

VISUAL IDENTIFICATION OF SEEDS OF FIVE SPECIES OF *BRASSICA* AND ONE SPECIES OF *SINAPIS*

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Brassica and *Sinapis* are genera of the *Brassicaceae* or Mustard Family. This large family includes 380 genera and about 3,900 species and is known for plants that produce oils with a sharp or peppery taste. Cruciferous vegetables, mustards, rapes, and several weedy species are the most well-known members of the family, and although none are poisonous, some are considered noxious weeds in certain states.

Several factors make identification of the seeds challenging:

- 1.) vegetables in this group may be very closely related and therefore have very similar seeds (e.g., cabbage, collards, broccoli, cauliflower, kale, and Brussels sprouts are all merely different varieties of the species *Brassica oleracea*);
- 2.) *Brassica* varieties are known to cross, producing seeds with intermediate characteristics;
- 3.) characteristics of immature seeds are not always clear-cut; the seeds may differ in color and texture from more mature seeds;
- 4.) environmental conditions may affect seed appearance; and
- 5.) seed-conditioning may alter the seed coat by removing surface texture, important for differentiation. Despite these challenges, the seed analyst, with a little patience and practice, can usually identify seeds in the *Brassicaceae* Family at least to the species level.

Surface characteristics (see definitions and drawings below) of the seeds are very important in *Brassicaceae* identification and require a microscope with a magnification of at least 40 X. However, it may be surprisingly helpful to view seeds with the naked eye, and then again with low magnification (10 – 20 X), before moving to the higher power.

Because over-all size, shape, color, and texture are visible at low magnification, it is usually possible to narrow down the choices during this step. Also, the analyst may find contaminants more easily at low magnification than at a high power where the over-all characteristics may be lost. Observe the texture, size, and color differences between the six seeds in the photo below (fig. 1), taken at a magnification of 20 X.

Definitions - Surface Characteristics:

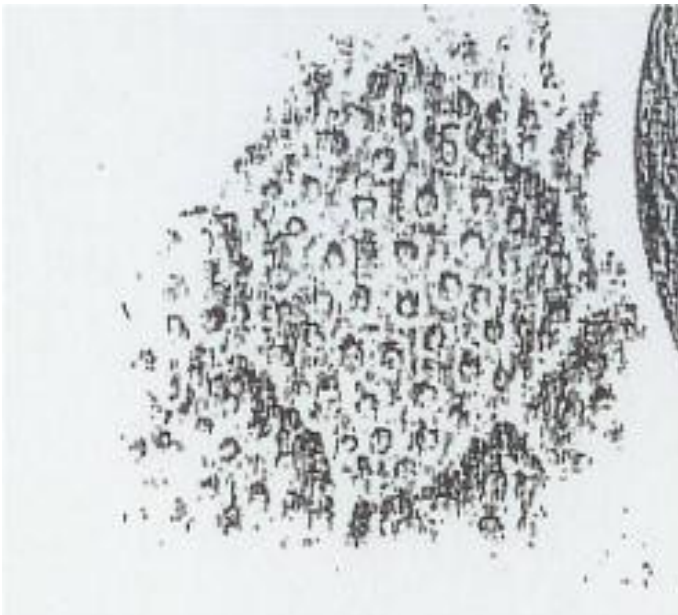
Reticulum - a network of lines or ridges over the seed surface

Interspaces - areas, often polygonal, created by the reticulum (View an area away from the hilum or the end of the seed opposite the hilum, for more representative interspaces.)

Stipples - microscopic pits on the surface of the seed (Note that a mucilaginous substance is often produced by seeds of the Brassicaceae Family, giving them a waxy or oily appearance and sometimes obscuring the stipples, particularly when available magnification is inadequate.)



interspace reticulum



stipples

Drawings by Regina O. Hughes, USDA

B. rapa (turnip)

B. napus (winter rape)

B. oleracea (cabbage)



B. niger (black mustard)

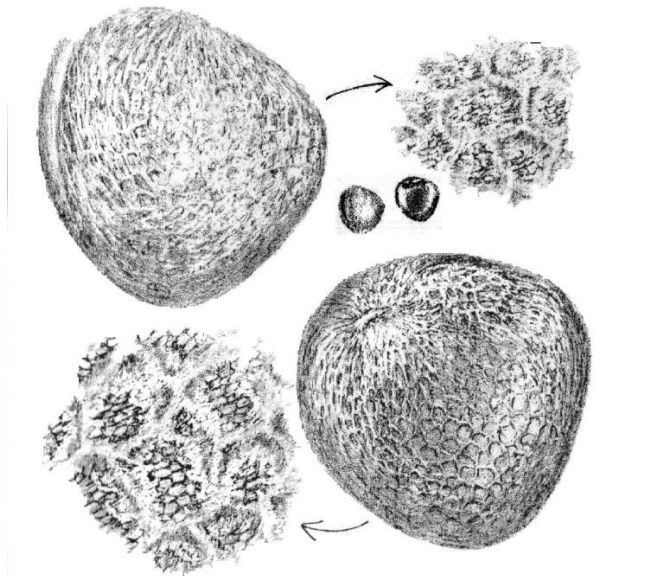
B. juncea (India mustard)

S. arvensis (charlock, wild mustard)

Photo by Sandy Dawson, USDA, AMS, 2007

FIGURE 1—Photo (20X) of *Brassicaceae* seeds demonstrating the value of examination at low or intermediate magnification. Note the differences in texture, size and color.

Brassica oleracea (fig. 2) is the species that contains the cruciferous vegetables: collards, cabbage, broccoli, cauliflower, kale, and Brussels sprouts. The seeds are 1.5 to 3 mm in length, with color ranging from bronze, brown or grayish-black to reddish. Surface characteristics include a fine, narrow reticulum that sometimes display a waxy appearance. The interspaces formed by the reticulum are very small in comparison to other *Brassica* species, with very small stipples that are more often visible in the interspaces than on the reticulum.



Drawings by Regina O. Hughes, USDA

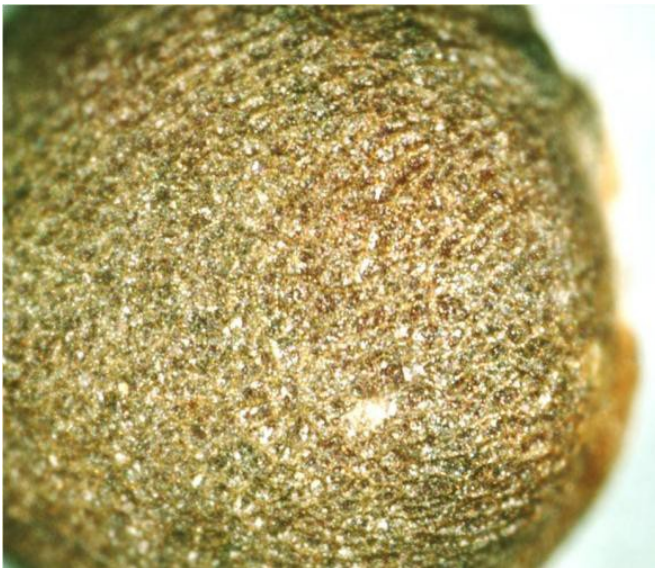
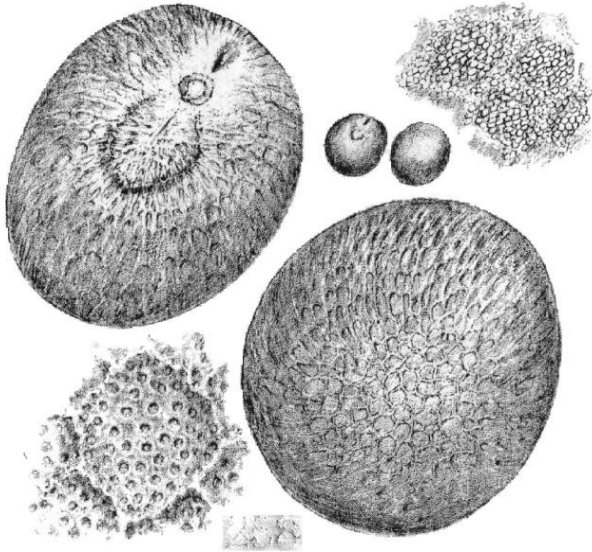


Photo by Sandy Dawson, USDA, AMS, 2007
FIGURE 2--*Brassica oleracea* (cabbage)

Brassica napus (figure 3) includes the varieties annual rape, winter rape, Siberian kale, and rutabaga. The seeds of this species are very similar to that of *Brassica oleracea* but tend to be more spherical, and although the color is sometimes reddish or reddish-brown, it is often gray or grayish-black. The reticulum is fine like that of *Brassica oleracea*, but is relatively flat and sometimes indistinct, giving the seed an overall smooth appearance. When not oily, the flat reticulum often gives the seed a whitish color. The stipples are small, round, and tend to equally blanket the interspaces and reticulum.



Drawings by Regina O. Hughes, USDA

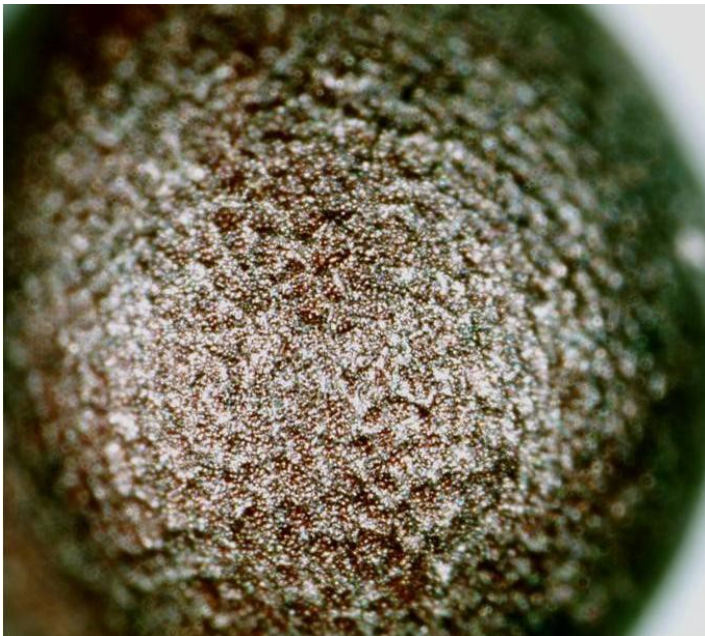
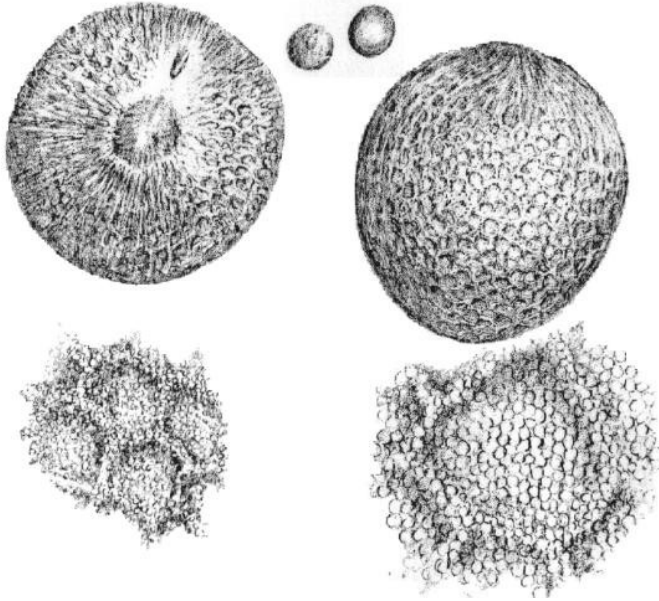


Photo by Sandy Dawson, USDA, AMS, 2007

FIGURE 3--*Brassica napus* (winter rape)

Brassica rapa (fig. 4) (turnip, turnip rape, pak-choi, Chinese cabbage, field mustard) seeds are less than 2 mm in size and are usually smaller than *B. oleracea* and *B. napus*, which range from about 1.5 to 3 mm. They are often reddish or reddish-brown, but some may be grayish-black. The reticulum is distinctive when compared to the previous two species as it consists of coarse, distinct ridges. Interspaces are usually small; stipules are small, shiny, and roundish and may cover the entire seed surface.



Drawings by Regina O. Hughes, USDA



Photo by Sandy Dawson, USDA, AMS, 2007

FIGURE 4--*Brassica rapa* (turnip)

Brassica juncea (figure 5) or India mustard and *Brassica niger* (figure 6) or black mustard appear very similar at first, with seeds of both species less than 2 mm in diameter, and reddish-brown to brown or orange in color. Upon closer inspection, however, differences become fairly obvious.

Although sometimes slightly flattened, *B. juncea* is more spherical than *B. niger*, which is broadly oval or oblong. The textures of the two species are also distinguishable, with the reticulum of *B. juncea* composed of fine distinct lines forming large, shallow, usually flat-bottomed interspaces, in contrast to the reticulum of *B. niger*, which is made up of thick prominent ridges outlining deep, concave and glossy interspaces.

The stipples of *B. juncea* are small, distinct and may cover the entire seed surface; stipples of *B. niger* are very small, partially or completely obscured, and may not be visible on the reticulum. *B. juncea* may also look similar to *B. rapa* but can normally be differentiated by the large size of its interspaces and its coarse reticulum. Compare *B. juncea*, *B. niger*, and *B. rapa* at 20 X, Figure AA.

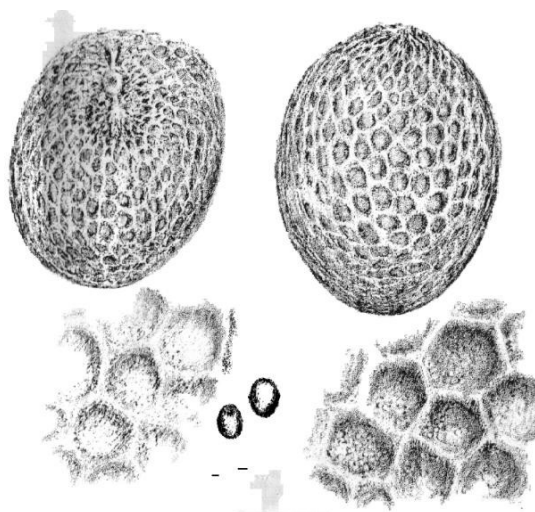
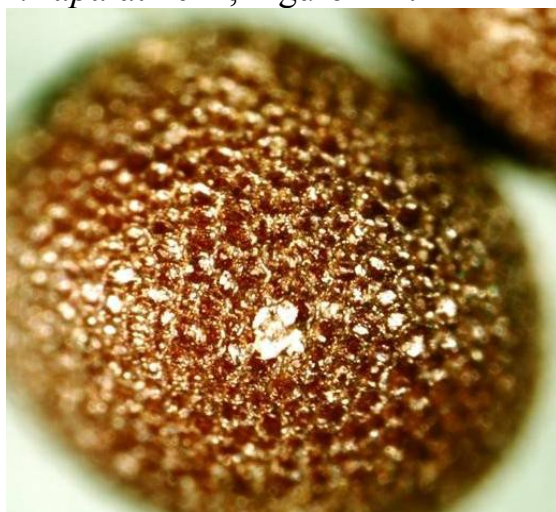


Photo by Sandy Dawson, USDA, AMS, 2007 Drawings by Regina O. Hughes, USDA

FIGURE 5--*Brassica juncea* (India mustard)

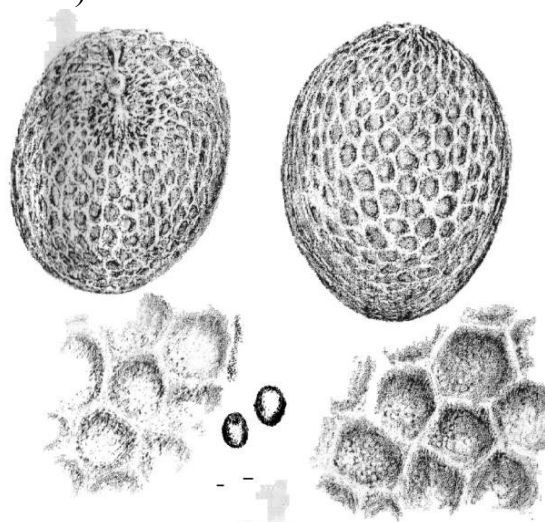
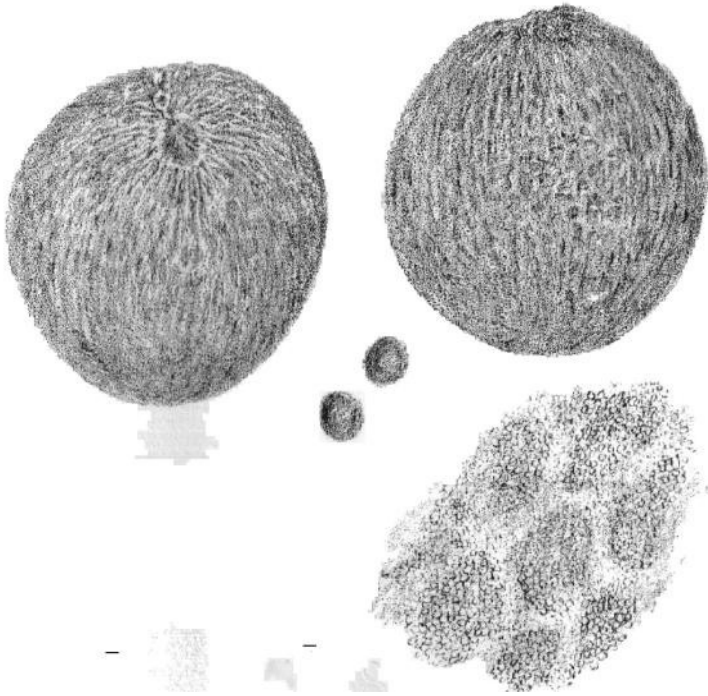


Photo by Sandy Dawson, USDA, AMS, 2007 Drawings by Regina O. Hughes, USDA

FIGURE 6--*Brassica niger* (black mustard)

Sinapis arvensis (figure 7) (charlock, field mustard, wild mustard, wild turnip) is a common weed in agricultural and horticultural crops that is found in all areas of the United States and most of Canada. A single plant can produce 1200 seeds that have the ability to remain dormant in the soil for many years before germinating. Seeds are less than 2 mm in diameter, spherical (roll easily), and normally black, although reddish, probably immature seeds are sometimes seen. *S. arvensis* has a very fine, indistinct reticulum that creates very small interspaces and an over-all smooth or velvety look. The reticulum and stipples are visible only at high magnifications.



Drawings by Regina O. Hughes, USDA

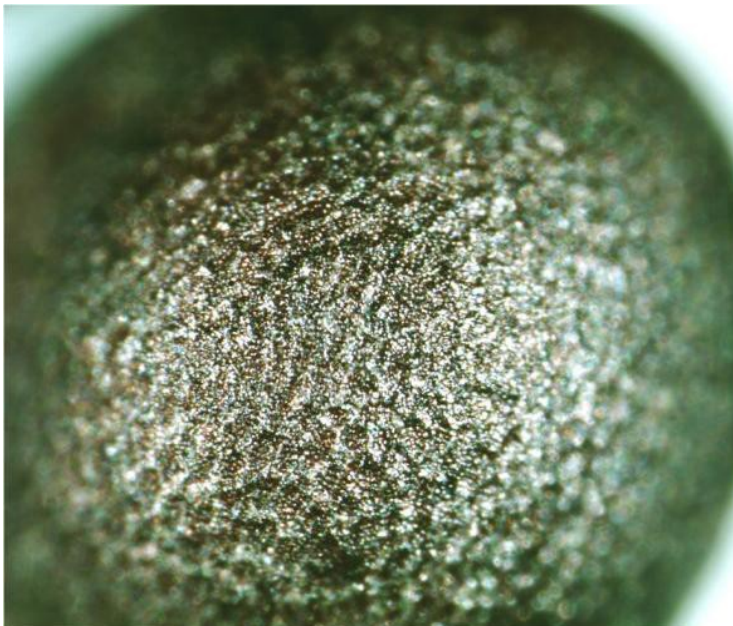


Photo by Sandy Dawson, USDA, AMS, 2007
FIGURE 7--*Sinapis arvensis* (charlock)

There are variations in characteristics among different varieties within a single species of *Brassica*. For example, although *B. oleracea* seeds have the same general characteristics, cabbage seeds are often bronze in color and somewhat triangular and flattened in shape, whereas broccoli seeds tend to be more spherical and are often brown to reddish or even sometimes grayish in color. The differences among varieties of the same species are often slight and not usually consistent. Seed Regulatory and Testing Branch analysts generally visually identify *Brassica* seeds only to the species level when performing purity tests.

Due to multiple challenges and the fact that there is an overlap of physical characteristics among the species, it is important to use as many characteristics and techniques as possible when identifying these seeds. The seed analyst may be able to visually identify *Brassica* seeds by variety when they are in bulk, but may not be able to identify a single seed by variety, with certainty. However, with a little experience and patience, an analyst can distinguish most seeds of the *Brassica* and *Sinapis* genera to the species level with confidence.

References:

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