# Specific work instructions (SWI 142.1.2-6): Soybean seed crop inspection procedures

The purpose of pedigreed seed crop inspection is to provide an unbiased inspection of a seed crop and complete a Seed Crop Inspection Report for the Canadian Seed Growers' Association (CSGA) on the isolation, condition, and purity of the crop. It is the inspector's responsibility to describe the crop as observed at the time of inspection.

Updated: April 2, 2024

**On this page**

# 1.0 Scope

This Seed Program specific work instruction (SWI) outlines the procedures that a seed crop inspector will follow in inspecting soybean seed crops for pedigreed seed status. The seed crop inspection program ensures that seed crops grown for pedigreed status meet the requirements for varietal purity and seed crop standards as specified by the CSGA's Canadian Regulations and Procedures for Pedigreed Seed Crop Production (Circular 6).

These procedures apply not only to oilseed soybeans that are subject to variety registration under Part III of the *Seeds Regulations*, but also miso type, tofu type, and natto-type soybeans as well as vegetable-type and high protein soybean varieties destined for roasting for livestock feed. These latter types are not subject to variety registration.

# 2.0 References

The publications referred to in this SWI are those identified in Seed Program Regulatory Authority Standard SPRA 101 - Definitions, acronyms and references for the seed program. In addition, the following were used in the development of this SWI:

- Modern Soybean Production, Scott, W.O. and Aldrich, S.R., S&A Publications Inc.
- Principles of Cultivar Development, Vol. 2, W.R. Fehr (ed.). 1987. Macmillan Publishing Co.

# 3.0 Definitions

For the purposes of this SWI the definitions given in SPRA 101 and the following apply:

**Abscission layer**
in soybeans, the layer of parenchyma cells formed at the point of attachment of the seed and the seed pod; as the parenchyma disintegrates, the seed becomes separated from the pod

**Bushy type**
soybeans with determinate growth type, 90 to 100 cm tall, drying more slowly than normal soybeans

**Determinate growth habit**
the terminal bud ceases vegetative activity when flowering begins

**Herbicide tolerant soybean variety**
a variety of soybeans that is tolerant of a herbicide for which tolerance is not ubiquitous throughout the traditional North American soybean gene pool

**Hilum colour**
the colour of the hilum or center spot on the seed can range from yellow, gray, brown, or black (see appendix I); hilum colour and shape can be affected by plant maturity, environment and disease

**Indeterminate growth habit**
the terminal bud continues vegetative activity throughout the growing season

**Maturity**
for inspection purposes, maturity means that at least 90% of the plants in the inspected field have dropped their leaves. Soybean varieties are classified early, medium or late maturing

**Miso type soybean varieties**
soybean varieties which are fermented to make a paste with barley or rice malt

**Natto type soybean varieties**
small seeded soybeans varieties with high sugar content used for food purposes

**Pubescence colour**
colour of the short hairs on soybean plant stems and pods at maturity; the colour can be gray, light brown, or brown and is best observed on the bottom 1/3 of the plant

**Semi-determinate growth habit**
the terminal bud continues vegetative growth after flowering but terminates this growth before indeterminate types

**Soybean kinds**
include oilseed, high protein, natto, tofu/soymilk, sprouting, and miso

**Tofu type soybean varieties**
soybeans soaked and mashed to produce a curd

**Tall**
a plant can be considered tall when the top petiole is removed/absent, and the main stem is approximately 15 cm above other main stems of the general plant population

# 4.0 Specific inspection procedures

Inspection of pedigreed seed crops of soybeans should be carried out as described in SWI 142.1.1 Pedigreed seed crop inspection, with the additional conditions and information provided in the following sections.

### 4.1 Inspection requirements

Seed crop inspection for soybeans must be made at maturity. As a general guide, and based on harvest pressures, inspection could be conducted when a minimum of 90% of the plants have

dropped all their leaves and the mature plants have developed distinguishing pod, pubescence, and hilum colour characteristics. Beginning in 2016, descriptors provided in the variety description for pubescence, mature pod and hilum colour follow a standardized colour scheme. See appendix VI. Only standardized colour descriptors for pubescence, mature pod and hilum may be reported. Crop inspectors do not need to report plants as tall if they are shorter than the SWI definition (and otherwise conform) even if they are described in the variety description as variants.

### 4.2 Field inspection

The soybean is a highly self-pollinating crop with an outcrossing rate of less than 1% among fertile plants. In Canada, most soybean varieties have an indeterminate growth habit. Indeterminate varieties begin to flower when less than half of the nodes on the main stem have developed such that vegetative and reproductive development occur simultaneously for a considerable portion of the plant's life. Pod and seed development begin at the bottom of the plant and progress toward the top as new nodes form, but all seeds reach maturity at the same time.

Oilseed soybean varieties are required to be registered for sale in Canada. Variety descriptions for miso type, natto type, tofu type, vegetable and other specialty use soybeans may be obtained from the CSGA. Variety descriptions for unregistered oilseed soybean varieties must be provided by the grower.

When inspecting soybean seed crops, some key varietal characteristics at maturity are determined by colour and, therefore, it is important that light conditions for colour and contrast be maximized. This is important when determining off type characteristics such as pubescence and pod colour during inspection. The time of day, shadows, direction and the light angle may also be crucial. Sometimes cloudy or overcast conditions allow for more contrast in colours and easier identification of variants and off-types than bright overhead sunlight. It should be noted that with the passing of time after maturity, the colour characteristics can be affected by weather and may not be as distinguishable. Pod colour at maturity can vary from light brown to black.

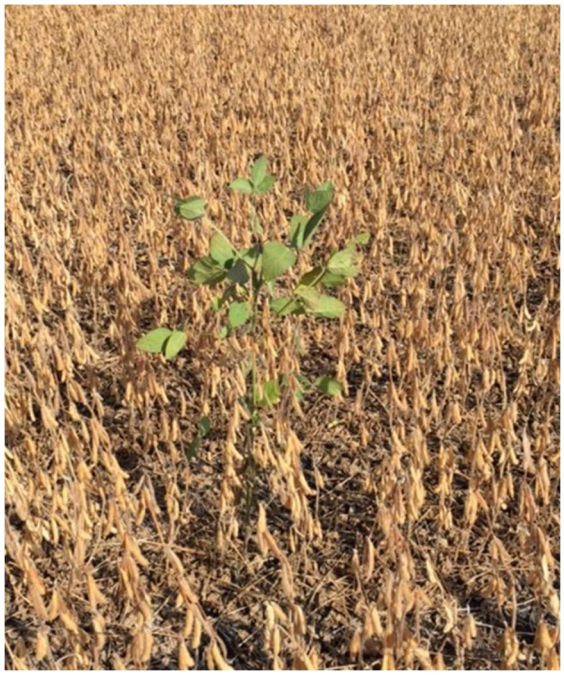

Description for Figure 1 – The pictures A and B (above) demonstrate that a lighter pubescence colour can be deceiving and may make the pod colour appear lighter. These are examples of the **same** pod colour, but different pubescence colours.


Description for Figure 2 – The pictures C and D (above) are examples of **different** pod colours, but the same pubescence colours.

Seed coat lustre can vary from dull to glossy. Soybean seed coat exists in a range of colours including yellow, green, brown, black and bicolour, however the most common colours are yellow, black and brown. The seed coat colour can be affected by environmental factors and diseases. When colour pigmentation, like black or brown, is present in the seed coat, it will be visible on all of the plant's seeds. In contrast, when the seed coat colour varies on the seed, the plant, and from 1 plant to another, the seed coat colour variation is likely caused by a disease or frost.

Seed shapes may be round and spherical to elliptical and flattened. See appendix III. It should be noted that while seed characteristics should be used to confirm the variety, seed characteristics should only be used to confirm variant or off-type plants in counts based on other visible morphological off-type characteristics.

Other factors to watch for include maturity with later maturing plants often retaining their leaves and being taller than the other plants in the field (Figure 3; appendix V). The time of emergence, soil type, disease, herbicide injury and weather conditions can cause variability in plant height and maturity, making off-types for these factors difficult to distinguish at maturity. Plants that are immature due to environmental factors should not be included in counts. Appendix IV provides information on diseases that may alter the plant's appearance.



Description for Figure 3 – Example of an immature soybean plant in a field

Description for Figure 4 - Although the hilum colour is not fully developed in an immature plant, the developing colour may be helpful in determining if the plant will conform to the variety, for example, the colour is developing into a light versus a dark hilum. 3 soybeans are shown with different hilum colour appearance due to maturity.

When reporting off-types and variants, the seed crop inspector must report 2 characteristics to describe the plant, or note “otherwise conforms" as the second characteristic.

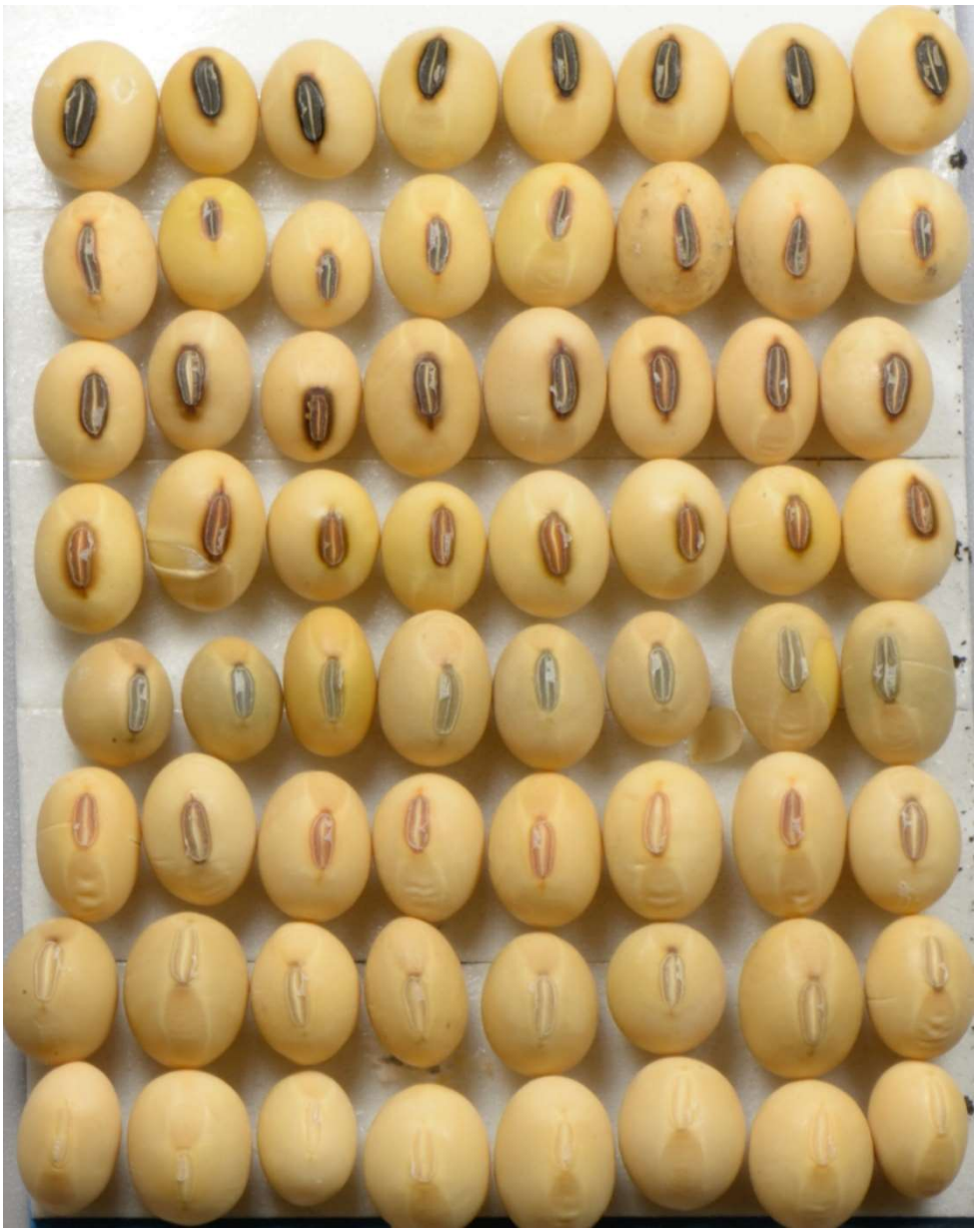
Where the previous land use was soybean, particular attention should be paid to the possibility of volunteers.

Note: the maximum field size for production of Breeder and Select status seed is 2.5 acres (1 ha).

If off-types are found in a number of fields of a variety, seed crop inspectors should notify their lead inspector and the Canadian Food Inspection Agency (CFIA) as it may be indicative of contaminated parent seed.

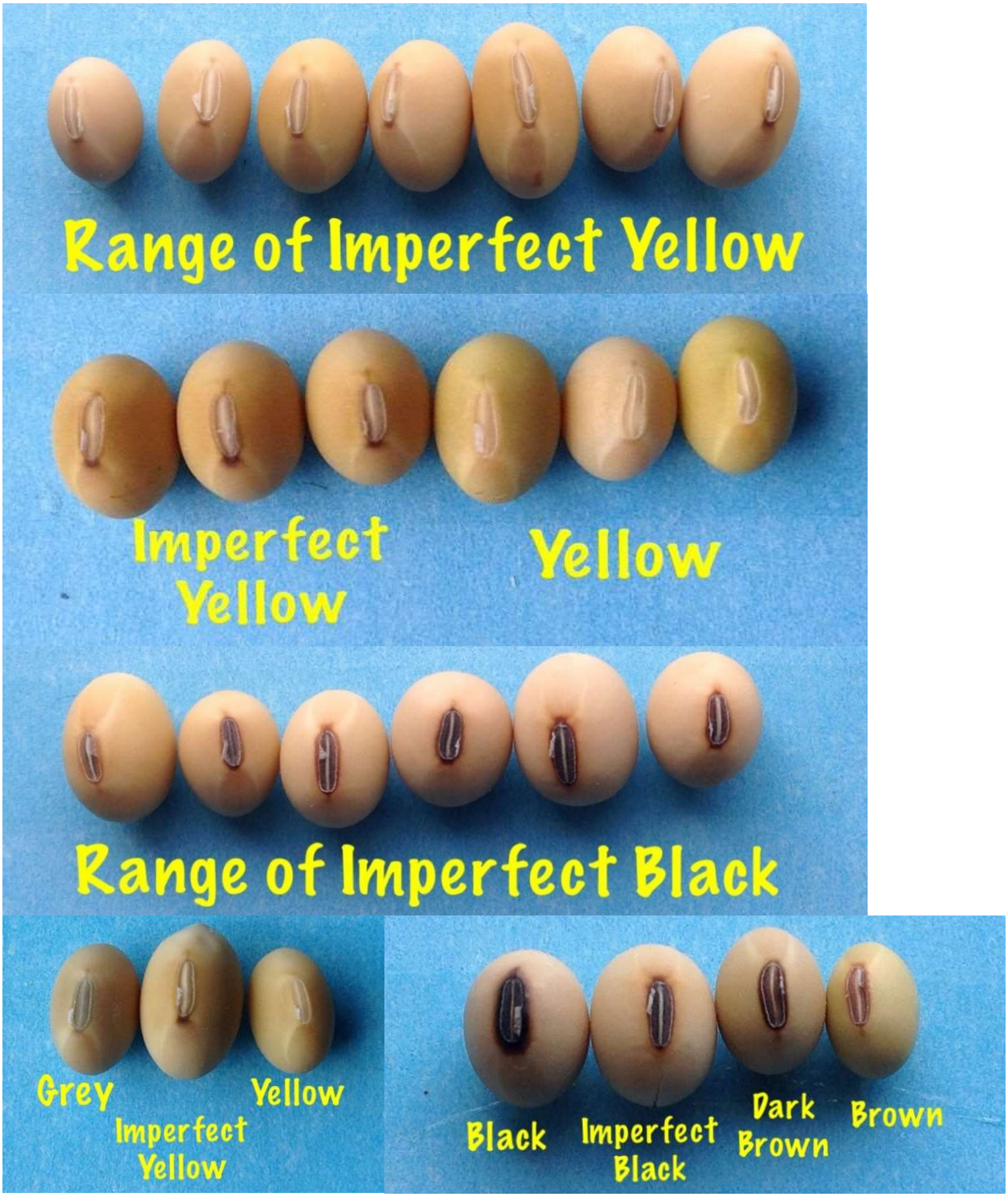
**Appendix I: Soybean hilum colour**

**Soybean hilum colour**



Description of photo of soybean hilum colour:
This photo shows rows of soybeans seeds of each hilum colour option: black, imperfect black, dark brown, brown, grey, light brown, imperfect yellow, and yellow.

**Range of soybean hilum colours**




Description of photos of soybean hilum colour range:
5 photos of soybean seeds depicting soybean hilum colour variations: range of imperfect yellow; imperfect yellow and yellow; range of imperfect black; grey, imperfect yellow, and yellow; and black, imperfect black, dark brown, and brown.

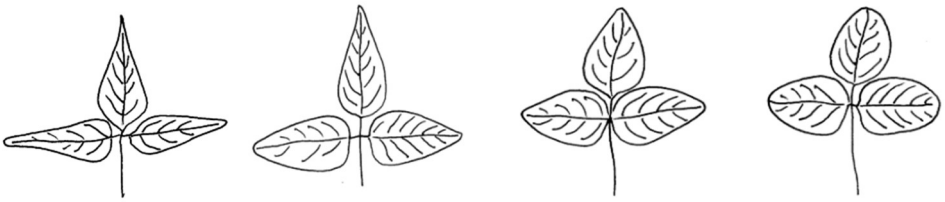
**Appendix II: Abscission layer**

Lacking an abscission layer is a single gene trait in soybean. If the abscission layer between the seed and the seed pod is lacking, you cannot remove the adhering material from the seed easily. The adhering material can be polished off some seeds in a combine but in general it should be a constant trait in a variety. The description of the variety will characterize the abscission layer as lacking or normal. If a dash "-" is provided on the variety description, that indicates that the breeder has not provided information on this characteristic. The characteristic is considered stable when the abscission layer presents in the same way (lacking or normal) and not partially, on all the seeds in all the pods from the top to the bottom of the plant. If this is not the case, this characteristic is not stable and should not be used.

Description of photos of soybean abscission layers**:**
2 photos of 6 soybeans each depict 3 seeds each with material clearly still attached to the seed (lacking abscission layer) on the right, and 3 seeds each on the left where no material is attached (abscission layer is normal).

**Appendix III: Soybean characteristics diagrams**

**Terminal leaflet shape**



lanceolate triangular pointed ovate rounded ovate

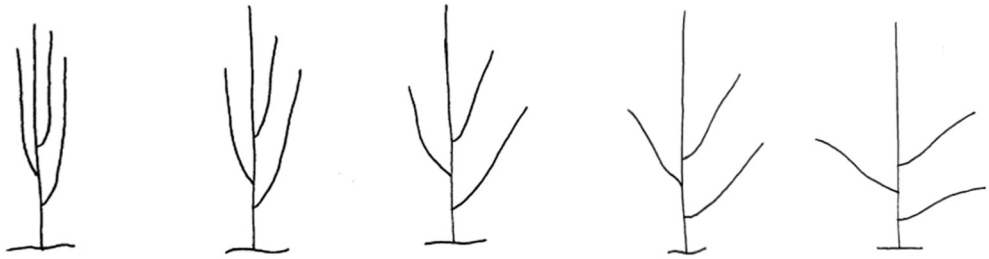
Description of terminal leaflet shape diagram**:**
4 leaflets are presented – lanceolate, triangular, pointed ovate and rounded ovate

**Stem termination type**

determinate indeterminate

Description of the stem termination type diagram:
2 terminal stems are presented - determinate and indeterminate

**Plant growth habit**



erect semi-erect intermediate semi-prostrate prostrate

Description of the plant growth habit diagram:
5 different growth habits are presented: erect, semi-erect, intermediate, semi-prostrate and prostrate

**Seed shape**

length width thickness

Description of the seed shape diagram:
3 seeds are presented to illustrate how the measurements for length, width and thickness are taken

Spherical rounded (length/width, length/thickness, and thickness/width ratios = < 1.2)

Spherical flattened (length/width ratio > 1.2; length/thickness ratio < 1.2)

Elongate (length/thickness ratio > 1.2; thickness/width ratio < 1.2)

Elongate flattened (length/thickness ratio > 1.2; thickness/width ratio > 1.2)

**Appendix IV: Diseases that may influence soybean plant appearance**

Plant is normal height but leaves are discoloured:

- anthracnose
- bacterial pustule
- downy mildew

Plants die prematurely/mature plants retain dead leaves:

- brown stem rot
- phytophthora root rot
- pod and stem blight
- sclerotia rot (also sclerotia bodies)
- stem canker

Pods and/or seeds abnormal in appearance:

- anthracnose
- downy mildew
- pod and stem blight
- purple seed stain

Plants stunted with crinkly or ruffled leaves:

- 2-4, D damage
- soybean mosaic virus (also streaks near the hila)

## Appendix V: Potential causes of green, immature plants

Green, immature plants should not be assumed to be off-types. There can be many causes of green, immature plants as outlined in the chart below. The shaded column on the left contains titles of parts of the plant (leaves, stem, pods, seeds) or the plant population that are examined for identifying characteristics of the green, immature plant. The top shaded row contains titles of the causes of green, immature plants. Based on the described characteristics to identify environmental stress, green stem syndrome, male sterile, and bud blight, these plants should not be counted as off-types. Only off-types as described in the last column should be noted on the report.

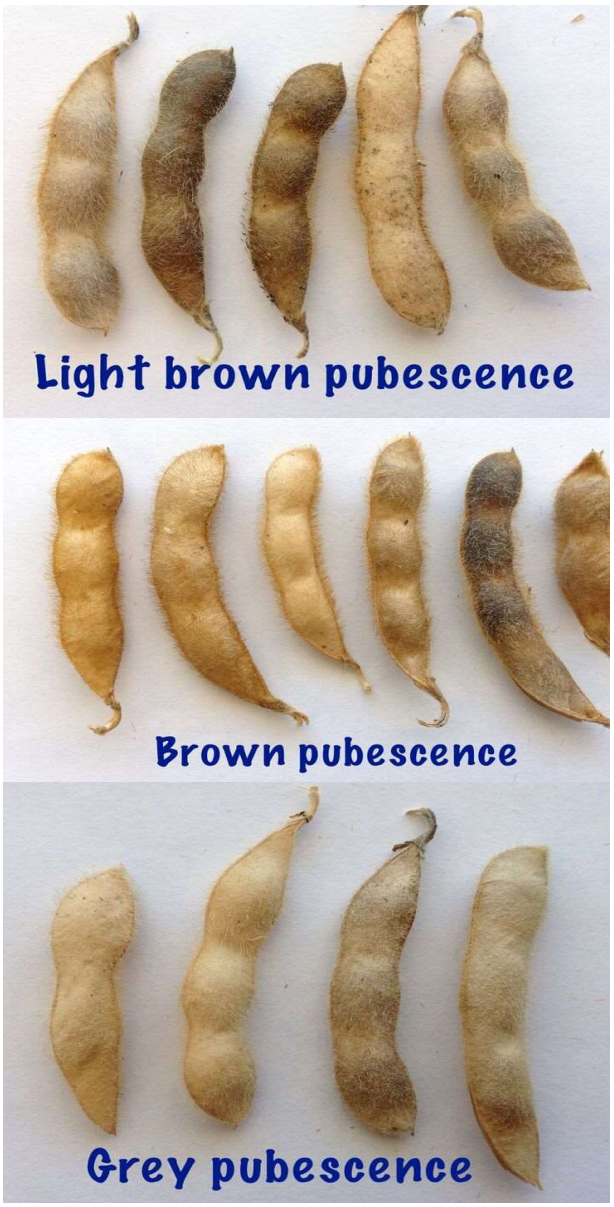
### Table of potential causes of green, immature plants

| | **Environmental stress** | **Green stem syndrome** | **Male sterile** | **Bud Blight** | **Off-type** |
|---|---|---|---|---|---|
| **Leaves** | Green, present, can be diseased | None to present on upper nodes | Green | Green, leaflets may be smaller than normal and cupped | Green, 80 to 90% present |
| **Stem** | Green | Green | Green | May be stunted, brown discolouration of pith | Green |
| **Pods** | Present, immature | Mature, few to none | Largely absent, small on top of the plant | Developed poorly or aborted, may have brown patches | Present, immature |
| **Seeds** | Present, immature | Mature | 0 to1 present in a pod | Few, if any | Present, immature |
| **Plant population** | Either plant population uniformly impacted by stress, or a number of plants in certain locations | Distributed randomly or clustered in a field | Rare in population | Varies | Isolated individual plants |

**Appendix VI: Pre-2016 and current colour descriptors used for soybean pubescence, pod and hilum colours**

**Standardized pubescence colour descriptors:**

- light brown
- brown
- grey




Description of photos of soybean pod pubescence colour:
3 photos of mature soybeans pods with different pubescence colours: light brown pubescence, brown pubescence and grey pubescence

If non-standardized pubescence colour descriptors are encountered in a description of the variety (not included in the list directly above), use the following chart to convert them to the closest acceptable colour descriptor.

**Pre-2016 to current pubescence colour descriptor conversion chart**

| Pre-2016 pubescence colour descriptors | Current pubescence colour descriptors |
|---|---|
| tawny or brown tawny | brown |
| grey at top to tawny at bottom | brown |
| light tawny, very light tawny, very light brown, or near grey | light brown |
| light tawny with some darker gold tawny | light brown |
| dark brown | brown |

Some variety descriptions may have "additional information" indicating that the pubescence colour may appear different from what is specified in the description of variety (DOV). In these cases, the inspector does not need to flag the DOV or take plant samples to confirm the pubescence colour.

**Standardized hilum colour descriptors**

1. black
2. imperfect black
3. grey
4. dark brown
5. brown
6. light brown
7. imperfect yellow
8. yellow


Description of soybean hilum colour descriptors photo:
This photo shows 8 soybean seeds with different hilum colours labelled 1 to 8 to align with the standardized hilum colour descriptors

If non-standardized hilum colour descriptors are encountered in a description of the variety (not included in the list directly above), use the following chart to convert them to the closest acceptable colour descriptor.

**Pre-2016 to current hilum colour descriptor conversion chart**

| Pre-2016 hilum colour descriptors | Current hilum colour descriptors |
|---|---|
| brownish black | brown or black |
| buff | light brown |
| dark buff | light brown or brown |
| grey to imperfect black with brown tint | imperfect black |
| light buff | light brown |
| light gray | gray |
| mid-light brown | light brown |
| tan | light brown |
| very light brown | light brown |
| clear | yellow |
| medium brown | brown |

**Standardized mature pod colour descriptors**

- light brown
- brown to dark brown (a mix of brown-hued pods)
- black

When describing off-types with “brown to dark brown pods,” inspectors should use the full descriptor if possible, or they can write “brown pod” or “dark brown pod” if space is limited.

Description of photo: soybeans with light brown pods

Soybeans with a light brown pod will generally have a consistent light brown colour across the whole pod.

Description of photos: 2 photos showing soybeans with brown pods and dark brown pods

Soybeans with brown to dark brown pods will generally have a slightly lighter colour on the portion of the pod in between the seeds.

Description of photo: soybeans with black pods

Soybeans with a black pod will generally have a consistent black colour across the whole pod.

If non-standardized mature pod colour descriptors are encountered in a description of the variety (not included in the list directly above), use the following chart to convert them to the closest acceptable colour descriptor.

**Pre-2016 to current mature pod colour descriptor conversion chart**

| Pre-2016 mature pod colour descriptors | Current mature pod colour descriptors |
|---|---|
| tan | light brown |
| beige | light brown |
| mixed | light brown or brown to dark brown |
| pale tan | light brown |