Food Microscopy

Excercise

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Topic exercise:

The microscopic identification of adulterated foodstuffs

Vegetable raw materials used for adulteration:

- **Starch (Corn, Potato)**
- **Flour (Wheat, Rye, Soy)**
- **Soy**
- **Fiber**
- **Carrageenan**

Raw vegetable materials

- meat products contains some raw vegetable materials

Classification :

- **materials with impact to structure of products**

  flour, starch, soy protein, fibrous material, carrageenan

- **materials with impact to taste and aroma products**

  spice, vegetable

Raw vegetable materials

- in meat product we can take control of forbidden raw vegetable materials.
- Their presence is given by **national legislation**. Composition is defined for some type of meat products (fermented meat products…)

Starch and flour – identification principle

Starch :

- **only the starch granules**

Flour :

- **the main part - starch granules**
- **contain the seed (caryopsis) – seed coat, pericarp**

Starch granules

Starch is present in most plants and is used frequently as storage. So seeds and tubers, wheat and potato, have a high percentage of starch. Starch occurs in starch granules. They are many different -

Shapes:

Ovoidal, eliptical, lenticular multilateral, …

Large:

1 – 150 µm

Nucleus:

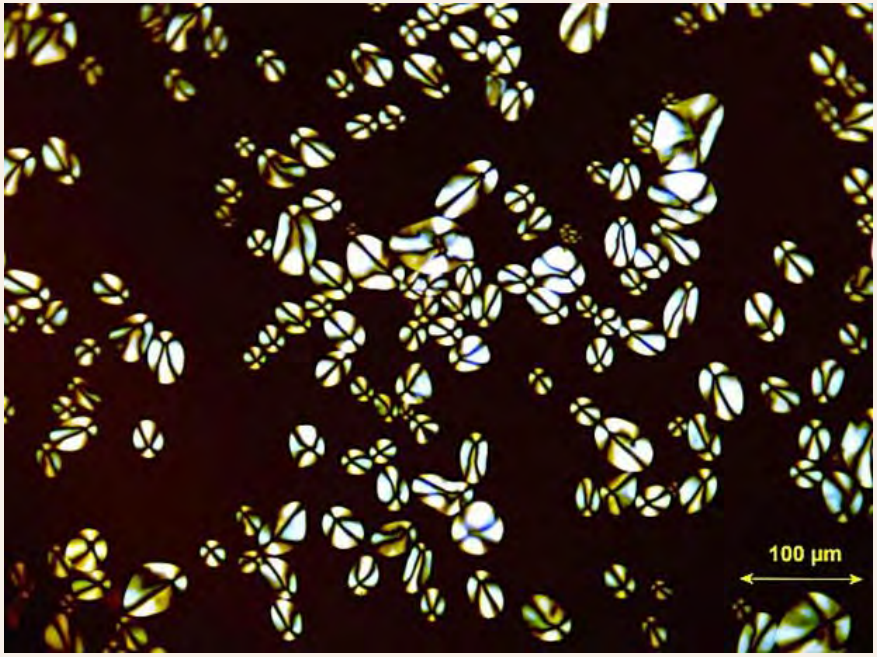
-look as black round cavity, filled with air

-Grain with a single nucleus is simple

-Grain with a multi nucleus is composed

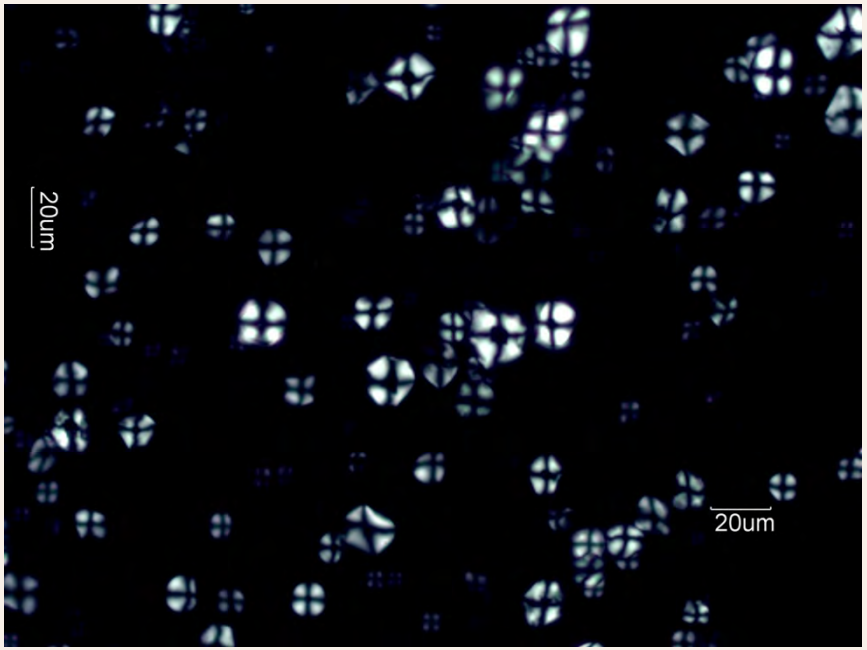
-in a polarized light we can see dark cross in the starch structure

Starch in a polarized light



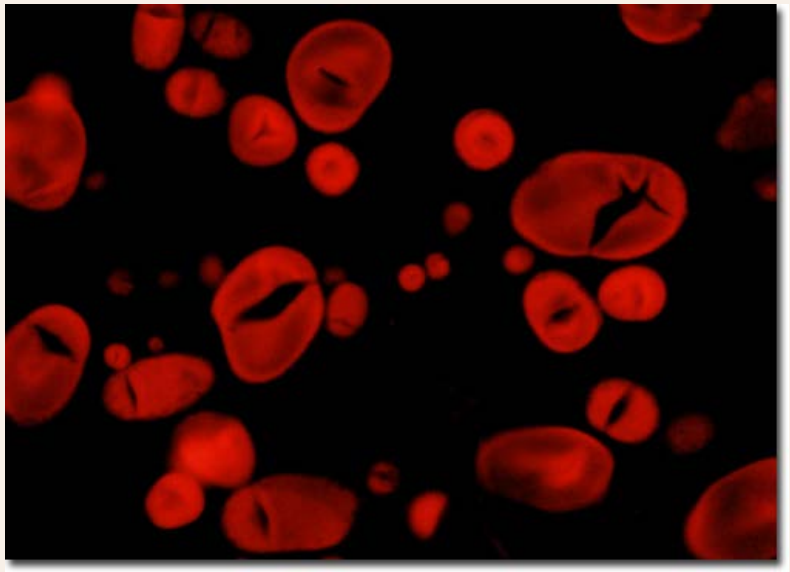
Here is a picture of potato starch in polarised light

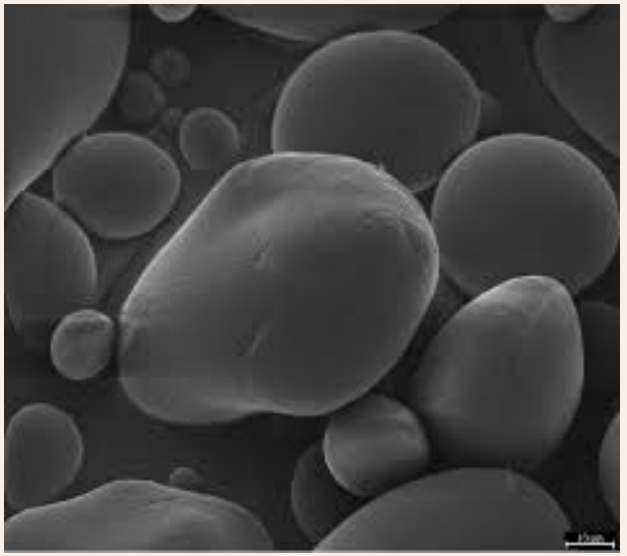
Here is a picture of corn starch in polarised light



Potato Starch

-has a largest grain (70 - 100 um)
-grain are ovoidal or eliptical
-nucleus of the potato starch is in the narrow end
-has excentric layering





Photos: Potato Starch as seen under Fluorescence and SEM

Potato starch

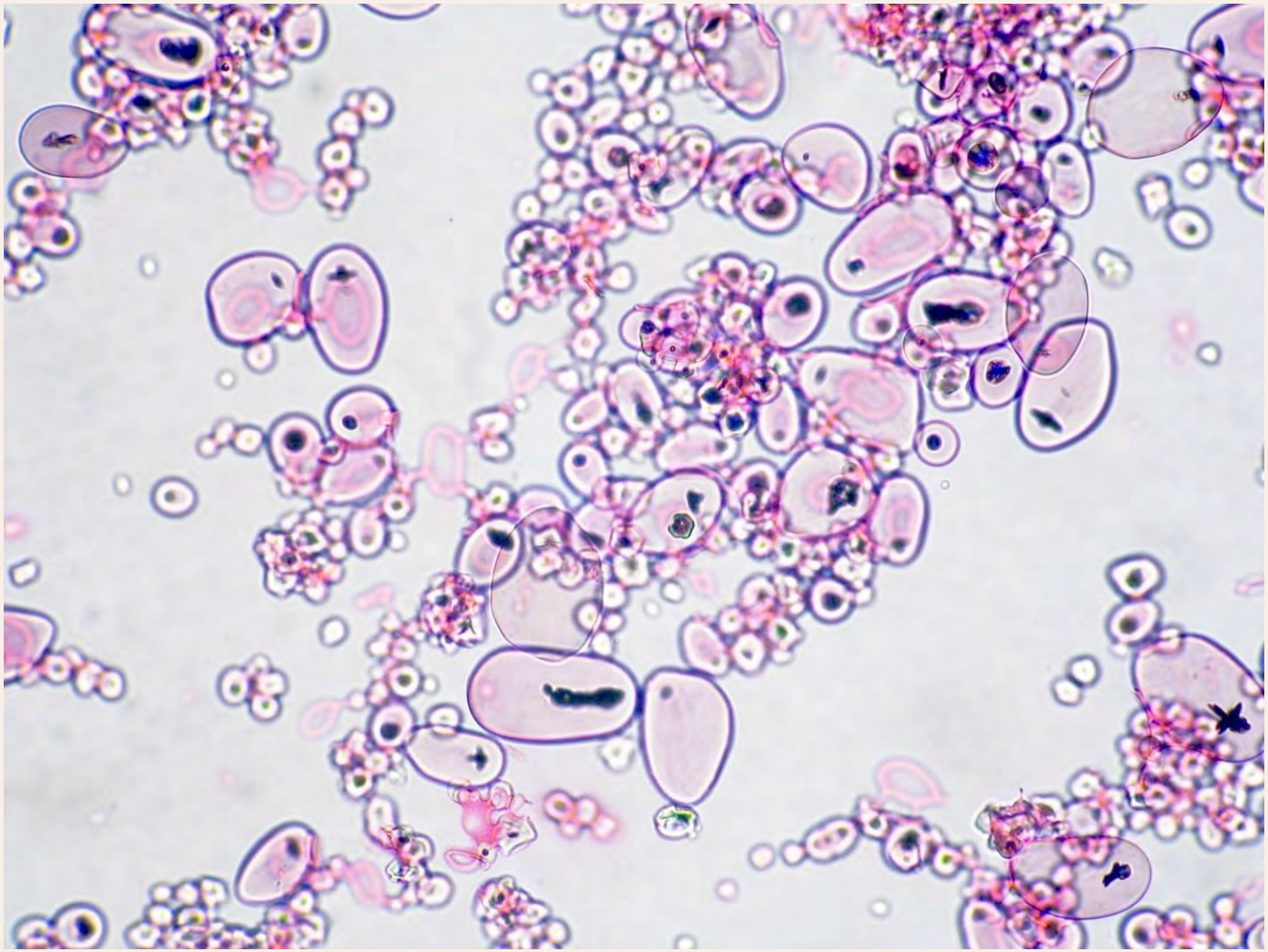


Photo: Potato Starch and Corn Starch as seen under Light Microscopy – Staining:Hematoxylin-Eosin (HE) **Enlargement :200x**

Potato starch in meat product

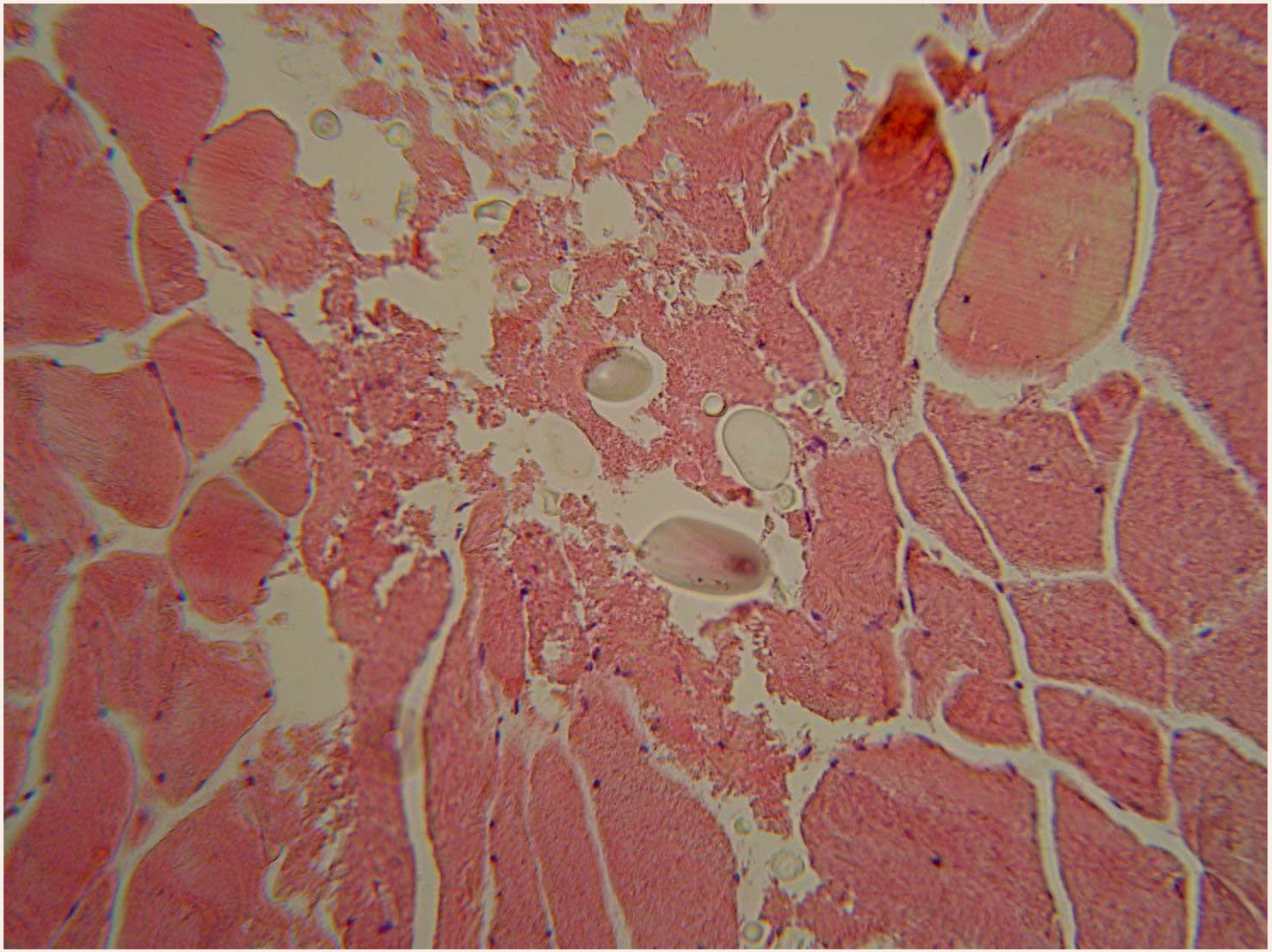


Photo: Potato Starch in meat product as seen under Light Microscopy

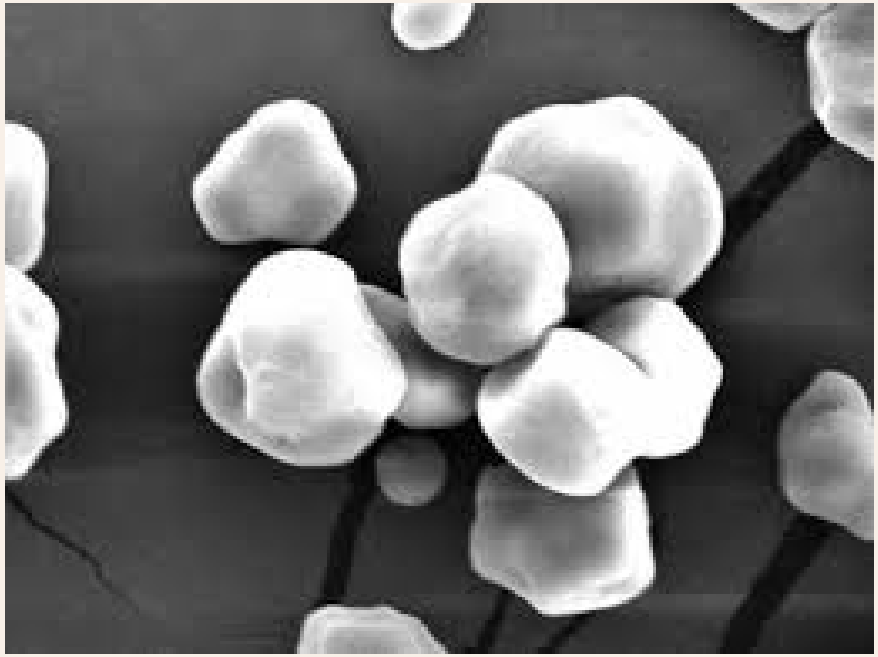
Samples for the study-Potato starch

Box No. 2:

order	block No.	description
12.	215/05	Potato starch
13.	215/05	Potato starch (HE)

Corn Starch

-has a multilateral grain
-star shape rift in the middle structure
-layering is not evident
-has a small grain (8 - 20 um)



Photos: Corn Starch as seen under Light Microscopy and SEM

Corn starch

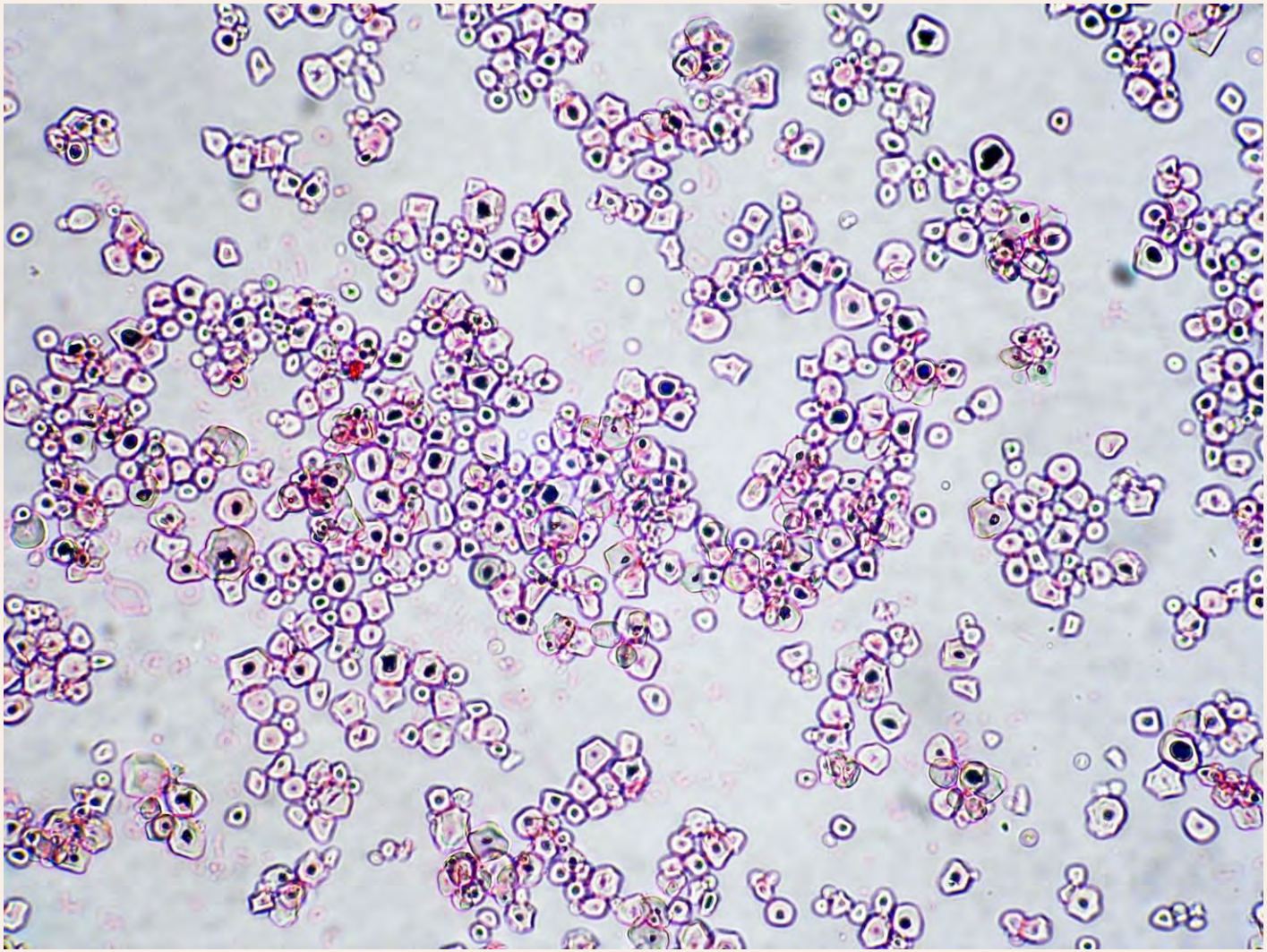


Photo: Corn Starch as seen under Light Microscopy **HE 200x**

Corn starch in meat product

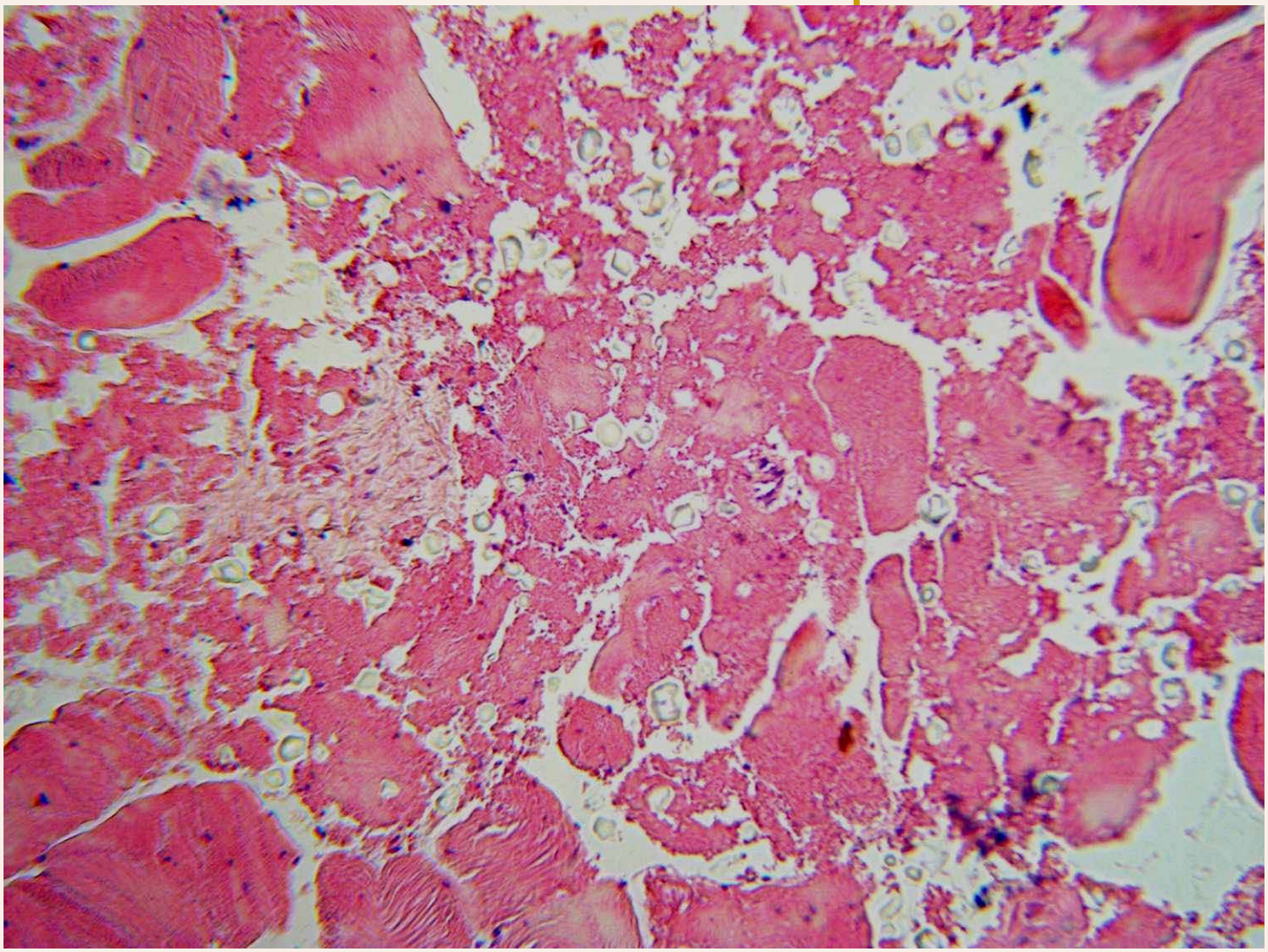


Photo: Corn Starch in Meat Product as seen under Light Microscopy

Samples for the study- Corn starch

Box No. 2:

order	block No.	description
15.	216/05	Corn starch (HE)

Wheat Starch

-has a dual gran
-the big grain are 12-41µm long
-the small grain are 2-8 µm long
-lenticular shape

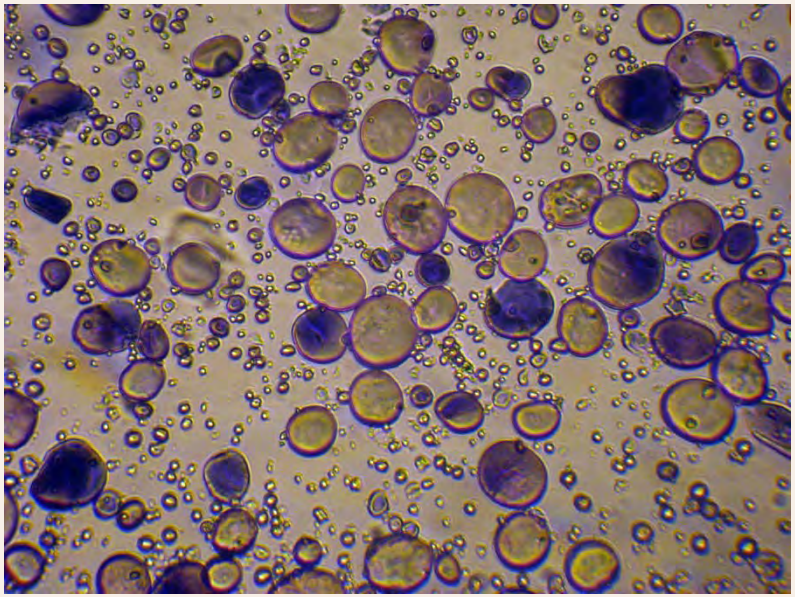


Photo from light microscope, wheat starch granules stained with iodine

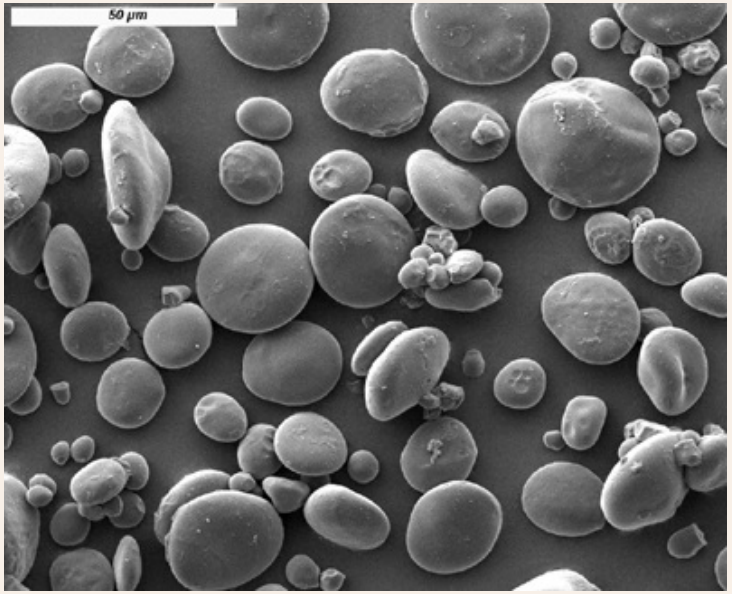


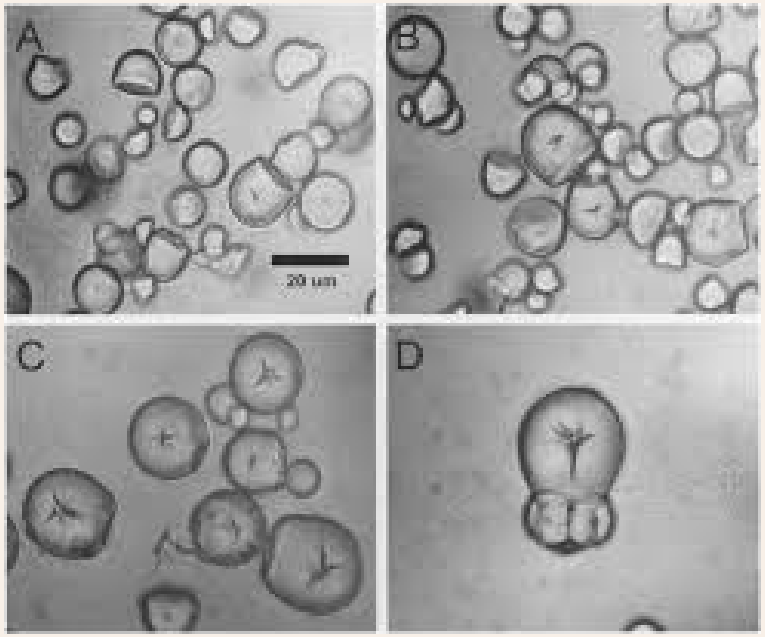
Photo from SEM: wheat starch

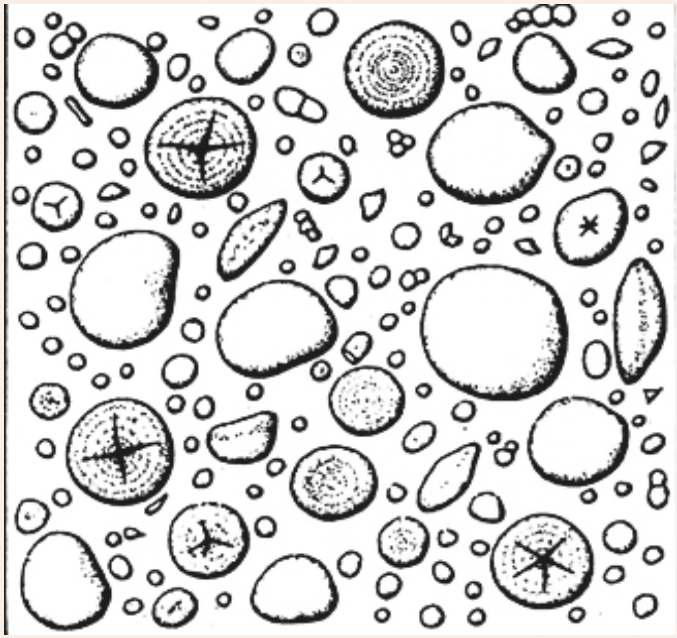
Rye Starch

Grain of the Rye starch looks like the grain of the Wheat starch

BUT

The big Grain (14-47µm) has star shape rift in the middle of its structure, the small grain are 2-9 µm long



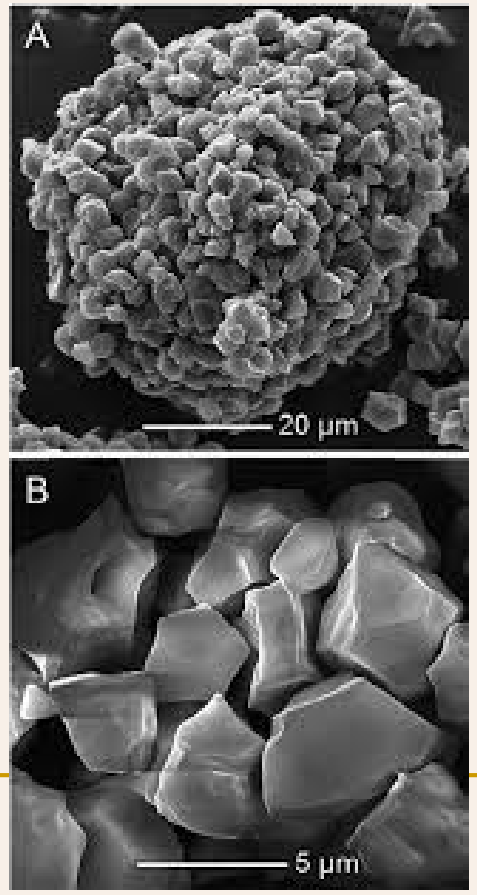


Photos from light microscope

Other type of Starch

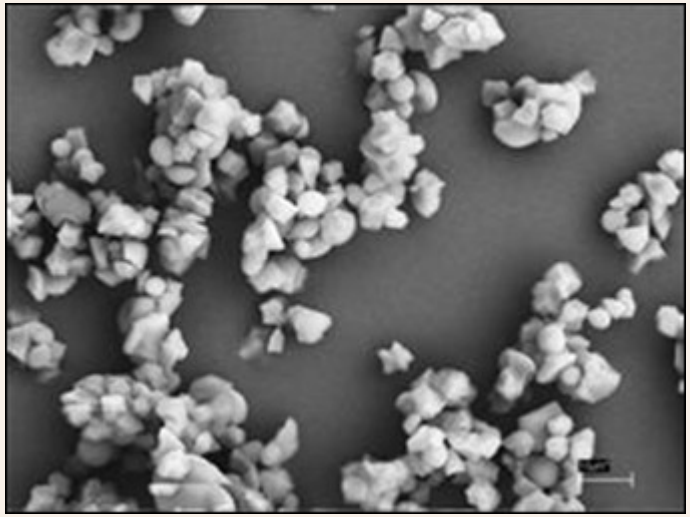
Rice starch

-is wery small (3-7µm)
-has punctate nucleus in the middle of its structure



Oat starch

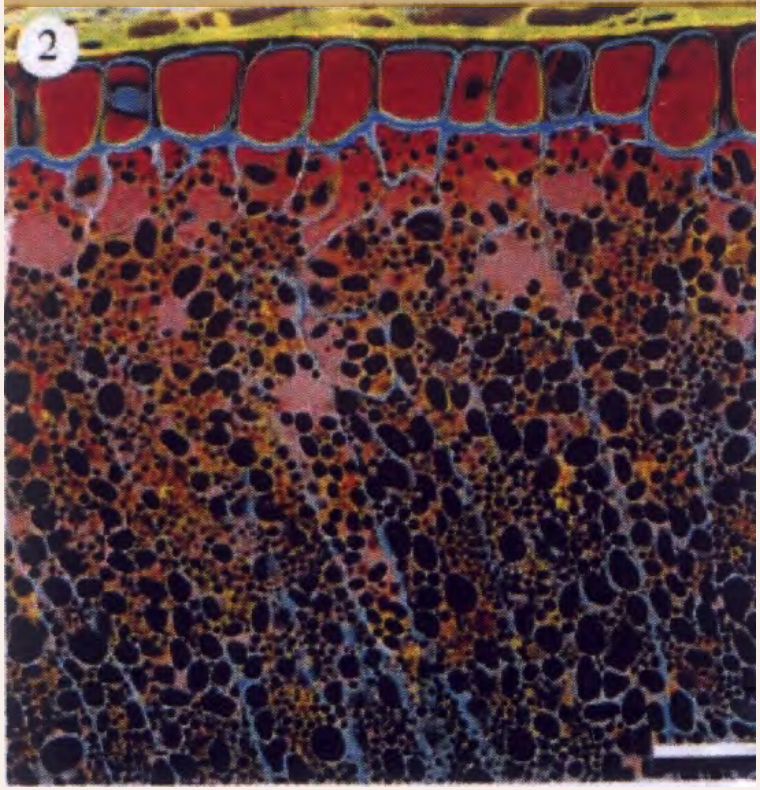
-is also wery small
-has multilateral grain



Photos from SEM

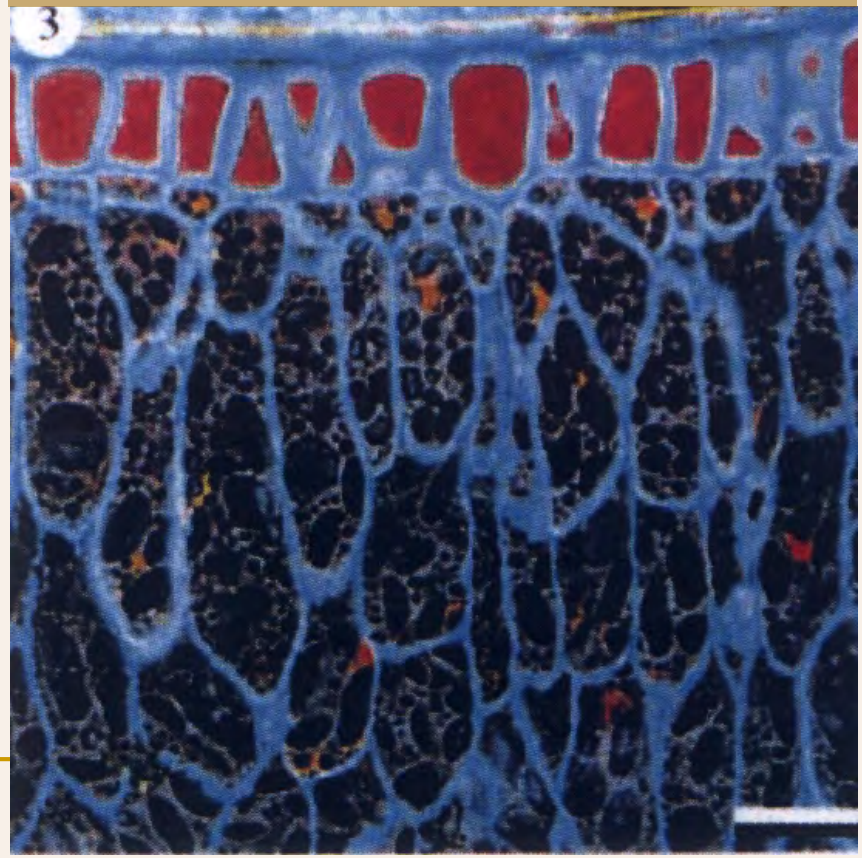
Grain structure of wheat and rye

wheat grain



Coloured with acid fuchsin and Calcofluor

rye grain



cell wall – blue

protein - brown-red

starch - black

Wheat flour

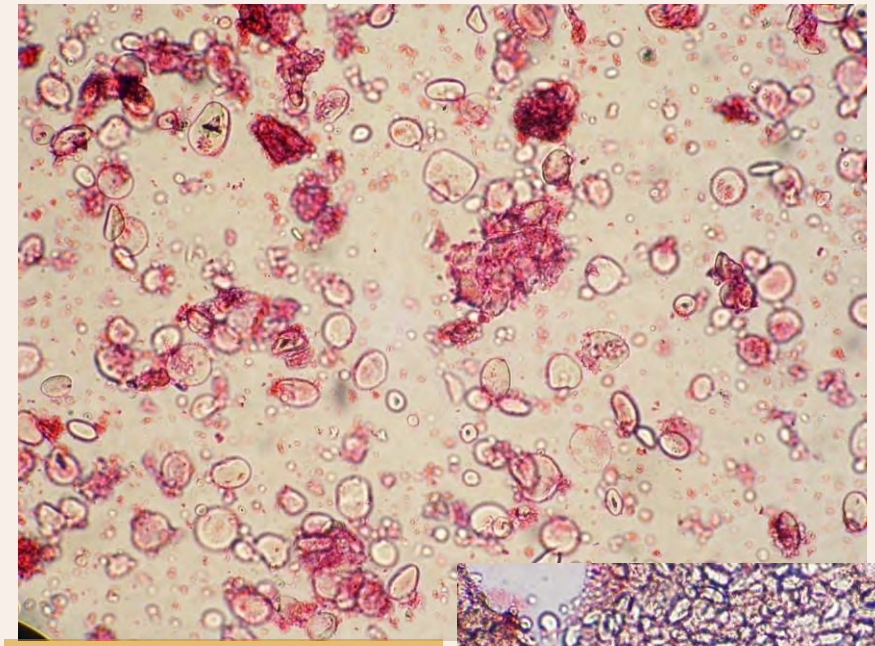
Contain: starch and pericard

Wheat starch:

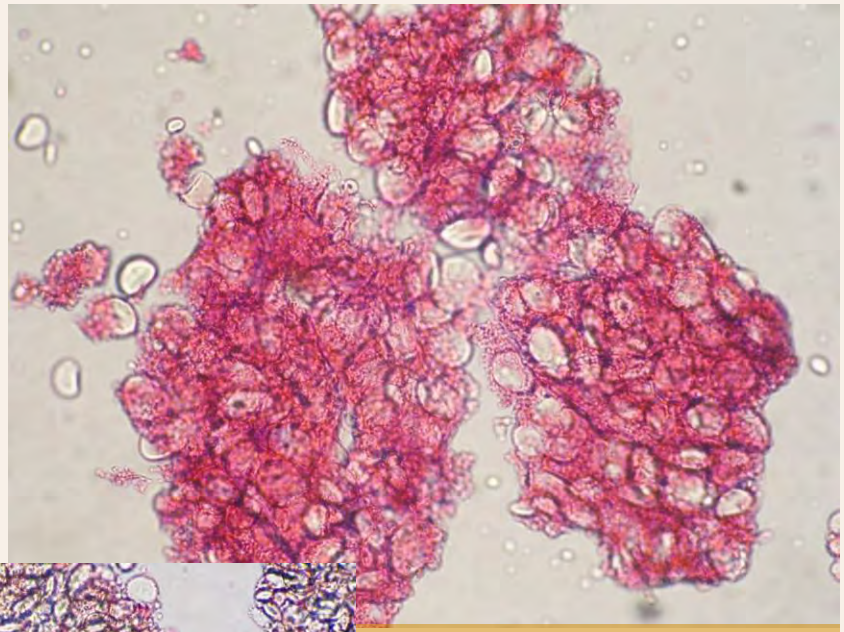
- Dual grain: big and small
- Lenticular shape
- The big grain are 12-41μm long
- The small grain are 2-8μm long

Wheat flour

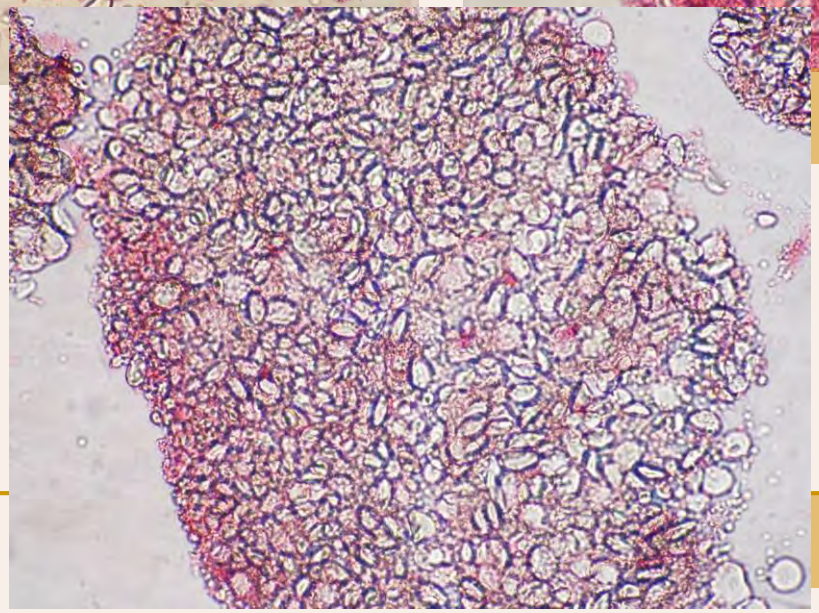
3 type in Czech Republic:



smooth



semi-coarse

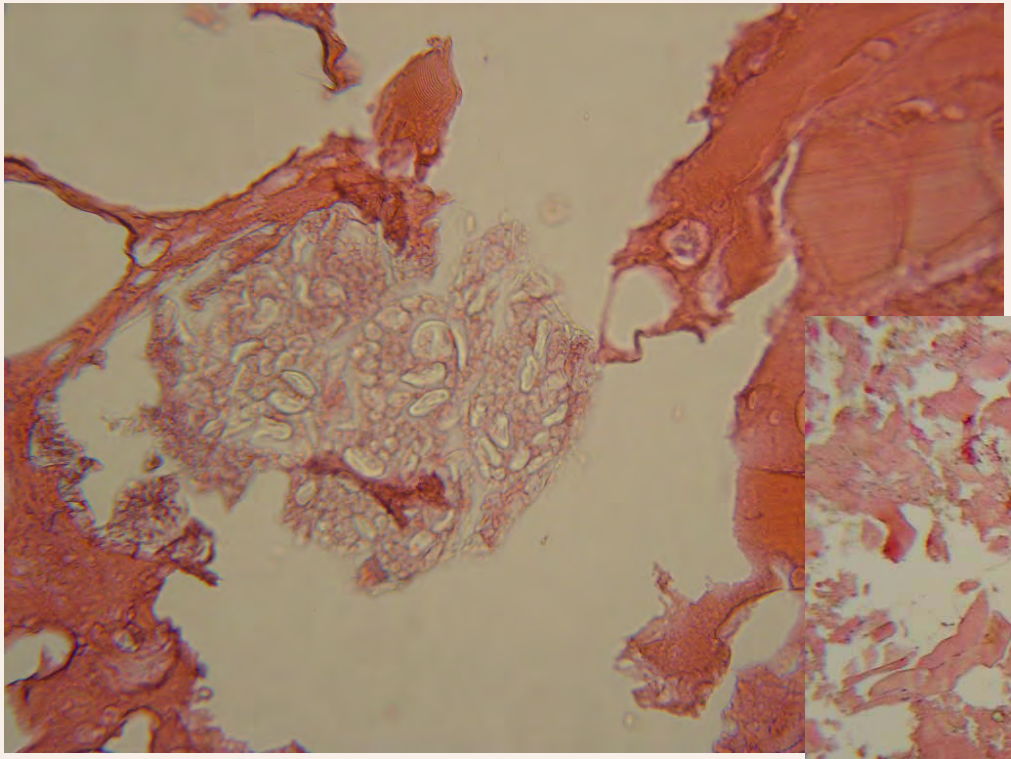


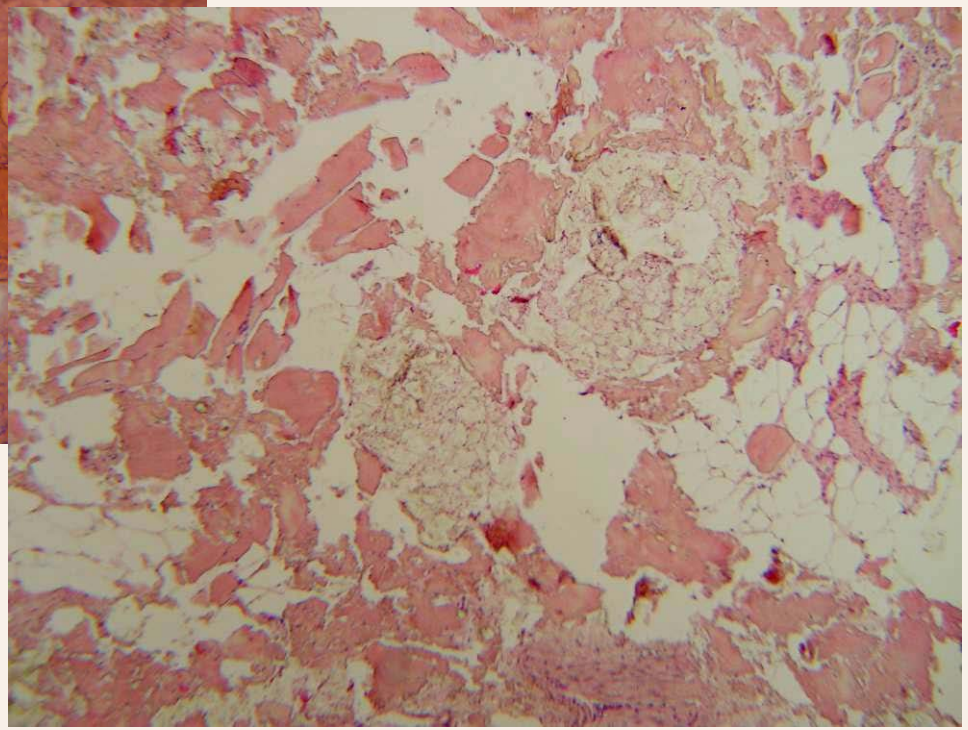
coarse

Difference-
Intensity of milling

HE 200x

Wheat flour in meat product





Photos: Wheat flour in Meat Products as seen under Light Microscopy

Samples for the study-Wheat flour

Box No. 2:

order	slide No.	description
2.	134/95	Coarse wheat flour
3.	205/05	Semi-coarse wheat flour - uncut
5.	241/05	Smooth wheat flour
8.	240/05	Wheat flour (Lugol)
9.	240/05	Wheat flour (PAS)

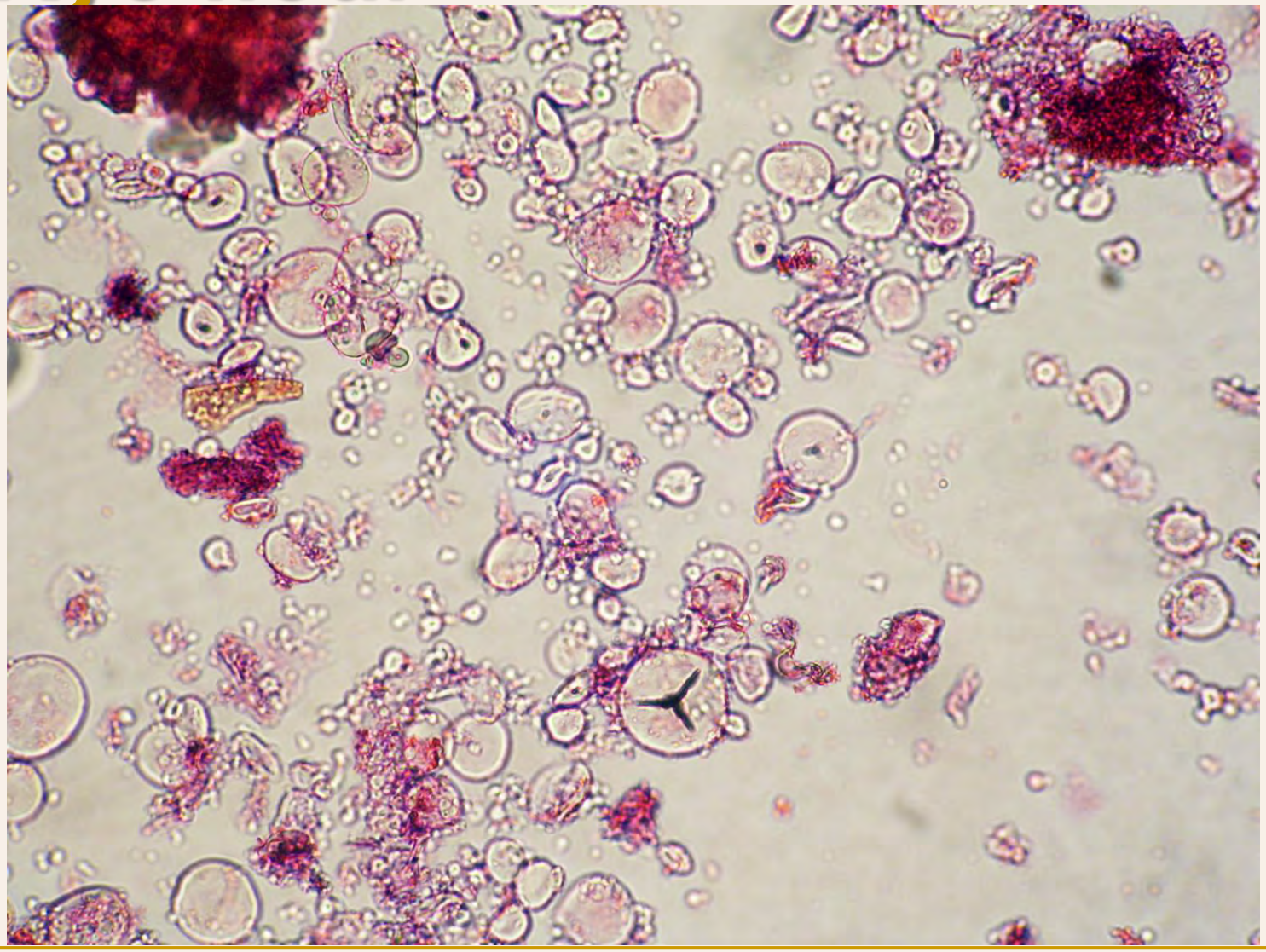
Rye flour

Contain: starch and pericard

Rye starch:

-looks like the grain of the wheat starch
-the big grain are 14-47μm long
-the small grain are 2-9μm long
-the big grain has star shape rift

Rye flour



Photos: Rye flour in Meat Products as seen under Light Microscopy

Samples for the study-Rye flour

Box No. 2:

order	slide No.	description
6.	242/05	Wholemeal rye flour

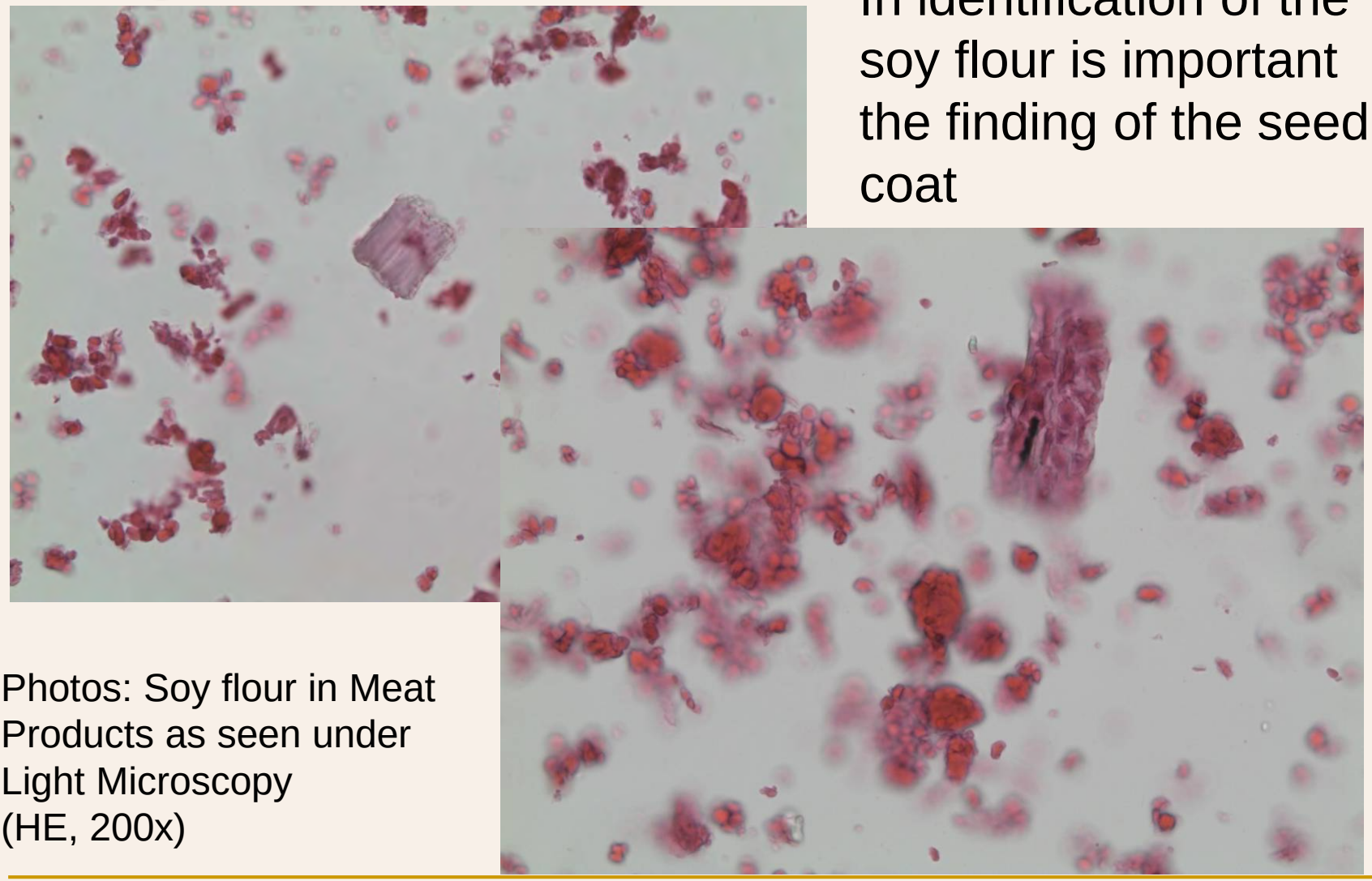
Soybean

Soy protein

Soy flour

Soy flour

In identification of the soy flour is important the finding of the seed coat



Photos: Soy flour in Meat Products as seen under Light Microscopy (HE, 200x)

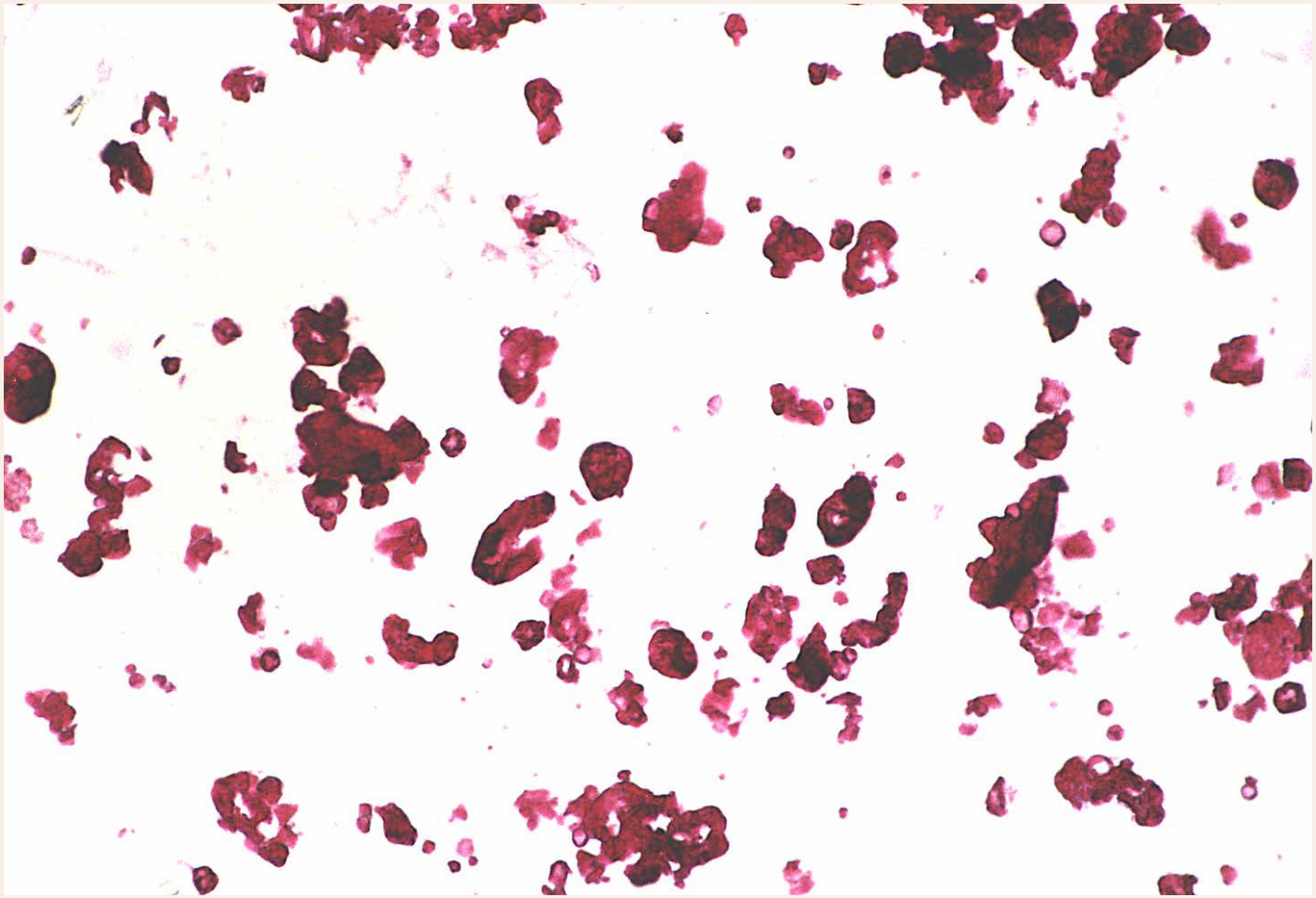
Samples for the study

Box No. 2:

order	block No.	description
7.	178/99	Soy flour

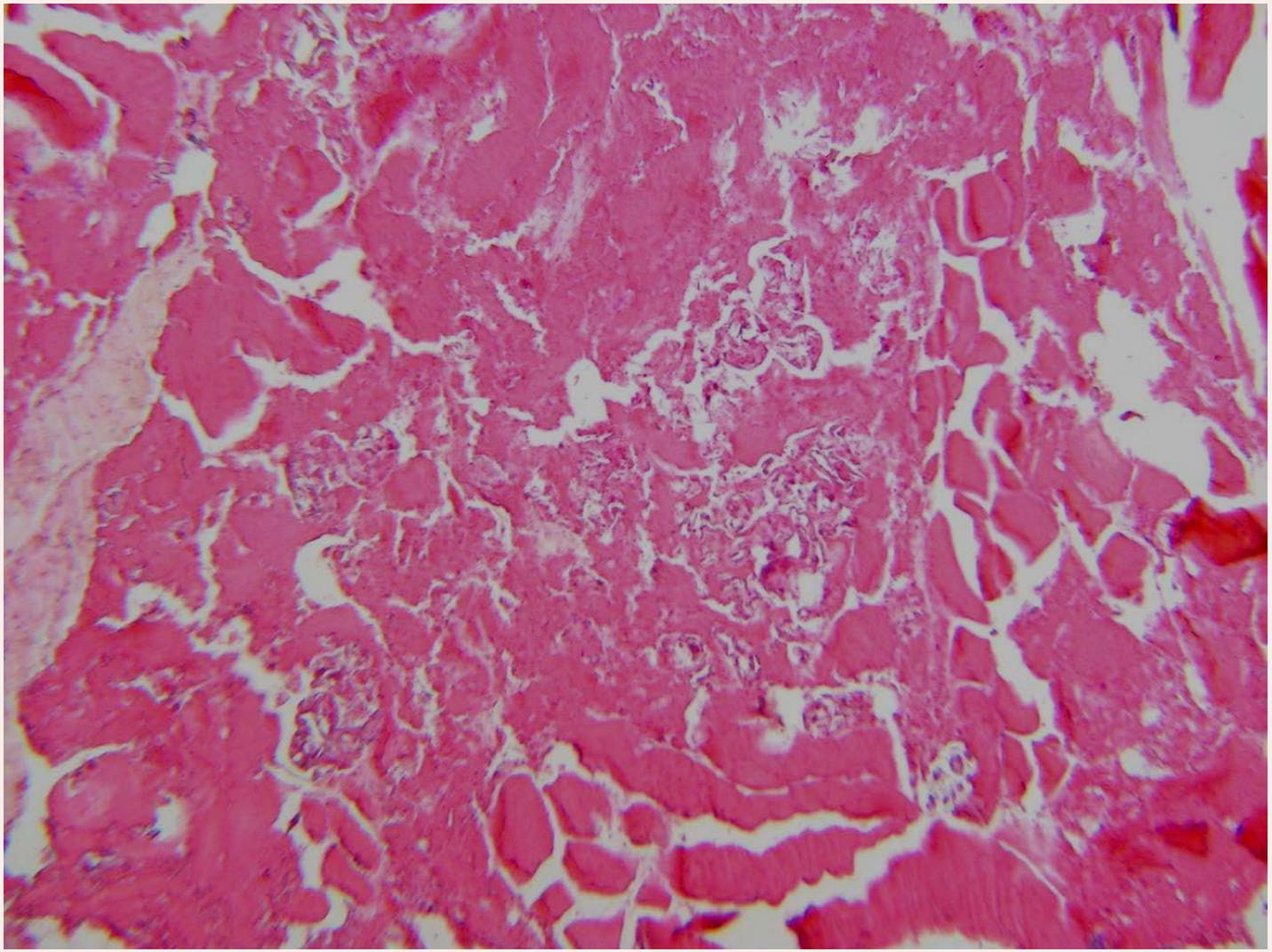
Soy protein

Structure of soy protein is spongy, circular or ring



Photos: Soy protein as seen under Light Microscopy (HE, 200x)

Soy protein in meat product



Photos: Soy protein in Meat Products as seen under Light Microscopy (HE, 200x)

Samples for the study

Box No. 2:

order	block No.	description
10.	249/05	Ground soy
16.	16/00	Soy protein
17.	218/96	Soy - isolated

Fiber

- potato, wheat, fruit
- is based on cellulose and hemicellulose (walls from empty cells endosperm)
- also it contains small amounts of protein, pectins and starches
- binding water and fat

Fiber

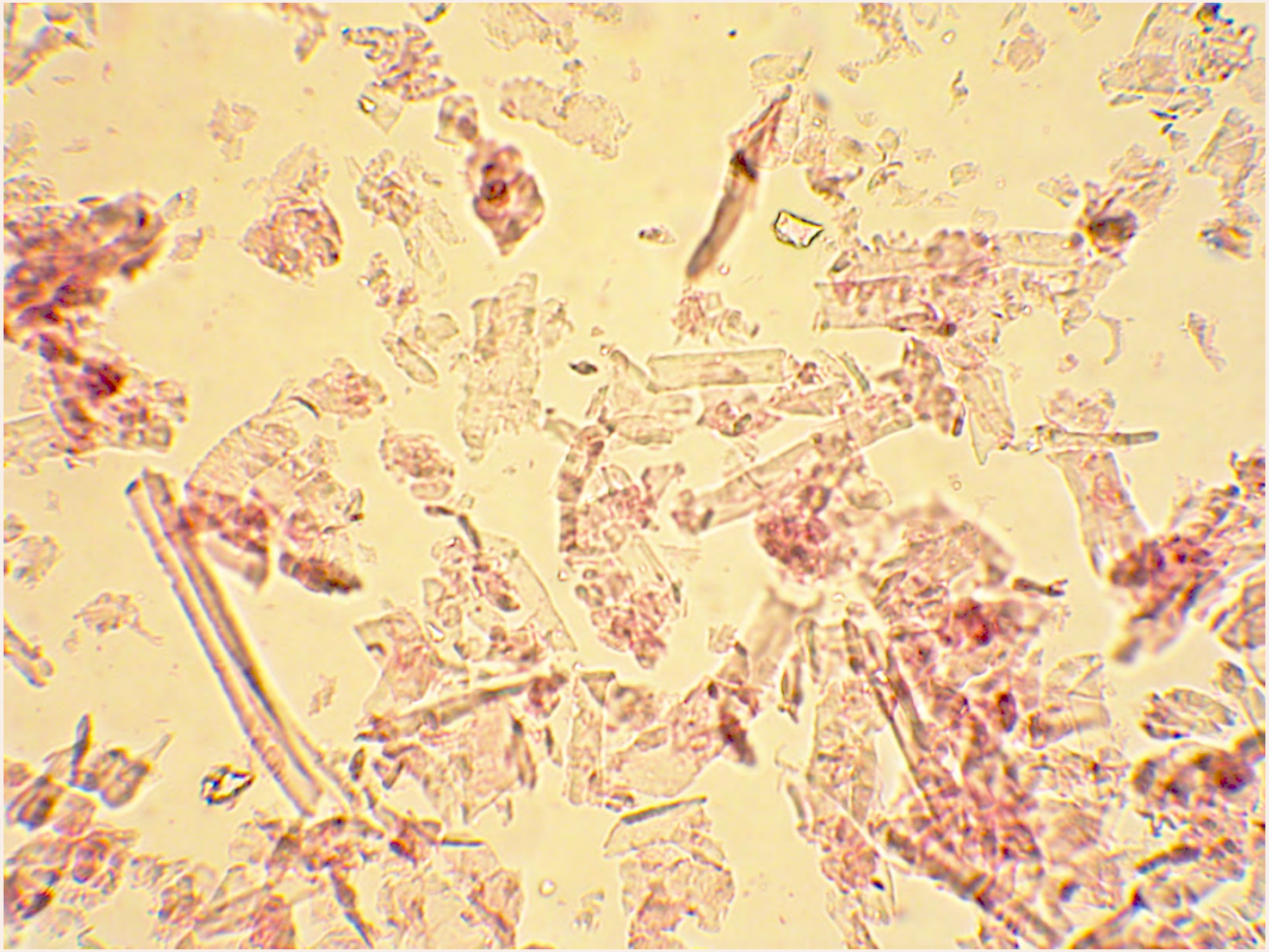


Photo: Fiber as seen under Light Microscopy (HE, 200x)

Sample for the Study

Box no. 2 :

order	block No.	description
18.	199/05	vláknina
19.	201/05	-“-

Carrageenan

Characteristics:

-polysaccharides (are composed of calcium, ammonium, magnesium, potassium and sodium salts)

-Seaweed family *Rhodophyceae*

Carrageenan

Use is as :

-thickener

-gelling agent

-stabilizer and emulsifier in the manufacture of dairy desserts, beverages, ice cream, and in the production of canned meat

-they are also used in cosmetics, in the manufacture of paints etc.

Carrageenan

- cube structure

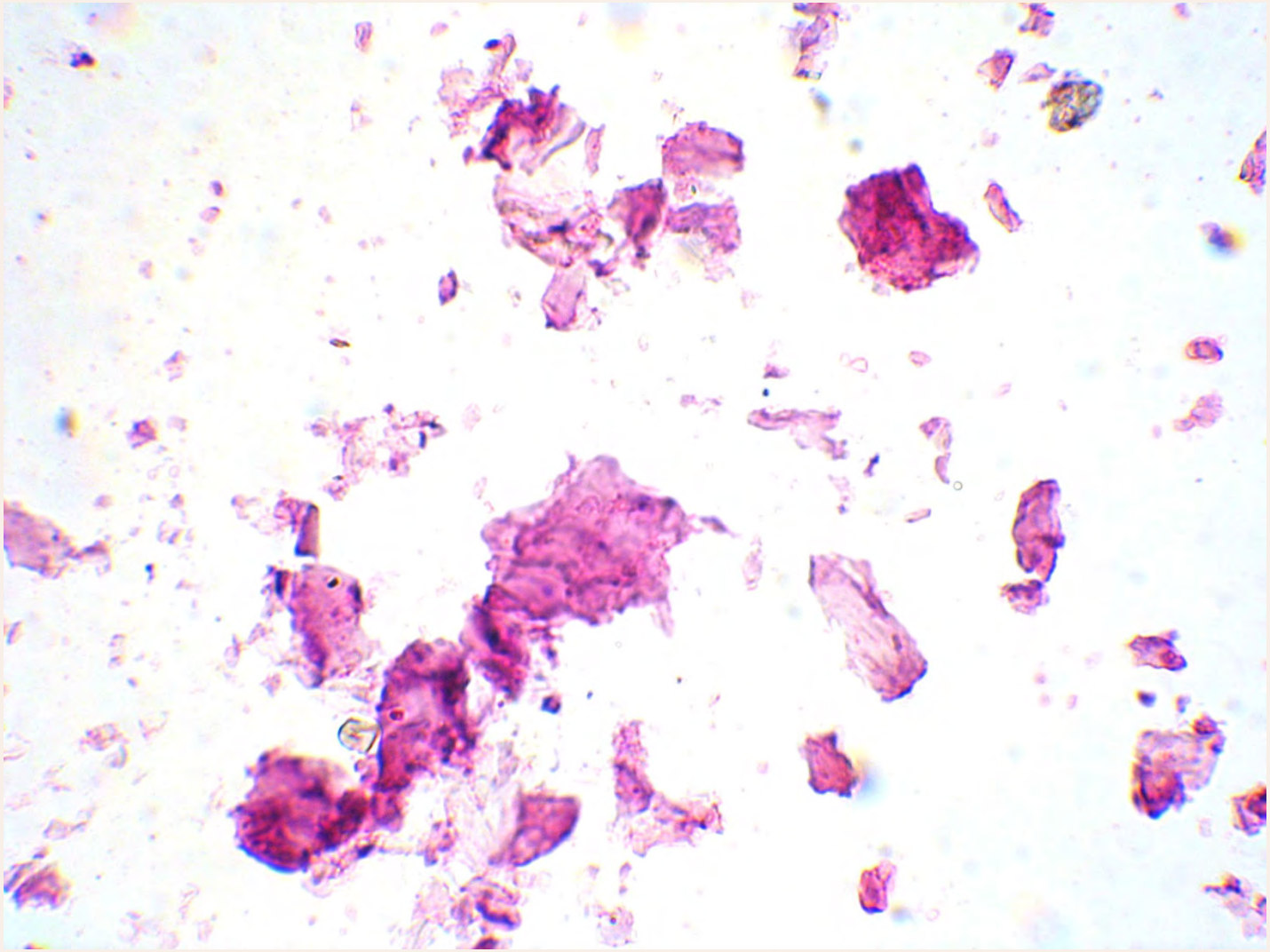


Photo: Carrageenan as seen under Light Microscopy (HE, 200x)

Sample for the Study

Box no. 2:

order	Block No.	description
20.	191/05	karagenan

Thank you for your attention

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