

PHARMACOGNOSTIC EVALUATION OF SALIENT FEATURES OF BABULA (ACACIA ARABICA WILLD.) FRUIT

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ABSTRACT

Background: *Acacia arabica* Willd. (syn. *Vachellia nilotica*), commonly known as *Babula*, is a significant medicinal plant in Ayurvedic and traditional medicine systems. Although various parts of the plant are used therapeutically. **Materials and Methods:** Pharmacognostical studies were carried out through macroscopic, microscopic (TS and LS), and powder microscopy methods using standard procedures and staining agents such as Saffranine, Iodine, and Sudan III. **Observation & Result:** Transverse sections showed multilayered mesocarp, uniseriate trichomes, thin cuticle, endocarp with multiple stone cell layers, and inclusions like starch grains, oil globules, acicular crystals, and aleurone grains. Longitudinal sections confirmed the presence of spiral vessels and trichomes. Powder microscopy revealed unicellular trichomes, macro-sclereids, cotyledon cells, stone cells, and epidermal fragments. **Conclusion:** The

pharmacognostical study of *Acacia arabica* fruit reveals key diagnostic features aiding its accurate identification. These findings support its authentication and standardization in Ayurvedic and traditional medicine.

KEYWORD: Ayurveda, *Babula*, Pharmacognosy, *Acacia arabica* Willd.

INTRODUCTION

Acacia arabica Willd. (syn. *Vachellia nilotica*), commonly known as *Babula*, belongs to the family Mimosaceae and is a well-known medicinal plant in Ayurvedic and traditional systems of medicine. In Ayurvedic literature, *Babula* is identified by various vernacular names across different regions and languages. It is referred to as *Babula* in Sanskrit, *Kikar* in Hindi, *Bavala* in Gujarati, and commonly known as Indian Gum or Arabic Tree in English.^[1]

Pharmacognosy serves as a foundational tool in the standardization and authentication of medicinal plants by evaluating their macroscopic, microscopic, and powder microscopic characteristics. Despite the widespread use of *Acacia arabica* in traditional medicine, detailed pharmacognostical profiling of its fruit remains limited. This study aims to bridge this gap by conducting a comprehensive pharmacognostical examination of *Acacia arabica* fruit, focusing on its macroscopic features, anatomical structure, and powder microscopic characteristics, using standard laboratory protocols and staining techniques.

Taxonomic Classification: Acc. To Bentham and Hooker^[2] (1862-1883)

Table No. 1: Taxonomical classification of *Acacia arabica*.

Kingdom	Plantae
Subkingdom	Tracheobionta
Superdivision	Spermatophyta
Division	Magnoliophyta
Class	Magnoliopsida
Superorder	Rosidae
Order	Fabales
Family	Mimosacea
Genus	Acacia
Species	arabica willd

Botanical description

Babula (*Acacia arabica* Willd.) is a single stemmed plant, grows 15 to 18 m in height and 2-3 m in diameter. Pods are 6 to 17 cm long, its colour yellowish green, indehiscent, deeply constricted between the seed giving a necklace appearance. Seeds are 8-12 per pod, compressed and ovoid. The leaves are bipinnate, pinnate 3-10 pairs, 1.3-3.8 cm long, leaflets 10-20 pairs, and 2-5mm long. Flowers are globular heads, yellow in colour. Thorns are thin, straight, light grey exist in axillary pairs (usually 3-12). The gum varies in colour from very pale yellowish brown to dark reddish brown depending on the quantity of tannins in the sample.^[3]

AIM

To perform Pharmacognostical (macroscopy, microscopy and powder microscopy) study of *Babula* (*Acacia arabica* Willd.) Fruit.

OBJECTIVE

1. To study the macroscopic features of *Babula* (*Acacia arabica* Willd.) Fruit.
2. To study the microscopic features of *Babula* (*Acacia arabica* Willd.) Fruit.
3. To study the powder microscopic feature of *Babula* (*Acacia arabica* Willd.) Fruit powder.

MATERIAL AND METHODS

The study was performed at Pharmacognosy laboratory of Upgraded department of *Dravyaguna Vijnana*, Government Ayurveda College, Vadodara.

The plan of work was as following

1. Plant collection and identification
2. Pharmacognosy study
 - A. Macroscopic study
 - B. Microscopic study

1. Plant Collection and Identification

Fruit of *Babula* (*Acacia arabica* Willd.) was collected from forest area of Junagadh (21.52° North latitude and 70.47° East longitude) Gujarat after proper identification. After proper drying Fruit was converted into powder form in Government Ayurveda pharmacy, Vadodara, Gujarat.

2. Pharmacognosy study**A. Macroscopic study**

Babula (*Acacia arabica* Willd.) Fruits was studied for macroscopic identification characters and observations were mentioned as below table.

OBSERVATIONS**Table No. 2: Macroscopic characters of *Babula (Acacia arabica Willd.)* Fruits.**

No.	Characteristic of Fruit	Observation	Fig. No.
1.	Shape	Fruits stalked, compressed moniliform pods with constriction between the seeds	Fig. 1b, 1c
2.	Size	Pods 6 to 17 cm in length and contracted between the circular seeds.	Fig. 1b, 1c
3.	Colour	Yellowish green	Fig. 1b, 1c
4.	Surface	Glabrous to velvety	-
5.	Fracture	Fibrous fracture	-

B. Microscopic study**Slide preparation**

Transverse and longitudinal section of Fruit of *Babula (Acacia arabica Willd.)* were prepared separately using reagents Saffranine, Iodine, Sudan III and slides for powder microscopy were prepared using solution of glycerine and water in ratio of 30:70 and observed under microscope. Various microscopic structure of transverse section and powder microscopy of *Babula (Acacia arabica Willd.)* Fruit is evaluated.

B1: Observations of transverse section of *Babula (Acacia arabica Willd.)* Fruit

In transverse section of fruit of *Babula (Acacia arabica Willd.)* Mesocarp, Epidermis elongates to form uniseriate short to elongated trichomes, thin cuticle, endocarp consists of several layers of stone cell, epidermis covered by thin cuticle layer, starch grain, oil globules, aciculate crystal and aleurone grain were observed.

Table No. 3: Microscopic study of Ts of *Babula (Acacia arabica Willd.)* Fruit.

No.	Characteristics of <i>Babula (Acacia arabica Willd.)</i>	In Saffranine	In Iodine
1.	Mesocarp made up of 7 to 9 layers	Present [Fig. 2a]	Present [Fig. 3a]
2.	Epidermis elongates to form uniseriate short to elongated trichomes	Present [Fig. 2b]	Present [Fig. 3b]
3.	Thin cuticle	Present [Fig. 2b]	Present [Fig. 3b]
4.	Endocarp consists of several layers of stone cell layers with small lumen filled with brownish content of tannin.	Present [Fig. 2c]	Present [Fig. 3c]
5.	Epidermis covered by thin cuticle layer	Present [Fig. 2d]	-
6.	Starch grain	Present [Fig. 2e]	Present [Fig. 2d]

7.	Oil globules	Present [Fig. 2f]	-
8.	Acicular crystal	Present [Fig. 2g]	-
9.	Aleurone grain	Present [Fig. 2h]	-

B2: Observations of Longitudinal section of *Babula* (*Acacia arabica* Willd.) Fruit

In longitudinal section of fruit of *Babula* (*Acacia arabica* Willd.) trichomes, thin layer of cuticle and spiral vessels were observed.

Table No. 4: Microscopic study of Ls of *Babula* (*Acacia arabica* Willd.) Fruit.

No.	Characteristics of <i>Babula</i> (<i>Acacia arabica</i> Willd.)	In Saffranine	In Iodine
1.	Endosperm Wall	-	Present [Fig. 5a]
2.	Trichomes	Present [Fig. 4a]	Present [Fig. 5b]
3.	Thin cuticle	Present [Fig. 4a]	Present [Fig. 5b]
4.	Spiral Vessels	Present [Fig. 4b]	Present [Fig. 5c]

B3: Observations of powder microscopy of *Babula* (*Acacia arabica* Willd.) Fruit

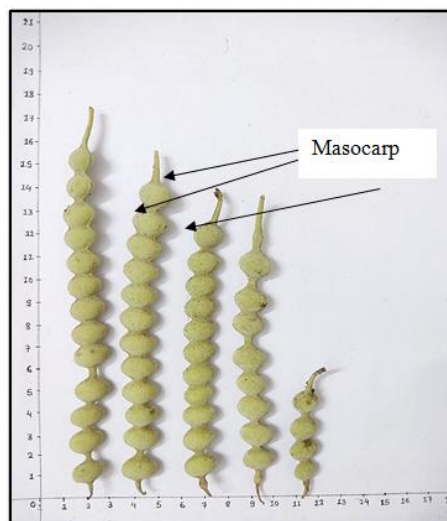
In powder microscopy Different fragments of tissues like abundant unicellular trichomes, Oil globules, stone cell, macro-sclereids, Cotyledon cells with starch grains & oil globules, and Fragments of epidermal cell with trichomes & mesocarp cells were found.

Table No. 5: Powder microscopy study of *Babula* (*Acacia arabica* Willd.) Fruit.

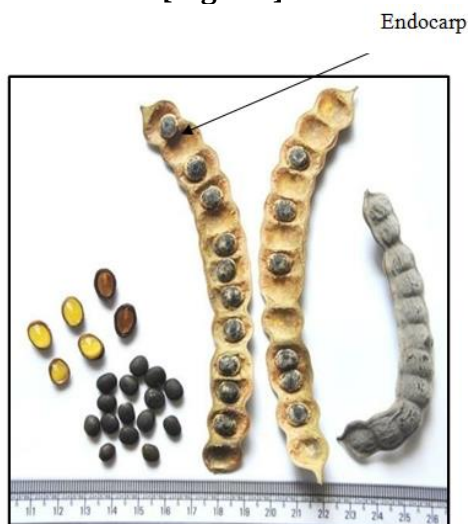
No.	Characteristics of <i>Babula</i> (<i>Acacia arabica</i> Willd.)	Figure no.
1.	Different fragments of tissues like abundant unicellular trichomes	Fig. 3a
2.	Oil globules	Fig. 3b
3.	Stone cell	Fig. 3c
4.	Macro-sclereids	Fig. 3d
5.	Cotyledon cells with starch grains & oil globules	Fig. 3e
6.	Fragments of epidermal cell with trichomes & mesocarp cells	Fig. 3f



[Fig. 1 a]



[Fig. 1 b]



[Fig. 1 c]



[Fig. 1 d]

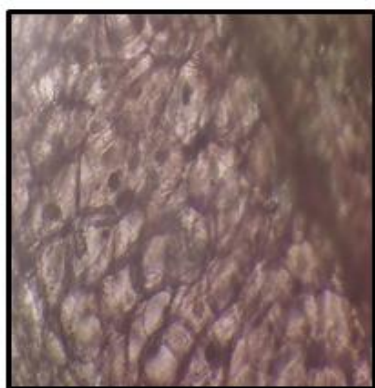
Plate No. 1: Photos of Macroscopic features of Babula Phala.



[Fig. 2 a]



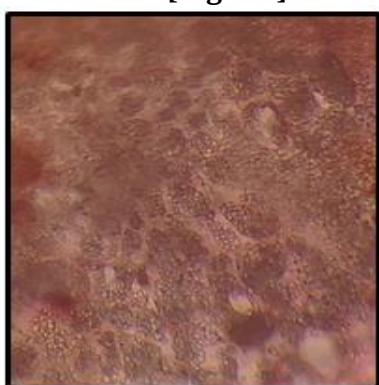
[Fig. 2 b]



[Fig. 2 c]



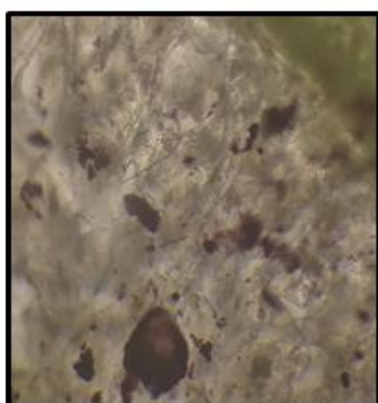
[Fig. 2 d]



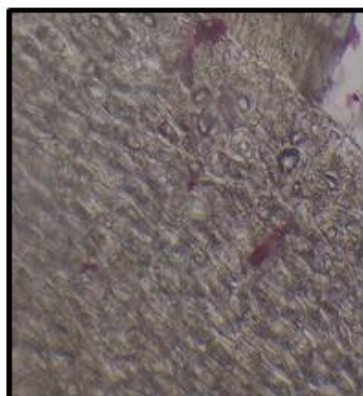
[Fig. 2 e]



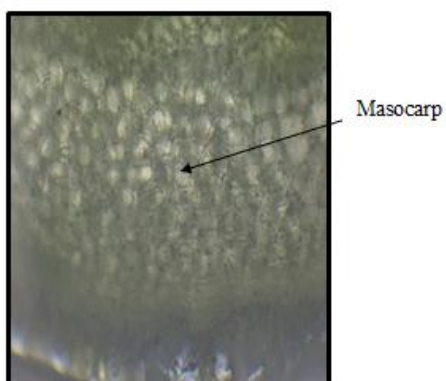
[Fig. 2 f]



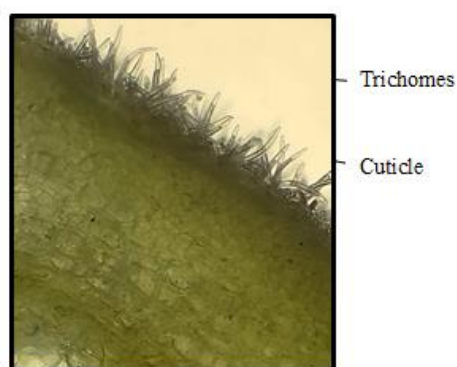
[Fig. 2 g]



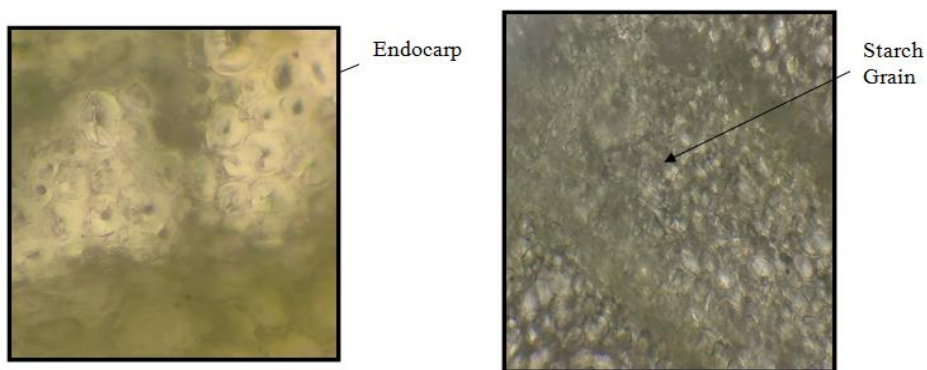
[Fig. 2 h]

Plate No. 2: Photos of Ts of Babula Phala in Saffranine.

[Fig. 3 a]

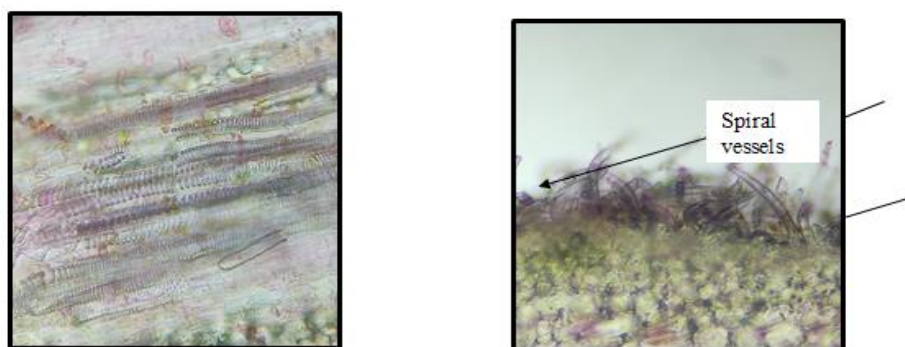
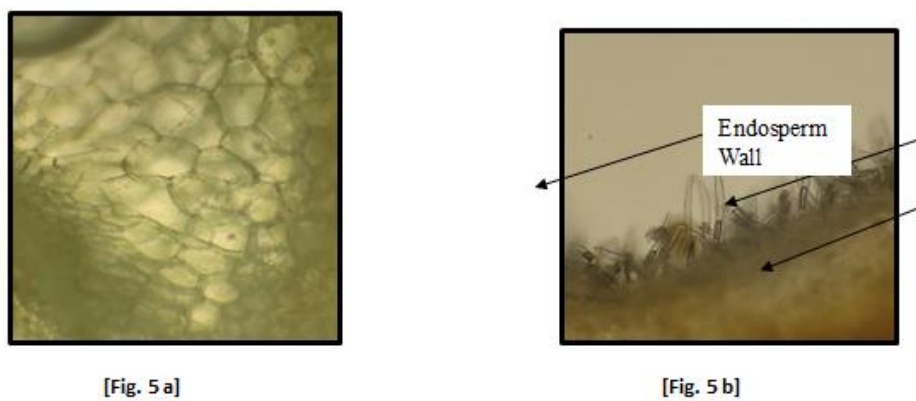


[Fig. 3 b]



[Fig. 3 c]

[Fig. 3 d]

Plate No. 3: Photos of Ts of Babula Phala in Iodin.**Plate No. 4: Photos of Ls of Babula Phala in safranin.**

[Fig. 5 a]

[Fig. 5 b]

**Plate No. 5: Photos of Ls of Babula Phala in Iodin.**

CONCLUSION

The fruit of *Babula* (*Acacia arabica* Willd.) is yellowish green in colour and measures up to 8 to 15 cm in length with Glabrous to velvety surface. Microscopic analysis, including transverse and longitudinal sections, confirmed the presence of diagnostic characters such as multilayered mesocarp, uniseriate trichomes, thin cuticle, multiple stone cell layers in the endocarp, spiral vessels, and various cell inclusions like starch grains, oil globules, acicular crystals, and aleurone grains. These features were distinctly observed using saffranine and iodine staining techniques. In powder microscopy, different fragments of tissues like abundant unicellular trichomes, oil globules, stone cell, macro-sclereids, cotyledon cells with starch grains & oil globules, and fragments of epidermal cell with trichomes & mesocarp cells were found.

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REFERENCES

1. Gadilohar N.R, Girase A. M, Suryawanshi H.P, Pawar S.P; A Descriptive study of *Acacia nilotica* Linn, Asian journal of Pharmaceutical Research, 08, 03.
2. Gadilohar N.R, Girase A. M, Suryawanshi H.P, Pawar S.P; A Descriptive study of *Acacia nilotica* Linn, Asian journal of Pharmaceutical Research, 08, 03.
3. Gadilohar N.R, Girase A. M, Suryawanshi H.P, Pawar S.P; A Descriptive study of *Acacia nilotica* Linn, Asian journal of Pharmaceutical Research, 08, 03.