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Detailed Micromorphological and Pharmacognostic Evaluation of Dadima Fruit *(Punica Granatum)*

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ABSTRACT

Dadima (Pomegranate) is one of the most frequently used drug as a part of medicine and food in Ayurved having varied effects on the human body. Dadima is used in *Mukharoga* (diseases of mouth), *Shukra daurbalya* (sexual debility), *Samanya daurbalya* (general debility), *Aruchi* (tastelessness), *Amlapitta* (acidity), etc. and is having effects like *Daha shamaka* (reduces burning sensation), *Jwaraghna* (antipyretic), *Shukrala* (increases semen), *Pachana* (digestive), *Balya* (general tonic) and *Medhya* (brain tonic). Till date the detailed pharmacognostical aspects of Dadima i.e its fruit bark, false septa, seed, powder microscopy including its histochemical evaluation was not found reported systematically. The present study was conducted on the fruit of Dadima (*Punica granatum* Linn.) for its pharmacognostical characters. The microscopic characters of the fruit show epidermis covered with thick cuticle, single layered epicarp, paranchyma cells filled with prismatic crystals, simple and compound starch grains and oil globules, well developed parenchymatous cells, fibres, schleroids, stone cells, prismatic crystals etc.

Keywords: Dadima, Fruit, Histochemical, *Punica granatum*, Pomegranate. Pharmacognosy.

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INTRODUCTION

Dadima (Pomegranate) consists of fresh fruit of *Punica granatum* Linn. (Fam. Punicaceae). It is a large shrub or small tree with axillary thorns, 5-10 m high. Leaves are simple oblong or obovate to lanciolate. Flowers are scarlet red, mostly solitary or 2-4 together. Fruits globose, woode, tipped with persistent calyx. Seeds many angular with a fleshy testa which is red, pink or whitish in color. Generally juice of its seeds are indicated as *anupana, bhavana and pathya.* In market, numbers of varieties of Dadima are available like small and big also yellow and red etc. In some fruits color of seeds is found red while in some it is having white pigment. In present study red colored (red colored fruit bark and red colored seeds) and medium sized Dadima fruit was selected because it is the variety which is most frequently used by the consumers. Thus it is the need of time that these parts should be analyzed through microscopical analysis and then nutritive value too. Dadima *swarasa* (juice) is used in *Mukharoga* (diseases of mouth), *Kantharoga* (diseases of throat), *Trishna* (thirst), *Mastishkadaurbalya* (mental weakness), *Shukradaurbalya* (sexual debility), *Samanyadaurbalya* (general debility), *Aruchi* (tastelessness), *Agnimandya* (digestive impairment), *Amlapitta* (acidity), etc[1]. Dadima is a drug having effects like *Tridoshashamana* (pacifies all three *doshas*), *Trishnashamaka* (cures excessive thirst), *Dahashamaka* (reduces burning sensation), *Jwaraghna* (antipyretic), *Shukrala* (increases semen), *Pachana* (digestive), *Balya* (general tonic) and *Medhya* (brain tonic) [2]. Pharmacognosy of a plant drug plays a crucial study which can help in the identification and authentication of any herb. Till date no work on detailed scientific pharmacognostical evaluation has been found on its fruit. Thus, the present study was undertaken for detailed pharmacognostical evaluation of Dadima (Pomegranate) fruit including its powder.

MATERIALS AND METHODS**:**

Collection of sample:

Fresh Samples of Dadima fruits were collected from the local market of Jamnagar i.e. red colored cultivated variety was selected as it is the most frequently used by consumers because of its large quantity of juice. Dadima fruit was collected in August 2015. The fruit selected for present study was imported from Nagpur, Maharashtra, India.

Pharmacognosy study:

Preparation of powder

Different parts of fruit (fruit bark, false septa and seeds) were dried under the shade. Then dried fruit bark, false septa and seeds were subjected for powdering individually by mechanical mixer grinder. Then sieved through 60# for powder microscopy and stored in air tight container.

Morphology

Morphological characters of fruit of *Punica granatum* Linn. were studied as per visual observation, following standard procedure of taxonomy and verified with existing floras for authentication[3,4].

Microscopic evaluation

Thin free hand transverse section of fruit and its individual parts of *Punica granatum* Linn. were taken. Then sections were first observed in distilled water then stained with suitable staining reagents (phloroglucinol+HCl and $FeCl_3$) and again examined to assess different cellular structure and content. The samples were observed and photographs were taken by using Carl Zeiss trinocular microscope attached with camera[5,6,].

Organoleptic characters

The color, odor, texture and taste of fruit powder were recorded separately through visual and sensory observations.

Powder microscopic evaluation

The fruit powder were studied under microscope with distilled water and also examined after staining with different suitable reagents[7].

Histochemical evaluation

Sample thick sections subjected to Histochemical tests to find starch grins, tannin, calcium etc. by treating various reagents[8].

RESULTS AND DISCUSSION:

Macroscopy of Dadima fruit

The fruit was collected in August 2015. Its outer most layer was red in color and seeds were also red colored.

The fruit was 10 cm long and was having width of 7.5 cm. (Plate 1 - a). The cut pieces of fruit rind were having width of 3 cm (Plate 1 - b). Fresh seeds were 7 to 10 mm in length, 5 to 8 mm in width, while dried seeds are 6 to 7 mm in length, 1.5 to 3 mm width and thickness.(Plate 1 – c)

Plate 1: Macroscopy of Dadima Fruit

Transverse section of fruit bark

Diagramatic transvers section of Dadima fruit showed outer epicarp followed by mesocarp and endocarp. (Plate 2 - a)

Epicarp single layered, containing square shaped cells compactly arranged, some of the cells filled with red coloring matter and some of the cells filled with yellow coloring matter. (Plate 2 - b)

Epidermis was found covered with thick cuticle. Mesocarp made up of paranchyma cells and occupies most of the section. Groups of sclerides and stone cells were found distributed all over the mesocarp.(Plate 2 - c)

Paranchyma cells filled with prismatic crystals, simple and compound starch grains and oil globules were found here and there. Inner to the mesocarp cells rich in starch grains and oil globules.Vascular bundles were open and collateral. Xylem was arranged radially with xylem fibres. Phloem was situated above the xylem with some sieve elements and fibers. Endocarp single layered, consisting simple and compound starch grains and transversely barreled shaped cells.(Plate 2 - d)

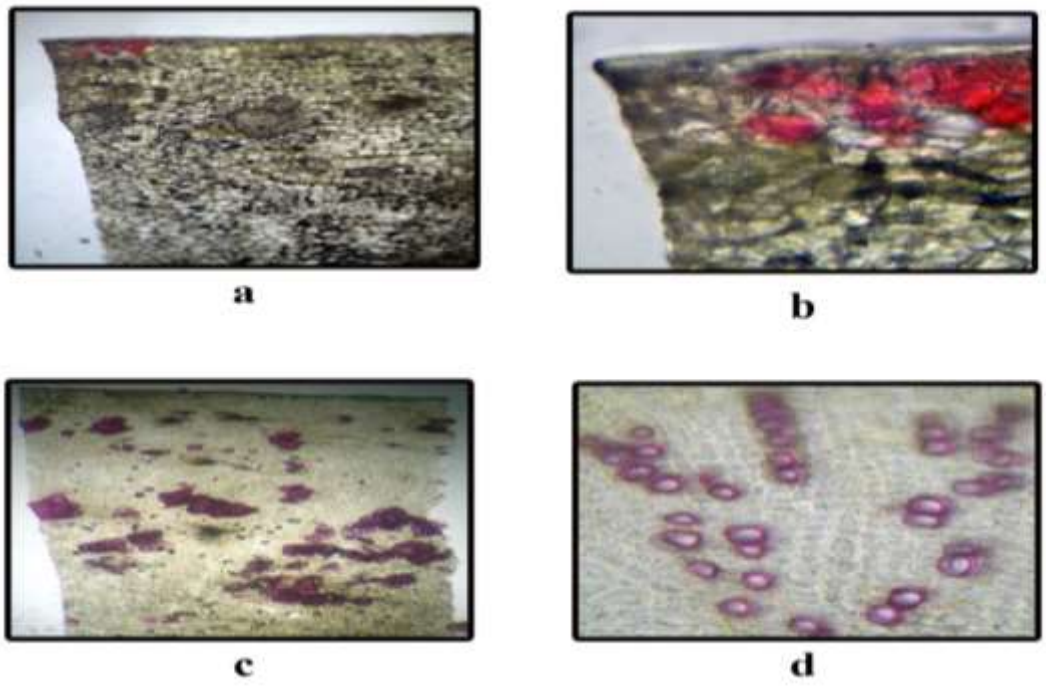

Plate 2: Transverse section of Fruit bark

Transverse section of false septa

Transverse section consist upper and lower epidermis as well as middle ground tissues. Both the epidermal cells were square shaped with cuticle.Ground tissue were found made up of loosely

arranged parenchyma cells, heavily loaded with simple and compound starch grains and also with oil containing cells. (Plate 3 – a to i)

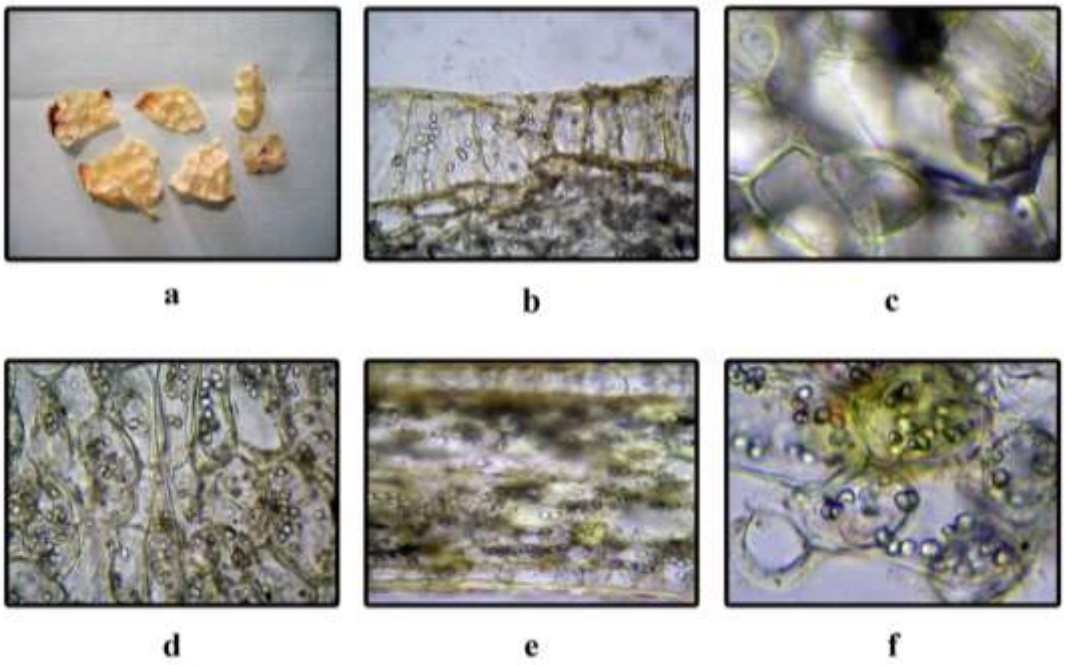

Plate 3: Transverse section of Falsa septa

Transverse section seed

Detailed T.S. of fresh seeds shows an outer layer of palisade like cells of testa, constiting of hexagonally faceted, isodiametric, about 3 mm long, prismatic columnar cells, with thicker inner walls, filled with white or red colored juice and traversed with very few starch grains.

Underneath this lies 2 to 3 rows of tangentially elongated small sized rectangular parenchymatous cells of their outermost 1 to 3 layers run tangentially and are smallest in size, thick walled cells, underneath this lies a layer of spirally reticulated thickened brown colored cells and then a layer of radially thickened brownish colored cells of tegmen.

Perisperm composed of 1 to 2 rows of well developed parenchymatous cells and a narrow band of collapsed layer lying underneath it.

Endosperm embedded with aleurone grains and very few starch grains, a narrow band of compressed parenchymatous tissue lies underneath it; cotyledon is encircled by upper and lower epidermis, enclosing mesophyll tissue embedded with small aleurone grains and few oil globules and vascular strands, a layer or two of palisade cells being located underneath its lower epidermis. (Plate 4 – a to i)

Powder microscopy:

Organoleptic characters

The powder was of Buff color, oily powder with somewhat astringent taste, rough in touch and characteristic odor. Table No. 1.

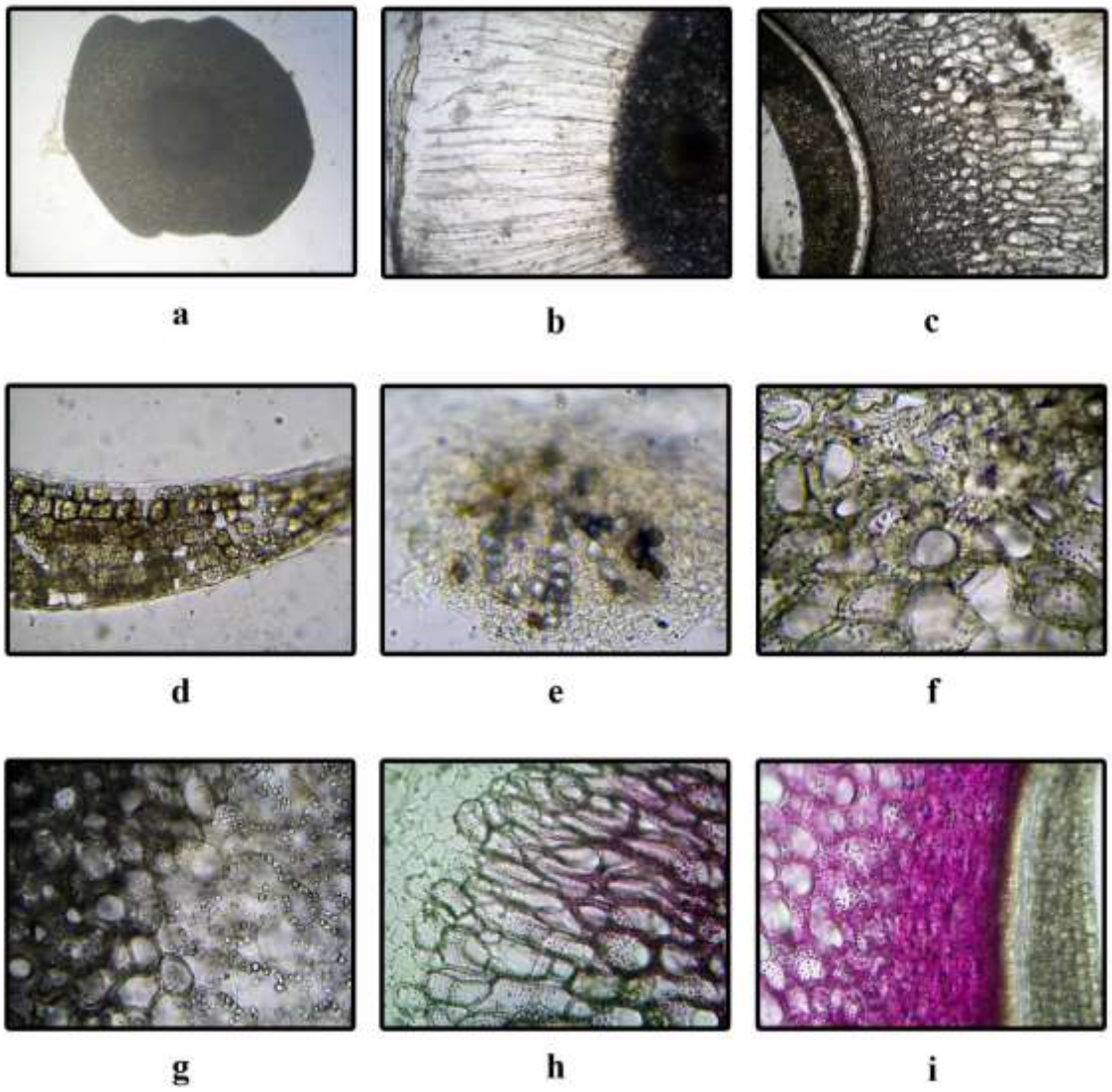

Plate 4: Transverse section of Seed

Table No. 1: Histochemical evaluation of Dadima fruit parts

Sl. No.	Reagent	Observation	Characteristics
1.	Phloroglucinol+Conc. HCl	**Red**	Lignified cells
2.	Iodine	**Blue**	Starch grains
3.	Phloroglucinol+Conc. HCl	**Dissolved**	Calcium Oxalate – crystals
4.	$Fecl_3$ solution	**Dark blue**	Tannin cells
5.	Ruthenium red	**Red**	Mucilage

Powder microscopy

Diagnostic characters under the microscope showed that simple and compound starch grains, fibres, scleroids, stone cells, prismatic crystals, colouring matter, pollan grains (fruit is inferior,

epigynous, fruit along with floral parts including calyx and also Androecium) were observed. (Plate 5 – a to h)

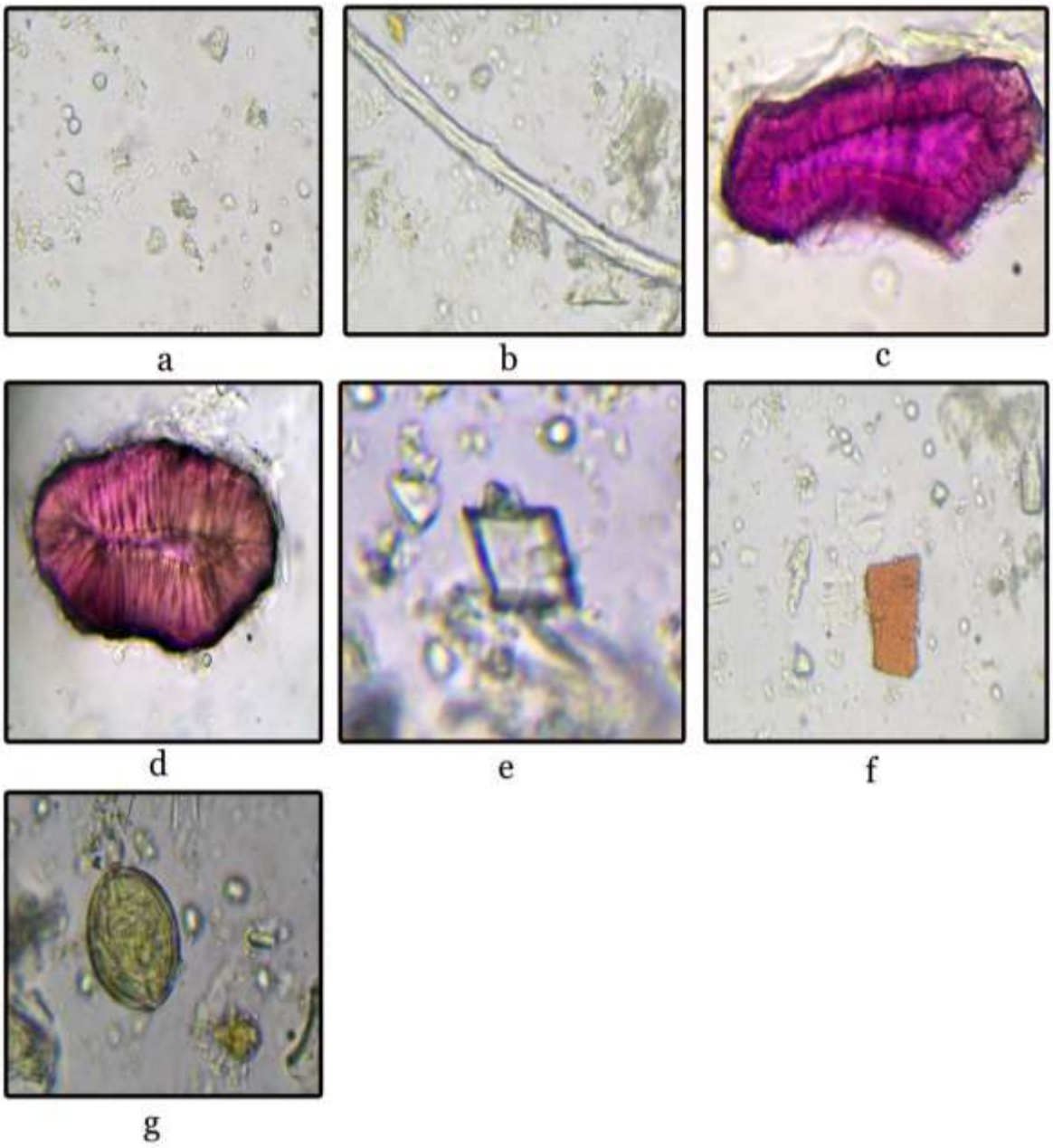

Plate 5: Powder characters of Dadima fruit

Histochemical evaluation

Sample thick sections subjected to Histochemical tests to find starch grins, tannin, calcium etc. by treating various reagents. Results were depited in the table No. 2.

Table No. 2: Organoleptic tests of Dadima fruit powder

Character	Fruit	Seed	Epicarp
Color	Buff colored	Buff colored	Light pink
Odor	Characteristic	Characteristic	Characteristic

Taste	Astringent	Sour and Astringent	Astringent
Texture	Coarse	Coarse	Coarse

CONCLUSION:

Observed pharmacognostical characters like fruit T.S., powder microscopy and histochemical tests are standard and can be used for any further research works.

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