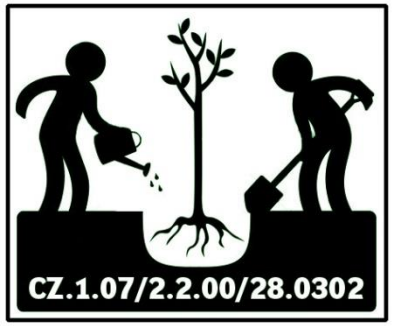
INVESTICE DO ROZVOJE VZDĚLÁVÁNÍ



Inovace studijních programů AF a ZF MENDELU směřující k vytvoření mezioborové integrace CZ.1.07/2.2.00/28.0302

Tato prezentace je spolufinancovaná z Evropského sociálního fondu a státního rozpočtu České republiky

Vegetable Seed

Vegetable Seed

Seed quality

- Biological value – genetic potential of the plant (variety)
- Seed value – laboratory tests:
  - **Purity** – weight %, + seeds of other species, weeds
  - **Germinating capacity** (%) – the capability of seeds to germinate
    (A minimum of 95% for propagation trays, 50-70% for bags)
  - **Moisture** (percentage of the weight) – significance for storage (12%)
  - **HTS** – the weight of 1,000 seeds

- Field rate of emergence – the percentage of healthy, regularly developed plants
  - The seeds that have germinated continue to vegetate

Seed Treatment

- ***Grading*** – the sorting out according to the **size**

- ***Fractionalisation*** – the sorting out according to the **weight** (HTS)

- ***Grinding*** – the sowing of individual seeds (tomatoes, carrots)

- ***Disinfection*** – chemical protection (fungicides, insecticides)

Pelleting

1. *Pelleting:*

- A layer of inert material
- Allows precision seeding (carrots, onions, lettuce)
- Bulking agents (Bentonit) + binding agents

2. *Encrustation*:

- A thin layer – encrustation does not impact on the shape to a large extent
- A mix of polymers, additives, dyes + fungicides, insecticides
- Seeds are either immersed in the solution or the solution is sprayed on them

1.Heating – fruit bearing vegetables (30-60°C), not used

2.Swelling – seeds are immersed in water for about 12 hours, th

- ***Technical vernalisation***

•Vernalisation takes place due to the impact of low temperatures

- Tomatoes: swollen seeds are kept at 12°C for 10 days

•The vernalisation accelerates the formation of flowers

- •Plants go to flower faster; earlier harvesting
- •The vernalisation heightens the yield – it extends the fertility period

Germination

- Favourable for celeriac – fine seeds
- Regular seeds germinate and come up unevenly

- ***Germination stimulation*** – growth substances, phytohormones

- *The stimulation is usually not conducted in the present day practice*
- *Seeds would have to be dried out to the original weight*
  - *Otherwise, the germinating capacity would deteriorate, fungal diseases would occur, the process is tedious*

Biological Seed Treatment

•An alternative besides the chemical treatment

•• Use of fungi and bacteria

➢ Leguminous plants: nodule bacteria

Rhizobium, Bradyrhizobium

Nowadays, this treatment is scarcely used

Examples of Bio Agents Used for Biological Seed Treatment

Bio agent	Regulated pathogen (disease)
Trichoderma harzianum	Pythium spp. Damping-off
Pseudomonas aureofaciens	Pythium ultimum Damping-off
Bacillus subtilis **Pseudomonas putida**	Pythium aphanidermatum Fusarium oxysporum f.sp. cucurbitacearum Root rot
Gliocladium catenulatum	Pythium spp., Rhizoctonia spp. Damping-off

Hot-water disinfection

Crop	Temperature (°C)	Exposure (minutes)	Disease
Savoy cabbage	52	30	Black rot of brassica vegetables, damping-off, bacterial spotting
Broccoli, Brussels sprouts	50	20	
Cauliflower (cultivars)	52	25	Bacterial ring spot
Tomatoes	56	30	Damping-off, bacterial wilt of tomatoes, bacterial spotting
Peppers	50	25	Bacterial spotting
Celeriac	50	30	Septoria leaf spot, damping-off
Carrots	50	20	Alternaria leaf spot

Recognition of Vegetable Seeds

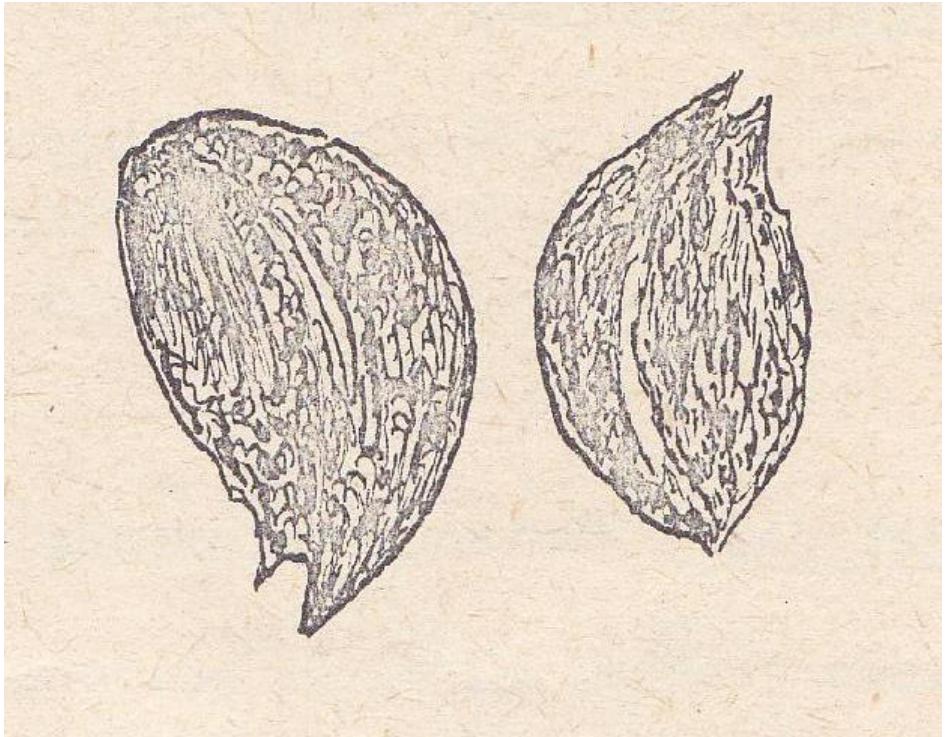
Family: Liliaceae – The Lily Family

Onion, common chives, leek, asparagus

Onion *Allium cepa* L.

A seed of an irregular **shape of a bowl**, **triangular**

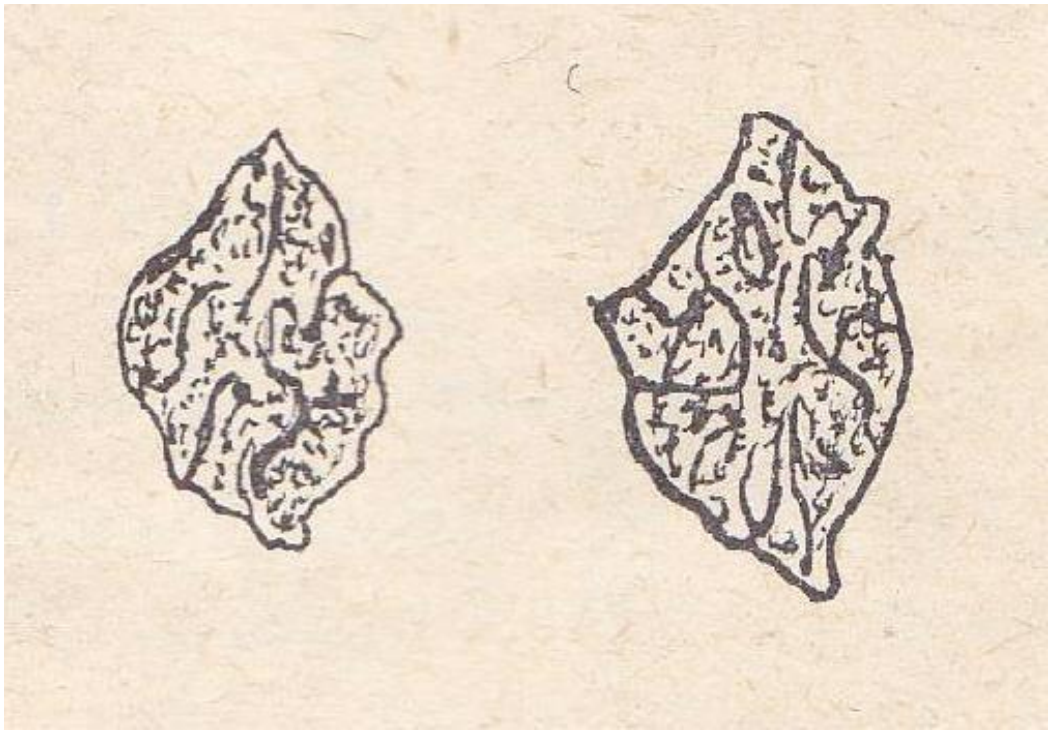
- Pointed at the bottom
- **Of a black (grey-black) colour with a matt surface**
- **Bigger than the leek seed**



Leek *Allium porum* Rgl.

The seed is very similar to the onion seed, but is smaller, **more wrinl**

- The seed is not shiny, but **pruinose**



Common Chives *Allium schoenoprasum* L.

The seed is smaller and thinner than the onion seed, **is of the shape**

Black-coloured, **shiny**

Common Asparagus *Asparagus officinalis* L.

The asparagus fruit is a red berry with 3-5 black seeds

- A **global** seed, dented on one or two sides
- The surface is **finely reticulate**

There is a **noticeably light spot on the belly side**

Family: Fabaceae LEGUMINOUS PLANTS

Pea, bean

Garden Pea *Pisum sativum* L. ssp. *hortense*

•The seed:

•Round

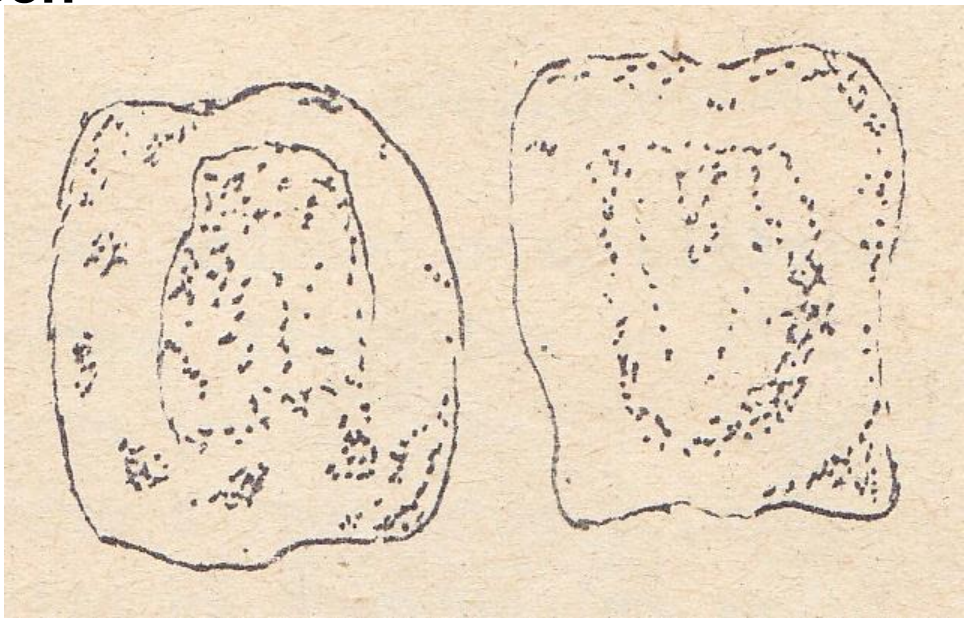
<u>Wrinkled</u>

•Frequently also of a <u>quadrilateral</u> shape

•Colours:

•Mostly **light green**

Sometimes **beige** or **yellow-green**



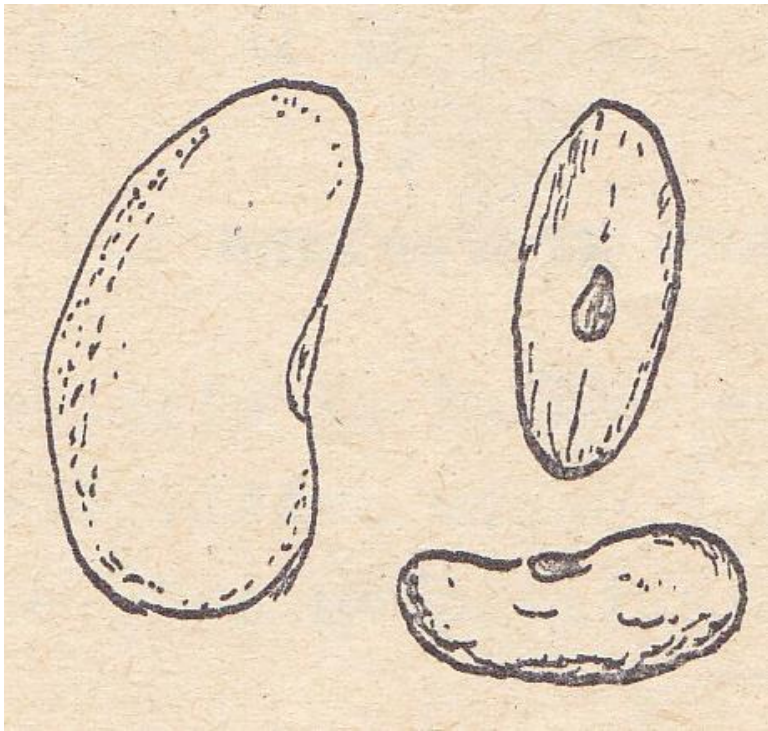
Common Green Bean *Phaseolus vulgaris* L.

The seed of a characteristic reniform shape

•Colours:

•Czech cultivars are **white**

Yellow, **light brown**, **dark brown**, **black** as well as **multi-coloured**



Family: Apiaceae (Umbellifer)

Celeriac, carrot, parsnip, parsley, dill, coriander, caraway, fennel

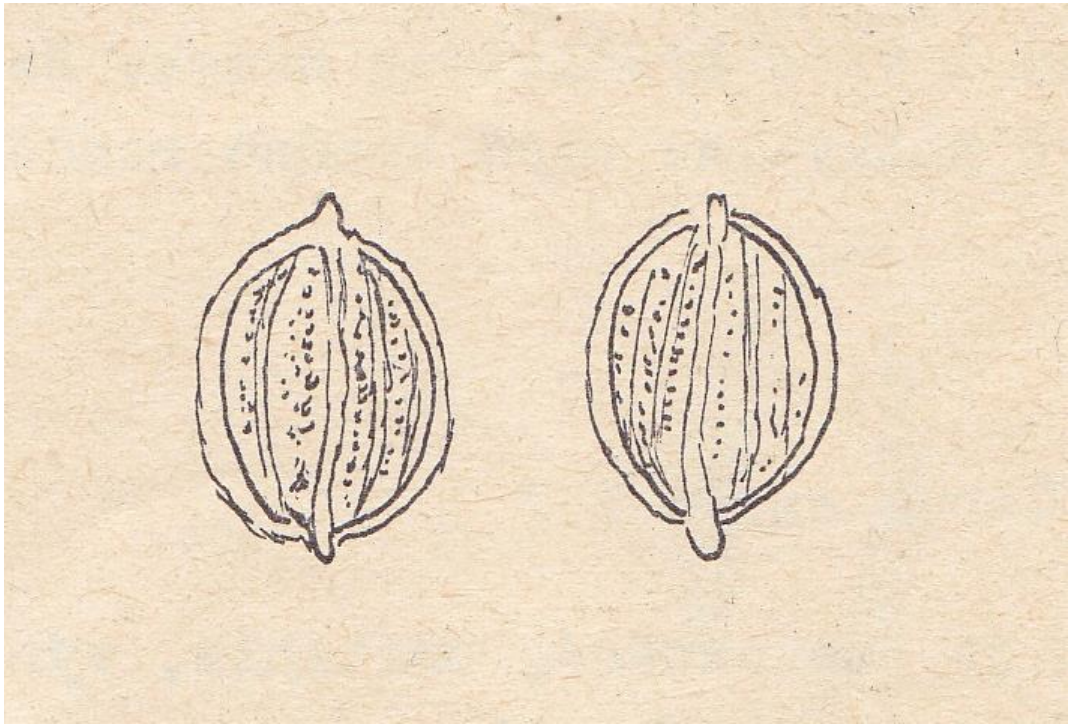
Celeriac *Apium graveolens* L.

•Achenes, brown-coloured

Slightly inflated to flat on the belly side, considerably inflated with marked

•Characteristic taste, **strong aroma**

The seed counts among the tiniest ones



Carrot *Daucus carota* L.

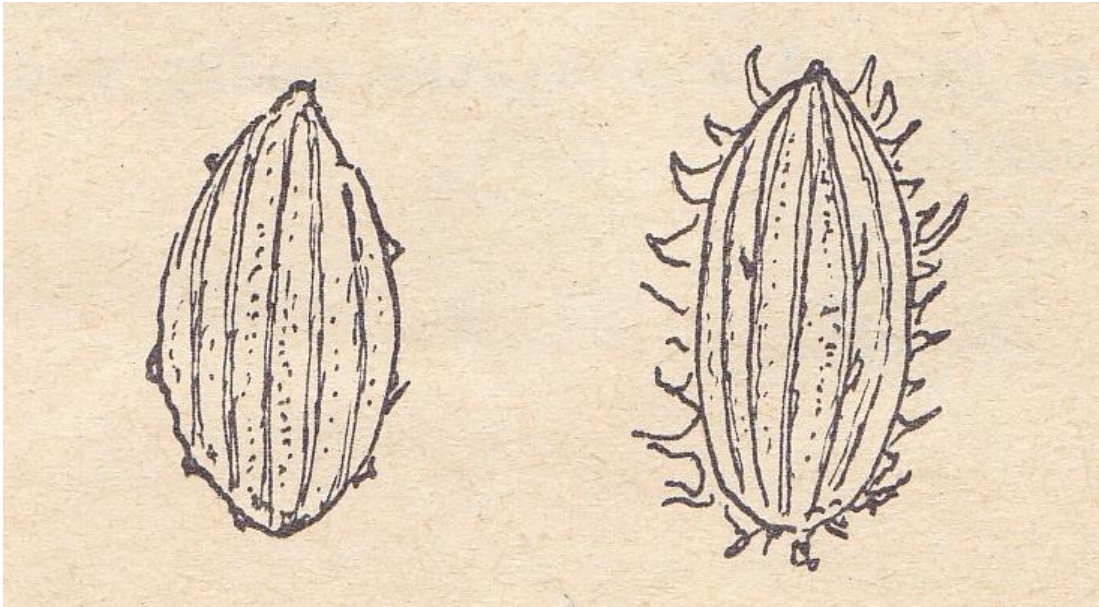
•The fruit is a diachenium which, at threshing, splits into two separate, c

Light brown coloured

•Flat on the belly side, inflated on the back side, the whole surface has

•The seeds have an intense scent

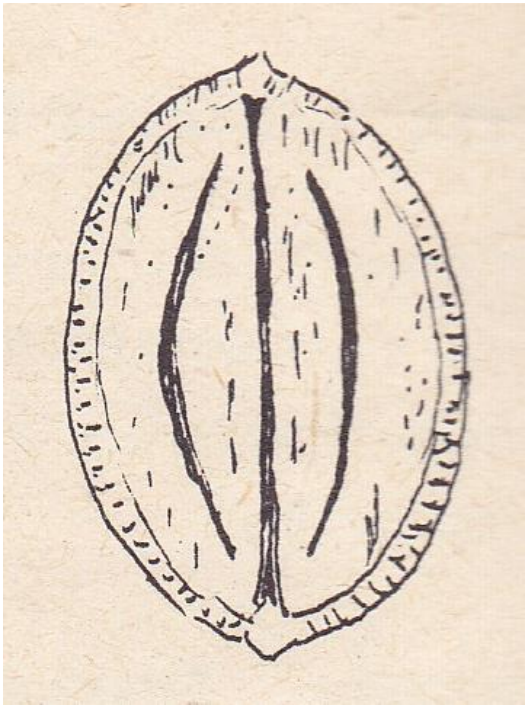
•At threshing, achenes are scrubbed off on special shellers so that the seeds do not clu

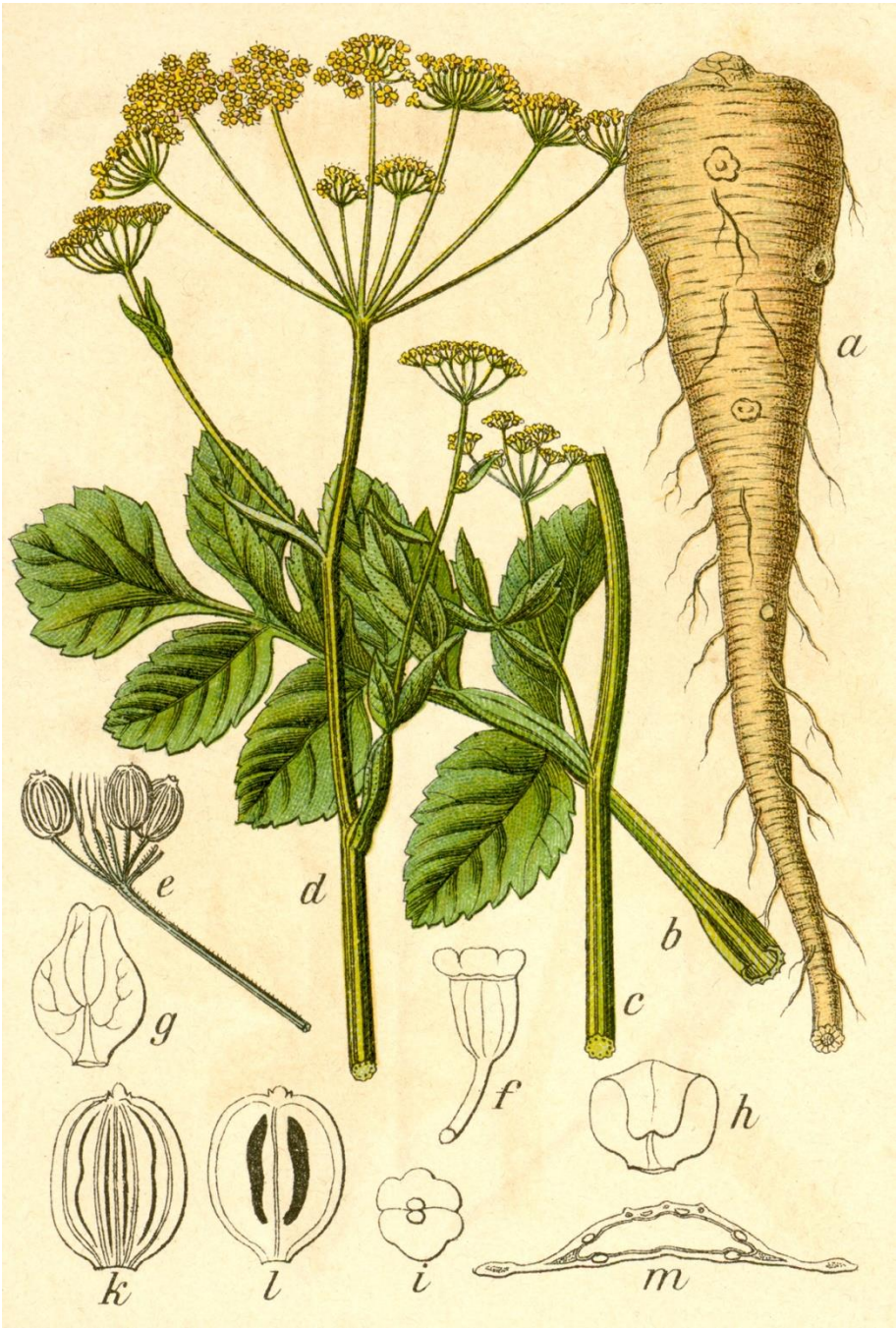


Parsnip *Pastinaca sativa* L.

The fruit is a double samara

- The seed is <u>relatively big</u>, widely oval, <u>6mm long</u>
- Ligh-brown colour, **<u>with a wide rim of a paler colour</u>**



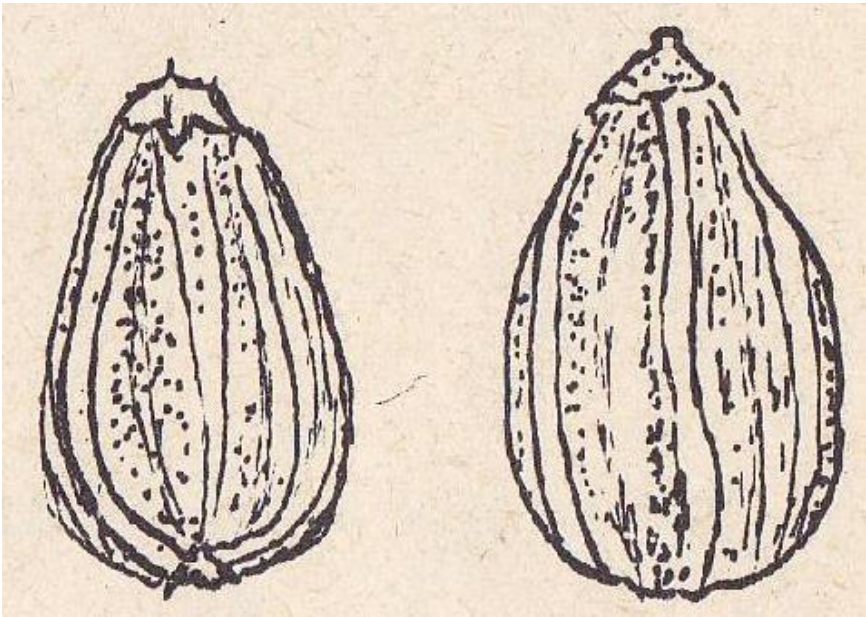


Parsley *Petroselinum hortense*

The fruit is a double samara

•The seed is flat, widely oval, 5 mm in length

Light brown coloured, with a wide rim of a paler shade

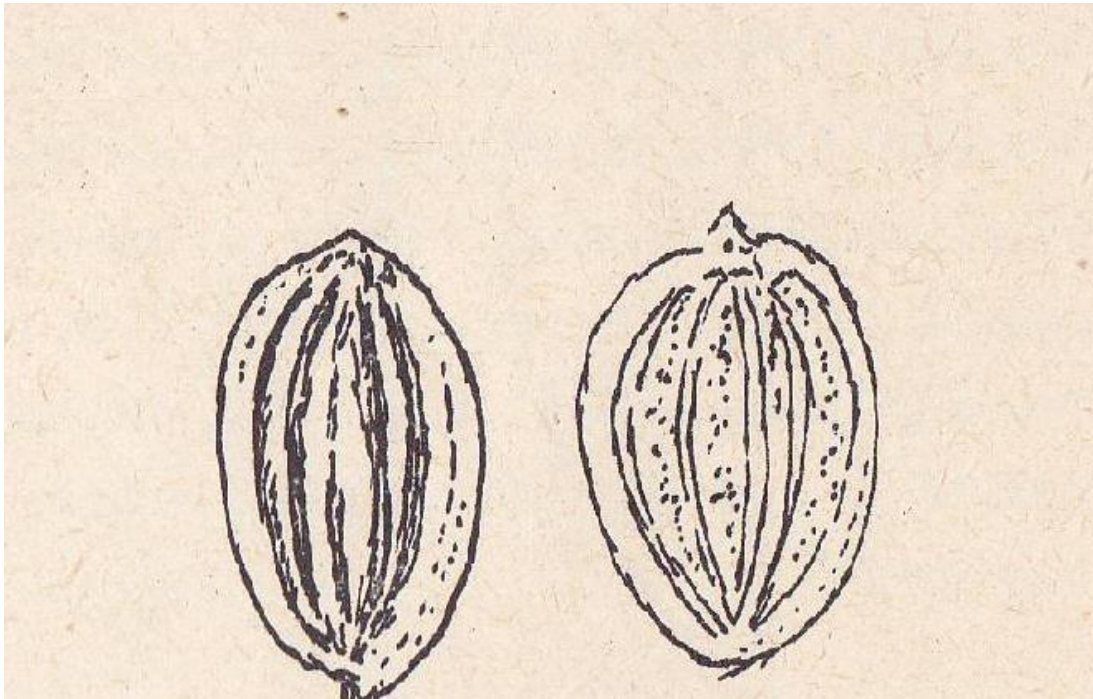


Fragrant Dill *Anethum graveolens* L.

The achenes are widely oval to elliptical

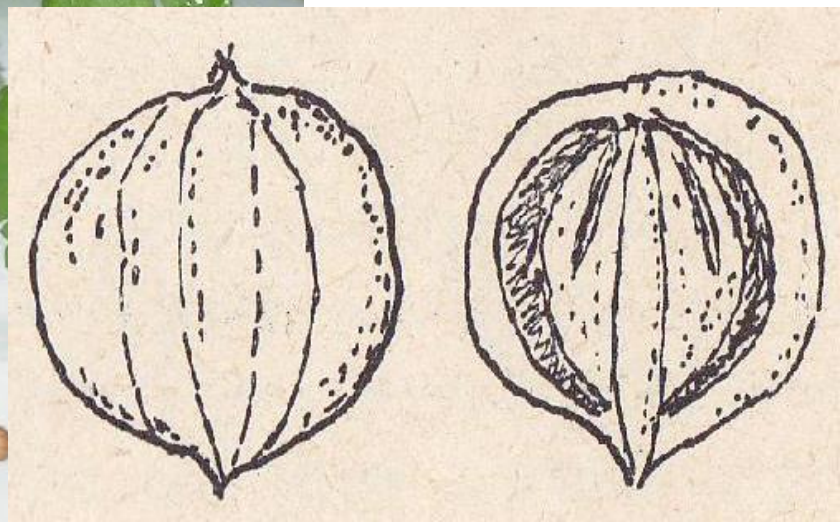
•Dark brown coloured, with a narrow rim of a paler shade

Characteristic scent and taste



Coriander *Coriandrum sativum* L.

Global fruits
•Yellow-brown
•The fruits consist of 2 or more samaras
The individual achenes of a fruit can be easily separated by a fingernail

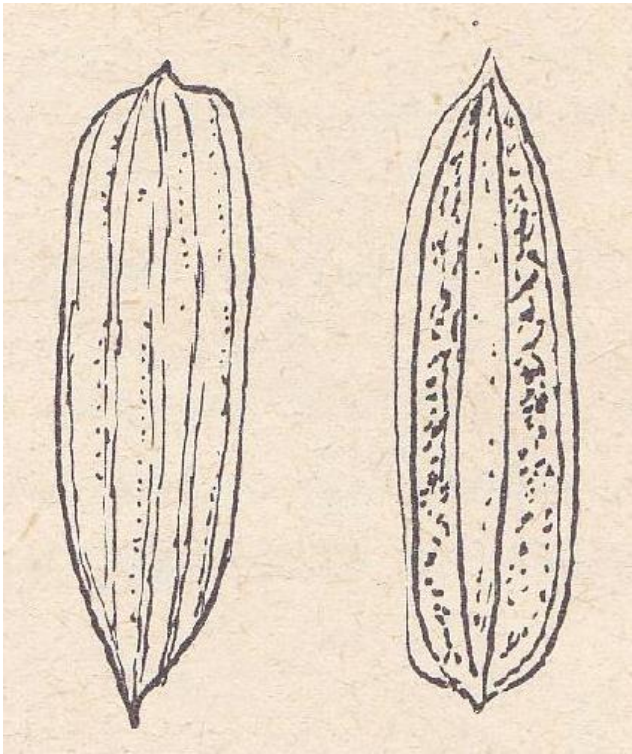


Carawa *Carum carvi* L.

- An oblong, considerably costate achene, 3-5 mm long
- Dark-browncolour
- Typical f**lavour and smell**
- The diachenium fragments into two separate achenes
- at the time of ripening

Common Fennel *Foeniculum vulgare* L.

- The achene is narrow, oval, slightly curved, markedly costate
- green-brown colour
- Typical flavour and smell

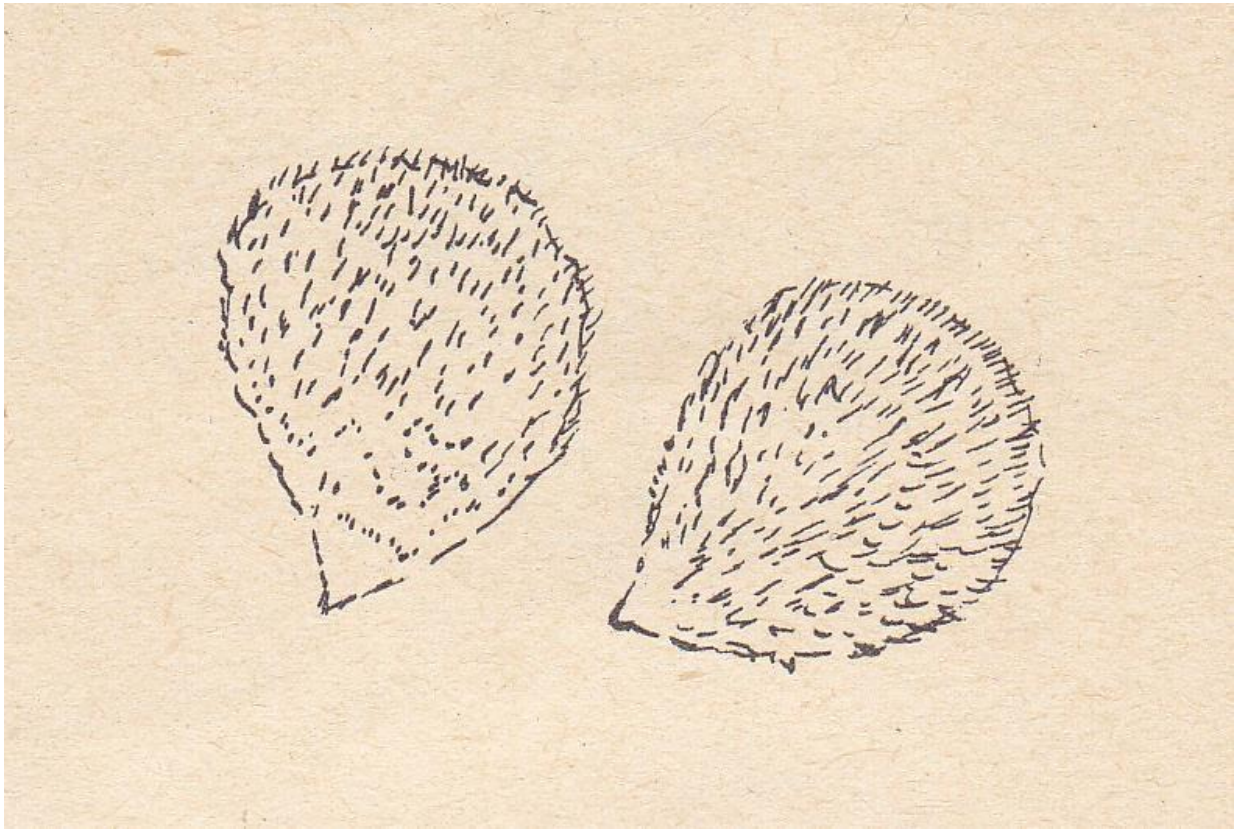


Family: Solanaceae – The Nightshade Family

Tomato, pepper, aubergine

Tomato *Lycopersicon esculentum* L.

A round, flat seed
•Light brown coloured
The whole surface of the seed is covered with **silver-grey hairs**, the seed feels like velvet



Red Pepper *Capsicum annum* L.

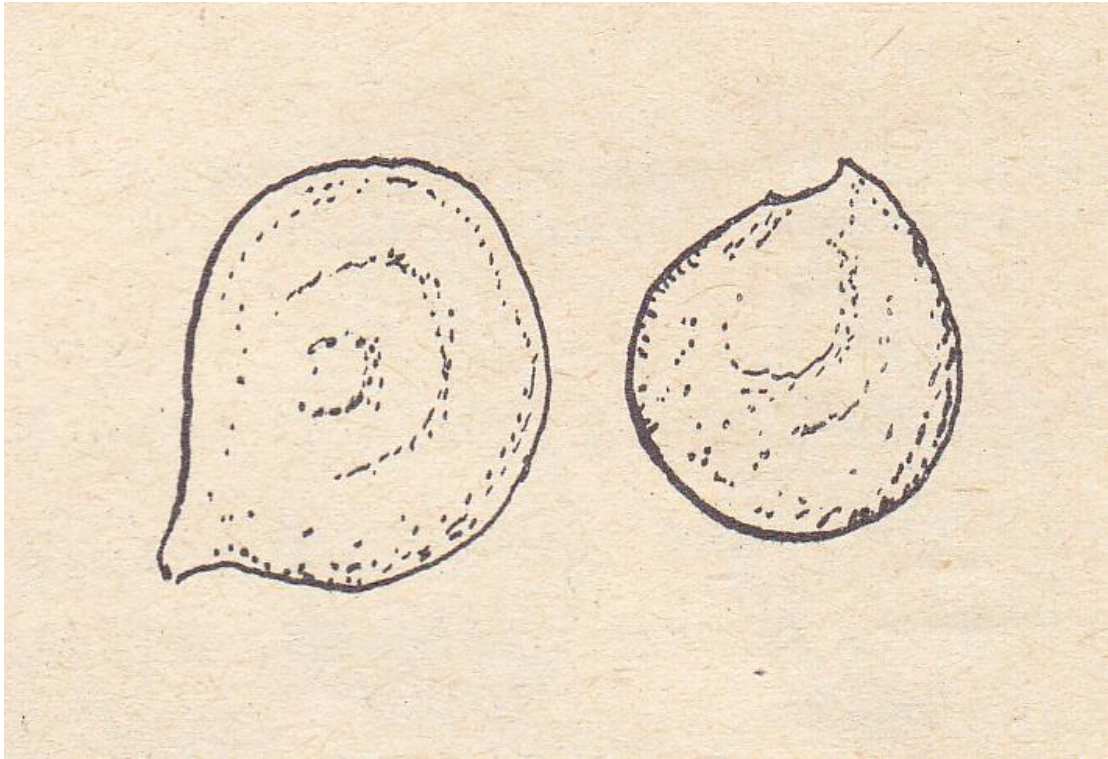
•A round seed

With a small **beak-shaped projection** in the bottom part

•**Coarse** to touch

•Of a deep yellow to orange-yellow colour

Dark seeds do not germinate



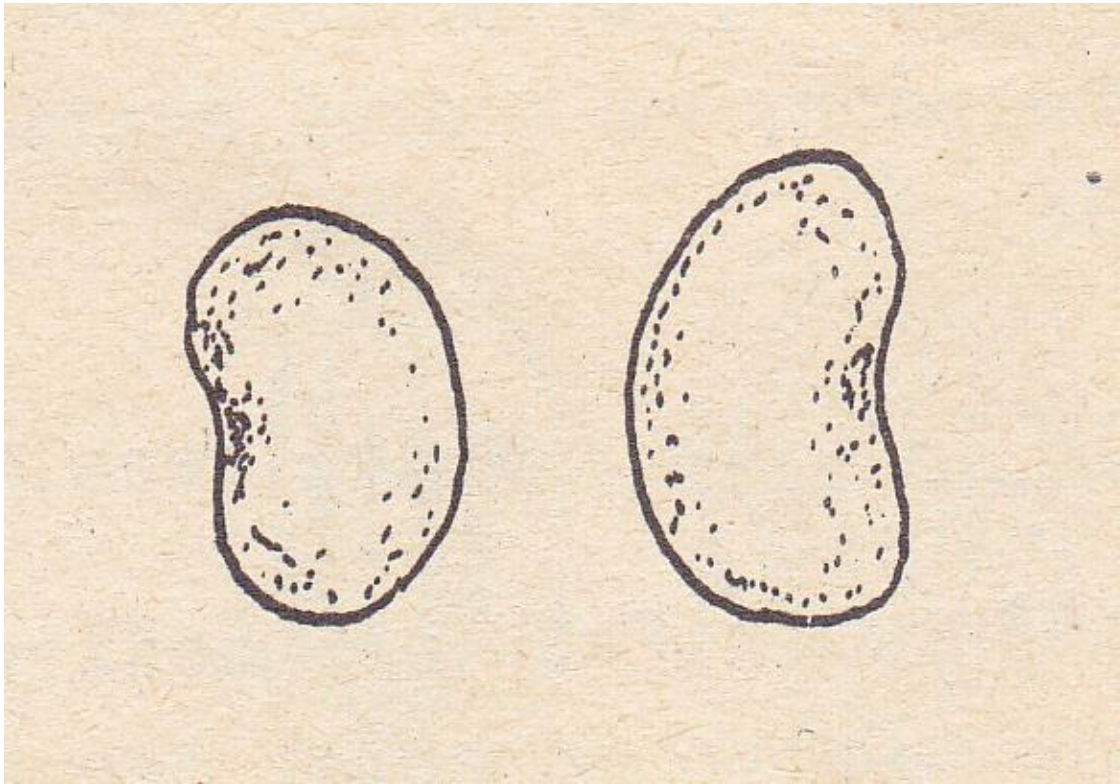
Aubergine *Solanum melongena* L.

•The seed is flat, small, having a **smooth surface**

A kidney-like shape

•With a small nick in the middle

•Mostly of a **light brown**, **pinkish**, as well as **yellow**, or possibly **black colou**



Family: Cucurbitaceae – The Cucurbits Family

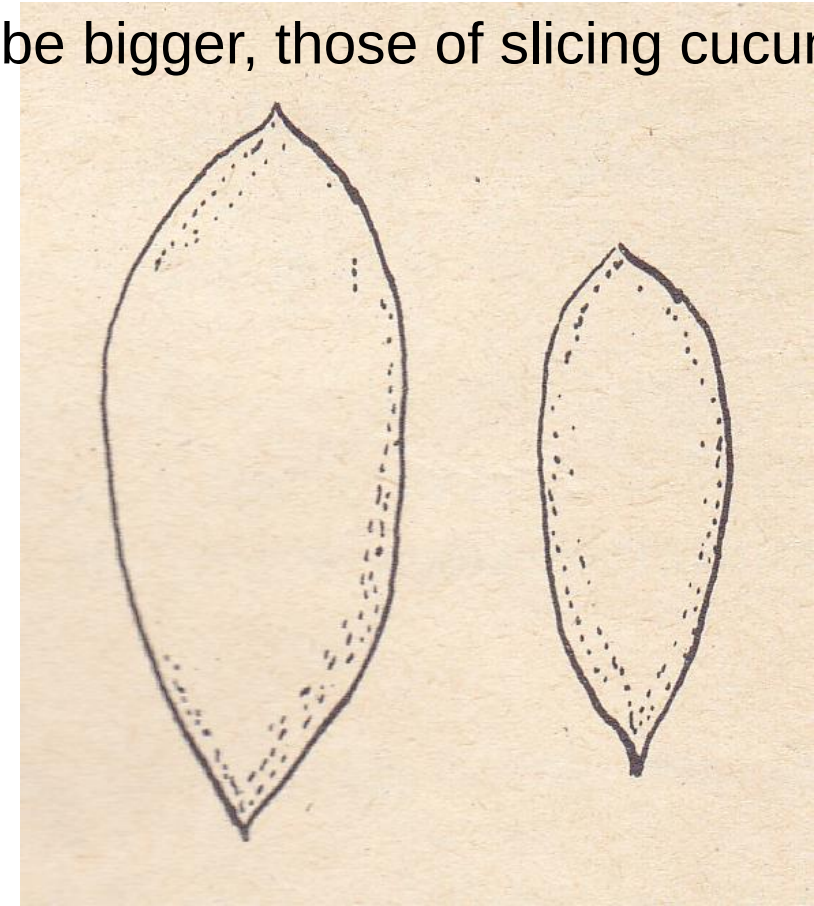
Cucumber, gourd, Siam pumpkin, muskmelon, watermelon

Cucumber *Cucumis sativus* L.

- A seed of an oblong, ovoid shape
- Rounded at the base, pointed at the vertex

Right after harvesting, the seed develops a considerable point that often goes bro

- **A beige colour**
- The seeds of pickling cucumbers tend to be bigger, those of slicing cucu



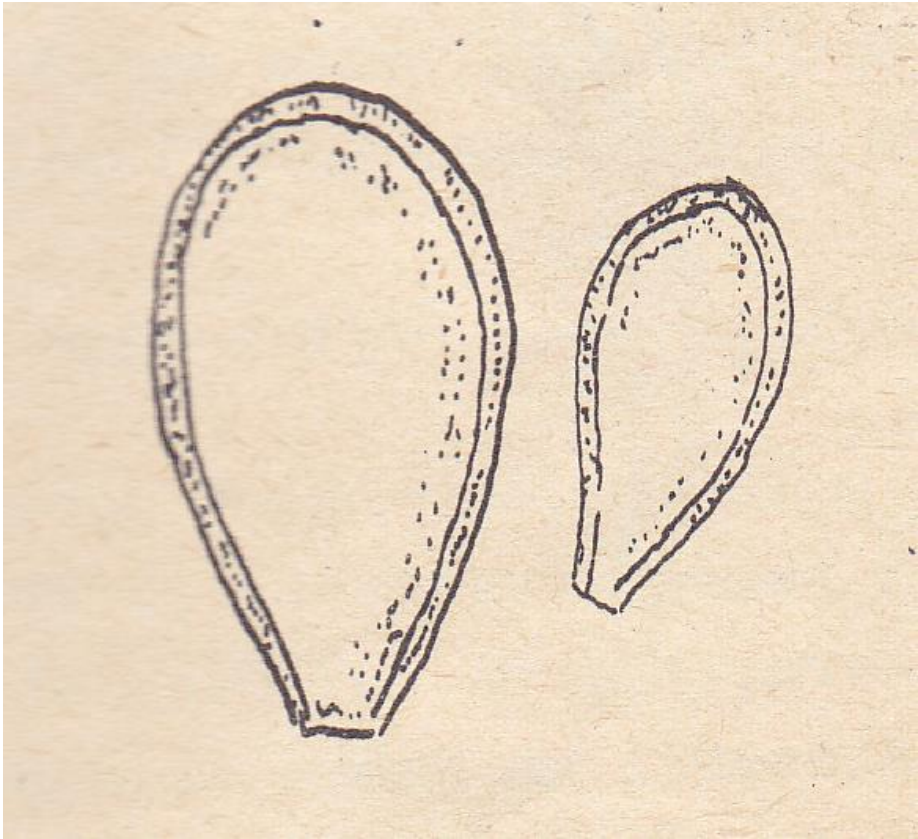
Gourd *Cucurbita pepo* L.

The seed can be of 1 cm or more and has a **blunt end**

•Of an ovoid shape, flat, with a considerable seam along the whole circu

•A **white** or a **beige** colour

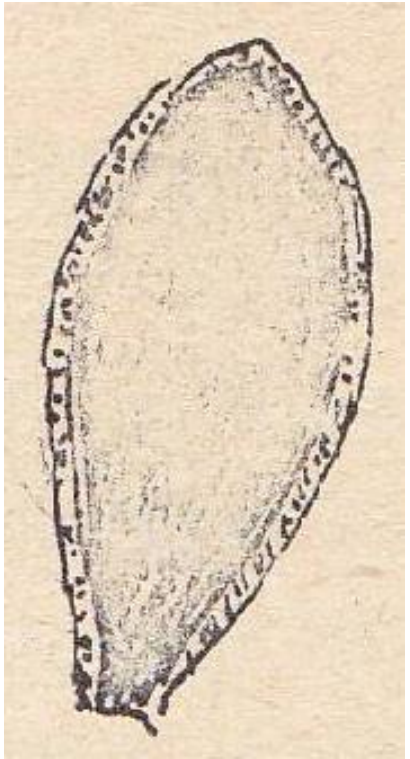
The seed of the pattypan squash is smaller



Siam Pumpkin *Cucurbita ficifolia* L.

Used as rootstock for the grafting of slicing cucumbers

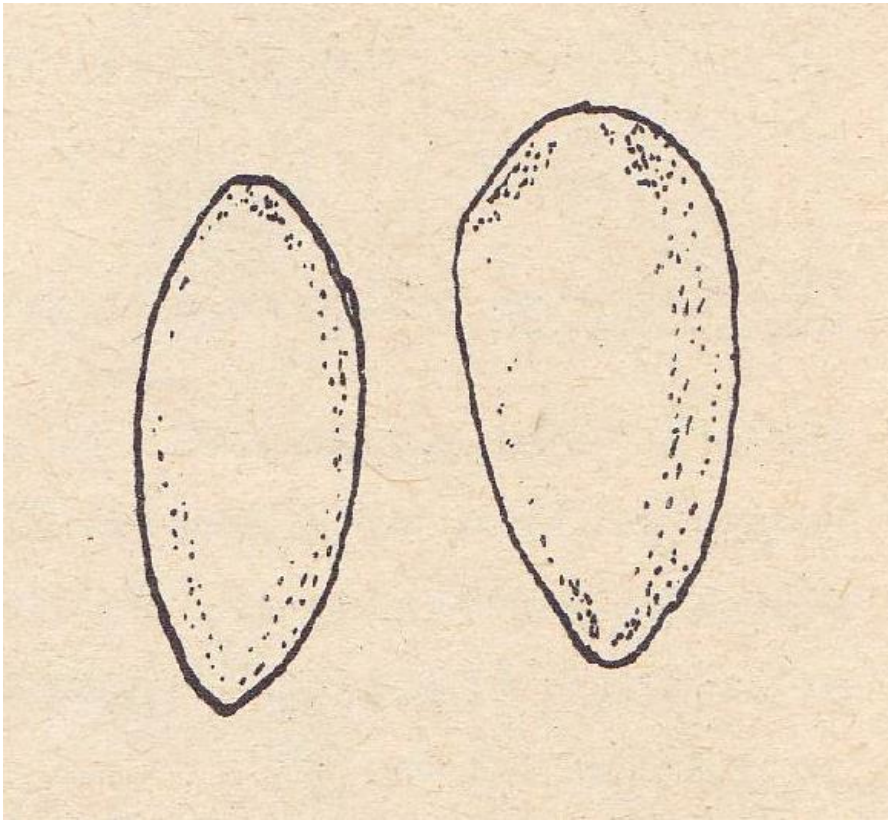
The seed is of the same shape as that of the gourd, but this seed is of



Muskmelon *Cucumis melo* L.

An ovoid seed, *being almost identical in shape with the seed of the cuc*

- **Of rather intense colours, mostly yellow-orange**
- The seed is usually bigger and thicker than that of the cucumber



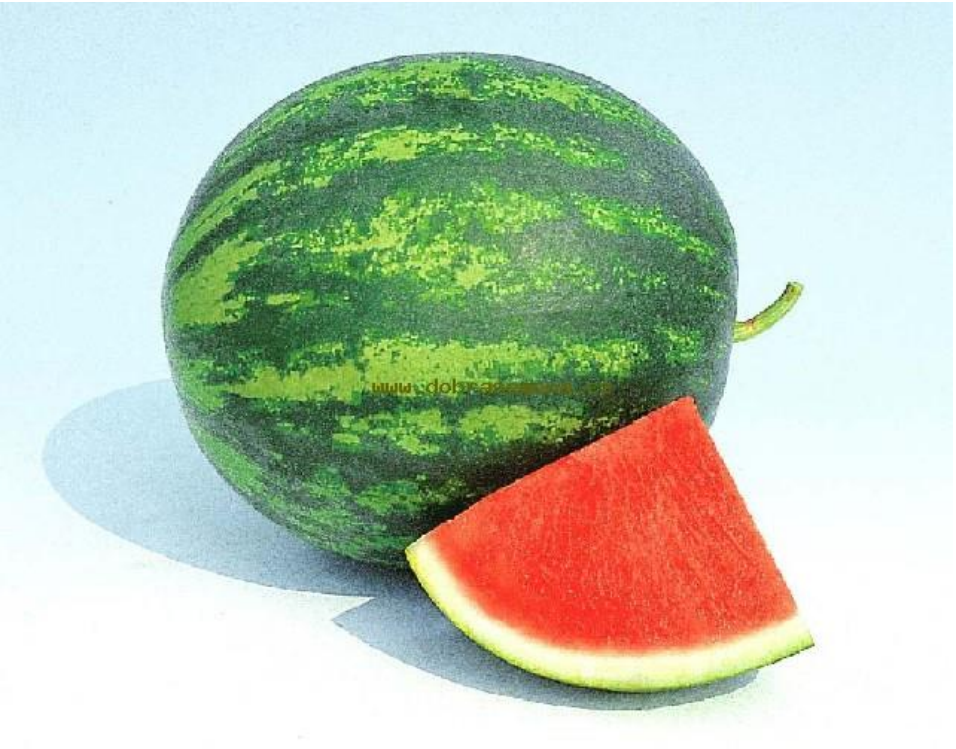
Watermelon *Citrulus vulgaris* L.

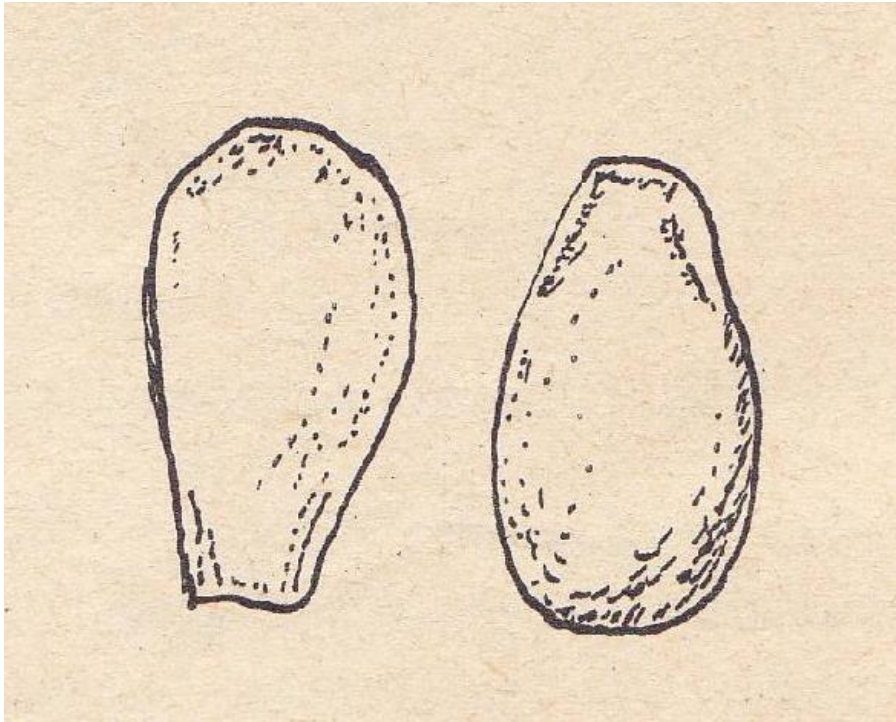
- The seed is the same size as the muskmelon seed or bigger

The seed is rather thick with a trace of a seam in the bottom part

- The seed colour is a cultivar characteristic – from a **light brown**, to a **re**

The seed has a blunt end and is dented in the bottom part





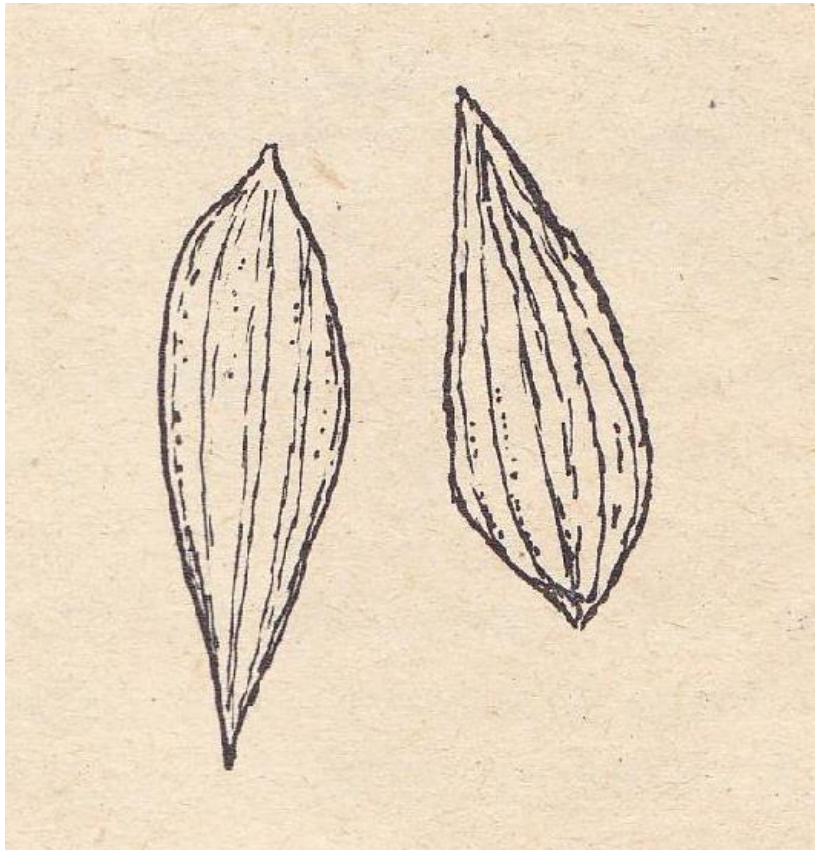
Family: Asteraceae – The Aster Family

Cabbage lettuce, endive, witloof chicory, black salsify, artichoke

Cabbage Lettuce *Lactuca sativa* L.

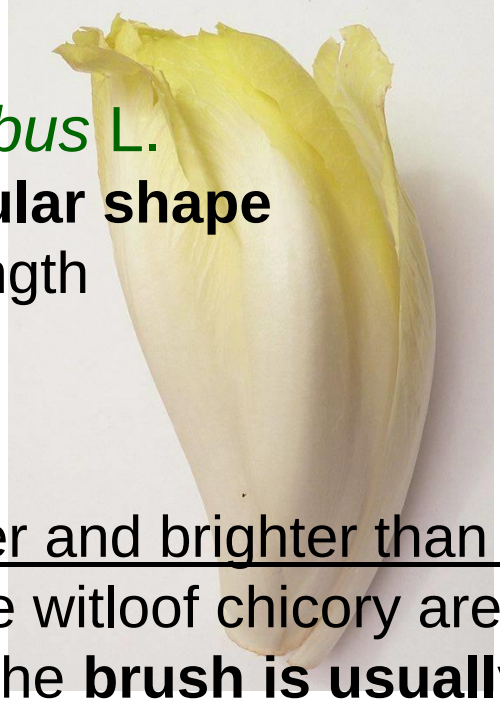
The fruit is an oblong, costate achene with a blunt tip

- **The colour is a cultivar characteristic – dark brown** or **silver-grey**
- Smooth to touch and shiny
- When touched, the seeds give a nice feeling of cold (the spaces between the ribs filled



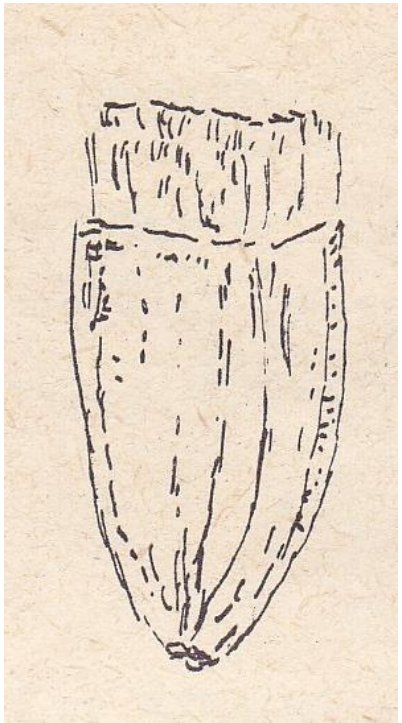
Witloof Chicory *Cichorium intybus* L.

- **Light brown achenes of an angular shape**
- **Markedly costate** in the entire length



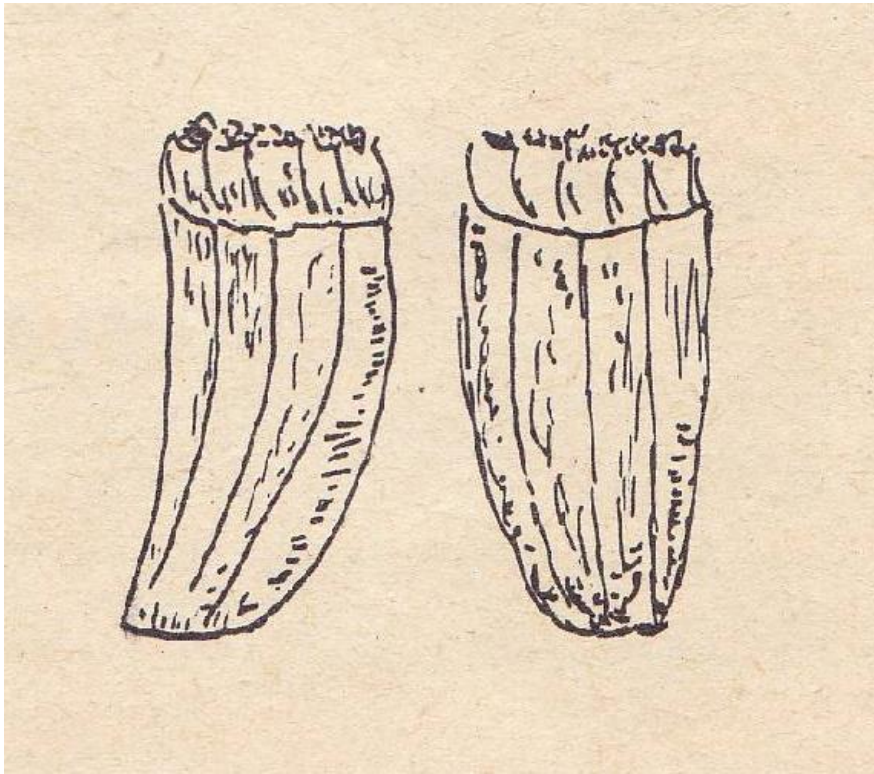
<u>The colour of the achenes is deeper and brighter than that of the endive</u>

- The achenes of the endive and the witloof chicory are identical in shap
- At the vertex of the chicory seed, the **brush is usually missing** and it



Endive *Cichorium endivia* L.

The fruit is a light brown or beige achene
•Rather wide at the vertex
Often with a **sessile, short brush**



Black Salsify *Scorzonera hispanica* L.

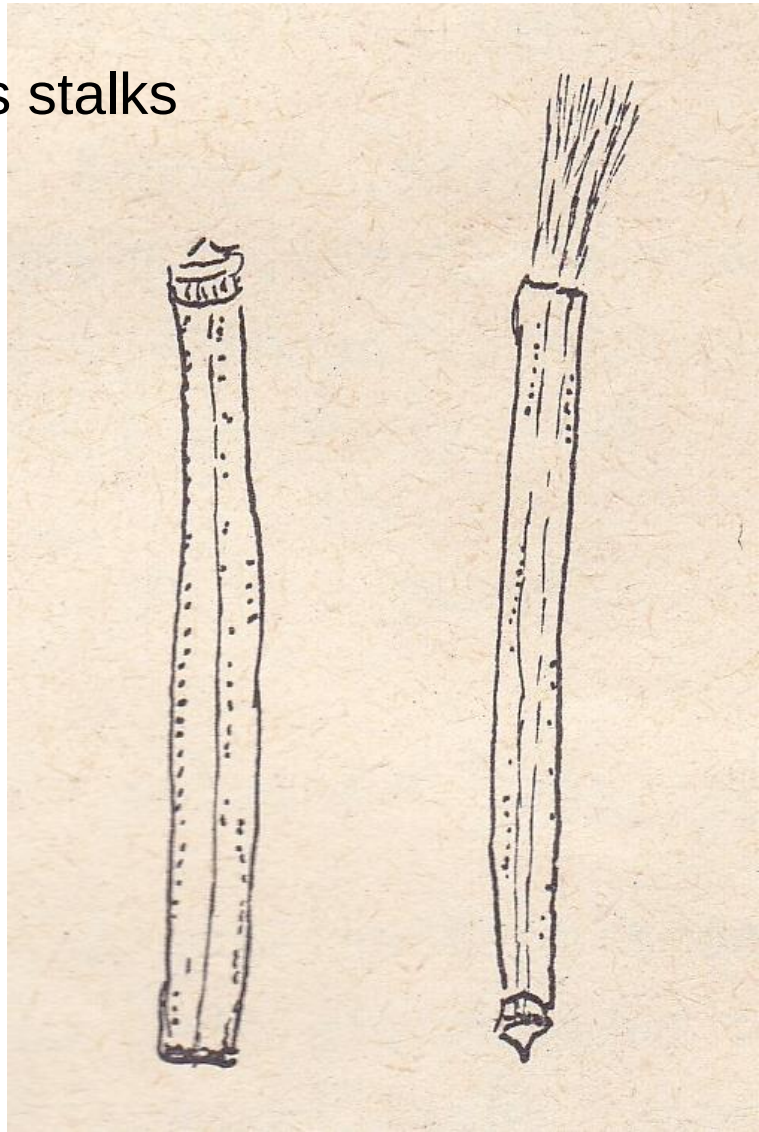
•A long, narrow achene of around 2 cm in length

A beige to straw yellow colour

•The achene resembles fragments of grass stalks

•There is often a fluffy brush at the vertex

– A parachute (comes off easily)

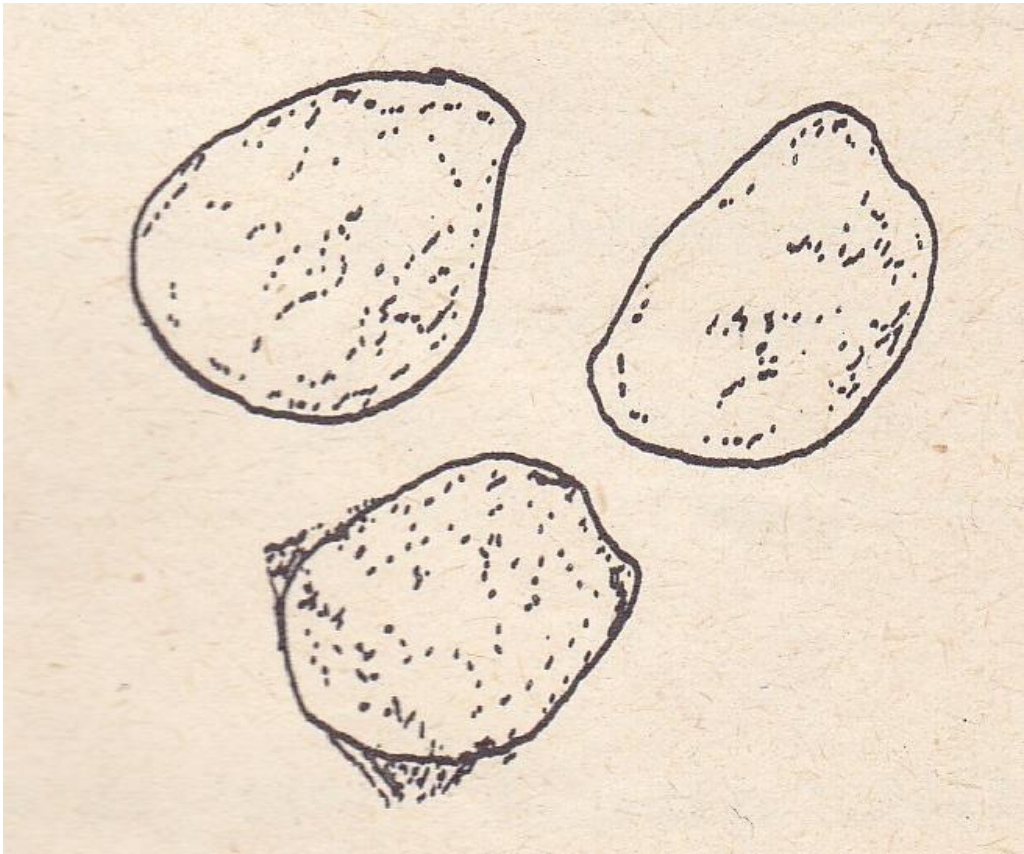


Family: Chenopodiaceae – The Chenopod Family

Spinach, red beet, Swiss chard

Spinach *Spinacia oleracea* L.

Spinach seeds are of an irregular globular shape
•Slightly wrinkled, coarse to touch
•**Green-brown**, but also **beige** and **dark brown**
Not unified to a high degree as to the shape, size or colour



Beetroot *Beta vulgaris var. conditiva*

Similarly to the sugar beet, the red beet forms seed balls containing sev
•The seed balls are smaller than those of the sugar beet
The seeds can be infallibly recognised only by the red-purple colour of th

Swiss Chard *Beta vulgaris var. flavescens*

Tiny seed balls of the same shape as the beet seed balls

Family: Mezembryathemaceae – The Ice Plant Family

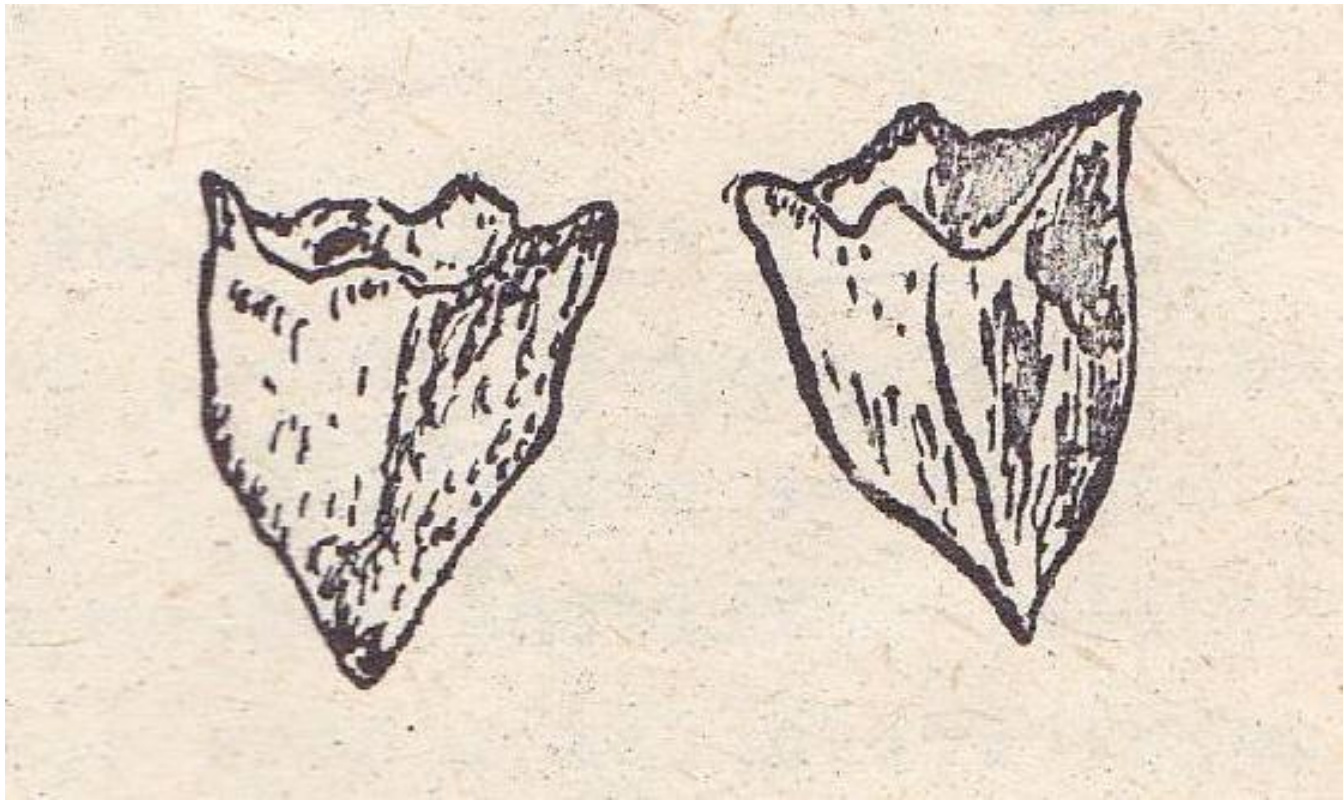
New Zealand spinach

New Zealand Spinach *Tetragonia expansa* L.

•The seed is of a relatively **big size of 1 cm** and of a dark brown to a gre

•Heavily encrusted and asymmetrical

Noticable **four pointed tips**

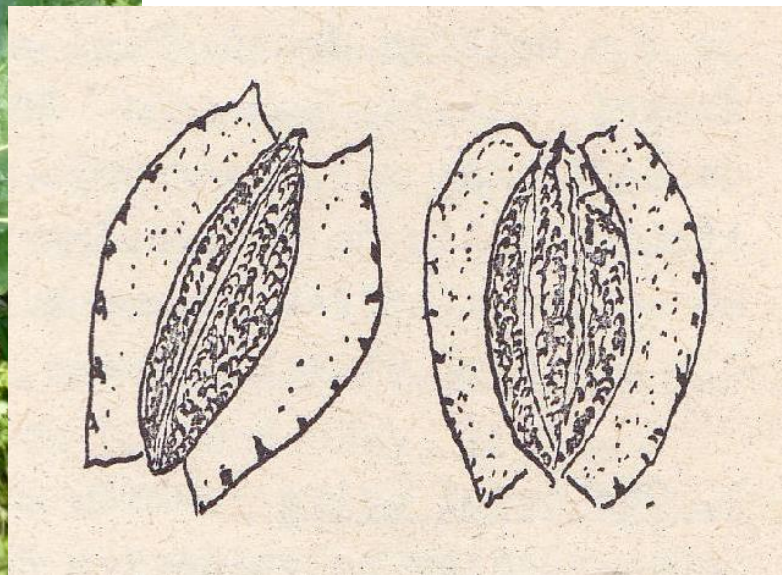


Family: Polygonaceae – The Persicary Family

Rhubarb

Rhubarb *Rheum rabarbarum* L.

•Triple-achenes of around 1 cm and of a chocolate to red-brown colour
Bitterish taste



Family: Brassicaceae – The Crucifer Family
COLE CROPS

Head cabbage, Peking cabbage, Chinese cabbage, savoy cabbage, Brussels sprouts, savoy, cauliflower, broccoli

- **The seeds are very similar to each other and cannot be infallibly distinguished from each other**

- Differentiation possible by the shape and pappus of the seed leaves, a reliable differentiation only by the first true leaf

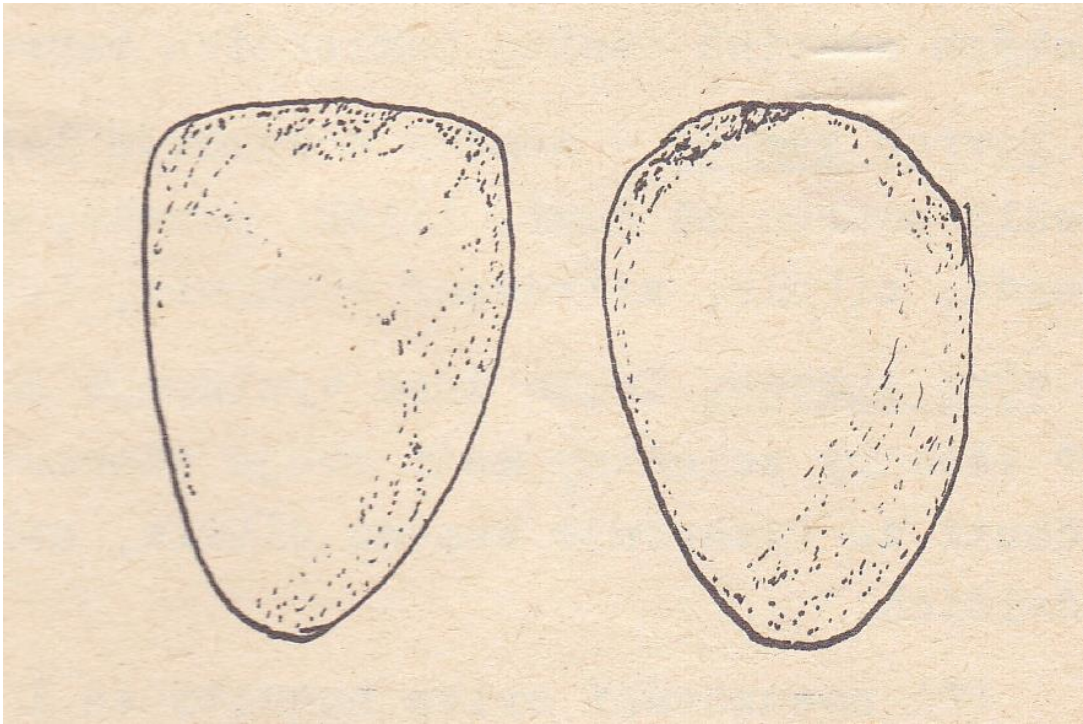
Radish *Raphanus sativus* L. var. *niger*

- The fruit is a silique – a dry dehiscent fruit containing 4-5 seeds

The seed of a light brown to red-brown colour

- An ovoid to global shape
- Irregularly dented
- Bigger than the small radish seed

The colour of the hypocotyl is always green



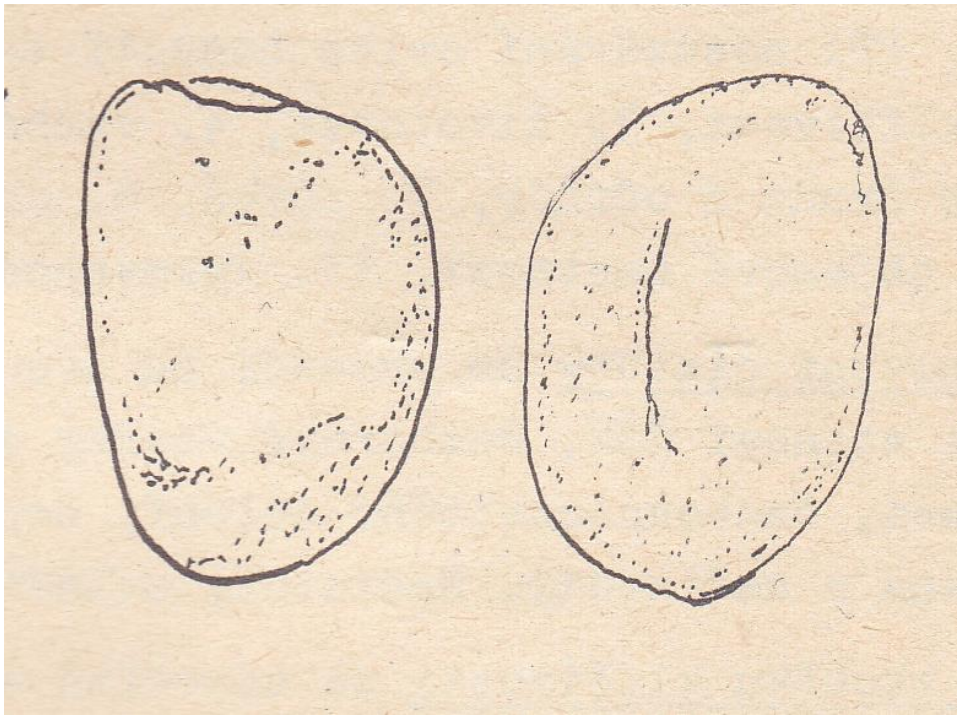
Small Radish *Raphanus sativus* L. var. *radicula*

The fruit is a silique

•The seed of a light brown to pink-red colour, pruinose

•An irregular global shape

By a quarter smaller than in radishes



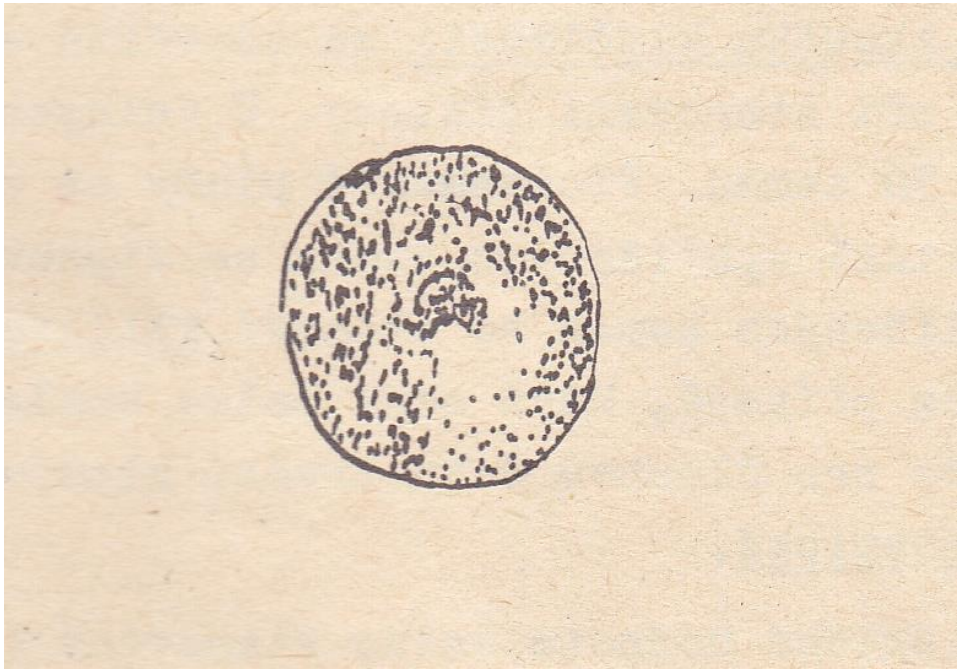
Turnip *Brassica rapa* L. var. *rapifera*

The seed of a global shape, being around 1 mm in diameter

•Brown-red, dark

The superficial cells do not contain any mucilage,

due to which the seed – when moistened – can be distinguished from the seeds of cole crops

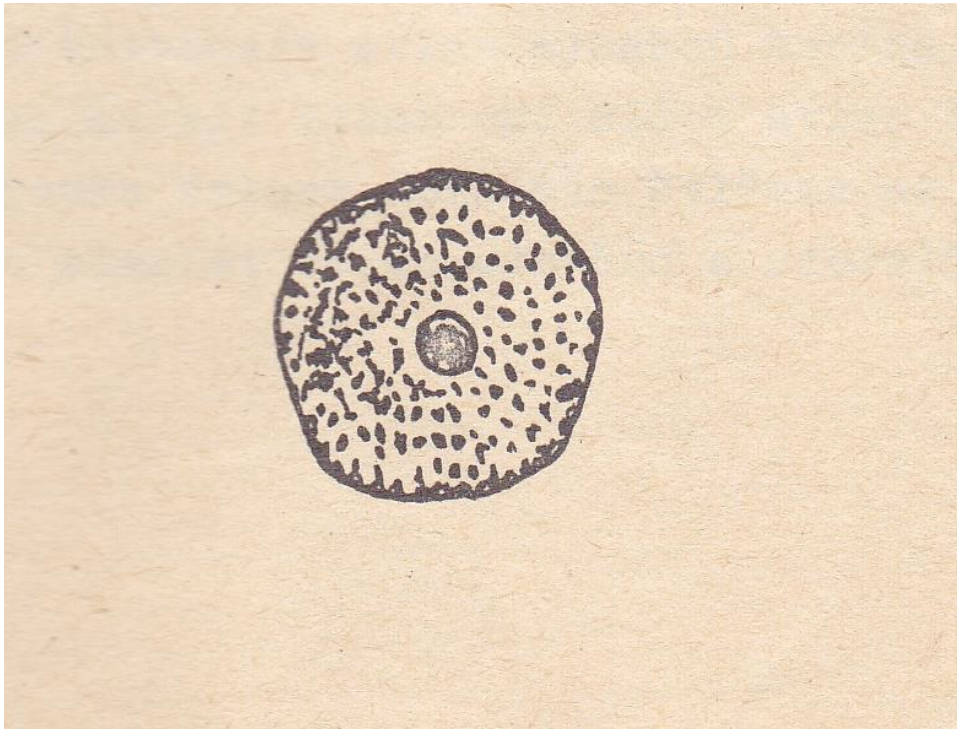


Swedish Turnip *Brassica napus* L. var. napobrassica

The seed of a global shape, 1.5-2 mm in size

- A dark brown to brown-red colour
- The superficial cells do not contain any mucilage

A reliable differentiation only by a vegetation test



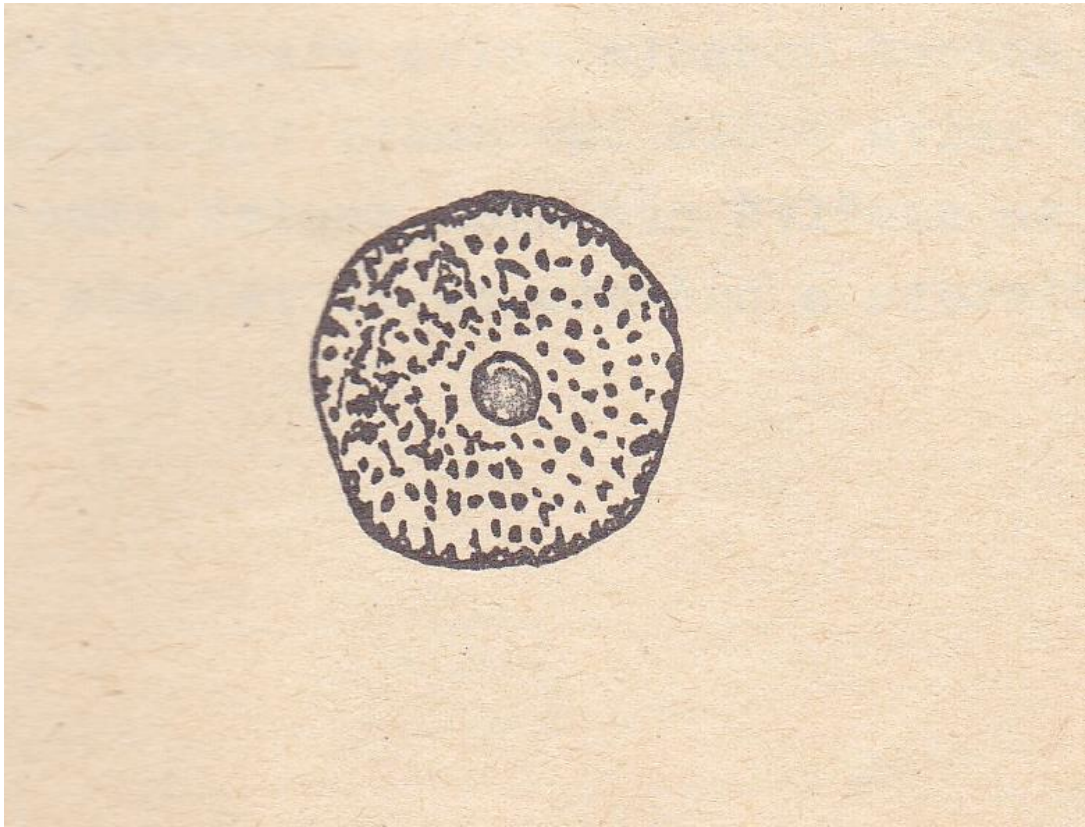
Cabbage, Kale, Cauliflower, Broccoli, Kohlrabi

Brassica oleracea .....

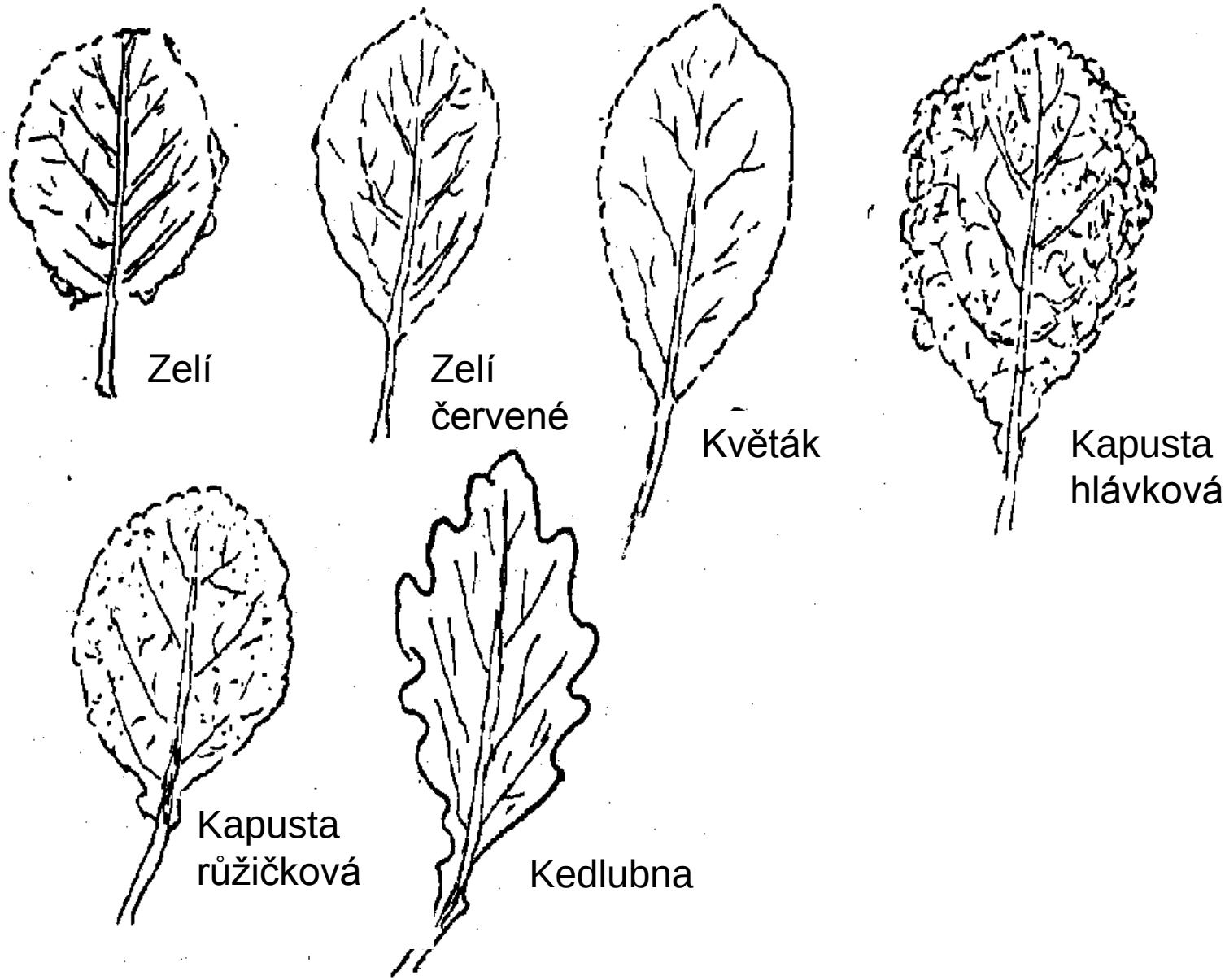
•The seed of a global shape, 1.5-2 mm in size

•**The superficial cells contain mucilage**

A reliable differentiation only by a vegetation test



Differentiation of Seedlings of Cole Crops by the **First True Leaf**



Family: Gramineae – Grasses

Sweet corn

Sweet Corn *Zea Mays* L. ssp*. sacharata*

•Seeds of a yellowish, beige, or yellow colour, **with a glassy, shiny surface**, **wrinkled**, coarse to touch