

## MACRO AND MICROSCOPICAL STUDIES OF THE SEEDS OF *LEPIDIUM SATIVUM*, *NIGELLA SATIVA* AND *TRIGONELLA FOENUM GRACEUM*

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### ABSTRACT

This study aimed to determine the macro and microscopical structure of the seeds of three Sudanese plants used in folkloric medicine *Lepidium sativum*, *Nigella sativa* and *Trigonella foenum graceum*. Microscopical study includes prepared slides for section of the seeds and powder study, preparation of permanent slides was done using wax method technique. The transverse section of the seeds of *L. sativum* showed presence of thick testa, tegmen, alleurone layer, endosperm and embryo. The cells of the embryo are small in size and polygonal in shape. The seed of *Nigella sativa* is preceded by the epidermis which is formed cells covered by cuticle, the external layer is extended into papillae. The epidermis is followed by two layers of hypodermis. The endodermis is formed of many layers of parenchyma cells, the outer most layer of which is filled with pigmented materials. In the central region of the section is found the embryo which is very small. The seed of *Trigonella foenum graceum* is characterized by seed coat formed of epidermis formed of uniseriate cells covered by cuticle, followed by the palisade layer of malphigian cells with an un evenly thickened walls. An anatomically complex structure of the seed-coat is a general characteristic of all members of the Leguminasae. The sub epidermal is formed of many layers of thick walled lignified parenchyma tissue, the endosperm is formed of one layer of small parenchyma cells. The powders of the seeds were studied microscopically, they containing cells of the different tissues. The study will lead to correct identification, dicover of adulterance and taxonomical classification of these plant seeds.

**Keywords:** *Lepidium sativum*, *Nigella sativa*, *Trigonella foenum graceum*, seeds, macroscopy, microscopy.

### INTRODUCTION

Plants are utilized extensively as raw drugs for many formulations in traditional systems of medicine. To check the genuineness of the raw drugs and to detect adulteration of these materials, an authentic pharmacognostic study is needed for each raw drug. Usually the drugs are collected by traditional practitioners who have inherited herbal practices. Their identification is mostly based on morphological features. In such cases, there is a chance of selecting incorrect raw drugs/adulterants. Therefore, an extensive anatomical and phytochemical screening is needed for each raw drug used in the formulation to avoid any ambiguity and such a study will serve also as a reference for further studies (Vaibhav and Kamlesh, 2007).

Anatomical studies are helpful in describing a particular drug with a special emphasize on quantitative microscopy, such as sclereids, starch grains, crystals, stomata, and trichomes, and qualitative microscopy, such as xylem, phloem, and other tissues (Brinda *et al*, 2000).

*Lepidium Sativum* (Family: Brassicaceae) is an erect annual herb up to 80 cm tall, (Wadhwa *et al*, 2012). The seeds are used in different medicinal applications, and the leaves are used in salad. The plant was used as antidiabetic, anti-asthmatic, diuretic, hypotensive, anticarcinogenic, and antibacterial agent Thnaian (2014).

*Nigella sativa* (Family: Ranunculaceae) is an erect annual herb which grows about 45 cm in height (Rajsekhar and Kuldeep, 2011). Used as diuretic, antihypertensive, liver tonic, digestive, antidiarrheal, analgesic, anthelmintic, antibacterial, and useful in skin disorders (Gilani *et al.*, 2004).

*Trigonella foenum graecum* (Family: Fabaceae), fenugreek is thought to promote digestion, induce labour, and reduce blood sugar levels in diabetics. In herbalism, fenugreek is thought to increase breast milk supply in nursing mothers (Bazzano, 2016).

The objective of this study is to determine the morphological and anatomical characteristics of the seeds of *Lepidium Sativum*, *Nigella sativa* and *Trigonella foenum graecum* which will lead to correct identification, taxonomical classification, and to avoid adulterants.

## METHODOLOGY

### Plant Materials

The plant materials selected for the present study are the seeds of *Lepidium Sativum*, *Nigella sativa* and *Trigonella foenum graecum* they were purchased from herbal markets from Khartoum state (Sudan). They were identified at Department of Botany, Faculty of Science and Technology, Omdurman Islamic University.

### Macroscopical Studies

The seeds of the studied plants were individually studied for its morphology such as form, colour and odor, the sizes were measured, 10 readings were taken and the mean was calculated.

### Microscopical Studies

The anatomical investigation was achieved through transverse sections of the seeds by a hand microtome using wax method techniques (Willy, 1971). The prepared permanent slides were examined using (Leitz Dialux20), Microscope with large field of view, using power X40 and X100. The prepared slides were photographed using a Samsung Galaxy note 5 phone.

### Powder Study

The studied seeds were finely powdered, cleared in chloral hydrate solution and mounted in 10% aqueous glycerin and examined under the microscope to determine their anatomical characteristics (Shome, 1981).

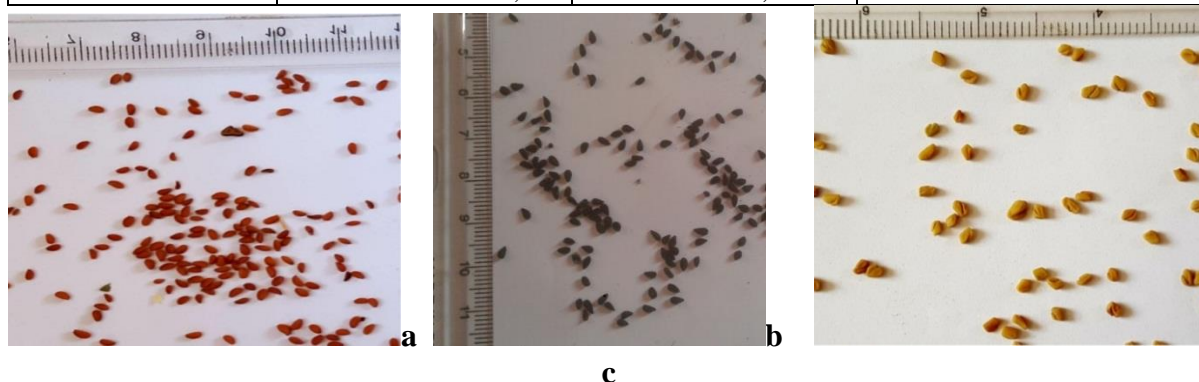
## RESULTS

### Macroscopical Characters:

The macroscopical (morphological) characters of the studied seeds are shown in table (1)

**Table (1): Macroscopical characters of the studied seeds**

character	<i>Lepidium sativum</i>	<i>Nigella Sativa</i>	<i>Trigonella foenum graceum</i>
<b>Origin:</b>	Dry seeds	Dry seeds	Dry seeds
<b>Color:</b>	Reddish brown	Black	yellowish brown
<b>Surfaces:</b>	an arrow present on both surfaces	hairy	smooth
<b>Shape:</b>	small oval- shaped pointed and triangular at one end	flattened, oblong, angular, small, funnel shaped	rectangular to rounded with a deep groove
<b>Odor:</b>	aromatic	slightly aromatic and bitter taste	characteristic bitter pungent
<b>Dimensions:</b>	2 to 3 mm long and 1 to 1.5 mm wide,	0.2 cm long and 0.1 cm wide,	2 to 4 mm long, 1-2 mm thick



**Plate 1: External morphological features of a. *Lepidium sativum*  
b. *Nigella Sativa* c. *Trigonella foenum graceum* seeds**

### Microscopical Characters

#### *Lepidium sativum*

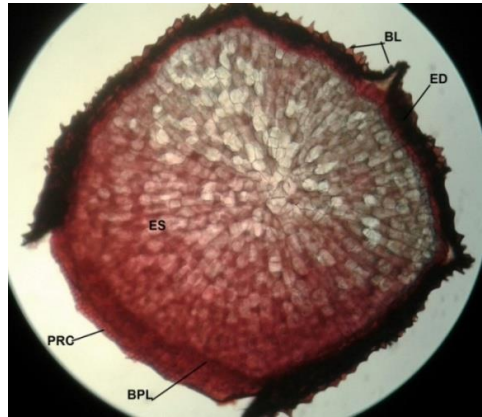
The transverse section of the seeds of *L. sativum* (plate 2) showed presence of testa, tegmen, alleurone layer, endosperm and embryo. Testa is thick, formed of 1-2 layers and appeared yellowish brown whereas. Tegmen layer is attach to the inner side of the testa layer and appeared as single layer. The cells of endospermal region in the section are not appeared. Embryo appeared as innermost structure surrounded by endosperm region. The cells of the embryo are small in size and polygonal in shape.



**Plate 2: Transverse section of the seed of *L. sativum* X100**

***Nigella sativa***

Transverse section of the seed (plate 3) is preceded by the epidermis which is formed of 3 layers of thick lignified parenchyma cells, covered by cuticle, the external layer is extended into papillae (epidermal out growths). The epidermis is followed by two layers of hypodermis. The endodermis is formed of many layers of parenchyma cells, the outer most layer of which is filled with pigmented materials. In the central region of the section found the embryo which is very small.

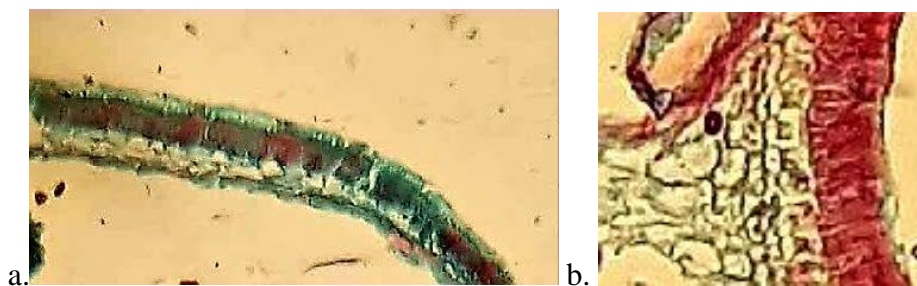


**Plate 3: T. S. Of *Nigella. Sativa* Seed (x 10)**

ed: epidermis, es: endosperm, pl: papillae, prc: parenchyma, bpl: brown Pigment Layer.

***Trigonella foenum graceum***

The transverse section of the seed of *Trigonella foenum graceum* (Plate 4) is formed of seed coat, sub epidermal layer, endodermis and the embryo. The seed coat has a rough cuticle surface and rigid structure. The seed coat is formed of the epidermis and the palisade layer, the epidermis is formed of uniseriate cells covered by cuticle, followed by the palisade layer of malphigian cells with an unevenly thickened walls, An anatomically complex structure of the seed-coat is a general characteristic of all members of the Leguminosae. The sub epidermal layer, formed of many layers of thick walled lignified parenchyma tissue ranging from 3-7 layers, the innermost layer is the endosperm composed of one layer of small parenchyma cells. The embryo is formed of two elongated cotyledons. The outermost layer of the embryo is the epidermis and it is formed of one layer of small compact cells surrounding ground tissue of parenchyma cells filled with reserved food materials. Food materials are stored in the cotyledons of the embryo.



**Plate 4: transverse section of the seed of a. seed coat X100 b. X400**

**Powder Microscopy*****Lepidum sativum***

The powder of the seeds of *L. sativum* was studied under the microscope for its microscopical structures. It is found that, the powder formed of trichomes, cells of testa, fiber, vessels, cells of endosperm and Calcium oxalate.

***Nigella sativa***

The powder of the seeds of *N. sativa* was studied under the microscope for its microroscopic structures. It is found that, the powder formed of trichomes, fiber and epidermis cell

***Trigonella foenum graceum***

The powder of the seeds of *T. foenum graceum* was studied under the microscope for its microroscopic structures. It is found that, the powder formed of epidermis of the testa in surface view, sectional view showing the epidermis, hypodermis and parenchymatous layer of the testa, mucilaginous cells of the endosperm and palisade of the cotyledons in sectional view.

**DISCUSSION**

Singh and Shukla (2011) studied the anatomy of the seeds of *L. sativum* and he found the same tissues in our section. The study of Wadhwa *et al.* (2012) is similar with little difference, the section may be cut at a different region or different stage of growth.

Sharma *et al.* (2011), studied the anatomy of the seeds of *N. sativa* and found the same structure of our section.

The palisade layer in *T. foenum* is formed of malphigian cells with an un evenly thickened walls, and as stated by (Esau,1960), the palisade layer characteristic of leguminous seeds and its structure in hard legume seeds is connected with their high degree of impermeability and thus their germination ability.

**CONCLUSIONS**

The results generated from this study would be useful in identification and standardization of the studied plant seeds towards quality assurance and also for preparation of a monograph on the plants. This study is important and lays down parameters for standardization and authentication of the studied plants with the help of which adulteration and substitution can be proved.

**ACKNOWLEDGEMENTS**

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