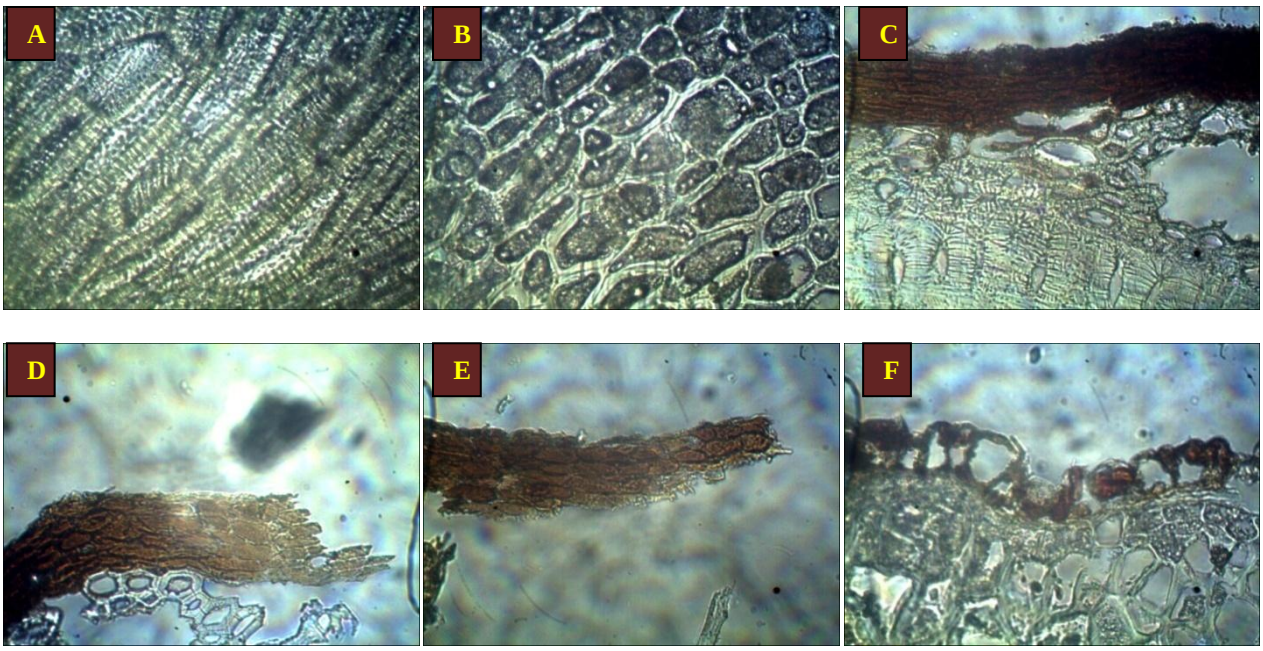
Table 3: Microscopical features of drugs

Features identified	V	A	H	B	KJ	SJ	S	M	P
Endocarp	+	-	-	-	-	+	-	-	+
Mesocarp	-	+	+	-	-	+	-	-	+
Epicarp	-	+	+	-	-	+	-	-	-
Endosperm	+	-	-	-	+	+	-	-	+
Hypodermis	+	+	-	-	-	-	-	+	-
Stone cells	+	-	+	+	-	-	-	-	+
Starch grains	-	+	+	+	-	-	+	+	+
Vascular bundle	-	+	-	+	-	+	+	+	+
Epidermis	-	-	+	+	+	-	+	+	+
Parenchyma cells	-	-	+	+	+	-	-	+	-
Oleoresin	-	-	-	-	-	-	+	-	+
Cuticle	-	+	-	-	+	+	-	-	+
Oil globules	-	-	+	-	-	+	-	-	-
Crystal	-	+	+	+	-	-	-	-	-
Cork	-	-	-	-	-	-	+	-	-
Raphae	-	-	-	-	-	+	-	-	-
Sclerides cells	+	+	-	-	-	-	-	-	-
Vittae	-	-	-	-	-	+	-	-	-
Endodermis	-	-	-	-	-	-	+	+	-
Carpophore	-	-	-	-	-	+	-	-	-

V=Vibhitaki, A=Amalaki, H=Haritaki, B=Bahera, KJ=Krishnajiraka, SJ=Swetajiraka, S=Sunthi, M=Mustaka, P=Pippali

Microscopical features of each ingredient with important illustrations:[8-10]

A: Vidanga- Transverse section of fruit shows epicarp consisting of single row of tabular cells of epidermis, usually obliterated, in surface view cells rounded with wrinkled cuticle, mesocarp consists of a number of layers of reddish-brown coloured cells and numerous fibrovascular bundles and rarely a few prismatic crystals of calcium oxalate, inner part of mesocarp and endodennis composed of stone cells, endodermis consisting of single layered, thick-walled, large, palisade-like stone cells, seed coat composed of 2-3 layered reddish-brown coloured cells, endosperm cells irregular in shape, thick-walled, containing fixed oil and proteinous masses, embryo small when present otherwise most of the seeds sterile.



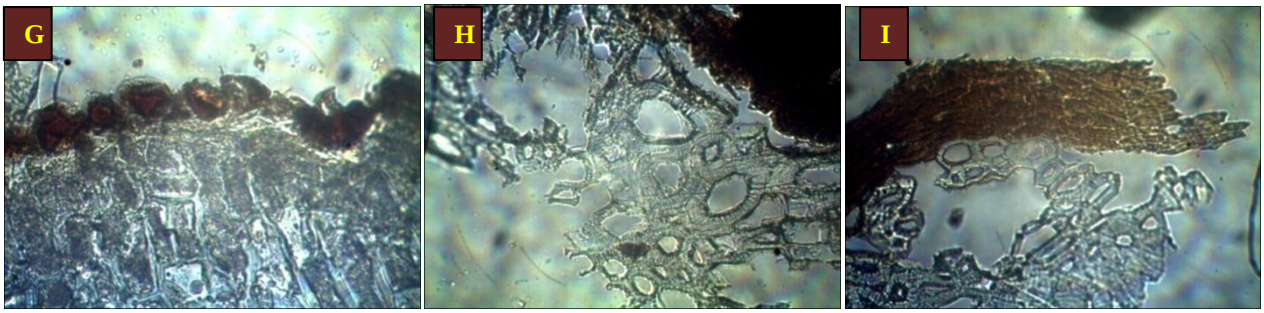


Fig.1: A. Endocarp; **B.** Endosperm; **C.** Hypodermis, stone cells, endocarp; **D & E.** Hypodermis; **F. & G.** Pigment layer and endosperm; **H.** Sclerides cells; **I.** Stone cells (Images were taken under light field microscope 5X × 40X)

B: Amla **-** Transverse section of fruit shows epicarp consisting of a single layered epidermis, cell appearing tabular and poygonal in surface view; cuticle present; mesocarp cells tangentially elongated parenchymatous and crushed, differentiated roughly into peripheral 8 or 9 layers of tangentially elongated smaller cells, rest consisting of mostly isodiametric larger cells with walls showing irregular thickenings; ramified vascular elements occasionally present; stone cells present either isolated or in small groups towards endocarp ; pitted vascular fibres, walls appearing serrated due to the pit canals, leading into lumen.

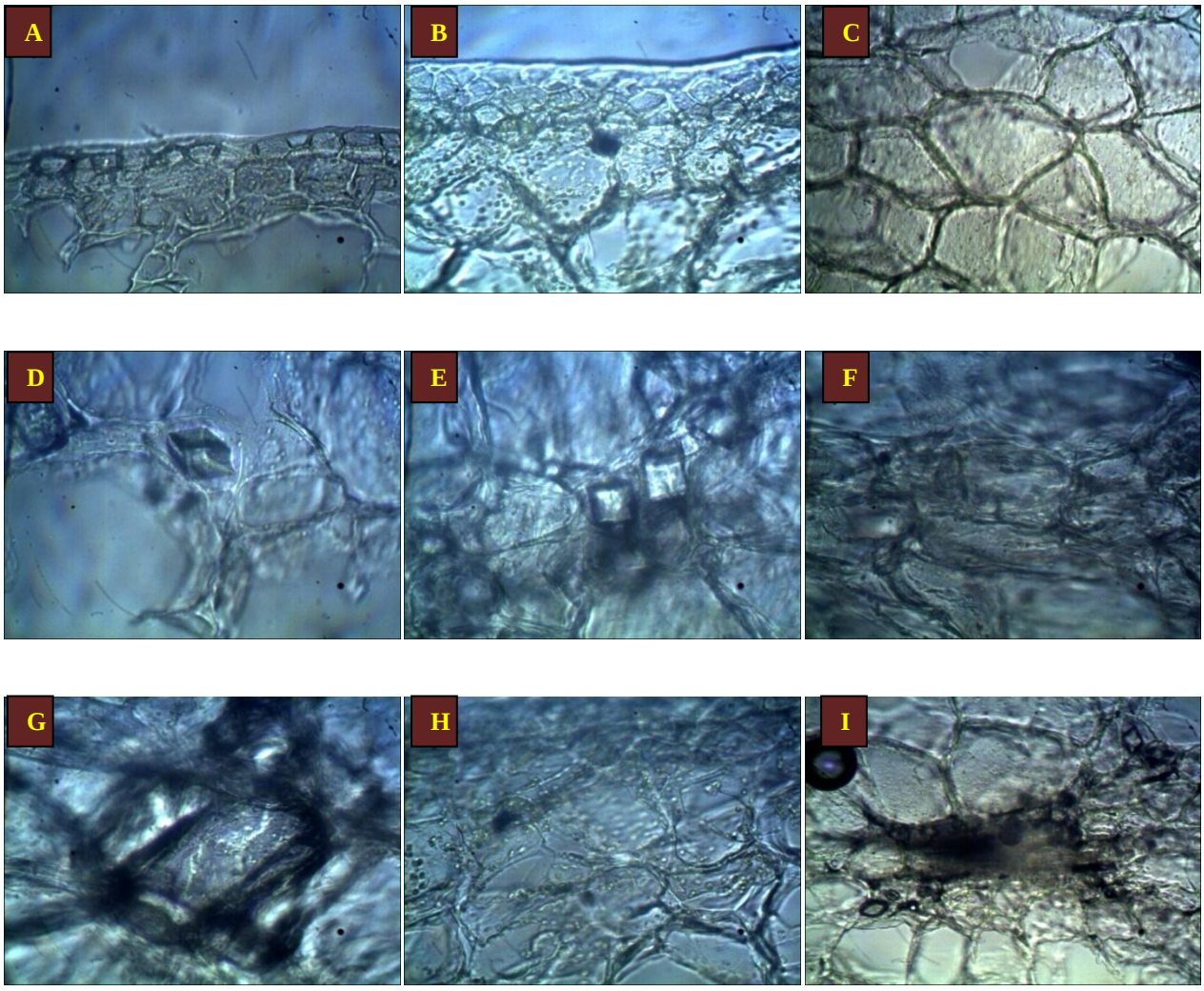


Fig.2: A. Cuticle and epicarp; **B.** Cuticle, epicarp and hypodermis; **C.** Mesocarp; **D.** & **E.** Prismatic crystal **F.** & **G.** Sclereids **H.** Starch grains **I.** Vascular bundle(Images were taken under light field microscope 5X × 40X)

C: Haritaki-Transverse section of pericarp shows epicarp consisting of one layer of epidermal cells inner tangential and upper portions of radial wall thick, mesocarp, 2-3 layers of collenchyma, followed by a broad zone of parenchyma in which fibres and sc1ereids in group and

vascular bundles scattered, fibres with peg like out growth and simple pitted walls, sclereids of various shapes and sizes but mostly elongated, tannins and raphides in parenchyma, endocarp consists of thick-walled sclereids of various shapes and sizes, mostly elongated, epidermal surface view reveal polygonal cells, uniformly thick walled, several of them divided into two by a thin septa, starch grains simple rounded or oval in shape, measuring 2-7 µ in diameter, found in plenty in almost all cells of mesocarp.

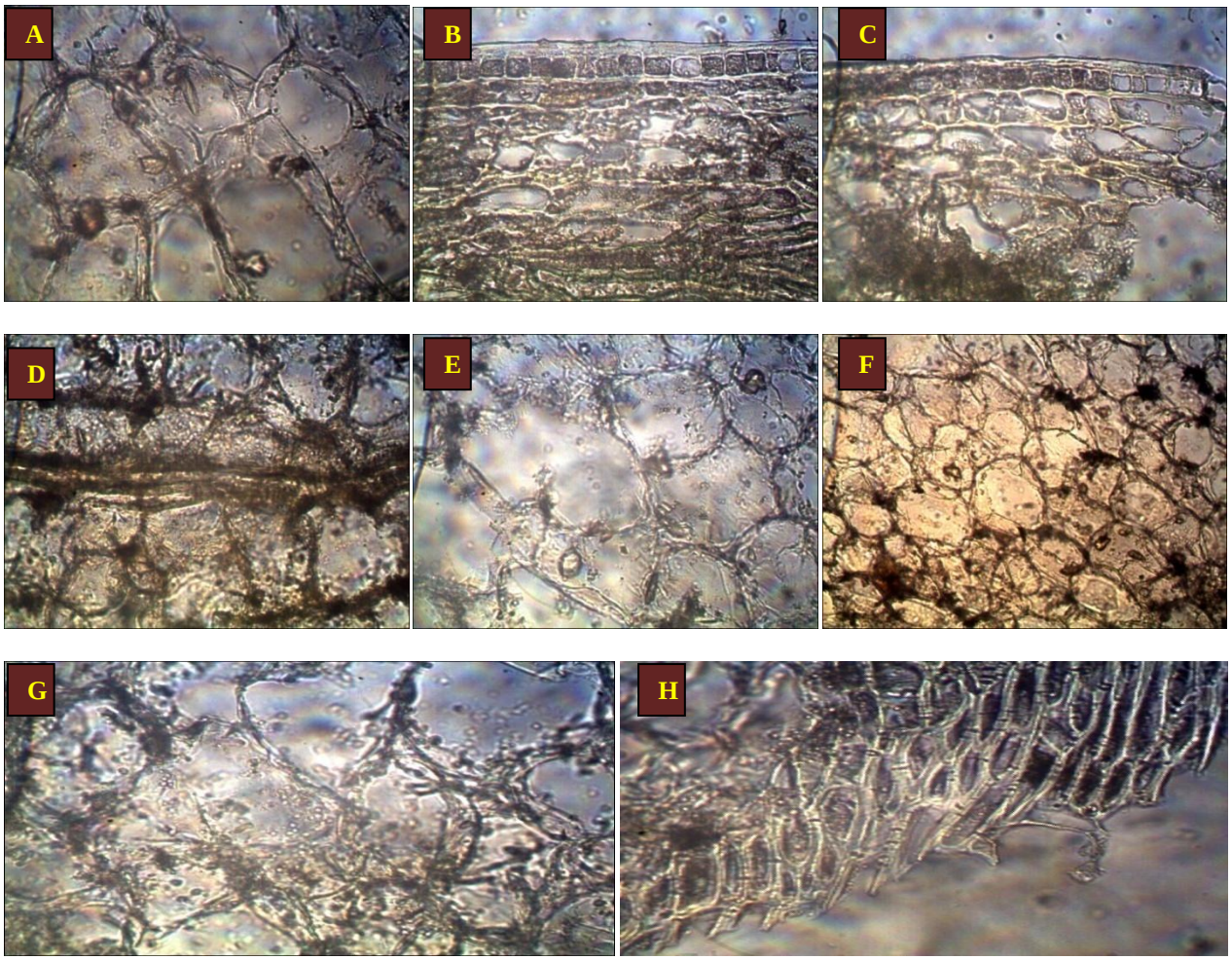
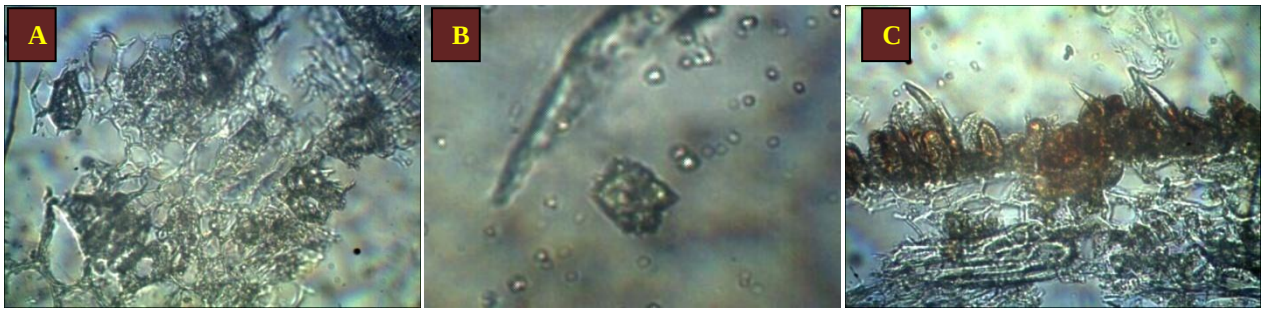


Fig.3: A. Calcium oxalate crystal; **B.**Epicarp; **C.**Epidermis and parenchyma cells; **D.**Fibre; **E.**Mesocarp;**F.** Oil globules;**G.**Starch grains;**H.** Stone cells (Images were taken under light field microscope 5X × 40X)

D: Bahera-Transverse section of fruit shows an outer epicarp consisting of a layer of epidermis, most of epidermal cells elongate to form hair like protuberance with swollen base, composed of a zone of parenchymatous cells, slightly tangentially elongated and irregularly arranged, intermingled with stone cells of varying shape and size, elongated stone cells found towards periphery and spherical in the inner zone of mesocarp in groups of 3-10, mesocarp traversed in various directions by numerous vascular strands, bundles collateral, endarch, simple starch grains and some stone cells found in most of mesocarp cells, few peripheral layers devoid of starch grains, rosettes of calcium oxalate and stone cells present in parenchymatous cells, endosperm composed of stone cells running longitudinally as well as transversely.



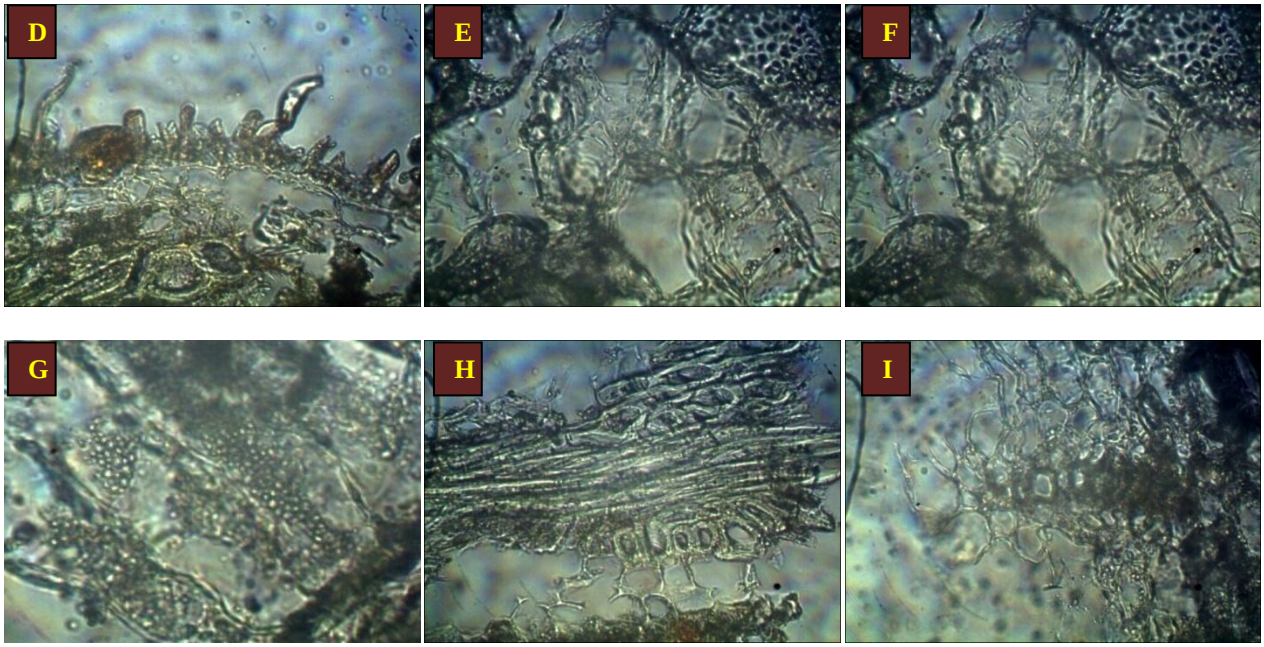


Fig.4: A.&B. Cluster of crystal; **C.&D.**Epidermis and hair; **E.**Parenchymatousmesocarp;**F.** &**G.**Starch grains**H.** Stone cells**I.** Vascular bundle (Images were taken under light field microscope 5X × 40X)

E: Krishna jeeraka - Transverse section of fruit shows pericarp with outer epidermis of polygonal tabular cells with a thick outer wall and striated cuticle, trichomes, absent, vittae four dorsal, intercostal and two commissural extending the length of each mericarp, with an epithelium of brown cells and volatile oil in the cavity, mesocarpparenchymatous without reticulate thickening, costae five in each mericarp with vascular strand consisting of an inner group of small vessels and fibres and arched, outer group of pitted sclerenchyma with a small group of phloem on each lateral surface, on the outer margin of each vascular strand a small schizogenous canal extending into both stylopod and pedicel, inner epidermis of thin - walled, subrectangular cells, elongated tangentially each about 8-12µ wide and 40-100µ long, arranged parallel with one another, endosperm of thick-walled, cellulosic parenchyma, containing much fixed oil and numerous small aleurone grains upto 10 µ in diameter, each containing one or sometimes two micro-rosette crystals of calcium oxalate, carpophore, when present, passing at the apex to a raphe in each mericarp, and with a small strand of sclerenchyma, the sclereids of which continue into the stylopod.

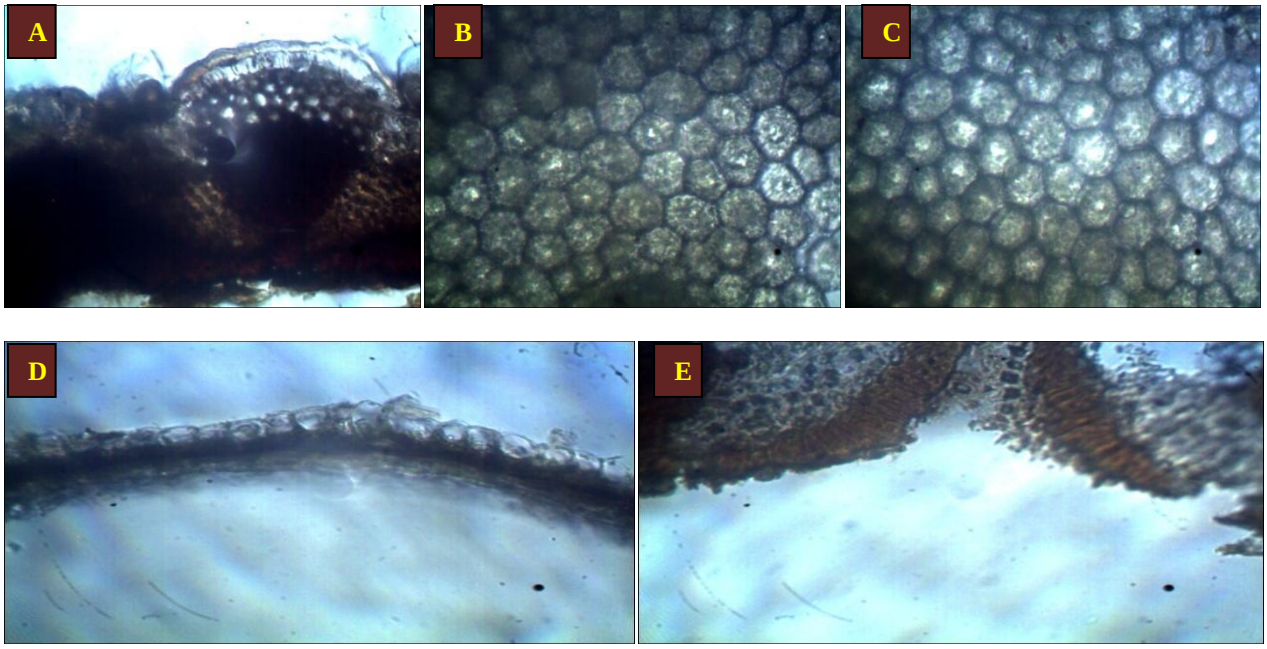


Fig.5: A. Cuticle, epidermis and parenchyma; **B.** & **C.** Endosperm; **D.** Epidermis; **E.** Pigment layer (Images were taken under light field microscope 5X × 40X)

F: Swetajiraka – Transverse section of fruit shows epidermis consisting of short polygonal, tabular cells densely covered with short, bristle hairs on ridges, mesocarp with few layers of parenchyma and five vascular bundles under five primary ridges, six vittae under secondary ridges, four on dorsal and two on commissural surface, endocarp consists of polygonal cells containing fixed oil and aleurone grains carpophore consists of slender fibres.

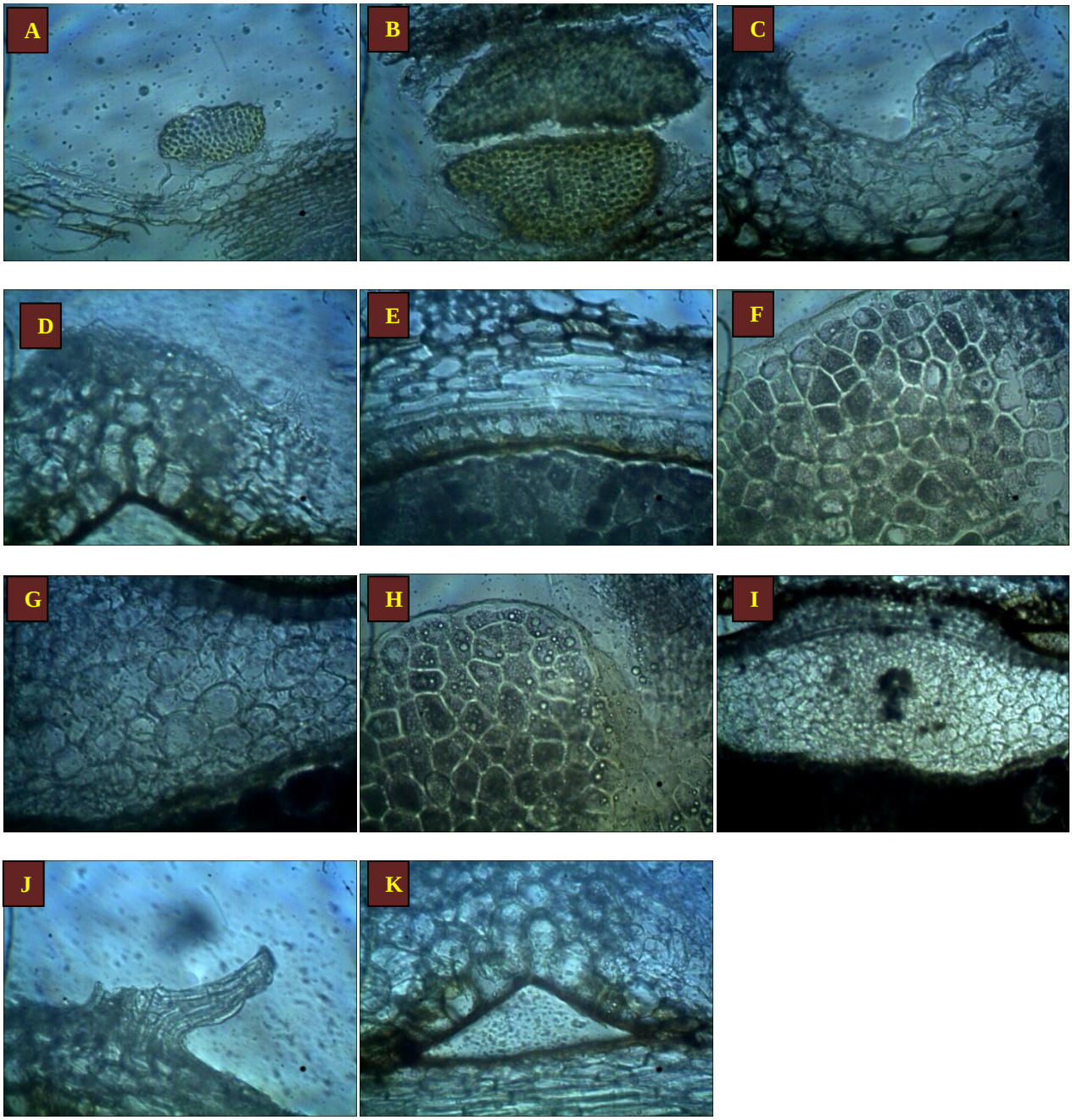


Fig.6: A.&B. Carpophore; **C.**& **D.** Cuticle and epicarp; **E.**Endocarp and sclerenchyma; **F.** Endosperm; **G.**Mesocarp**; H.** Oil globules; **I.**Raphae; **J.**Trichomes; **K.**Vittae; **L.** Vascular bundle (Images were taken under light field microscope 5X × 40X)

G: Sunthi -Transverse section of rhizome shows cortex. of isodiametric thin-walled parenchyma with scattered vascular strands and numerous isodiametric idioblasts, about 40-80 µ In diameter containing a yellowish to reddish-brown oleo-resin, endodermis slightly thick walled, free from starch immediately inside endodermis a row of nearly continuous collateral bundles usually without fibres stele of thin-walled, parenchyma cells, arranged radially around numerous scattered, collateral vascular bundles, each consisting of a few unlignified, reticulate or spiral vessels upto about 70 µ in diameter, a group of phloem cells, unlignified, thin-walled, septate fibres upto about 30 µ wide and 600 µ long with small oblique slit, like pits, present, numerous scattered idioblasts, similar those of cortex, and associated with vascular bundles, also present, idioblasts about 8-20 µ wide and up to 130 µ long with dark reddish-brown contents: in single or in axial rows, adjacent to vessels, present, parenchyma of cortex and stele packed with flattened, rectangular, ovate, starch grains, mostly 5-15 µ - 30-60 µ long about 25 µ wide and 7 µ thick, marked by five transverse striations.

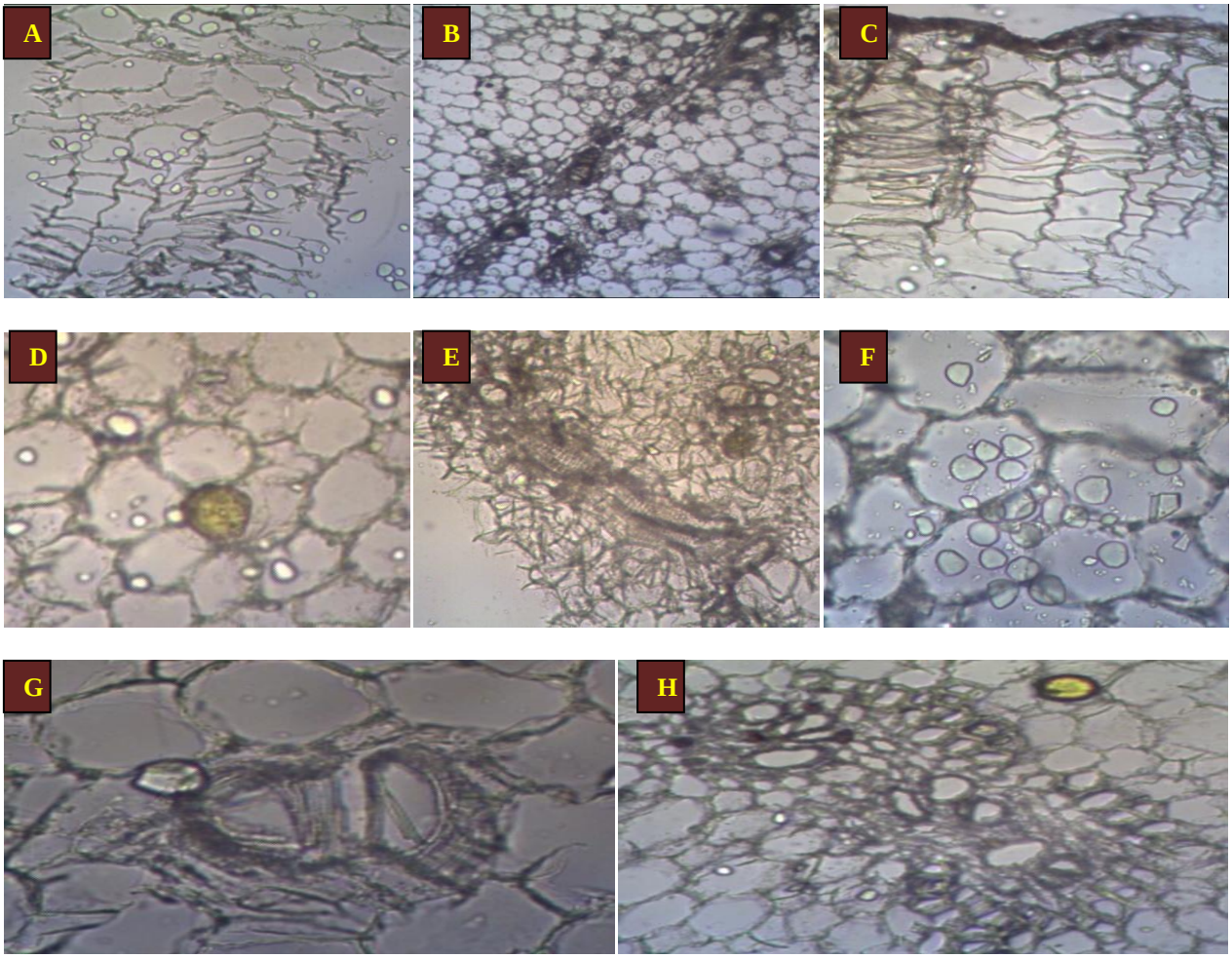
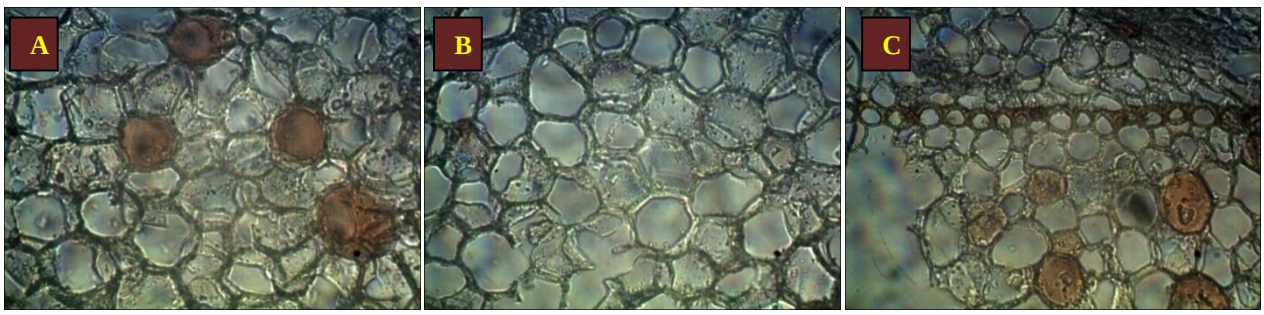


Fig.7: A. Cork; **B.** Endodermis; **C.** Epidermis; **D.** Oleoresin; **E.** Reticulate vessel; **F.** Starch grain; **G.&H.** Vascular bundle (Images were taken under light field microscope 5X × 40X)

H: Mustaka - Rhizome shows single layered epidermis, followed by 2-6 layers, suberised sclerenchymatous cells; epidermis and outer sclerenchymatous layers filled with dark brown content; ground tissue of cortex consists of circular to oval, thin-walled, parenchymatous cells with small intercellular spaces; a few fibro-vascular bundles present in this region; endoderm is distinct and surrounding the stele; wide central zone beneath endodermis, composed of circular to oval, thin-walled, parenchymatous cells with intercellular spaces, numerous collateral, closed, vascular bundles surrounded by bundle sheath, scattered in this region; vessels narrow having simple reticulate, and scalariform thickening and oblique pore; simple round to oval starch grains measuring 6-28 µ in dia., a number of pigmented cells filled with reddish-brown content, present throughout the cortex and stele.



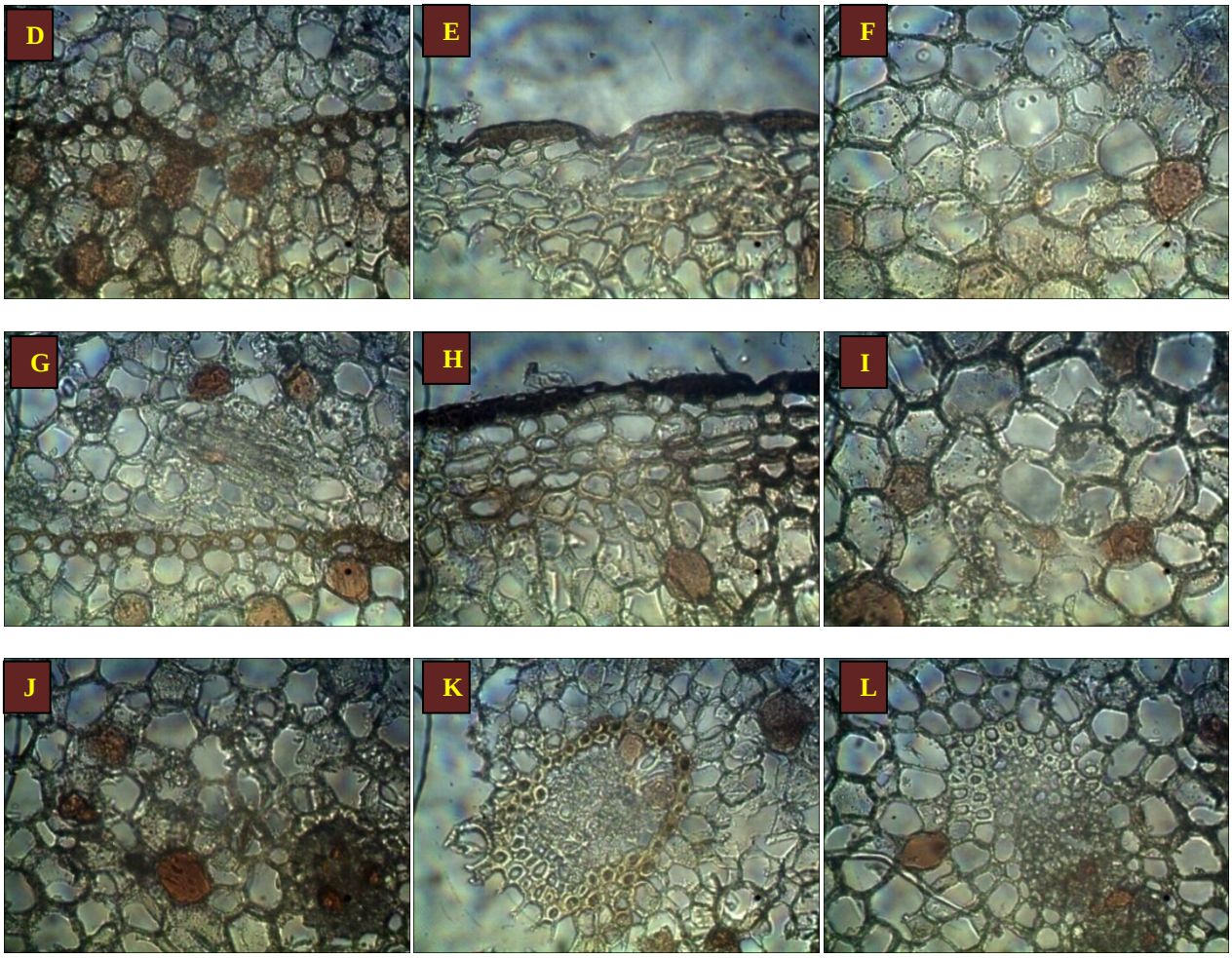
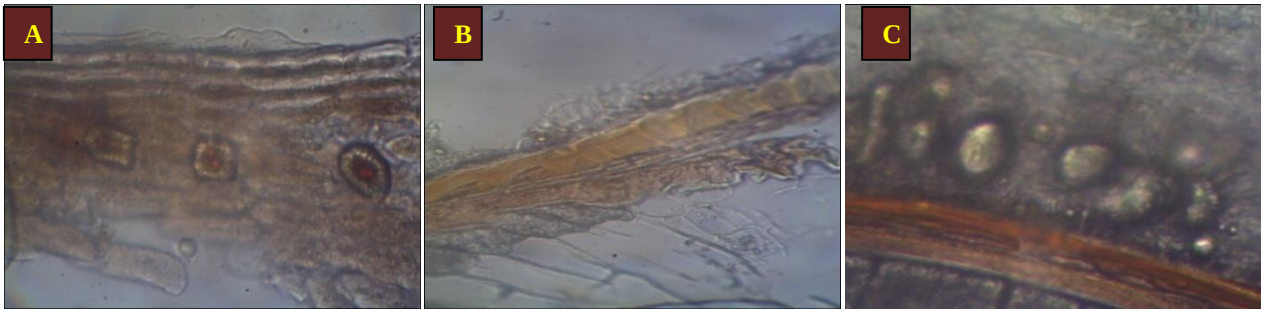


Fig.8: A. Brown pigment cells; **B.** Central pith; **C.** &**D.** Endodermis; **E.** Epidermis; **F.** Parenchymatous cortex; **G.** Pericycle fibre; **H.** Sclerenchymatous hypodermis; **I.** & **J.** Starch grains; **K.** & **L.** Vascular bundle (Images were taken under light field microscope 5X × 40X)

I: Pippali - Catkin shows 6 to 12 fruits, arranged in circle on a central axis, each having an outer epidermal layer of irregular cells filled with deep brown content and covered externally with a thick cuticle; mesocarp consists of larger cells, usually collapsed, irregular in shape and thin-walled; a number of stone cells in singles or in groups present; endocarp and seed coat fused to form a deep zone, outer layer of this zone composed of thin-walled cells and colourless, inner layer composed of tangentially elongated cells, having reddish-brown content; most of endocarp filled with starch grains, round to oval measuring 3 to 8 µ in dia.

Louhabhasma used here was bought from authentic stockist of Shree Dhoot papeswar Limited Company. No separate microscopical or analytical tests were performed on it. Only classical bhasmaparikshan physical tests like baritara(float over water), rekhapurnata(insert in finger tip furrows), nischandratwa(no shiny appearance) etc. were performed and positive results were found.



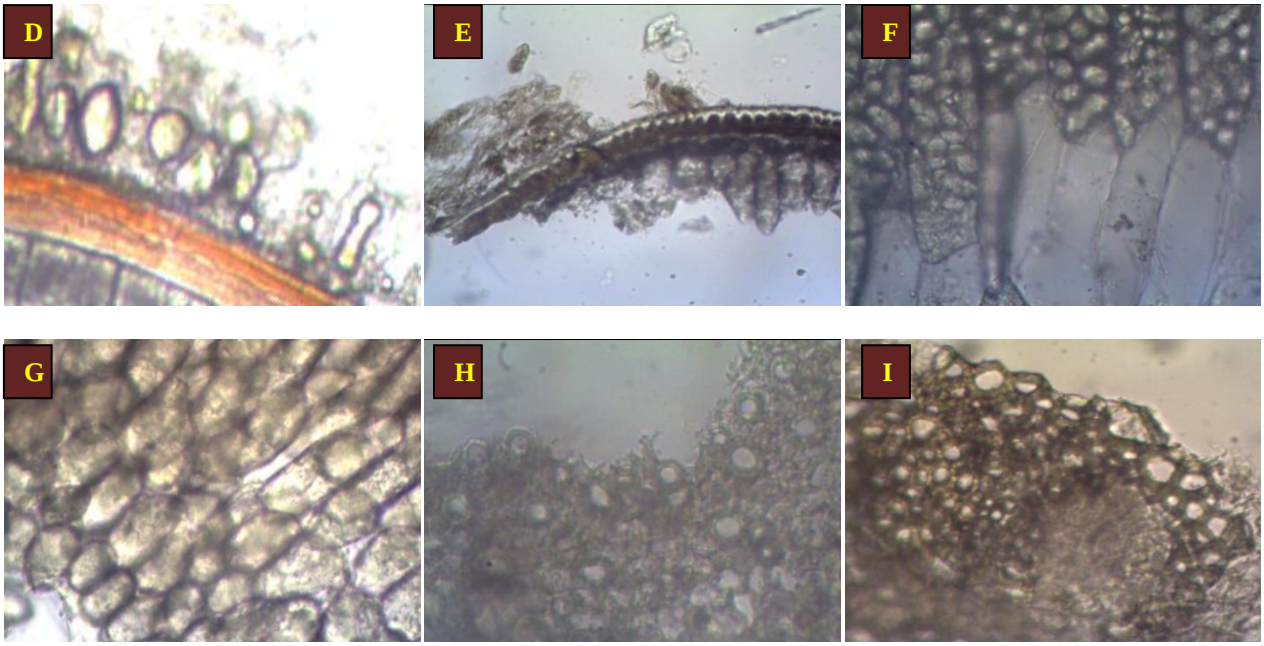


Fig.9: A. Cuticle, epidermis and stone cells; **B.** Endosperm; **C.&D.** Oleoresin cells; **E.** Palisade, endocarp; **F.** Perisperm with starch grains; **G.** Perisperm; **H.** Vascular bundle with mesocarp; **I.** Vascular bundle (Images were taken under light field microscope 5X × 40X)

Physico-chemical analysis of ingredients[11] In physical evaluation foreign matter, moisture content, ash values viz., total ash, acid insoluble ash and extractive values viz., alcohol soluble extractive value, water soluble extractive value as well as pH value etc. was determined following the standard procedure as prescribed in Ayurvedic Pharmacopoeia of India (API). The results were summarized under table 4.

Preliminary phytochemical screening tests were carried out on methanolic extract to check the presence or absence of secondary metabolites like alkaloids, tannins, flavonois, saponins and other compounds (table 5). Qualitative phytochemical screening for each drug was performed and test results were noted down.

Table 4: Physicochemical test results of crude drugs

S. no	Physico-chemical properties	Vidanga	Amlaki	Haritaki	Bahera	Krishna jiraka	Swetajiraka	Sunthi	Pippali
1	Foreign matter	1.17	0.83	0.75	1.58	1.05	0.9	1.14	1.66
2	Total ash (% w/w)	3.84	5.69	4.83	7.38	6.27	6.46	5.44	4.95
3	Acid insoluble ash (% w/w)	1.21	0.57	3.49	0.96	1.04	0.83	1.33	1.47
4	Alcohol soluble extractive (% w/w)	6.94	22.59	44.15	7.52	2.31	6.78	2.77	3.43
5	Water soluble extractive (% w/w)	7.18	45.17	56.06	23.30	10.90	13.4	8.03	6.62
6	Loss on drying at 110 °C (% w/w)	1.42	3.05	9.303	6.76	4.0	9.5	2.8	4.62
7	pH of 5% solution	2.65	2.38	1.52	1.65	1.35	3.0	2.11	2.56

Table 5: Phytochemical analysis of crude drugs

S No.	Constituents	Vidanga	Amlaki	Haritaki	Bahera	Krishna jiraka	Swetajiraka	Sunthi	Mustaka	Pippali
1	Carbohydrate	+	+	+	+	+	+	+	+	+
2	Tannin	+	+	+	+	+	+	-	+	+
3	Alkaloid	+	+	-	-	+	+	+	-	+
4	Steroid	-	-	-	-	-	-	+	-	+
5	Terpenoid	-	+	+	+	+	-	-	+	-
6	Phenolic compound	-	+	+	+	+	+	+	+	+
7	Ammino acid	+	-	+	+	-	-	-	-	+
8	Glycoside	-	-	+	+	+	+	-	+	+
9	Fixed oil	-	-	-	-	-	-	-	-	+
10	Saponin	+	-	+	+	-	+	-	-	+

Table 6: Physicochemical analysis of the formulation vidangalilouham

S. No	Physico-chemical properties	Final product
1	Foreign matter	1.0%
2	Total ash (% w/w)	10.31
3	Acid insoluble ash (% w/w)	1.92
5	Water soluble extractive (% w/w)	9.0
6	Alcohol soluble extractive (% w/w)	14.0
7	Chloroform soluble extractive (% w/w)	5.0
6	Methanol soluble extractive (% w/w)	3.5
6	Loss on drying at 110 °C (% w/w)	4.16
7	pH of 5% solution	3.05

Table 7: The results of phytochemical screening of the formulation

S No.	Phyto-constituents	Performed Test	Pet-ether Extract	Chloroform Extract	Methanol Extract	Water Extract
1	Carbohydrate	Molish's Test	++	+	+	+
2	Tannin	Ferric chloride test	-	-	+	+
3	Alkaloid	Mayer's Test	-	-	+	-
4	Steroid	Salkowski Test	+	+	+	+
5	Terpenoid	Salkowski test	-	-	+	-
6	Phenolic compound	Ammonia test	-	-	+	+
7	Ammino acid	Ninhydrin	-	-	-	-

		test				
8	Glycoside	Baljet test	-	-	+	-
9	Fixed oil	Spot test	+	++	+++	-
10	Saponin	Froth test	+	+	+	+
11	pH		5	5	6	7

'+' = positive inference; '-' = negative inference.

Physicochemical tests of the formulation vidangadilouham:[12,13] The physicochemical tests of the prepared formulation were performed following the standard procedure of API and the the results are summarized under table no. 6. Phytochemical screening was also performed for the finished product. The pet-ether, chloroform, methanol and water extracts of the sample were analyzed qualitatively for different functional groups. In qualitative method, presence of carbohydrate, tannin, alkaloid, steroid, terpenoid, phenolic compound, glycoside, fixed oil and saponin were found in methanolic extract except amino acid. The results are summarized under table no. 7.

CONCLUSION

The literature review about Vidangadi louham stands for its great therapeutic efficacy regarding diabetes and urinary disorder. By the name vidangadi louham many formulations are available in market but the here the reference of Rasendrasarsamgraha is chosen for its unexplored evaluation status. However, all the macroscopy and microscopic characters of individual ingredients place the supportive signature of authenticity as per API guide guidelines. The phytochemical screening test for each ingredient shows the presence of various secondary metabolites which combines their presence when the extract of final formulation was tested individually.

Acknowledgement

The authors are very much grateful to the Department of Pharmaceutical Technology, Jadavpur University, for technical support and Mr. Subir Pal, CEO, Bengal Institute of Pharmaceutical Sciences, Kalyani, West Bengal for constant encouragement.

Source of support – Nil.

Conflict of interest – None declared.

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HOW TO CITE THIS ARTICLE

Debnath M, Chaudhuri S, Nanda A, Biswas M, Haldar PK. Pharmacognostic and preliminary physicochemical study of vidangadilouham- an ayurvedic antidiabetic herbomineral preparation. J Ayu Herb Med 2017;3(1):15-26.