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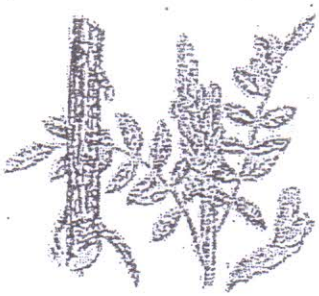
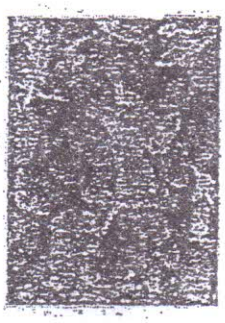
PG 102

Staff Members of

Pharmacognosy Department



The Best of British Higher Education in the Best Environmen

Contents

Part I

SEED

SEEDS

Definition

A seed is a plant member derived from a fertilized ovule, which thus contains an embryo, or it is a highly specialized productive structure formed in flowering plants as results of fertilization induced in a mature ovule. It is constructed so as to facilitate its transportation and its purpose is to insure the continuation and distribution of the individual.

The origin of the seed from the ovule necessitated the presence of structures in the seed corresponding to the various parts of the ovule and also fixes the general relative disposition of the parts to one another in the seed.

The Mature Ovule

A typical mature ovule consistes of masses of parenchymatoas tissue called nucellus, which is with the exception of a narrow opening called micropyle. enveloped by one or two integument i.e coats. The nucellus varies in size in different groups of plants. It is massive in certain families and persists into the ripening seeds and in a few families it may even from a special nutrient tissue, the perisperm. On the other hand in certain other families the nucellus is very small, represented by little or even may become disintegrated and disappeared at early stages of development

The nucellus is labouring a large cell, named the embryo sac. The embryo sac in the mature state contains eight or seven nuclei grouped as follows three ones, each surrounded by walls forming the antipodal cells, which are placed at the farther end from the micropyle; two ones, called polar nuclei; which fuse to form the primary endosperm nucellus or secondary nucellus of embryo sac; and three ones which are naked Le. with no cell walls at the micropylar end; forming the egg apparatus or zygote. This zygote is consisting of similar ones, termed synergidae and a large one the oosphere or the ovum or the egg. The basal part of the nucellus from which arise the integuments is somewhat swollen and called chalaza

The ovule may be sessile or commonly attached at the chalaza to the placenta by a small stalk called funiculs or funicle. which may fuse for some distance with the integument to form the raphe'. In the chalaza the vascular strand from the funicle branches to enter the different parts of the ovule. According to the extent to which ovules are turned upon their stalks. There are four types of ovules

1- Orthotropous or atropous ovule

The ovule is straight, having funicle, chalaza and micropyle on one straight line and the micropyle is lying at the extreme apex opposite the funicle or its scar (the hilum), which *immediately* above the chalaza.This type is relatively uncommon found in Piperaceae . Cannabinaceae... ... ... etc. and shows no raphe'

2- Anatropous Ovule

This type of ovule is the most common one. The ovule is inverted i.e. bent upon the funicle and fused with it so that the micropyle is near the placenta and the raphe runs from one end to the other. The vascular strand of the stalk continuous up the side of the ovule to the chalaza and this portion of the vascular strand constitutes the raphe'. The raphe and chalaza can be observed as markings on the testa and the micropyle is found adjacent to the hilum as in Linseed and Almond

3- Amphitropous ovule

The body of the ovule is bent so that the micropyle and chalaza are on a line at right angle to the free funicle or hilum, In this type, the hilum, chalaza and micropyle are widely separated, example is Colchicum seed. In the three previously mentioned types, the nucellus is straight

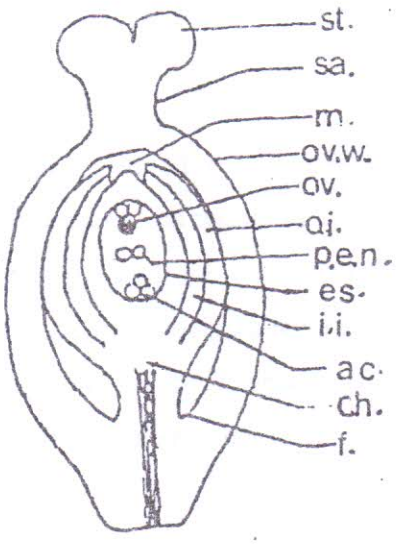
4- Campylotropous ovule

The nucellus is curved. The whole ovule is bent upon itself instead of upon the funicle, so that the funicle, chalaza and micropyle are all close to one another and no raphe' is present, example as in Crucifereae.

After fertilization, the ovule increases considerably in size, forming the seed. The integuments by thickening, suberisation and lignification of the cell-walls give rise to

Types of ovules

St., stigma; sa., style; m., micropyle; ov.w., ovary wall; ov., ovule; o.i, outer integument; i.i., inner integument, p.e.n., primary endosperm nucleus; e.s., embryo sac; a.c., antipodal cells, ch., chalaza; f., funicle.



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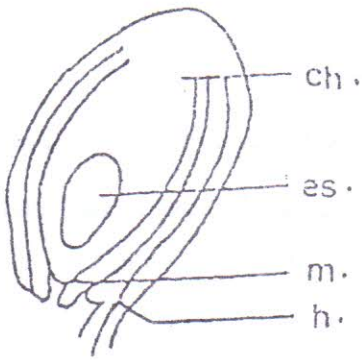

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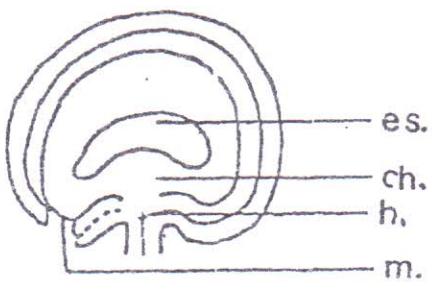

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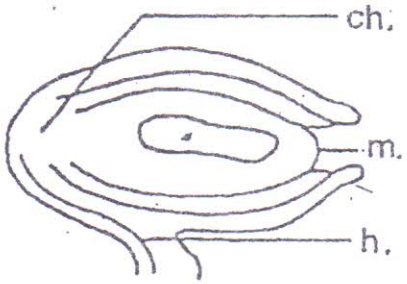


C

the testa which protects the embryo against drying and injury. The ovary wall enlarges and forms the pericarp of the fruit. .

A typical seed thus consists of

1- **Embryo** developed from the fertilized ovum,

2- **The endosperm** surrounding the embryo and developed from the primary endosperm nucleus of the embryo sac

3- **The perisperm** formed from the nucellus,

4- **Testa** formed of one or two seed coate originated from the integuments of the ovule. When the two coats, i.e. the outer and the inner are present in a seed they are termed the testa for the outer and the tegmen for the inner. Generally speaking the term testa is also used to indicate the single coat of seeds having only one coat or to signify the two coats considered as one protective covering. The testa, shows on its outer surface certain markings; the **hilum**, the **micropyle**, the **raphe** in anatropous or amphitropous ovules, and the **chalaza**.

The hilum is the scar left by the removal of the seed from its funicle or stalk.

The micropyle is the scar in the testa, resulting because the coats at the apex are not quite complete leaving such a scar.

The chalaza is the position at the base of the nucellus where the vascular strand from the funicle branches to enter the different parts of ovule.

The raphe is seen as a line running from the hilum to the chalaza.

The testa differs in texture and thickness. It may by

a) Membranous as in Almond and Peanut

b) Leathery as in Foenugreek

C) Hard as in Ricinus

d) Thick and woody as in Calabar beans

Outgrowths of testa

During the formation of certain seeds from the ovule, there frequently arise additional growths outside the integument or developed from the integuments. Different names are given to these outgrowths according to their origin and nature

1- **Arillus:** It arises from the funicle or from the tissue of the hilum and partly or completely enveloping the seed. It may be fleshy as in Taxus or dry and membranous as in Cardamom.

2- **Arillode:** It arises from the tissue of the micropyle and partly or completely covering the seed, being usually fleshy as in Euonymus

N.S. The outgrowth of Nutmeg, named mace, arises from the tissues of both funicle and micropyle and thus it is considered as Arillus or Arillode

3- **Strophiole** It is a local, usually barrel-shaped enlargement along the line of the raphe, due to an increase in the amount of parenchyma around the vascular strand of the raphe as in Colchicum seed.

4- **Wing** It is an extension of the testa in the form of a membranous fold as in Pinus or in the form of plume of hairs at the summit as in Apocynaceae or at the base as in Salix or at both ends of the seed as in Alstonia. The plume is sessile and when borne on a stalk it is termed awn as in Strophanthus

The Kernel means the structures of the seed enclosed within the testa. Therefore it consists either of the embryo alone or of the embryo surrounded by the endosperm or by the endosperm and perisperm. Accordingly we may have the following types of seed

1- **Exalbuminous seeds;** where the embryo alone exists within the testa as in Mustard seed

2- **Albuminous seeds;** where

a- The embryo is surrounded only by the endosperm and enclosed within the testa in Ricinus seed

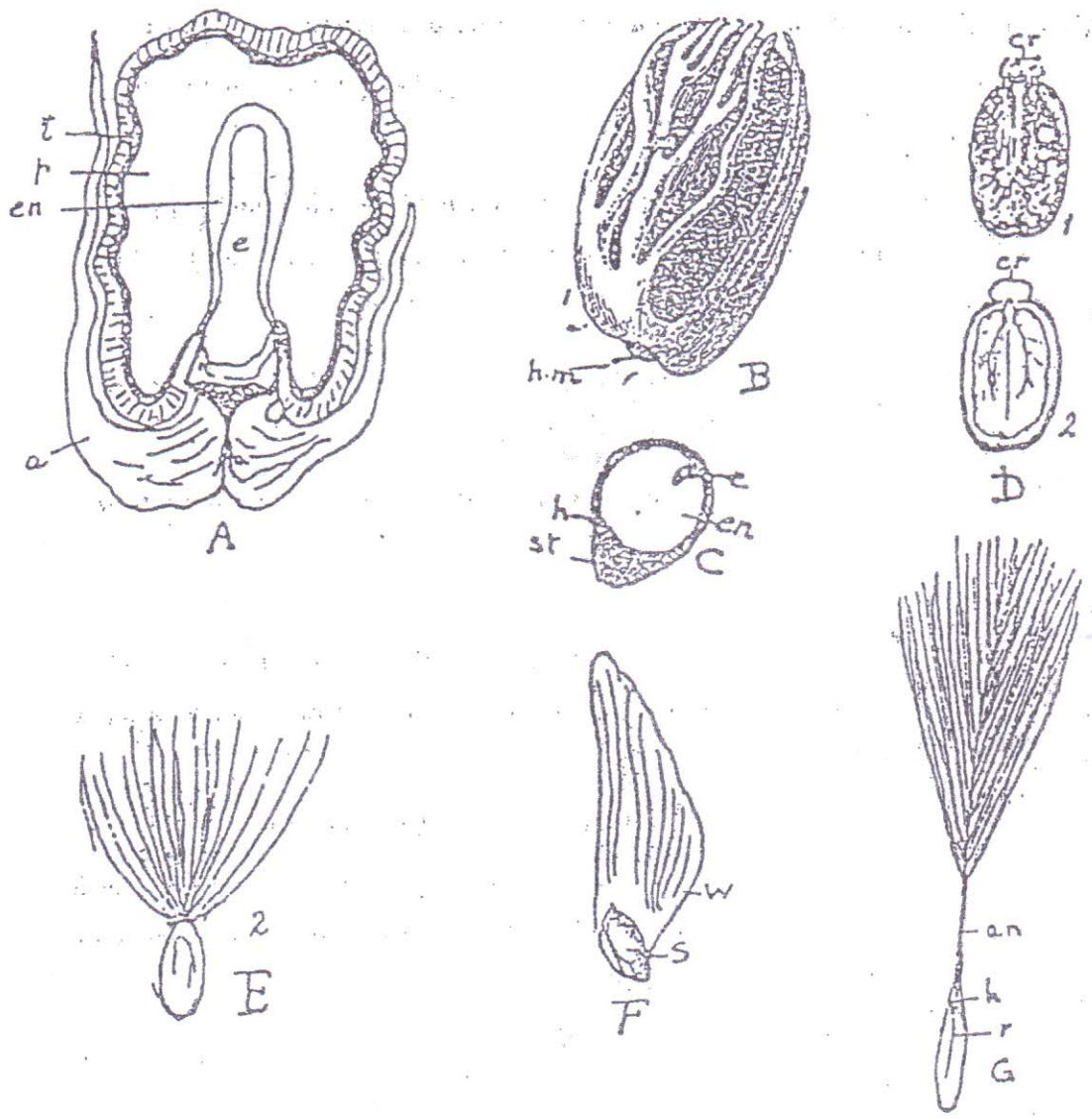


Fig. 2:- Outgrowths of testa. A, arillus; B,arillode; C, strophiole; D,caruncle; E,plume; F,wing; G,awn .a,arillus; an, awn; e,embryo; en, endosperm; cr, caruncle; h,hilum; h.m, hilum and micropyle; r, raphe; s, seed; st,strophiole; t, testa; w, wing.

b- The embryo is surrounded by the endosperm and the perisperm and enclosed within the testa as in Cardamom seeds

The Perisperm may be large and distinct or may form a membranous coat surrounding the kernel or it may be hardly distinct being much reduced

The Endosperm may be starchy as in Graminae, ...etc., fleshy or oily as in Umbelliferae, or formed of cells with thick hemicellulosic walls as in Colchicum, Strychnos

The Embryo varies in size from a large body constituting the whole seed to a small body or even very minute embedded in other tissue of kernel as in Colchicum seed, ...etc. The embryo consists of the following tissues

a- One cotyledon (monocotyledons), two cotyledoils (dicotyledons), or more.

b- A plumule or primary shoot. It is the stem growing point (forming the shoot system). It is enclosed between the cotyledons.

c- A radicle or primary root (forming the root system).

The embryo exists as one of the following forms

1- **Straight** as in Almond, Nux vomica; Strophanthus, ...etc.

2- **Curved** as in Poppy seeds.

3- **Coiled** or strongly curved as in Stramonium seed...etc

4-**Bent** on itself, including the following types

a – **Incumbent:** The radicle may be bent over either or against one of the straight cotyledons, as in Cannabis

b – **Accumbent:** The radicle may be bent against the two straight cotyledons, i.e. against their edges as in Foenugreek

c - **Orthoplocous** It is an incumbent embryo with the cotyledons folded along their midribs so as to enclose the bent radicle as in Black and White Mustard seeds

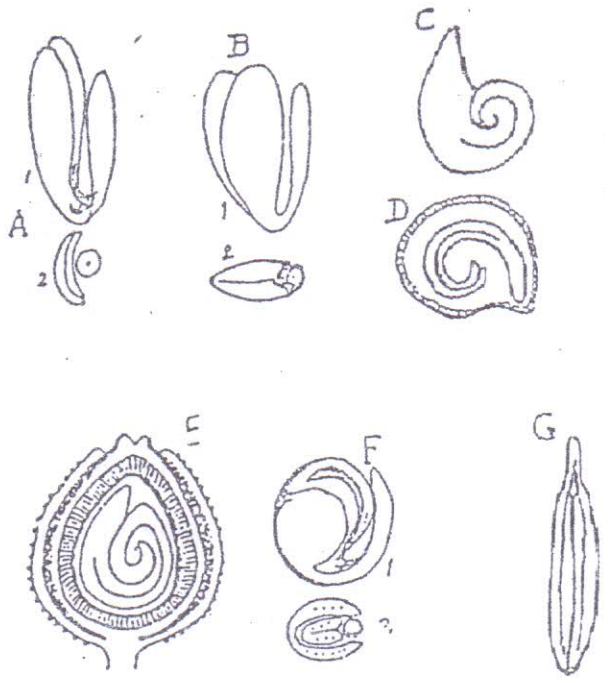


Fig. 3 : Forms of embryo. A, incumbent; B, accumbent; C,spiral; D,coiled; E,spirally rolled; F, orthoplocally arranged; G,straight.

Characters of Seeds

I. Macroscopical features

The most important of these are the shape, size, colour, odour, taste and weight of 100 seeds. Seeds differ in shape, being spherical as Mustard seeds Poppy seeds, ...etc. or flattened with diversity of form and shape. They vary considerably in size, ranging from one mm or less as in Papaver, Digitalis ...etc., to very large ones. Seeds vary considerably in odour and taste. Some seeds are odourless as Nux vomica, Colchicum, ...etc., but others are aromatic as Cardamom, Nutmeg, ...etc., or with characteristic, odour as Foenugreek, ...etc. As regards the taste, seeds used in medicine are mostly bitter as Nux vomica, Strophanthus, ...etc. Some seeds are pungent especially after chewing as Mustard

The weight of 100 seeds is a character of value for distinguishing related seeds, e.g. Seeds of *Atropa belladonna* weigh 0.107 gm, of *Hyoscyamus niger* weigh 0,04 to 0.07 gm, of *Digitalis purpurea* weigh 0.004 to 0.007 gm

Microscopical characters

The most important microscopical features of seeds are mainly due to the structure of their testa as well as the kernel including the cell contents. The following parts may, therefore, be present in a seed and each of them may furnish valuable diagnostic characters

1- Testa and outgrowths of testa, if present.

2- Perisperm.

3- Endosperm.

4- Embryo.

5- Cell contents.

I-The testa

It provides characters of diagnostic value for the identification arid differentiation at seeds. It exhibits a complex nature of structure. It is usually formed of several layers of cells but the following four tissues may be mentioned as of frequent occurrence. These are

(a) The epidermis

(b) The pigrment layer

(c) The sclerenchymatous layer

(d} The nutrient layer.

a- The epidermis

It is variously developed in different seeds and may take the following forms

- **Palisade-like epidermis** consists of radially elongated cells, closely packed and with no intercellular spaces, having variously thickened, usually cellulosic, occasionally lignified walls and usually narrow cavities. In Leguminous seeds, the lumen of the epidermal cells is enlarged at the base of each cell and then suddenly narrows to a fine-pore for the greater part of the length, the wall being very thick and usually cellulosic.

- **A layer of lignified sclereids** as in Nux vomica seed, Solanaceous seeds as Stramonium, Capsicum, Hyoscyamus, ...etc. In Nux vomica the walls of the epidermis are pitted and mostly equally thickened. In Strophanthus the cells are prolonged into a trichome, which is appressed to the seed and has a single lignified, thickened rod runs along its side adjacent to the seed. Nux vomica seeds have sclereid-like epidermal cells which are extended as appressed trichomes with about 10 thickened and lignified ribs, the cells being lignified in Nux vomica

A layer of prosenchymatous cells i.e. elongated fibre-like cells as in Cardamom seeds.

A mucilaginous layer as in Linseed, Mustard,...etc. The mucilage fills the lumen of the cell.

A layer bearing trichomes. The trichomes are generally unicellular, but they vary much in number, size form and thickening. In *Strophanthus gratus* seeds, the trichomes are scattered and are only slightly larger than conical papillae. In Nux

vomica and *Strophanthus kombe* seeds, nearly every cell of the epidermis is prolonged into an appressed trichome about 1mm long, giving a silky appearance to the seeds because of their firm texture and parallel arrangement

A subepidermal layer may be also developed in certain seeds as in Leguminous seeds where the cells within the epidermis are somewhat constricted in the middle and are usually provided with fibre-like cellulosic thickening on the anticlinal walls. These cells are termed Bearer cells or Basket cells as they generally have the shape of an hour-glass or of a basket. In Mustard, it is formed of very large parenchymatous cells while in Linseed it is of collenchyma.

b. The pigment layer: This layer is responsible for the dark colour of seeds. The pigment is deposited in one layer of the testa or occasionally in more layers. Frequently the pigment is deposited in the outer epidermis of the testa as in most seeds of the Solanaceae, in Colocynth,...etc, or in any of the other layers of the testa. It is found in the inner epidermis as in Linseed or in the outer epidermis of the inner coat as in Cardamom,...etc.

c. The Sclerenchyrnatous layer: In most seeds, this layer is formed of one or more rows of cells having strongly tbickened walls. In Nux vomica, Strophanthus, Solanaceous seeds,...etc, the thickened layer constitute the outer epidermis; in Mustard seeds, the inner epidermis of the outer seed coat is formed of sclerenchymatous cells; in Linseed, Cardamom,...etc., the outer epidermis of the inner seed-coat is sclerenchymatous, being composed of narrow elongated sclereids in Linseed and of small cup shaped cells in Cardamom; in the seed of Colocynth, almost the entire testa which is formed of many layers of cells, is completely sclerotic

The nutrient layer It is formed mostly of a compressed layer of empty flattened collapsed cells. This layer was originally formed of thin-walled parenchyma, filled particularly with starch, which was used up during the ripening of the seed and the cells eventually collapse.

II-The Kernel It includes the following tissues

1- The perisperm may be large and usually composed of thin-walled parenchyma containing starch and surrounding the endosperm as in Cardamom, Pepper,...etc. or it may be in small amount forming a membranous coat surrounding the kernel as in Ricinus or may developing infoldings penetrating the endosperm as in Nutmeg. It may be very much reduced and is only represented by the epidermis consisting of one row of cells

2- The endosperm Present in many seeds and is usually composed of cellulosic-walled parenchyma containing reserve food material, i.e., starch as in Graminae, oil and aleurone grains as in Linseed, Strophanthus, Umbelliferae,..etc. or mucilage as in Foenugreek. The walls of the endosperm are usually thin, but in some seeds, the walls become very thick, being largely composed of hemicellulose as in Nux vomica, and Date seeds.

3- The embryo The cotyledons, in most cases and especially when they are not greatly enlarged to form a storage tissue, have a structure showing an approach to a typical leaf. They usually show a palisade layer beneath the upper epidermis. When the embryo is small, the cotyledons are formed of small thin-walled cells. The radicle is usually formed of small, delicate, thin walled parenchymatous cells.

Reserve Food Material

The important reserves in seeds are starch, protein, fixed oil and fat. Starch constitutes an important means of identifying certain vegetable drugs and food because of the varying characters that their starches exhibit as in Graminaceous grains, e.g. Wheat. Maize, Rice, Cardamom, Nutmeg,

The protein reserve may be present as an amorphous mass completely filling the cells as in the endosperm of Cardamom, or may take the form of definite grains named aleurone grains. Since aleurone grains are found in ripe seeds only, it follows that their presence in a powder indicates the presence of a powdered seed or part of seed.

Aleurone graine are either simple in structure and consist of amorphous mass of protein enveloped by a rather more dense protein membrane as in Leguminous seeds and Cereals. Or they have inclusion embedded in an amorphous ground mass of protein, the whole being surrounded by a denser protein envelope. The following constituent parts have been observed in aleurone grains viz., ground substance, crystalloid, globoid and calcium oxalate crystals. It is however, comparatively rare to find all of them in one and the same grain

The calcium oxalate

Calcium oxalate occurs, most frequently, in the shape of small rosettes, sometimes, but comparatively seldom, in single crystals or in groups of a few acicular crystals. It is easily identified by the usual micro-chemical tests. In Umbelliferous fruits, the aleurone grain consists of a ground substance enclosing one or two rosettes of calcium oxalate

Fixed oil and fat

They occur in the cells as minute globules or solid, e.g. Cacao butter, occurring in the cells as masses or crystals as in Nutmeg.

They are stained red with tincture Alkanna and Sudan III.

Linseed

Bizrul Kittan

Names: Semen Lini, Flax Seed

Origin

Linseed is the dried ripe seeds of *Linum usitatissimum* Linne Family Linaceae. Linseed contains not more than 2% of foreign organic matter, and yields not less than 30% of fixed oil

Description

A. Morphology

-Seed are elongated ovate, compressed to nearly flat, rounded at one end and obliquely pointed at the other; 4 to 6 mm long, 2 to 2.5 mm wide and about 1 mm thick. It is glossy-brown to reddish-brown, externally smooth shining minutely pitted The raphe appears as a distinct yellow ridge along one ridge; hilum and micropyle, in a slight depression near the pointed end, becoming mucilaginous when placed in water. Internally light yellow or yellowish-white and oily showing a straight embryo composed of two fleshy piano-convex cotelydons and a radicle, nearly filling the seed, and being completely surrounded by a thin whitish endosperm all being enclosed in the brittle test. Linseed is odourless with mucilaginous oily taste.

B. Histology

Testa: It is formed of two seed coats:

1- A mucilaginous outer epidermis consisting of large isodiametric cells,

2- Sub-epidermal layer formed of 2 or 3 rows of thick walls parenchyma

The inner seed coat

1- A continuous single layer of yellowish-brown narrow longitudinally elongated sclerenchymatous cells, about 120 to 190 µ long and 14 to 17 µ wide, with pitted thick lignified walls,

2- A nutritive layer of collapsed cells.

3- The pigment layer. The innermost layer of testa formed of a single layer of

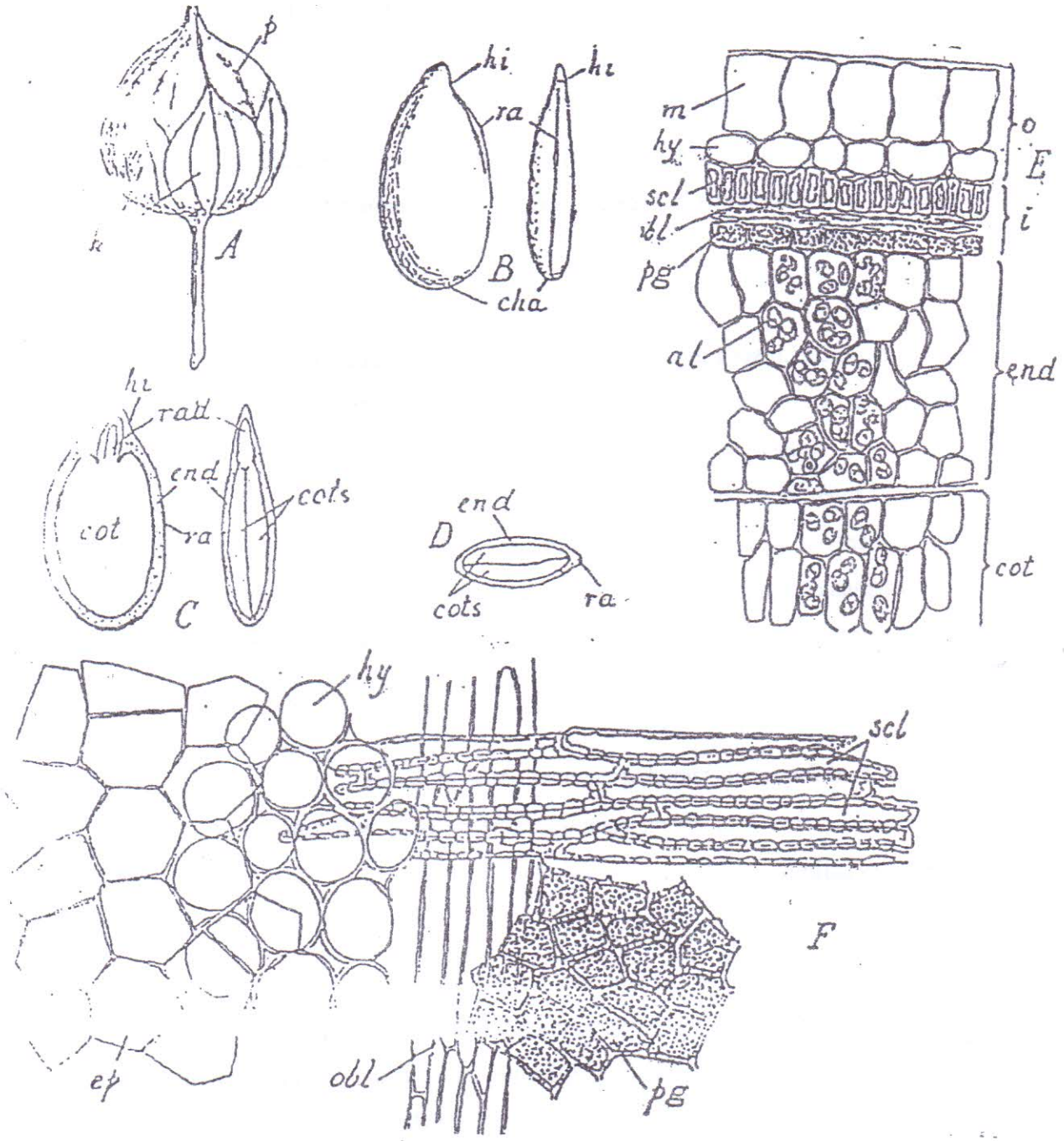


Fig. 4 Linseed. A, capsule; B, seed; C, longitudianl sections of seed; D,transverso scetion of seed; E, transverse section of testa and endosperm; F, surface view of layers testa; al, aleurone grains; cha,chalaza; col, cotyledon; end, endosperm; ep, epidermis; hi,hilum; hy, hypoderm or roundcelled layer; i,inner integument; k, sepals of calyx; m,mucilage; obl, obliterated parenchyma; p,pericarp; pg,pigment layer: ra, raphe; rad, radicle; scl, sclerenchyma.

polygonal flattened cells with pitted walls and reddish-brown contents

Endosperm and cotyledons

Both consist of thin-walled parenchyma cells, filled with globules of oil and aleurone grains, up to 20 microns in diameter, each with a globoid and one or more crystalloids

Powder

Powdered Linseed is grayish-yellow to yellowish-brown with readily visible dark reddish-brown fragments of the testa. It has a characteristic odour and a mucilaginous oily taste. Microscopically, it is characterized by:

1. Dark brown fragments showing pigment cells.
2. Fragments of the endosperm and cotyledons
3. Numerous oil globules, stained red with alkana tincture and sudan III.
4. Fragments with yellowish-brown sclerenchymatous cells, generally appearing crossed by thin walled elongated cells on one side and by rounded somewhat thickened parenchyma on the other
5. Occasional fragments showing mucilaginous epidermis
6. Aleurone grains 3 to 20 microns in diameter, each with one globoid and one to several crystalloids.

Constituents

1- 30 to 40% of fixed oil. The oil is yellowish-brown in colour and has high content of the unsaturated fatty acids: oleic acid, linoleic acid and linolenic acid (omega fatty acids) are referred to as essential fatty acids, since they can not be manufactured by mammals and must be consumed as part of diet.

2- 25% of protein

3- 3-6% of mucilage

4- Small amount of a cyanogenic glycoside linamarin.

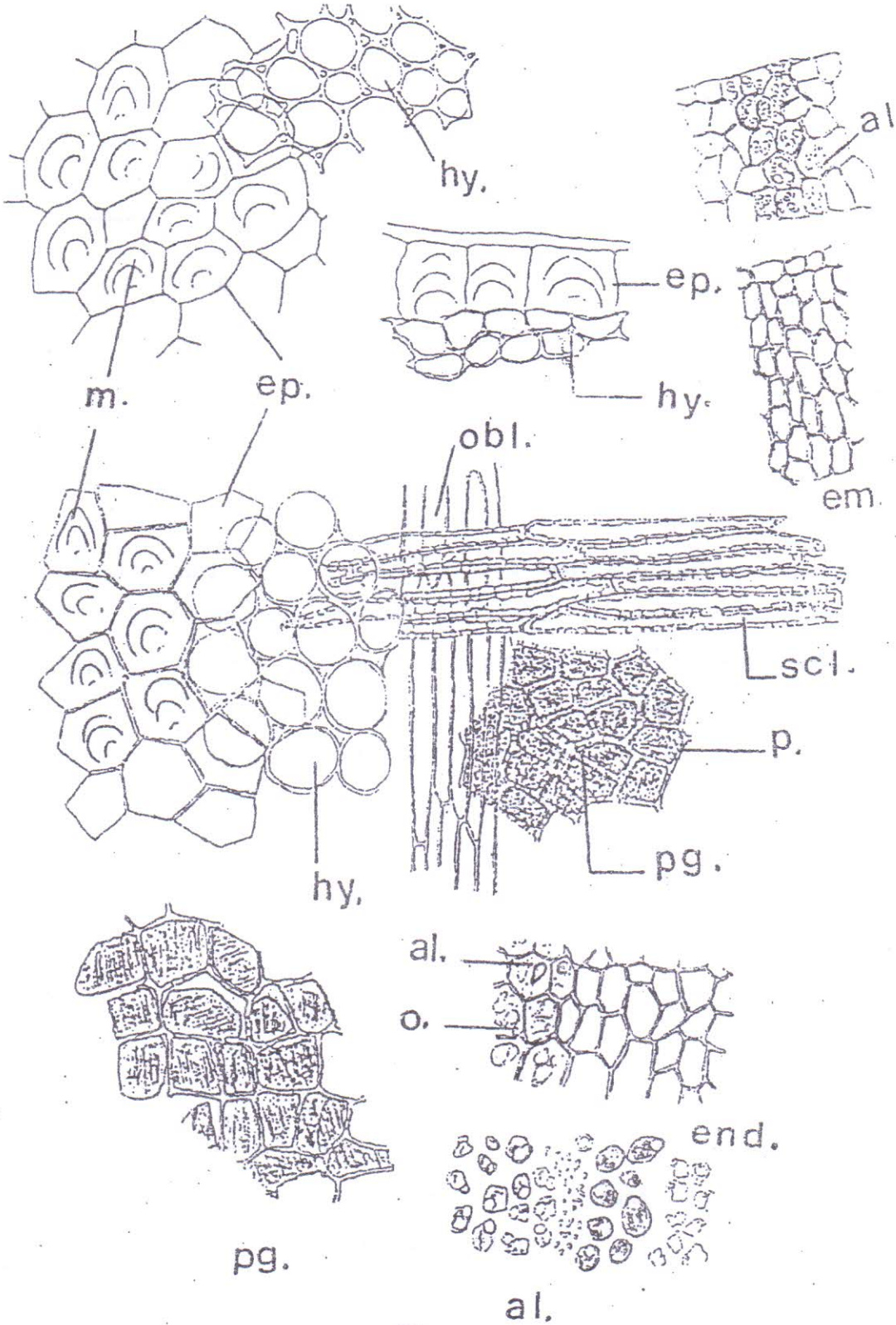
Uses and actions

1- Demulcent in acute or chronic gastritis.

2- Anti-inflammatory effect due to omega fatty acids. Thus, Linseed is used in

Powdered Linseed

al., aleurone grain; em., embryo cells; end., endosperm ep., epidermis hy., hypodermal cells.; m., mucilage; o., fixed oil; obl., obliterated parenchyma; p., pitted walls; pg., pigment layer; scl., sclerenchyma.



patients with rheumatoid arthritis and psoriasis.

3- Emollient in poultices for boils, carbuncles and other skin infections.

4- Laxative in habitual constipation, due to its mucilage which has a lubricant effect. The laxative action arises from an increase in the volume of the intestinal bowel contents and consequent reflex stimulation of peristalsis.

5- In painting to hasten the drying of the oil.

6- Linseed cake is used as a cattle food.

Contraindications: The drug is contraindicated in case of intestinal obstruction

Side effects and toxicity

When taken internally, Linseed must be accompanied by plenty of fluids, otherwise flatulence may occur. Toxic effects arising from the liberation of HCN from the cyanogenic glycoside (linamarin) by the enzyme linamarase, present in finely ground seeds, needed not to be feared even on prolonged use. When crushed seeds are taken internally, linamarase is partly inactivated under the influence of the acidity of the stomach and less than 1% of the cyanogenic glycoside is hydrolysed. A long hydrolysis time of four hours is required in vivo system. The majority of HCN, liberated is converted rapidly into the relatively non toxic thiocynate through a detoxification mechanism in the body. The minor part of HCN remained is eliminated via the urine and the feaces. Thus a relatively slow rate of formation of HCN is opposed by a relatively fast rate of elimination

Chemical test

1- It gives positive histochemical tests with Sudan III and ruthenium red

2- General test for cyanogenic glycoside (Guignard's paper test):

The freshly crushed seeds are moisten with water, a strip of filter paper impregnated with Na picrate (yellow) is hanged over the crushed seeds and the flask is corked. The flask put in water bath at 37 °C for 30 minutes. The yellow colour of the paper will be turned to brick-red colour by the effect of liberated HCN gas.

Black Mustard

Bizrul Khardalel Aswad

Names: Semen Sinapis Nigrae, Brown or Red Mustard.

Origin

Biack mustard is the dried ripe seeds of *Brassica nigra* (Linne) Koch. Family Brassicaceae (Cruciferae). Black Mustard contains not more than 5 % of foreign organic matter and yields no less than 0.7 % of allyl isothiocyanate.

Description

A- Morphology

Seeds are spherical or nearly spherical; 1 to 1.6 mm in diameter, reddish to dark purprlish-brown, sometimes with grayish but not blue tinge. Externally, minutely pitted and showing network reticulations; becoming mucilaginous when placed in water. Internally, it is light yellow to grayish yellow, and oily, showing two folded cotyledons embracing a small radicle (orthoplocus arrangement).

Black mustard seed has a slight odour, when dry but becoming pungent when triturated with cold water. Taste at first bitter but rapidly becomes strongly pungent.

B- Histology

Testa: It is formed of two seed coats. **The outer coat** consists of the following

1- Epidermis of large thin-walled cells containing mucilage

2- Subepidermal layer of large thin-walled cells called giant cells.

3- Sclerenchymatous layer of narrow, polygonal somewhat radially elongated cells, varying in height, and thickened on the radial and inner walls

The inner coat consists of

1- A pigment layer of thin-walled cells, filled with dark brown contents.

-**Endosperm** is reduced, narrow, represented by an outer layer of thick-walled cells containing numerous oil globules and rounded aleurone grains (aleuron layer), and by numerous layers of collapsed cells.

Cotyledons, which constitute the main bulk of the seed, consist of thin-walled polyhedral cells, filled with oil and small rounded aleurone grains containing globoids but devoid of crystalloids

Powder

Powdered Black mustard is light brown or greenish-brown, having a slight odour when dry but becoming pungent when triturated with cold water and having at first a bitter taste but rapidly becomes strongly pungent. Microscopically it is characterised by:

1-The reddish-brown fragments or testa, showing polygonal sclerenchyma cells in surface view, 4 to 10 microns broad, polygonal reticulations, 60 to 100 microns across, produced by the higher sclerenchyma cells projecting in between the large cells above.

2- Mucilaginous epidermis.

3-Numerous fragments of cotyledons with parenchyma cells containing oil and aleurone grains 8 to 16 microns in diameter.

4- Absence of starch.

Constituents

Black mustard contains

1- 4% of glucosinolates; sinigrin

The natural enzyme myrosinase, in the presence of water, acts upon sinigrin to yield glucose, potassium acid sulphate and allyl isothiocyanate. This latter substance is a volatile oily material and responsible for the powerful pungent taste and odour obtained by moistening the powdered seeds. From 0.7 to 1.3 %, of volatile oil can be obtained from the seeds and the oil contains at least 92% of ally isothiocyanate.

2- Mucilage in the epidermis of the testa

3- 27% fixed oil in the embryo

4- 29% Protein

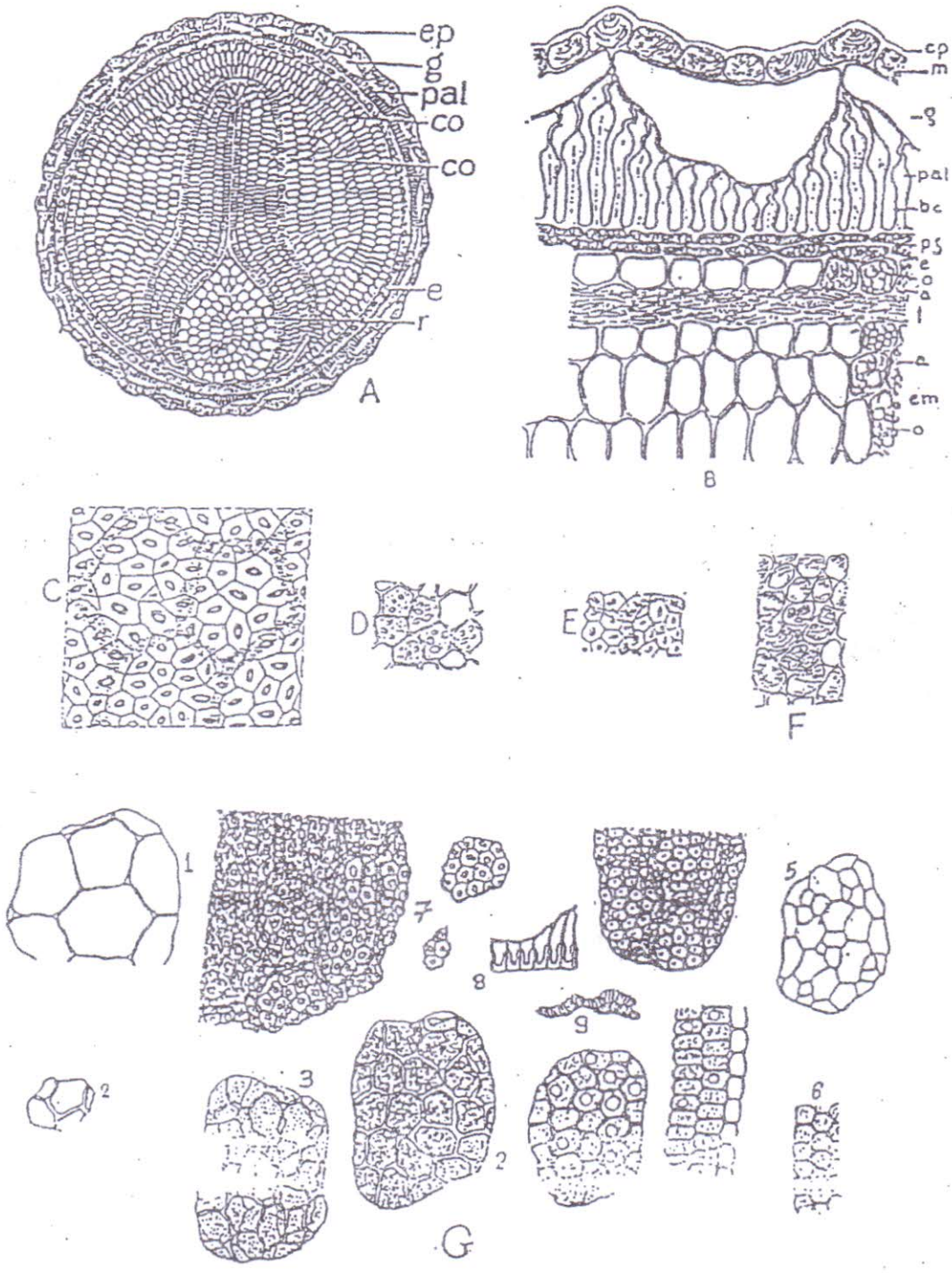


Fig. 5 Black Mustard. A,transverse section; B,detailed T.S.in the seed; C, palisade sclerechymatous underlying epidermis: D,aleurone cells; F,fragment showing pigment cells; G, elements of the powder. 1,epidermis; 2, aleurone layer; 3, the same; 4, cotyledon; 5, epidemis of cotyledon in surface view; 6,radicle; 7, sclerenchymatous layer; 8, the same in T.view; 9, debris of raphe.a,aleurone; bc,beaker cell; co,cotyledon; em,embryo; e,remains of endosperm; ep, epidermis; g, giant cells; pg,pigment layer; r,radicle.

Uses and actions

1- Spice

2- Rubefacient and counter irritant when applied externally. This rubefacient action causes a mild irritation to the skin, stimulating the circulation in that area and relieving muscular and skeletal pain. Oil appears to be associated with a reduction in risk of cancers of alimentary tract

-Folk uses: In China, Brown mustard seed is used to treat colds, stomach problems, abscesses, rheumatism, lumbago, and ulcers, irritant, stimulant, diuretic, emetic, pungent, laxative and digestive

Contraindications

- Severe circulatory damage and varicose veins.
- Peptic ulcer

Chemical tests

Test for purity: Macerate 2 gm. of powdered Black mustard with 20ml of water for 15 minutes, filter, add to the filtrate a few drops of Hg $(NO_3)_2$ T.S. and warm, no red colour is produced (c.f. White mustard).

White mustard

Bizrul Khardalel Abyad

Names: Yellow mustard, Semen Brassica Alba

Origin: White mustard is the dried ripe seeds of *Brassica alba.* Boissier Family Brassicaceae (Cruciferae)

Description

Morphology

White mustard seeds are yellow in colour, nearly spherical 2 mm in diameter The testa is very minutely pitted when examined with a lens. Internally, it resembles in structure that of Black mustard. White mustard seeds, either whole or powdered, have no pungent odour, even when triturated with cold water. They have a pungent taste

B. Histology

White mustard seed closely resembles Black mustard seed in structure but differs in the following points:

1- The hypodermal tissue of the testa consists of two layers of somewhat collenchymatous cells.

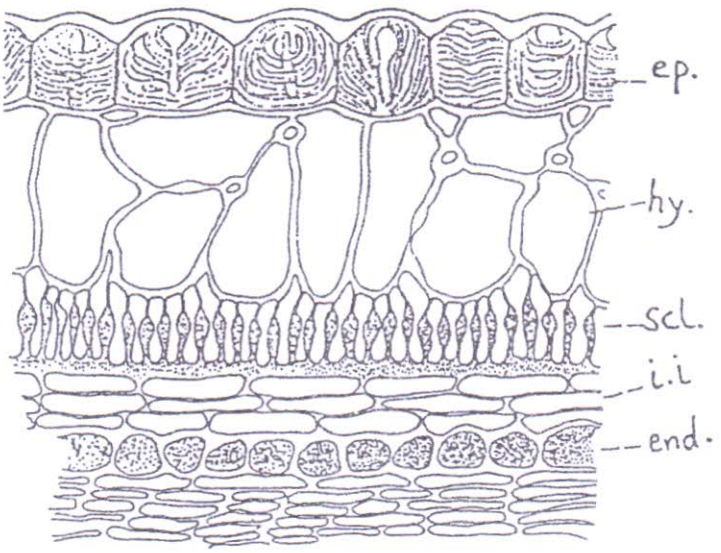
2- The palisade layer of sclereids consists of cells which are much more even in height and this difference result in absence of the distinct polygonal network in surface view of the testa.

3- The inner seed coat (pigment layer of Black mustard) is devoid of colouring matter.

Constituents

White mustard contains:

1- Glucosinolate sinalbin. An enzyme. myrosinase, in the presence of water, acts upon sinalbin to yield, glucose. acid sinapine sulphate and acrinyl-isothiocyanate.



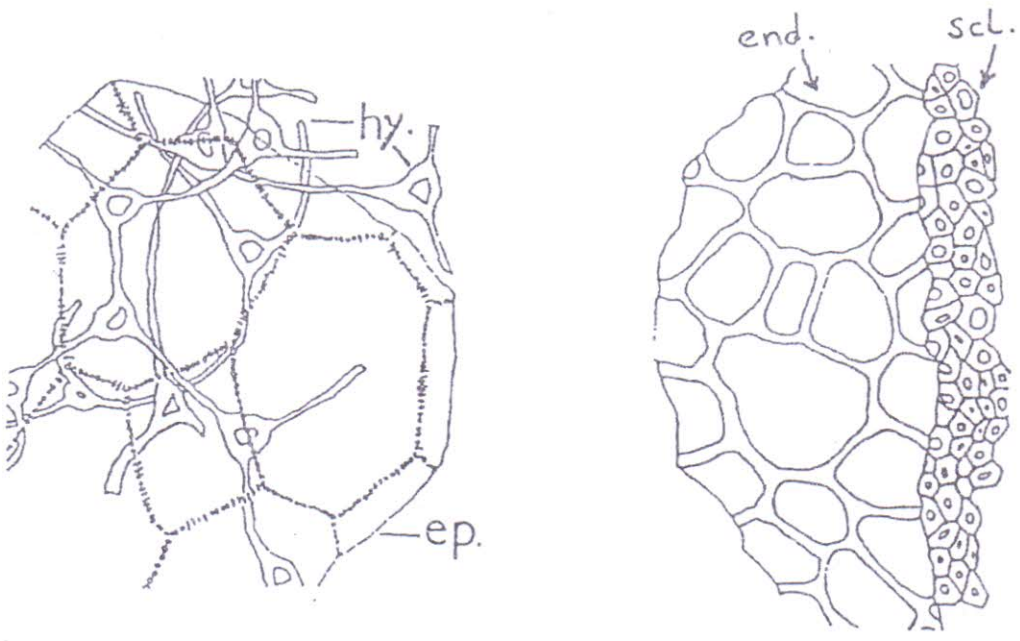


Fig. 7.: White mustard. A,detailed T.S. in the seed; B,surface view of the different tissues.ep, epidermis; end,endosperm; hy, hypodermis; I,I,inner integument; scl,sclerenchymatous layer.

Acrinyl isothiocyanate is a yellow liquid with a pungent taste and powerful rubefacient action as it is not volatile. it is devoid of pungent odour

2- 30 % fixed oil

3- Mucilage in the epidermis of testa.

4- 25 % protein.

Uses and actions

Similar to Slack mustard

Chemical tests

Test for purity: Macerate 2 gm. of powdered White mustard with 20ml of water for 15 minutes, filter, add to the filtrate a few drops of Hg $(NO_3)_2$ T.S. and warm, red colour is produced (c.f. black mustard).

Foenugreek

Bizrul Hilbah

Names: Foenum-graecum. Hilbah. trigonella, Semen Foenugreek

Origin: Foenugreek is the dried ripe seeds of *Trigonella foenumgraecum* Linne Family Leguminosae

Foenugreek contains not more than 2 % of foreign organic matter

Description

A. Morphology

-Seed are oblong, flattened or rhomboidal, 3 to 7 mm long; dark yellowish-brown. Externally, they are nearly smooth, the whitish hilum and deep furrow running diagonally dividing the seed into two unequal portions, the smaller containing the radicle and the larger, the cotyledons. Internally, they are showing a horny, translucent endosperm surrounding the radicle and the two yellowish accumbent cotyledons. When seeds are soaked in water the endosperm swells and becomes mucilaginous.

-Foenugreek seed has a faint characteristic odour when entire but strong when powdered and a mucilaginous slightly bitter taste

B. Histology

-Testa

1- **Epidermis** of palisade-like cells, about 2 to 6 times as long as they are wide, thick cuticle, and thick lamellated walls, the lumen being conical narrow at the upper extremity and rounded at the base

2- **Subepidermal layer** or **basket-like cells,** with bar-like thickening on the radial walls, followed by the

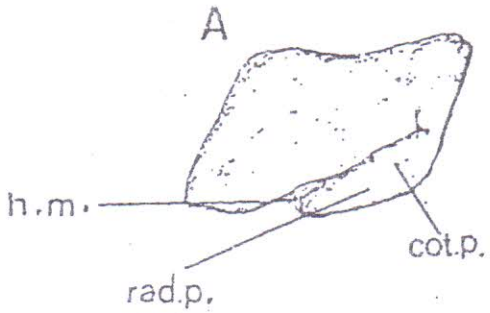
3- **Nutritive layer formed of parenchyma**

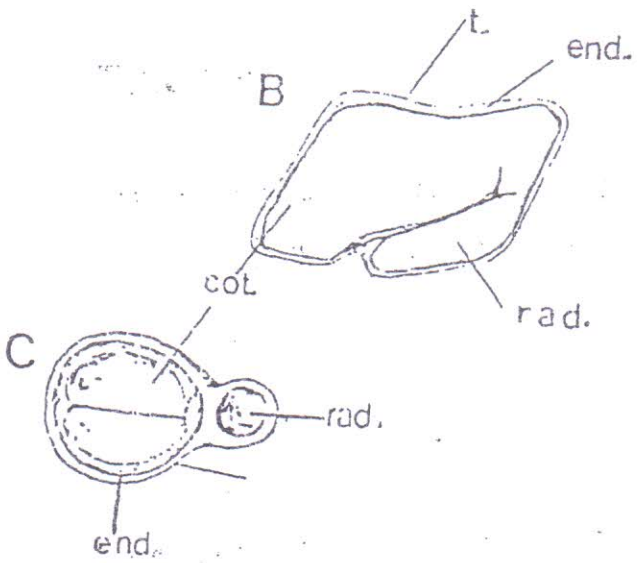
-**Endosperm:** Several layers of polyhedral cells with stratified contents of mucilage.

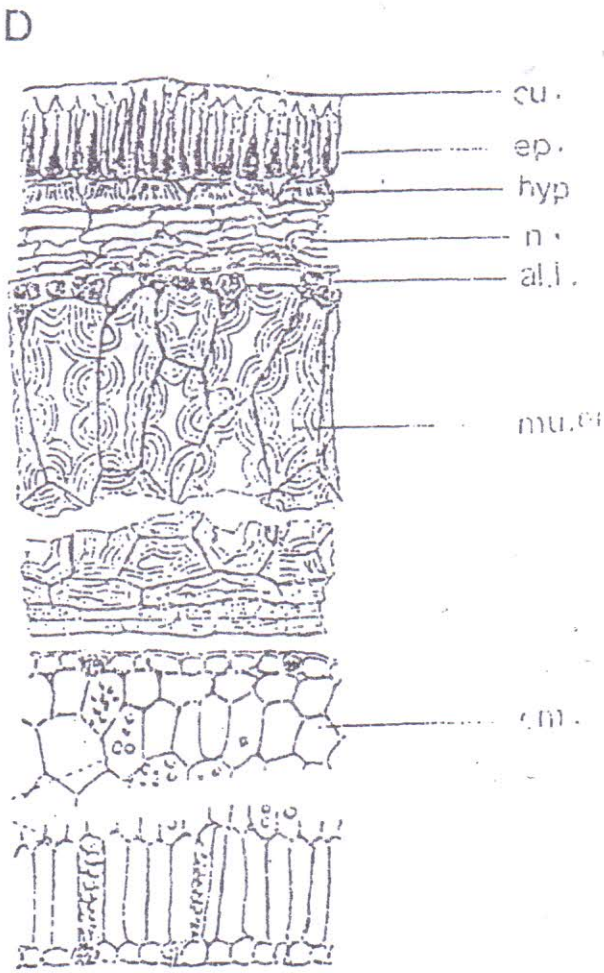
-**Cotyledons:** Parenchymatous cells containing fixed oil, and aleurone grains.

Foenugreek Seed
A.Entire foenugreek seed.
B.Longitudinal cut.
C.Transverse cut.
D.Transverse section.

al. l., aleurone layer, cot., cotyledon; cot. P.; cotyledon, pocket, cu., cuticle; end., endosperm; ep., epidermis; h., hilum; Hyp., hypodermis; m., micropyle; mu. end., mucilaginous endosperm; n., nutritive layer; rad., radicle; rad.p., radicle pocket; t., testa.







Powder

Powdered Foenugreek is yellowish in colour, with strong characteristic odour and mucilaginous slightly bitter taste. Microscopically it is characterized by:

1. Fragments of testa showing the palisade like epidermal cells and the basket-like cells of the sub-epidermal layer

2. Fragments of endosperm with mucilaginous cells

3. Fragments of the cotyledons with parenchymatous cells containing fixed oil and aleurone grains.

4. Very few small starch granules.

Constituents

1- 28 % of mucilage, which on hydrolysis yields mannose and galactose.

2- Alkaloids gentianine, trigonelline, and choline

3- 23-25% Proteins and amino acids.

4- Flavonoids; apigenin, luteolin, vitexin and quercetin

5-0.6-1.7 % saponins glycosides on hydrolysis yielding steroidal sapogenin, gitogenin, neogitogenin, sarsasapogenin, fenugreekine ....etc

6- Other constituents as coumarin, lipids (5-8 %), vitamins (including nicotinic acid) and minerals (a rich source of selenium).

7- Over 50 volatile constituents have been detected from Foenugreek seeds reveled to be the important volatile constituent responsible for the flavor of Foenugreek.

Uses and actions

1- Treatment of anorexia, dyspepsia, gastritis and convalescence

2- lactagogue.

3- Topically for furunculosis, myalgia, lymphadenitis, gout, wounds, leg ulcers. and to reduce inflammation.

4-It is stated to possess mucilaginous demulcent, laxative, nutritive

5-It is used as tonic, in impotence, hepatomegaly and splenomegaly

6- Foenugreek revealed hypocholesterolemic and hypoglycemic actions in normal

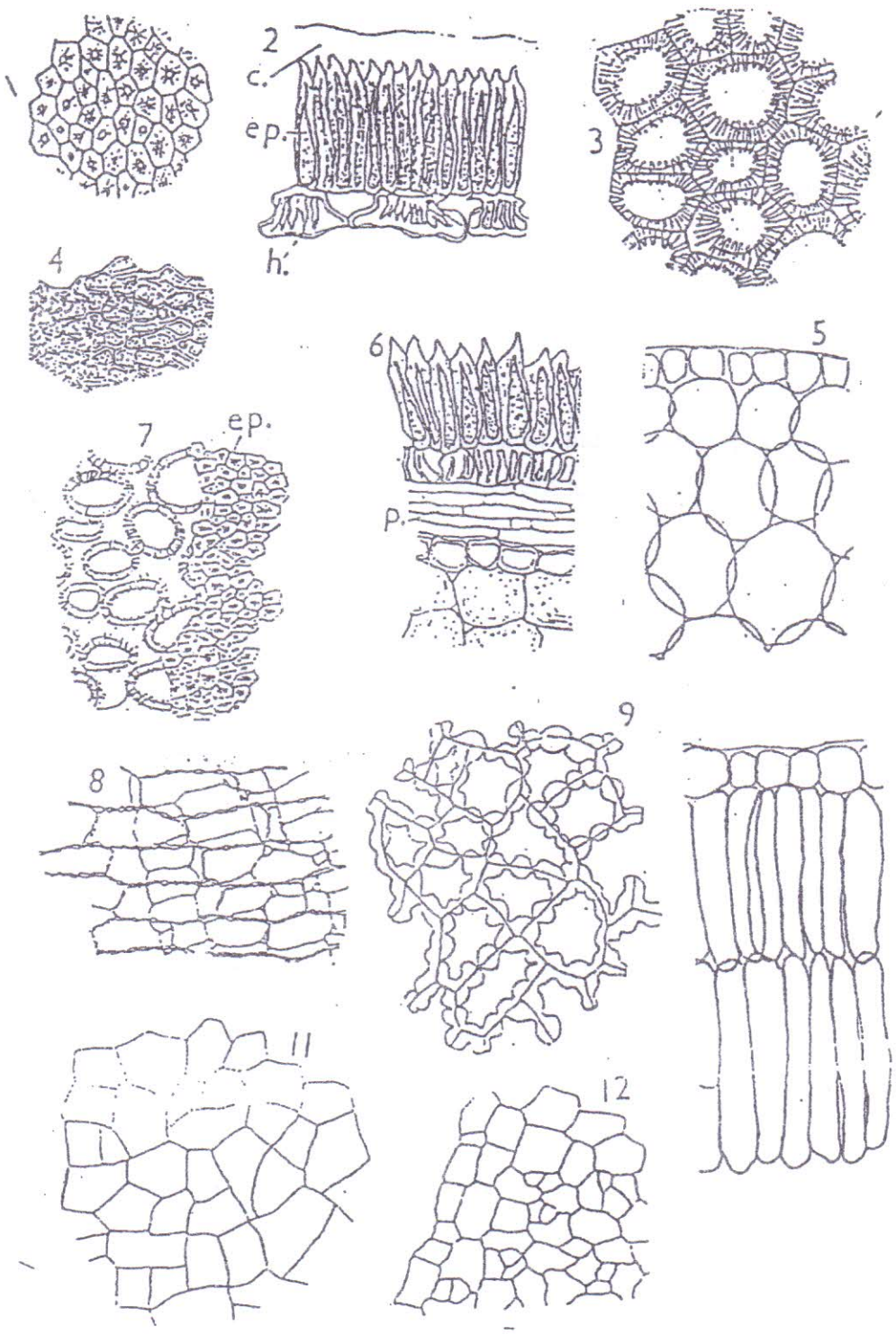


Fig. 9 : Foenugreek seed.Elements of the powder. 1,4, epidermal cells; 3,7, hypodermis; 2,6, fragments of seed in sectional view; 8,12, parenchyma of testa; 5,11, frag. of cotyledons; 9,outermost layer of endosperm.

and diabetic humans. It should be considered a useful dietary supplement for prevention of hyper lipidemia and atherosclerosis in diabetic persons

7-Foenugreek seeds are a potential source of diasogenin, a basic compound in the semi-synthesis of steroid drugs such as cortisone and sex hormones

Contraindications

-The hypoglycaemic activity of foenugreek may interfere with an existing hypoglycaemic therapy

-Fouenugreek showed oxytoxic and uterine stimulant activity thus the use of foenugreek during pregnancy and lactation in doses greatly exceeding those normally encountered in foods is not advisable

Side effects and/or toxicity

-Repeated external applications can result in undesirable skin reactions.

-Minor gastrointestinal symptoms such as diarrhea and flatulence.

Chemical tests

1- It gives positive histochemical tests with Sudan III and methylene blue

2- It gives persistent froth with water due to the presence of saponin.

Nux vomica

Bizrul Gawzel Moqay'e

Names: Semen Strychni, Nux vomica seed, Strychnos seed.

Origin: Dried ripe seeds of *Strychnos nux vomica*. Linne family Loganiaceae.

Nux vomica contains not more than 1% of foreign organic matter, and yield not less than 2.5% of total alkaloids of Nux vomica, and not less than 1.2% of strychnine.

Description

A- Morphology

The seed is disc in shape, compressed, nearly flat, usually concave on one side and convex on the other, with rounded margin. The seeds are gray or greenish gray in colour and measures 10-30mm in diameter and 3-6mm. thick. Externally, the surface have closely appressed hairs radiating from the center to the circumference. The hilum appears as a raised circular scar in the center of one of the flat sides, and connected to the micropyl by a raised ridge (mainly due to crossed hairs). The dried seeds are very hard but soften when soaked in water and can then be easily split into two thin discs. Internally, the seeds are grayish white, horny and translucent, consisting mainly of the endosperm with a central, thin, cordate cotyledons and a terete radicle adjacent to the micropyle

The seeds are odourless with an intense bitter persistent taste

B- Histology

- Testa consists of one seed coat formed of

1- Epidermis consists of lignified, thick walled cells with sinuous polygonal outline. Each cell prolonged externally into a closely appressed hair with 10 strongly, thick, lignified longitudinal internal ribs

2-Collapsed cells, flattened, brown parenchymatous layer, appearing in section a brown band, and in the region of the hilum showing a short vascular strand with, small spiral vessels.

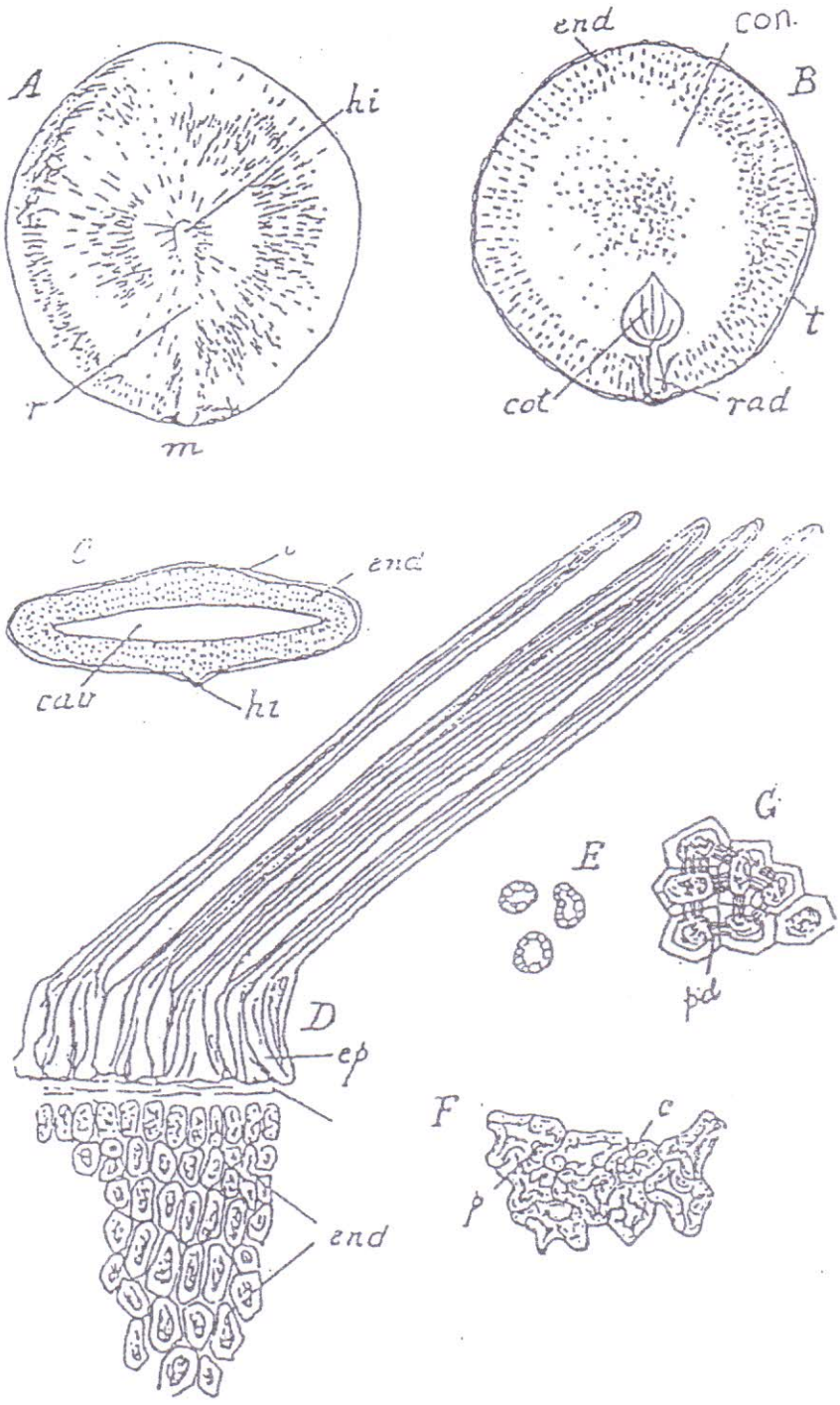


Fig. 10: Seed of Nuxvomica. A,external surface of seed; B,section of seed parallel to the flat faces; C,section at right angles to the flat faces; D,transverse section of outer part of seed; E,transverse sections of limbs of trichomes; F,bases of trichomes in surface view; G,cells of endosperm showing plasmodesma, pd; c,circles, and p, projections formed by rods passing down the inner surface of the bases of thichomes; cav. Central cavity; col, cotyledon; end, endosperm; ep,epidermis; hi,hilum; m,micoropyle; r,ridge on surface of testa; rad, radicle; t, testa.

- **Endosperm** is formed of polyhedral cells with very thick hemicellulosic, non lignified walls showing plasmodesma but no obvious pits. These cells containing oil drops and aleurone grains, up to 30 microns in diameter with globoids.

N.B. Plasmodesma is a thin cytoplasmic strands connect between the cytoplasm of the cells.

- **Embryo** consists of small parenchymatous cells containing oil and small aleurone grains.

Powder

Powdered Nux vomica is yellowish gray, with an intensely bitter and persistent taste Microscopically, it is characterized by:

1- Fragments of epidermis with thick lignified walled somewhat spirally pitted bases hairs, appear in surface view as polygonal sinuous outline

2- Numerous fragments of endosperm with hemicellulosic thick -walled polyhedral cells.

3- Numerous lignified rod shaped fragments of ribs.

4- The irregular aleurone grains, embedded in the oil plasma of the cells.

5- Starch and calcium oxalate are absent.

Constituents

1- Indole alkaloids: strychnine and brucine (1.8-5.3 %). Minor alkaloids as novacine and pseudostrychnine

2- Loganin glycoside

3- 3% fixed oil

4- Chlorogenic acid

Uses and actions

- Nux vomica improves the appetite and digestion but it has been considerably misused as a general tonic.

- It increase the blood pressure and is therefore valuable in certain cases of cardiac failure

Fig. 11: Nux vomica. Elements of the powder 1,6,part of epidermal cells; 2,4,part of trichomes; 3,outer part of endosperm; 5, fragments of ribs; 7, epidermis in surface view; 8,central region of the endosperm; 9,outer region of end. in surface view.

-The action of the whole drug closely resembles that of strychnine. The alkaloid was formerly used as a circulatory stimulant in such cases as surgical shock, but its use now is more limited to that of a respiratory stimulant in certain cases of poisoning.

Toxicity

In large doses, it causes violent convulsions and these involve the respiratory muscles and death ensues from asphyxiation

Chemical tests

1- Mount 2 little powdered Nux vomica in 1 or 2 drops of iodine T.S.; a fine granular brown precipitate is formed in the endosperm cells.

2- Mount a little of powdered Nux vomica in nitric acid, an orange red colour is produced.

3- Mount a little of powdered drug in sulfovandic acid T.S. (Mandalin's reagent); a pink to violet colour is produced.

Strophanthus

Bizrul Strophanthus

Names: Strophanthus seed, Semen Strophanthi

Origin: Strophanthus is the dried ripe seeds of *Strophanthus kombe* oliver, of S. *hispidus* DC. or of S. *gratus* Franchet Family Apocynaceae deprived of their awns. Strophanthus contains not more than 2 per cent of foreign organic matter. One gm of Strophanthus corresponds in potency not less than 0.055 gm of the International Standard ouabain.

Description

A- Morphology

S. kombe seeds are lanceolate to linear lanceolate unevenly flattened, with acute or acuminate apex and obtuse base 9 to 18 mm Sometimes up to 22 mm long, 3 to 5 mm broad and 1 to 2 mm thick; greyish -green sometimes with brownish tinge. Externally, they are covered with longitudinal rows of silk very closely appressed hairs, directed towards the apex. The hilum is situated just beneath the apex or the broken point left by the removal of the awn. The raphe extending as a distinct longitudinal ridge from the center of the ventral nearly flat side to the apex. Internally, the seed shows whitish oily narrow endosperm completely surrounding the straight embryo, which composed of two piano - convex, almost flat, oily cotyledons and a small radicle pointing towards the apex

-*S. hispidus* seed, 10 to 15 mm. long, about 3 mm broad, yellowish or reddish brown, and less hairy.

-*S. gratus* seed, 12 to 13 mm long, yellowish -brown and nearly glabrous

Strophanthus seeds have a slight odour or almost odourless but have characteristic and unpleasant odour when crushed. They have very bitter taste.

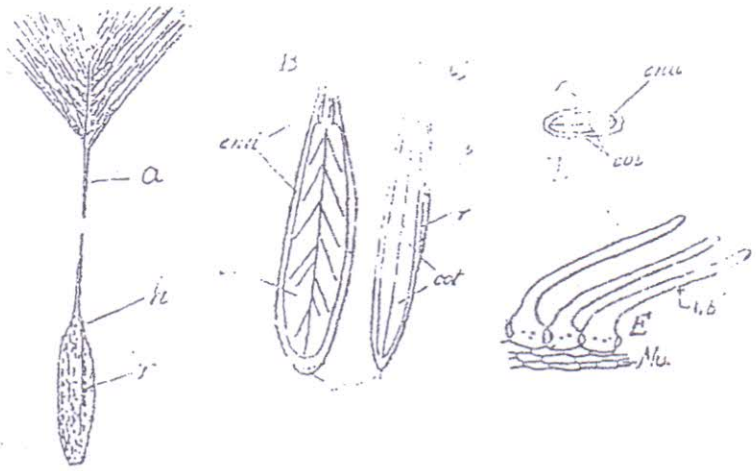


Fig. 12: Strophanthus seed. A,entire seed. B,C D,cut sections of the seed; E,detailed T.S.of the seed; a,awn; cot,cotyledon; end,endosperm; g.p,growing point of embryo: h,hilum; r,raphe; rad,radicle; w,wing; nu,nutritive layer.

B- Histology

Testa, of one integument consists of

1- Outer epidermis formed of large elongated polygonal cells with straight, lignified, thickened anticlinal walls. The outer walls usually prolonged in the center into long narrow appressed hairs, bent at right angles at the base, up to 0.8mm long each, with a single longitudinal lignified rib on the lower side.

2- Nutritive layer, of collapsed cells containing occasional cluster crystals and single prisms of calcium oxalate (absent in S . *gratus*) and a few small ovoid starch granules

3- Inner epidermis, of tangentially elongated cells. Raphe, with one vascular strand showing spiral vessels.

- **Endosperm**, of thick-walled parenchyma containing oil plasma, aleurone grains, fixed oil, very occasional ovoid starch granules about 10 microns in diameter.

Embryo, of small thin-walled parenchyma with oil plasma and aleurone grains

Powder

Powered Strophanthus is greenish-yellow, brownish-red or yellowish-brown having a characteristic and unpleasant odour and a very bitter taste. Microscopically, it is characterized by

1 - Numerous fragments of the thin-walled hairs.

2 - Fragments from testa showing the elongated cells of epidermis with hairs or circular scars of broken hairs. .

3 - Fragments of thick-walled parenchyma of the endosperm.

4 - Fragments of the thin-walled parenchyma of embryo.

5 - Aleurone grains and calcium oxalate crystals prisms or clusters.

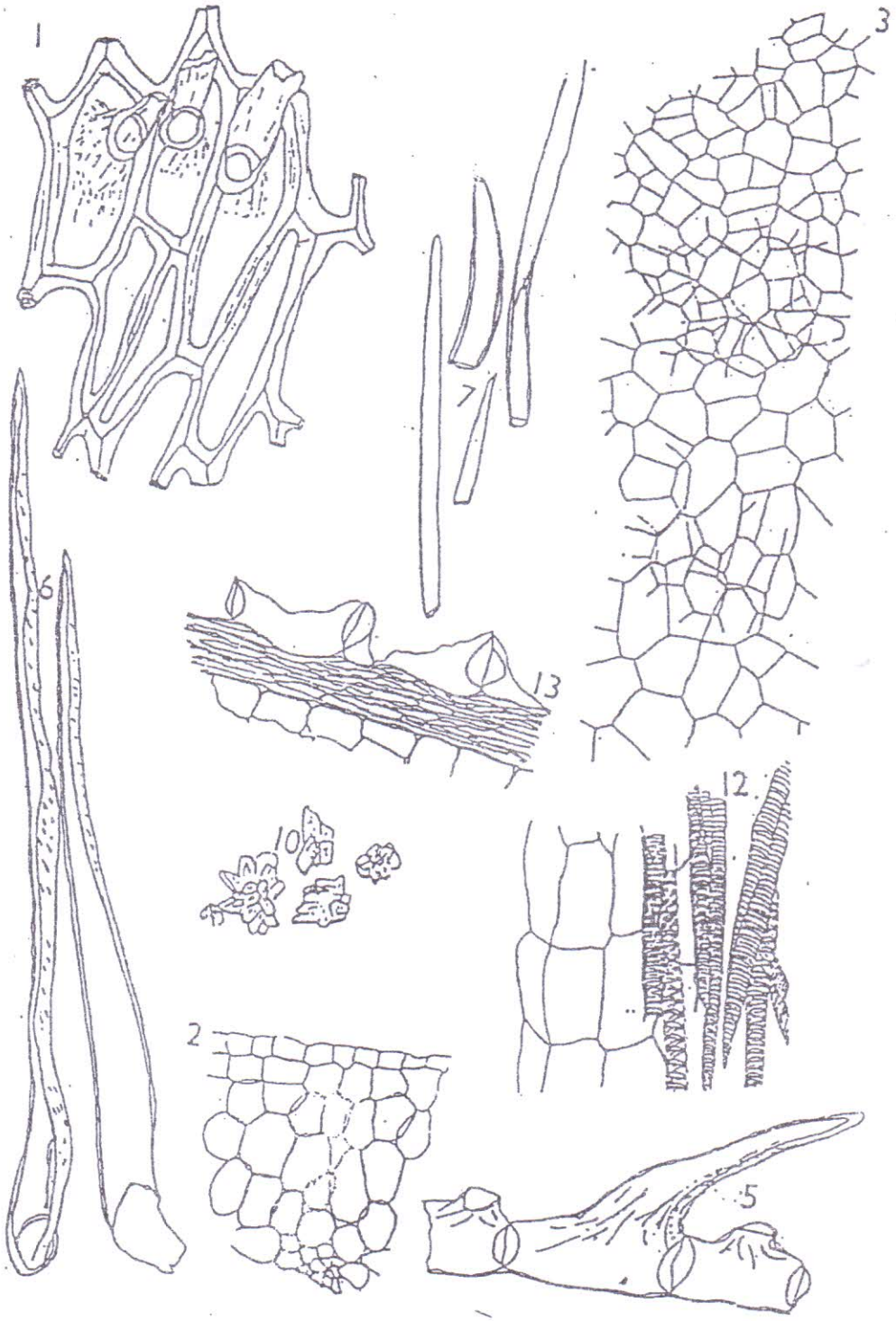


Fig. 13: Strophanthus seed Elements of the powder; 1,epidermis in surface view; 2,fragments of cmyledons; 3,layers of endosperm in S.V.; 5,13,fragments of testa; 6,7,trich 10,calcium oxalate crystals; 12.parenchyma and vessels of the raphe

Constituents

1- *Strophanthus kombe* contains about 8 to 10% of a mixture of cardiac, glycosides known as strophanthin or K - strophanthin, K - strophanthoside.

2- 30% of fixed oil

3- Kombic acid and the nitrogenous bases trigonelline and choline

K - strophanthoside is the principal primary glycoside in both *Strophanthus kombe,* and S. *hispidus.* It is composed of the genin (aglycon) strophanthidin , combined with a trisaccharide consisting of cymarose , α glucose, and β - glucose.

A mixture of these glycosides, existing in the seed in concentrations up to 5% was formerly designated strophanthin or K - strophanthin. Recent studies have revealed additional glycosides as minor constituents.

-*Strophanthus gratus* contains 4 - 8 % of ouabain (G - strophanthin), the rhamnoside of ouabigenin. It is stable, crystalline, glycoside, which often employed as the biological standard in assays for cardiac activity.

It is a potent cardiac glycoside, acts quickly, but wears off rapidly. This glycoside is very polar with rapid renal elimination and must be injected intravenously because it is poorly absorbed orally. Therefore, it has been used for emergency treatment in case of acute heart failure

Whereas Digitalis is the drug of choice in the United States, Strophanthus and its derivatives are frequently preferred in Europe

Uses and actions

The action of Strophanthus seed, which due to the strophanthin they contain, resembles that of digitalis leaves, being cardiac stimulant and cardiotonic. It raises the blood pressure, is an efficient diuretic. It is not cumulative and less liable than digitalis to produce gastric intestinal irritation, therefore in certain cases is preferable and may be substituted for digitalis especially when this remedy has failed or disagreed.

Chemical Tests

Mount a section of Strophanthus in sulphuric acid (66 per cent v/v). The endosperm acquires a green colour and the embryo a green or reddish colour in S. *kombe and* S. *hispidus* respectively (Strophanthin glycoside) and a red colour in S. *gratus (*ouabain)

Cardamom

Bizrul Habbahan

Names: Cardamom seed, Semen Cardamomi

Origin: Cardamom seed is the dried ripe or nearly ripe seeds of *Elettaria cardamomum* Maton var. *minuscula* Burkill, Family Zingiberaceae, recently separated from the fruit.

Cardamom seed contains not more than 3% of foreign organic matter and yields not less than 3% of volatile oil.

Description

A. Morphology

Fruit: Inferior, ovoid or oblong, septicidal capsule, plump or slightly shrunken; 8 to 20 mm, mostly 10 to 15 mm long, 8 to 10 mm thick, green to pale buff sometimes yellowish grey; mostly 3- sided. Externally, they are smooth or longitudinally striated; with rounded base and may bear the remains of the stalk. The apex is more or less blunt and sometimes crowned by a short beak-formed of the remains of the floral parts. Internally, 3-celled, in each cell is an adherent mass of two rows of small seeds attached to axile placenta.

Seed: Irregularly angular, 3 to 4 sided, oblong, ovoid; 2 to 4 mm long, up to 3 mm broad, pale orange to dark reddish-brown, usually enveloped by a thin colourless membranous arillus. Externally they are transversely wrinkled but not minutely pitted. Hilum is depressed and raphe is indicated by a channel extending on one side from base to apex. Internally, whitish, showing a thin dark testa, a whitish starchy perisperm grooved on one side, and in the centre a small yellowish translucent endosperm, surrounding a paler minute embryo

Cardamom has a strong aromatic odour, and an agreeable aromatic pungent taste. The pericarp is almost odourless and tasteless.

B. Histology

-**Arillus:** It is formed of several layers of elongated, more or less collapsed, flattene, thin walled cells, containing small rounded or oval droplets of oil

-**Testa:** It is formed of two seed coats

The **outer seed coat** consists of

1- Epidermis is fiber like end wall (prosenchyma) with long narrow cells, 20 to 30 microns wide, having slightly thickened walls.

2- A layer of collapsed parenchymatous cells, with brownish contents.

3- A single layer, becoming 2 or 3 layers in the region of the raphe, composed of large thin-walled, rectangular cells containing volatile oil.

4- A band of 2 or 3 layers of parenchymatous cells and an inner epidermis of thin-walled flattened cells.

Inner seed coat: It consists of

1- An outer layer of yellowish to reddish-brown, rectangular, radially elongated strongly lignified sclereids about 40 microns long, 20 microns wide, strongly thickened on the inner and anticlinal walls and each cell with a small funnel-shaped lumen, nearly filled with a small warty nodule of silica

2- Inner epidermis of flattened cells.

Perisperm: It is formed of thin-walled cells, packed with minute starch granules, 1 to 6 microns mostly about 4 microns in diameter, and containing 1 to 7 small prisms of calcium oxalate

-**Endosperm:** It is formed of small thin-walled parenchymatous cells, each filled with granular mass of protein, but no starch.

-**Embryo:** of small thin-walled cells containing aleurone grains but no starch

Fibres, fibrous sclerenchma and large vessels are present in the pericarp but absent from the seed.

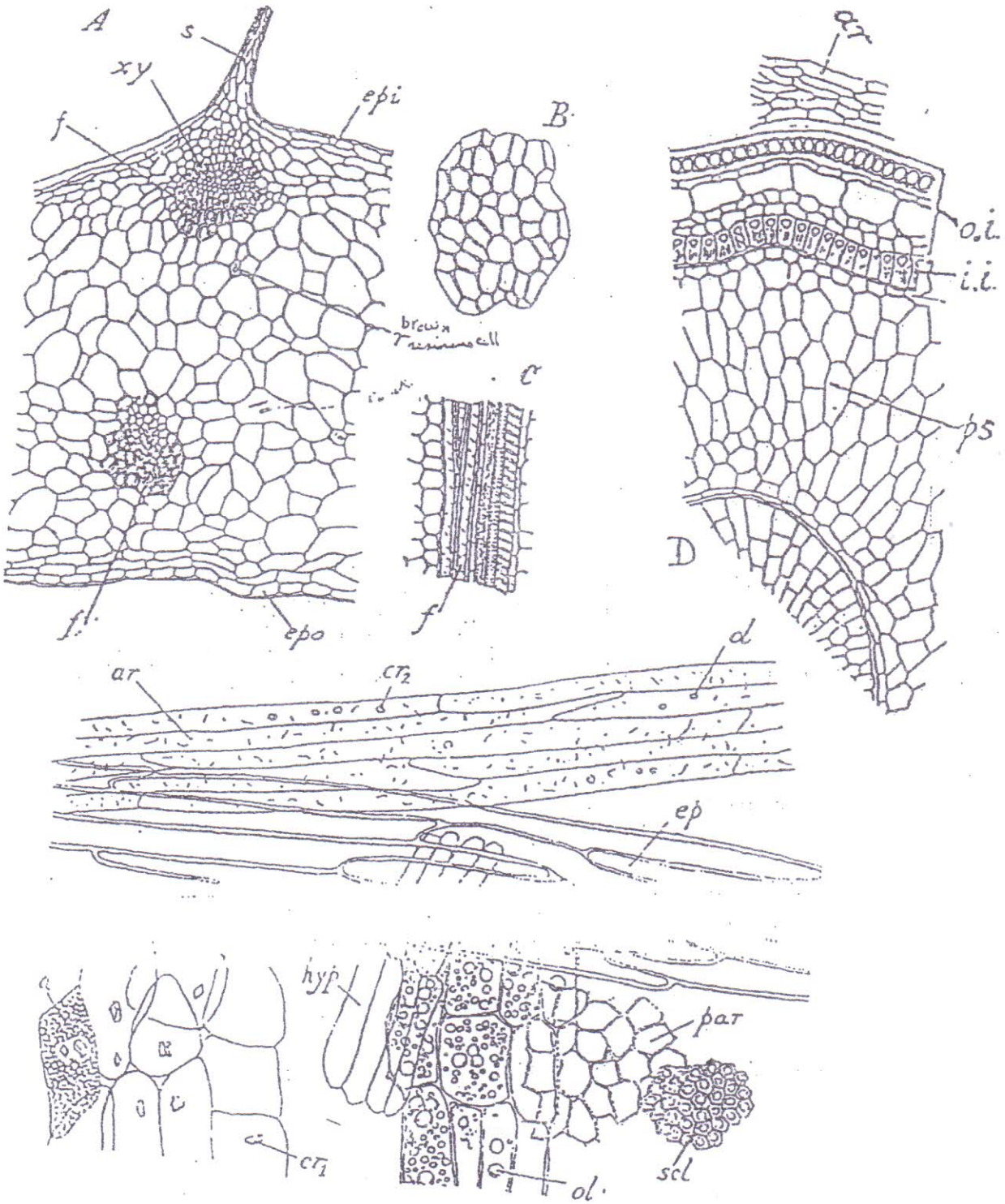


Fig. 14 Cardamom seed. A,detailed T.S. in the pericarp: B,epicarp cells; C, L.S. of vascular bundle; D,detailed T.S. in the seed; E, surface view of testa layers and perisperm.ar,arilus; cr,crystal of calcium oxalate; ep, epidermis; epi.epicarp;epo. endocarp; hyp. hypodermis; f. fibre; i.i. inner integumental; o.i. outer integumental; ol. oil droplet; par.parenchyma; ps,perisperm; scl. sclerenchymatous layer.

Powder

Powdered Cardamom seed is reddish to greyish-brown with a strong aromatic odour and an agreeable aromatic and pungent taste. Microscopically it is characterised by:

1. Numerous fragments of perisperm cells, each filled with starch granules and containing one or more prisms of calcium oxalate
2. Polyhedral masses of adherent starch granules from perisperm individual granules up to 4 microns in diameter.
3. Numerous fragment of yellowish to reddish-brown to dark brown sclereids.
4. Occasional particles of epidermal cells often crossed at right angles by the cells of the collapsed layer.
5. Absence of sclerenchymatous fibres (Pericarp of fruit) and of starch granules more than 10 microns (c.f. Graminaceous fruits and Ginger)

Constituents

Samples of Cardamom seeds contain

-Volatile oil yield 2.8-6.2%. The oil contains a high proportion of terpinyl acetate and cineole and smaller quantities of other monoterpenes, including alcohols and esters; over 40 compounds have been identified in the oils *of Elettaria* species. The loss of oil from seeds kept in the pericarp is small but a loss of 30% in 8 months takes place when the seeds are separated from the fruits.

-Starch (up to 50%),

-Fixed oil (1-10%) and calcium oxalate.

Uses and actions

-Digestive: aids digestion, improves appetite, relieve constipation. Used for anorexia, colic, cramp, dyspepsia, flatulence, heartburn, indigestion, vomiting and nausea.

-Emotions/mind and nervous system: to relieve inflexibility, intolerance, suspicion, confusion. For mental fatigue and nervous strain.

-Actions: Antiseptic, antispasmodic, carminative, digestive, diuretic, stimulant, stomachic, tonic for nerve, analgesic, antiallergic, antioxidant, antitussive in addition to antihepatotoxic effect due to presence of phenolic acids.

-Domestic: The principal uses of Cardamom are as a flavouring agent in curries and cake (called queen of spices).

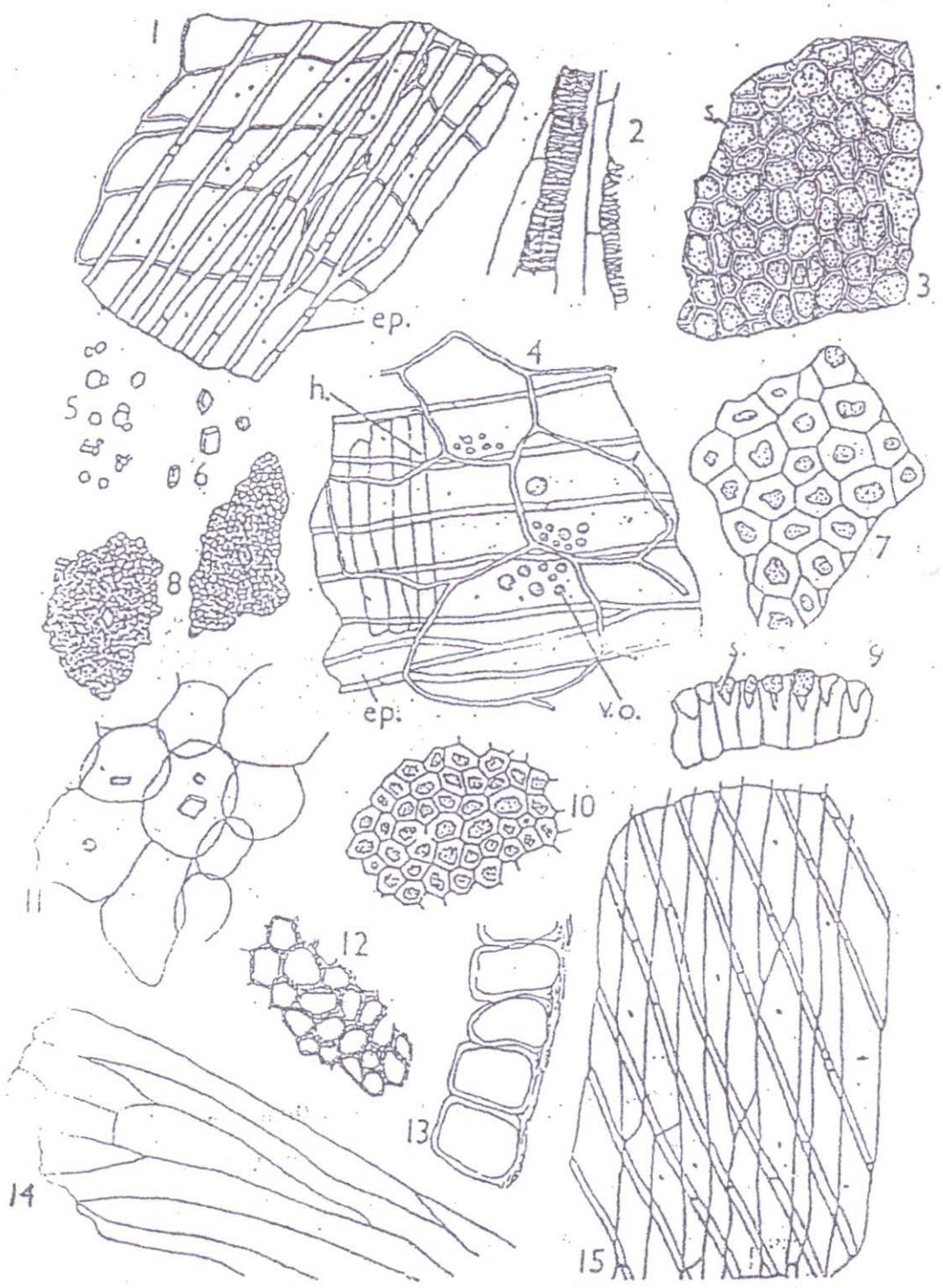


Fig. 15. Cardamom seed. Elements of the powder. 1,4,frag. of epidermis with oily layer and hypodermis; 3,7,10, sclerenchymatous layer; 5,starch; 6,calcium oxalate; 8,11,perisperm cells;14,arillus; 15, arillus and epidermis in s.v.;12, parenchyma of testa: 13. epidermis in s.v.

Contraindication

In case of gallstones, use only after consultation with a physician

Chemical test

It gives positive histochemical tests with Sudan III and iodine

Adulterants

Cardamom is chiefly adulterated with the following:

1. Loose seeds: when seeds are marked loose they are more liable to adulteration Loose seeds are usually quite ripe and yield less volatile oil than those which are stored in the pericarp until required for use.

2. Cardamom husk: The pericarps of the Cardamoms are imported in compressed masses.

3. Immature fruits, mouldy or insect infested fruits and Cardamom "Splits" (partially opened fruits).

Nutmeg

Bizr Gozzatel Tieb

Names: Semen Myristicae,

Origin: Nutmeg is the dried ripe seeds of *Myristica fragrans* Houtt. Family Myristicaceae, deprived of its arillus and testa and with or without a thin coat of lime. Nutmeg yields not less than 25 % of fat, and not less than 5 % of volatile oil.

Constituents

The chief constituents of Nutmeg are:

-Volatile oil (5 to 15 %), which contains myristicin and elemicin, which are related structurally and possess the same stimulant and psychomimetic effect as amphetamine

-Solid fat (about 30 to 40 %).

-Starch, phytosterol, colouring matter and saponin.

Uses and actions

1- Volatile oils have been used externally in chronic rheumatism.

2- Nutmeg butter (the fixed oil of Nutmeg with a small amount of volatile oil) is used externally in liniments and ointments as a counter irritant.

3- Due to presence of polyphenolic compounds in Nutmeg may be used for different types of cancers, anti hepatotoxic and as antioxidant.

4- Stomachic, stimulant, carminative as well as for intestinal catarrh and colic, to stimulate appetites, to control flatulence, and it has a reputation as an emmenagogue.

5- Spice and component of teas and soft drinks.

Contraindication

Consideration should be given. to possible nutmeg-ethanol. interaction since Nutmeg has hallucinogenic and MAO(Mono Amine Oxidaze) inhibition effects.

Side effects and/or toxicity

1- In large doses they are toxic, producing convulsions This action is due to the myristicin contained in the volatile oil.

2- Adults may abuse the hallucinogenic properties of nutmeg. Children maybe at high risk at home, since Nutmeg may be widely available as a coóking additive.

3- 1 to 3 Nutmegs (5 to 15g) is reported as the toxic dose. Death by Nutmeg intoxication in children has been reported in an 8-year-old boy after consuming two Nutmegs.

Chemical tests

1- It gives positive histochemical tests with Sudan III and iodine.

2 -Powder forms fatty crystals when boiled with chloral hydrates 50%.

Colchicum

Bizrul Lihlah

Origin: It is dried ripe seeds of *Colchicum autumnale* Family Liliaceae

Constituents

-All parts of the plant contain the alkaloid colchicine.

-The seeds contain from 0.2 to 0.8 % of colchicine, a resin, about 1 % of fixed oil and 5 % of glucose.

Uses and Actions

-Colchicum is chiefly used to relieve the pain and inflammation and shorten the duration of acute gout and certain gouty affections

-Colchicine is a plant hormone, it induces polyploidy. It has a potent cytotoxic effect and anticancer effect, but it is highly toxic

Chemical test

Boil about 20 seeds or about 0.1 gm of powdered Colchicum seed with 3ml of water forl minute, filter, then evaporate the filtrate, cool and add to the residue 2 drops of nitric acid, a reddish-violet colour is produced