

# **Recommended Practices For Seed Potato Field Inspection**



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**1. Introduction**

In the United States, certified seed potatoes are produced in 15 states in programs administered by a variety of state departments of agriculture, university and private entities. Throughout the programs, there are both common and unique aspects of each states certification process (see Appendix and also on-line at [http://potatoassociation.org/wp-content/uploads/2014/04/Seed\\_Cert\\_Regs\\_2016-2.pdf](http://potatoassociation.org/wp-content/uploads/2014/04/Seed_Cert_Regs_2016-2.pdf)). One common theme in certification programs is a minimum of two field inspections required for every field registered for certification. The first inspection is ideally conducted before row closure and when the plants have grown enough to express virus disease symptoms. The last inspection is generally conducted in late summer before vine kill with particular attention given to detection of bacterial ring rot symptoms and late blight. Earlier generation lots generally receive more detailed scrutiny and later generation lots receive a random assessment across the field. Each state details requirements for certification in their specific rules and regulations and uniform standards for the United States have been established in the State National Harmonization Plan (see Appendix). This inspectors field guide is based on the “Guide to Seed Potato Field Inspection: Recommended Practices” produced by the United Nations Economic Commission for Europe committee on standards. This handbook is designed to provide general guidelines for assessing certified seed potato fields for important faults including disease, insect infestation, varietal mixtures, herbicide injury and other field related issues that are common across all seed potato producing areas.

## **2. Training for field inspection**

In order to qualify to perform seed potato field inspection, the inspector must have completed the appropriate training.

Initially field inspection must be done in collaboration with a "senior/mentor" inspector (mentoring/shadowing process).

Prior to doing seed potato field inspections on their own, newly trained inspectors should undergo an evaluation to ensure they are qualified to conduct the inspection by themselves.

## **SEED LOT/CROP**

### **3. Information available to the Inspector**

For every potato seed lot/crop being grown on the farm unit the following information must be made available to the inspector at the point of inspection:

- Grower number
- Field eligibility information (e.g. zero-tolerance diseases)
- Field name or number
- Crop eligibility information
- Seed lot/crop number assigned
- Location of seed lot/crop

Identifiers for the seed lot/crops entered for certification

- Variety planted
- Number of acres planted
- Class planted
- Certification number of lots planted (source of seed)
- Quantity of seed planted
- Date of planting.

The inspector may also collect information on potato and other crops planted on the farm or in the vicinity of the potato seed lot/crops submitted for certification and the field history.

#### **3.1. Seed Source Eligibility and Documentation**

Seedlot eligibility will vary by state. See individual state rules and regulations for certification.

- Any variety protected by Patent or under the Plant Variety Protection Act must have authorization from the owner.

## **4. Field inspection**

For an inspector, it is important to build and maintain a strong working relationship with growers and be considerate of private property. Good practice for an inspector would be to:

- Communicate frequently with the grower
- Never discuss or compare one grower's field inspection readings with another grower
- Avoid unnecessary damage to fields while driving between fields or while conducting field inspections
- Leave the farm gates as found.

It is the grower's responsibility to ensure that the seed lot/crop entered for certification is ready for inspection and to inform the inspector on all potato crops grown on the farm.

“Roguing” is the physical process of removing all unwanted plants or plant parts including all tubers from the field. Tubers left in the field to be harvested or plants left in the row as sources of inoculum may affect the quality of the seed harvested. Growers should be encouraged to rogue early and often and in consultation with the inspector. This process should take place before the inspector initiates first inspection and should continue throughout the growing season.

### **4.1. Scheduling inspection**

The following items should be considered when planning inspection activities:

- Knowledge of the farm unit location, including the number and size of seed lot/crops, will help determine how long the inspection(s) will take
- Understanding the physical characteristics, disease reactions, growth habit, and time to field maturity for varieties listed on the application is necessary to conduct a field inspection.

#### **4.1.1. Level and timing of inspection**

Proper timing of field inspections is very important. The minimum is two inspections for every seed lot/crop for growing plants. Depending on the situation, inspections should start early and be scheduled accordingly until the end of the growing season.

In general, the procedures should allow the inspector to inspect at random a representative sample of plants from a seed lot/crop. The number of plants affected by the diseases listed in in your state certification standards and those not true to variety or varietal mix should be recorded separately in the field inspection report and each expressed as a percentage of the total number of plants inspected in the seed lot/crop.

During each crop inspection the inspector should verify the purity and identity of the variety. The first generation derived from Pre-Nuclear class seed potatoes is recommended to be inspected at a more intensive rate to identify off-types.

It is important for the inspector to communicate with the grower to ensure the final inspection occurs before vine killing takes place, making the timing of this inspection crucial for early maturing cultivars.

After ensuring the inspector has a good understanding of the points above, the grower should be contacted to schedule an inspection. Consideration must be given to the following:

- Safe field re-entry times after pesticide application, for reasons of occupational health and safety
- Environmental conditions, e.g. drought, environmental stress.

#### **4.2. Final review prior to field entry**

Once at the farm unit, inspectors should (if not known) introduce themselves and take the time to discuss the inspection process with the growers or representatives. The following is a list of items for the inspector to address prior to field entry:

- Update the grower or representatives on any policy changes or new regulations which may impact their operation
- Verify that the information on the application remains accurate
- Identify withdrawals and/or additions, as appropriate, from/to seed lots/crops submitted for certification
- Confirm information on potato and other crops planted in the vicinity of the potato seed lot/crops submitted for certification
- Review location, eligibility and history of each field
- Confirm class of seed planted in each field
- When the field has been planted with multiple seed sources, request how the different sources were positioned in the field
- Verify the safety for field entry following any chemical applications
- Any issues that may affect inspections, such as disease (e.g. late blight).

It is recommended that an inspector possess or have access to the following materials when conducting a field inspection:

- Map of the fields supplied by the grower
- Inspector's field notes noting the grower and preferably the variety, application number, class, seed source, acres, and proper minimum counts of each field)
- The guide "Recommended Practices of Seed Potato Field Inspection"
- The Regulations for your state
- Variety description of the varieties to be inspected
- Pen/pencil
- Approved disinfectant, sprayer and brush or bucket
- Knife
- Calculator

- Hand lens
- Handheld counter
- Plastic bags for plant samples
- Appropriate footwear, sun screen, insect repellent and protective clothing

### **4.3. Field inspection**

When an inspector is ready to start inspection, he/she may ask the grower or grower's representative to accompany him/her to the field.

Preferably, an inspector should be familiar with the variety to be inspected, disease expression, ensure the timing of their inspections are suitable, ascertain variety integrity, cover the crop adequately, take an appropriate number of counts, assess the crop properly and assign the appropriate class at the end of final inspection.

Inspections should start as early as possible. The first inspection is the initial opportunity for the inspector to observe the growing crop. At this time, the plants should normally show all of the characteristics of the variety and most disease symptoms should be identifiable.

The inspector is to inspect at random a representative sample of plants from a seed lot/crop. The number of plants affected by the diseases and those not true to variety or of another variety should be recorded separately in the field inspection report and each expressed as a percentage of the total number of plants inspected in the crop.

The first generation derived from Pre-Nuclear class seed potatoes is recommended to be inspected at a more intensive rate to identify off-types.

In terms of procedure and preparation, subsequent (if applicable) and final inspections are to be conducted in the same manner as the first inspection. The only notable difference is that the crop entry point should never be the same as the one used in previous inspections to avoid following the identical route as the one followed during the first inspection. This procedure gives the inspector more confidence in stating that the field inspection report is an accurate reflection of the seed lot/crop at the time of inspection.

General elements to observe and note on the inspector's field notes while performing a field inspection include, but are not limited to, varietal identity and trueness-to-type, virus content, insects present, possible varietal mixture, overall field condition (stand, vigor, and cultivation), bacterial and fungal diseases such as late blight, bacterial ring rot, blackleg, wilts, brown rot/bacterial wilt, abnormal plant symptoms, environmental factors, etc.

The inspector should also consider the seed lot/crop size to ensure it corresponds to what is declared on the grower's application. If the seed lot/crop size is obviously in question it should be verified for accuracy.

When entering a seed lot/crop it is important to verify that the variety you are about to inspect is the variety specified on the grower's application. Certification of a seed lot/crop should not proceed when the variety integrity is in question.

#### 4.4. Guidelines for field assessment

The field will be inspected to confirm compliance with your states regulations for the various classes of seed potatoes, as well as to assess the overall health status of the seed lot/crop. Familiarize yourself with your states standards as established in the rules and regulations before the beginning of the field season. In seed potato seed lot/crops, faults counted under the tolerances may consist of bacteria, fungi, viruses, mixtures and off-types or other biological entities affecting seed potato quality. The damage that they cause varies from year to year depending on a number of biotic and abiotic factors.

During field inspection the inspector attempts to confirm varietal identity and accurately describe the status of a seed lot/crop at the time of inspection based on random visual examinations of growing plants performed by walking through the fields. Any abnormal and/or unusual cultural conditions, such as chemical damage, observed in the crop are also recorded. To perform field inspection, an inspector must be familiar with symptom recognition, as well as some of the terminology used to describe disease symptoms or physiological disorders.

**Figure 1: The following are some of the examples of terms used in describing symptoms on potato plants:**

**Chlorosis:** Abnormal light green or yellow coloration of leaves due to insufficient production of chlorophyll, which may be caused by lack of light, mineral deficiency, infection (particularly viral), herbicide damage or genetic factors.



**Lesion:** A distinct area of diseased plant tissue. A canker on the stem or a confined area of necrosis on the leaf.



*Photo credits page 18*



**Mottling or Mosaic:** A variegated pattern marked with yellowish spots or patches of many colors or shades.



**Necrosis:** Death of plant cells or plant tissues, usually accompanied by darkening or discoloration, occurring as a disease symptom.



**Rotting:** Disintegration and decomposition of plant tissue, and may be of two general types, dry rot or soft rot. A dry rot is a firm dry decay; and a soft rot is soft, usually watery, and often odoriferous.



*Photo credits page 18*

**Rugose mosaic:** Severe mosaic accompanied by deformation such as crinkling, curling or ruffling of the leaf surface. It may be caused by a combination of viruses.



**Stalk break:** Disease caused by *Sclerotinia sclerotiorum* in which water soaked lesions expand causing the stem to dry out, turn brown and die. Foliage above the lesion wilts and dies. Symptoms progress until the whole stem is papery and, if broken open, the black sclerotia of *Sclerotinia* can be seen.



**Wilt:** Leaflets lack turgor, causing them to become limp and droop, with the leaves rolling inwards. Caused by a dehydration due to environmental or pathological causes (e.g. *Rhizoctonia*). May affect the whole plant or single stems (if pathological). Stem is dark on inside.



*Photo credits page 18*

## **4.5. Assessing and counting faults**

A representative sample of plants is inspected to determine disease infection and varietal mixture levels in the seed lot/crop. They are taken at regular intervals in a randomized pattern throughout the field/crop to ensure the inspection results are representative of disease levels and varietal mixtures in the seed lot/crop. There are many methods of calculation. For example, one count may consist of 100 consecutive plants in a row. They can be counted individually or by number of steps, as indicated below.

### **Field inspection sampling**

The sample is the number of plants observed. When no fault is found or observed, the sample does not need to be counted. When the planting density is known, the number of plants can be represented by the area observed.

To calculate the percentages of faults one needs to count a number of faults within the population of a known number of plants. For example when crossing rows one can count the number of rows and look for faults within two or five (possibly on each side) plants. After 100 rows and 10 plants each one has a population of 1000 plants. When one has counted 1 fault the percentage is 0.1%.

### **Field inspections by making counts**

One may follow the rows, e.g. 167 steps at a planting distance of 1', while looking over two rows will give you close to 1000 plants. It is recommended to count the plants the first time and then keep the same number of steps. In small fields one may count the plants in the row and based on that number calculate how many passes one needs to make to arrive at 1,000 plants. It is preferable to switch rows and not continuously walk in a straight line when counting.

The number of plants showing faults, such as virus, blackleg, varietal mixture, etc., is recorded and used to determine the percentage in the inspector's field notes. Any plant parts including tubers not properly rogued should be included in the inspection sample.

#### **4.5.1. Establishing the minimum sample size**

It is essential to establish and inspect each seed lot/crop using a minimum sample size (number of counts) depending on the class planted and the area. Infected plants which are observed but not part of a count should be noted in the inspector's field notes.

Additionally, there are times when the calculated percentage of faults does not give an accurate representation of the level of faults in the seed lot/crop. For example, an inspector may observe no faults in the sample but may have seen faults outside the prescribed samples. The sample thus shows zero percentage but it is apparent that the seed lot/crop is not totally free from faults. It is not appropriate for the inspector to add these additional faults to the official counts. However, in such a situation the inspector should note this on the note sheet and bring it to the grower's attention since these faults, if not removed, will reduce the quality of the seed lot/crop and may have an impact on subsequent inspections and/or test results.

#### 4.5.2. Patterns for walking the seed lot/crop to ensure random sampling

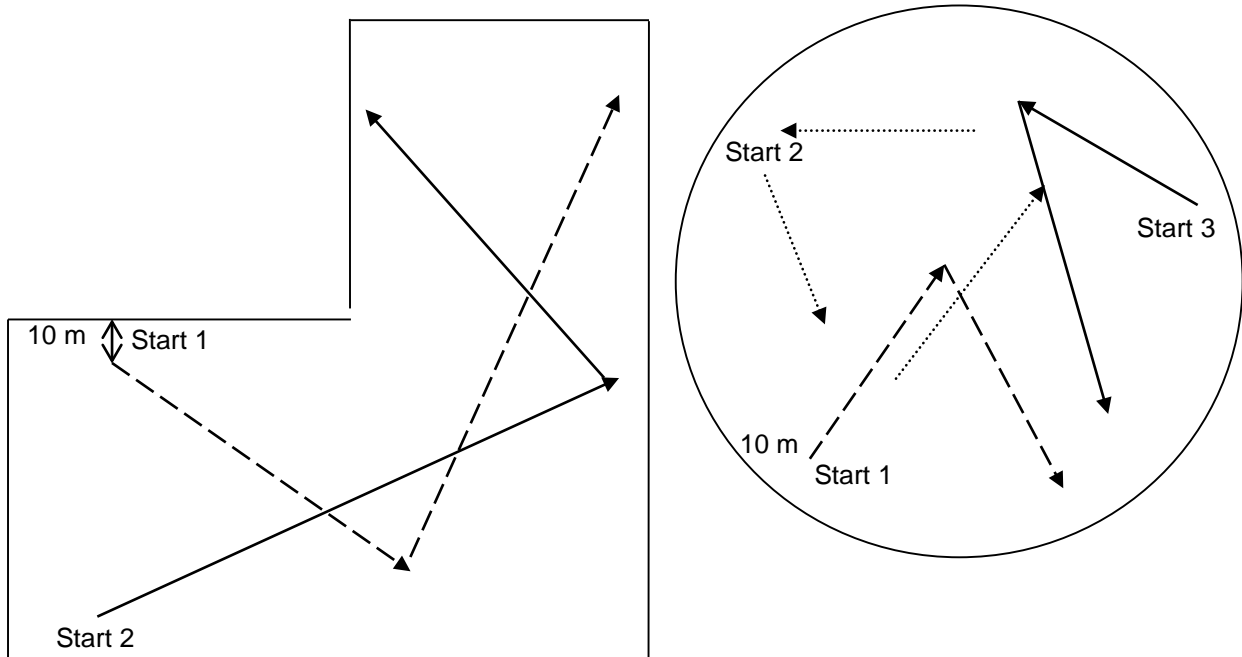
It is up to the discretion of the inspector to use the most random method possible to ensure the field is properly covered.

In general, if at all possible the inspector should try to cross all rows. Crossing rows facilitates the discovery of different seed sources if there are any.

The inspector may walk the seed lot/crop and make a random examination of the plants including/covering both sides of the seed lot/crop either following a figure "X" pattern or an inverted "V" or a zigzag pattern. These patterns generally give the inspector the highest degree of randomness and allow the greatest surface area of the seed lot/crop and the highest number of plants to be covered while reducing the chances of omitting a pocket of infestation unless the area is very small or the field configuration does not allow for this type of pattern.

For crops using center pivot irrigation, a "V" or triangular pattern to the center of the pivot may be followed for each inspection. This should be followed by two additional and shorter modified "V" patterns to complete the inspection. Sample patterns for inspecting circles and irregular-shaped fields are given below. The pattern in the field and entry point should be predetermined and varied between inspections. These two patterns, as illustrated below, will give the highest degree of randomness and allow the greatest surface area of the field and highest number of plants to be covered while reducing the chances of omitting a pocket of infestation.

**Figure 2. Sample patterns for inspecting circle- and irregular-shaped fields**



When entering the seed lot/crop, the inspector should be aware of the “edge effect” where the margins (e.g. 30’) may be particularly prone to insect attack, other stresses or varietal mixtures. Try to maintain the pre-determined sampling pattern without giving undue attention to the very edges of the field. From this point the entire field should be viewed, varietal integrity determined, and notes should be made on

potential problem areas to investigate as the inspection progresses. Special attention should be paid to areas in the field which are susceptible to biotic or abiotic interactions. The inspector should observe low or high spots and areas along hedgerows which could contribute to disease problems or preservation of volunteers. Be aware of potential presence of foreign varieties.

Although the diagrams in Figure 2 indicate a diagonal pattern, as this is basically how you are moving through the seed lot/crop, this is accomplished by an inspector moving through the seed lot/crop in a zigzag type of pattern, moving over several rows after each count, to commence a new count, i.e. count or pace a hundred plants, move over several rows, do another count, move over again, and continue as such. This will help ensure that the seed lot/crop is adequately covered.

During field inspection, in certain situations the inspector may need to take a sample. The grower should be informed that a sample was taken and what methods will be used to analyse the sample.

#### 4.5.3. Biosecurity

Biosecurity processes are a set of practices intended to minimize the introduction, transmission and spread of pathogens and pests in plant populations.

**Farm hygiene:** The inspector should be aware that poor farm hygiene is an efficient way to prevent spread of pathogens and pests. At all times equipment, machinery, boxes and other material coming in contact with seed potatoes or the soil coming from outside the seed farm should have been cleaned before being allowed on the farm.

**Inspector hygiene:** Upon completion of daily field inspection, on a farm unit, and at the end of each day, clean footwear and equipment prior to leaving the premises. When possible, clothing should be changed between each farm unit. If wearing disposable gear, discard and replace with new gear, (i.e. Tyvek pants). Footwear and other non-disposable equipment and protective clothing, required to conduct field inspection, should be cleaned. Washing and cleaning the vehicle between farm units is recommended, if dirty (soiled tires, wheel wells, etc.).

##### **Prior to field entry:**

- Prior to arriving on the production unit, ensure that your vehicle has been cleaned and is relatively free of soil
- If possible, park your vehicle in a location such as the side of the road or driveway, so as to avoid direct entry into the field
- Carefully clean and disinfect footwear and equipment (should be performed when arriving and leaving a farm unit)
- Begin with the highest class to be inspected that day on the farm unit and end with the lowest class. This is a good practice to reduce the probability of spreading/vectoring mechanically transmissible pests, i.e. bacteria, fungus and viruses. If it is not possible to start the inspection with the higher class, boots and protective clothing disinfection must be done prior to proceeding to another class inspection
- Schedule inspections of seed lot/crops, known to be infested with late blight outbreaks at the end of the day.

#### 4.5.4. During the inspection

During the field inspection, the inspector should take notes of all observations of varietal identity and purity, diseases and pests, or any other aspects, e.g. isolation conditions or late blight. In this case, please do not forget that the inspector's duty is a visual inspection and it is important to note all observations. The inspection should be done according to the patterns.

At the time of inspection, consideration should be given to the pattern choice and to the evaluation of disease level, virus content and varietal mixture, if the seed lot/crop was planted with different seed sources. This information is very important because if the seed lot/crop does not meet the regulations, the inspector may choose to proceed with partial rejection of the seed lot/crop.

##### 4.5.4.1. Assessing faults

Between counts, the inspector must stop periodically to:

- Look for insect and disease damage
- Inspect individual plants for aphid infestations by turning over leaf trifoliolate
- Inspect fields for insect damage predominantly close to the edge of the field. This is especially important for determining flea beetle and aphid activity
- Examine leaves and stems for symptoms of fungal infestation.

Symptoms are described e.g. in the “UNECE Guide to Seed Potato Diseases, Pests and Defects”, which can be downloaded from:

[http://www.unece.org/fileadmin/DAM/trade/agr/promotion/Brochures/SeedPotatoes/HighResolution\\_English.pdf](http://www.unece.org/fileadmin/DAM/trade/agr/promotion/Brochures/SeedPotatoes/HighResolution_English.pdf) .

##### 4.5.4.2. Assessing stand, vigor and cultivation

During the course of the field inspection, the stand, the vigor and isolation of the seed lot/crop are rated by the inspector. These are subjective ratings and a seed lot/crop will not fail as a result of these ratings. These assessments are valuable for inspectors, producers and buyers to determine if seed lot/crop characteristics are due to seed quality problems, a result of natural conditions or field management. For example, if one individual lot is planted in several fields in different areas and has reduced vigor in all of these seed lot/crops it may indicate another underlying problem, leading to further investigation.

**Stand** refers to overall uniformity of the plants in the seed lot/crop (e.g. in color, height, etc.) combined with the percentage of plant emergence. An excellent stand would show a very even and complete emergence with very few misses in a row.

**Vigor** is measured by observing the intensity of plant growth in the seed lot/crop. An excellent seed lot/crop should show lush new growth with even color. In cases where the seed lot/crop is performing poorly, possibly attributed to drought, variable fertility, herbicide injury or poor quality seed (physiologically aged, chilled, bruised, small seed pieces), the seed lot/crop will be given a lower vigor rating.

**Cultivation** is the condition of the field in relation to tillage and weed control. An excellent seed field should be free of weeds and the plants are well-hilled with loose friable soil.

Any disease or anomaly, other than those mentioned above, that is encountered during the inspection process, should also be noted in each of the “Remarks” sections in the inspector’s field notes, as well as in the report of field inspection.

#### **4.5.4.3. Corrective action during the inspection period**

The inspector may allow the grower to take corrective action (see 4.6.1) when it is determined that the problem can be corrected by the grower. In such a case a written interim report may be issued. In doing so the inspector needs to make sure that the grower understands the situation and sets a time limit for subsequent inspection. The grower/multiplier is responsible for the action to be taken, i.e. request a subsequent inspection, and carry out corrective measures.

#### **4.5.4.4. Termination of field inspection during the inspection**

During the inspection process or upon arrival at the farm unit, conditions can be encountered which will warrant immediate termination of inspection of a specific seed lot/crop, or termination of all seed lot/crop inspections on the farm unit. For example, the inspection of a single seed lot/crop may be terminated immediately under any of the following conditions:

- Inspection counts show excessive levels of disease or varietal mixture whereby the seed lot/crop is clearly ineligible for Certified class
- There is no clear marking or separation between seed lot/crops of the same variety in different classes and a lower class cannot be assigned because the seed lot/crop with the lowest class is not certifiable, e.g. is rejected
- The inspector becomes aware that the seed lot/crop has been treated with or has been exposed to a sprout inhibitor
- As a result of excessive presence of weeds, leaf injury (hail, insect feeding), pesticide or fertilizer injury, it is not possible to determine by visual inspection the varietal purity or disease incidence

The field inspection on a farm unit may not continue when:

- A zero-tolerance pest has been detected, such as:
  - *Globodera rostochiensis*
  - *Globodera pallida*
  - *Synchytrium endobioticum*
  - *Clavibacter michiganensis* spp. *sepedonicus*
  - *Ralstonia solanacearum*
  - Potato spindle tuber viroid
  - Potato/Tomato stolbur

Where a quarantine pest is suspected the inspector must notify the supervisor. The State Plant Health Director will be advised.

- Rotation and isolation requirements prescribed by the Seed Potato Certification Standards have not been met

- The inspector has confirmed that equipment used to plant or cultivate the field was used in a commercial operation or where a quarantine organism had been detected
- Falsification of records.

#### **4.5.5. Upon completion of inspection**

- Advise growers or their representative of the inspection results, i.e. virus content, blackleg, varietal mixtures, inappropriate separation, insects, blight, etc., and inform them of any action required prior to the next inspection in order to meet the applicable class requirements. This includes roguing, separation for varietal purity, notification prior to vine killing etc.
- If the grower or their representative is not available upon completion of inspection, contact the grower as early as possible to provide results. While on the farm unit, the inspector must record all field inspection results directly on the inspector's field notes and upon completion of inspection, determine if the observations recorded are consistent with the class intended. Changes to information on the field report must be initialled and dated, and the format for recording information (blanks, dashes, lines, checkmarks, etc.) must be consistent throughout. Comments or any actions or samples taken should be recorded and dated. Any plant samples sent for lab testing must be recorded in the inspector's field notes. The grower should be advised when samples are being sent to the laboratory.

#### **4.5.6. Subsequent inspection**

A subsequent inspection is not a first or a final inspection. A subsequent inspection is used or may be necessary to review a prior assessment of a field, if the inspector feels that he/she was not in a position to accurately determine disease expression or varietal mixtures at the time of their first inspection.

#### **4.5.7. Second-opinion inspection**

In the case of a disputed inspection, growers will be entitled to ask the Authorized Potato Seed Certification Official for a confirmatory inspection.

#### **4.5.8. Notes on final inspection**

As the growing season progresses, exposure to pathogens increases and the inspector should be aware of environmental conditions, such as temperature and moisture, which may influence disease levels. In addition, disease inoculum levels increase over time and potential for viral spread from virus-transmitting aphids is enhanced. Virus concentration levels within plants will increase over the growing season and plants which were symptomless could now show symptoms as virus replication occurs. Inspectors should remain aware of current-season virus infection which may appear as circular pockets of symptomatic plants when infested aphids move into a seed lot/crop and spread virus in a circular manner from the point of introduction. In addition, late blight, blackleg and early blight can develop rapidly at this time as heavy dews at night create an environment favourable for their development and spread.



## **4.6. Seed lot/crops not meeting regulations**

A seed lot/crop may fail inspection and be subject to rejection or downgrading to applicable class for a variety of reasons. When a seed lot/crop is downgraded or rejected, the inspector must indicate their readings and observations on the inspector's field notes and identify the reason(s) for rejection.

When a seed lot/crop does not meet the regulations applied for, the inspector must inform the grower of the inspection results.

### **4.6.1. Recommending corrective actions**

Based on requirements in the Seed Potato Certification Standard and field observations, the inspector must determine the status of the seed lot/crop inspected. To assist the inspector to make such a decision, the following is a non-exhaustive list of criteria that could be used in order to assist in determining if corrective action (roguing or other) should be administered or not to determine the seed lot/crop status.

Criteria that could justify the recommendation of the issuance of a corrective action:

1. Observations during the first field inspection are above the tolerances but a corrective action (e.g. roguing) is expected to be feasible.
2. First inspection results are above the tolerances.
3. When roguing or another corrective action is necessary to achieve the required regulations, and the total area to be covered is such that corrective action is realistic and achievable.
4. The variety, field condition and maturity (plant size, senescence, etc.) are at optimal conditions.
5. Corrective actions are put in place immediately or within a given period of time by the inspector.
6. Any other possible reasons.

A recommendation for a corrective measure may not be issued for the same problem twice. Failing to correct the situation, the seed lot/crop concerned will be downgraded or rejected.

When possible, the producer should initiate the implementation of the corrective actions while the inspector is on the farm unit in order to be able to refer to him, if needed. Once the corrective actions requested are completed, the producer must contact the inspector to conduct the first complete inspection, a subsequent inspection or the final inspection.

### **4.6.2. Seed lot/crop downgraded or rejected**

A seed lot/crop not meeting the regulations for the class applied for, will be downgraded to the class for which the regulations is met. Seed lots/crops that are downgraded will continue to be inspected, but will be required to meet the regulations for an appropriate class. Reasons for downgrading a seed lot/crop may include:

- Inspection shows disease or varietal mixture over the tolerance.
- In the case of no clear marking or separation for seed lot/crops of the same variety and different classes, one seed lot/crop will be downgraded to the

lower of the two classes. If the seed lot/crop does not meet the regulations for Certified class seed potatoes on the first or during subsequent or final inspection, the seed lot/crop must be rejected as seed. The inspector must indicate the reason for the rejection on the report of field inspection. Rejected seed lot/crops require no further inspection with regard to seed potato certification.

#### **4.7. Conditions warranting rescheduling of field inspection**

A field inspection may be rescheduled if:

- The plant growth or environmental conditions are not favorable for a good inspection (e.g. strong winds, excessive presence of weeds, wilted plants due to drought, recently cultivated, insufficient plant growth, etc.)
- Excessive foliar damage is present (e.g. damage from frost, hail, insect damage, fungus, etc.)
- The environmental conditions are not safe. Most pesticides have safe field re-entry times listed on the label (e.g. 24-72 hours). Encourage growers to post signs at the edge of the field which indicate any chemicals applied and date of safe re-entry. Consulting the appropriate guides is recommended to determine a specific chemical safe re-entry time.

#### **4.8 Upon completion of inspection**

- Advise growers or their representative of the inspection results, i.e. virus content, blackleg, varietal mixtures, inappropriate separation, insects, blight, etc., and inform them of any action required prior to the next inspection in order to meet the applicable class requirements. This includes rouging, separation for varietal purity, notification prior to haulm killing etc.
- If the grower or their representative is not available upon completion of inspection, contact the grower as early as possible to provide results.
- While on the farm unit, record all field inspection results directly on the inspector's field notes and upon completion of inspection, determine if the observations recorded are consistent with the class intended. Changes to information on the report must be initialled and dated, and the format for recording information (blanks, dashes, lines, checkmarks, etc.) must be consistent throughout. Comments or any actions or samples taken should be recorded and dated. Any plant samples sent for lab testing must be recorded in the inspector's field notes. The grower should be advised when samples are being sent to the laboratory.

#### **4.9. Official reporting of all field inspection results**

After the final field inspection a report of field inspection is produced from the inspector's field notes. That becomes the finished copy of the field inspection. All pertinent information contained within the inspector's field notes is transcribed.

Upon completion of all field inspections on a farm unit for the season, the original copy of the report of field inspection is to be filed with the state seed certification agency. The field inspection results must be provided to the grower.

All field inspection reports should be checked for accuracy and proper completion.

#### **4.10. Additional measures to support field inspection**

Field inspection results will normally be determined by visual assessment of the seed lot/crop. Inspectors may be supported by appropriate tests when confirmation of the cause of a particular symptom is required.

### **5. Conditions to downgrade or refuse certification after the final field inspection**

If after the final field inspection the inspector becomes aware of circumstances affecting the eligibility of the seed lot/crop for certification, the seed lot/crop may be downgraded or rejected from certification.

The following situations lead to refusal for certification:

- The seed lot/crop has lost its identity
- The seed lot/crop has been mixed with other seed lot/crop without the agreement by the inspector.
- Other inspection requirements have been breached
- If the inspector determines that the field had been contaminated with a zero-tolerance pest.

Other situations may lead to downgrading or refusal, such as:

- The seed lot/crop does not meet the tolerances in the regulations or other requirements in the regulations.
- Vine destruction was not carried out when necessary
- The seed lot/crop has been treated with or has been exposed to a sprout inhibitor or a herbicide, as in the case of drifting from another field.

### **6. Field inspection tips**

The following are a few inspection techniques or tips which may assist the inspector in increasing her/his accuracy in the assessment of a seed potato seed lot/crop.

- An inspector should have filled out grower name, field number, variety, acres, seed source, for each field on inspector's field notes prior to walking any field.
- Inspectors should pay close attention to symptoms of potato leafroll virus (PLRV), as the expression may be first seen on the bottom of the leaves when infected seed is planted (secondary infection).
- An inspector should attempt to maintain the sun at their back to reduce glare and strain on the eyes. This also helps significantly in being able to see symptoms of disease.

- The inspector should shade suspect plants to more readily view characteristic disease symptoms such as mosaic, interveinal necrosis and mild mottling.
- The inspector may need to physically handle plants to determine the presence and type of disease- or stress-related problem. For example, PLRV-infected plants show lower leaf curling, that is a lighter color, but the leaves are generally firm and rattle when shaken. Whereas blackleg-infected plants may show leaf curling that is a lighter color but leaves remain soft. This may require the pulling of a few plants to observe other symptoms and determine the cause.
- The inspector should examine suspect plants for the presence of insects, and physiological problems which may be attributed to other related factors. For example, nutrient deficient plants could display symptoms similar to mosaic in contrast to healthy plants. Examine the underside of the lower leaves of plants near edges and throughout the field to determine presence of aphids.
- The inspector should become familiar with the characteristics of the variety being inspected, as some pathogens are capable of expressing themselves very differently on various varieties.
- Inspectors should remember that varieties can display symptoms of primary and secondary infection during different periods of the growing season.
- Inspectors should take note of areas of potential environmental factors which could lead to disease development (e.g. along hedgerows, and other shaded areas, where moisture lingers on the plants, late blight symptoms may be more prevalent).
- Inspectors should determine where the planting was initiated in the field. Varietal mixture and disease spread may be most apparent in this area because planting equipment may not have been properly cleaned. Special attention should be given to these areas.
- Inspectors should stop periodically, look around and validate the variety of the field, observe the general health and status of the field and investigate any areas which give indications of pest or disease problems.

## References

This guide is adapted from:

UNECE Guide to Seed Potato Field Inspection: Recommended Practices 2015 (ECE/TRADE/421)

Procedures-P1-005-eng-Seed\_Potato Inspection\_Manual-Chapter\_5; (Canadian Food Inspection Agency).

UNECE Guide to Seed Potato Diseases, Pests and Defects 2014 (ECE/TRADE/416)

North Dakota Administrative Code: Article 74-04: Seed Potato Certification Standards

## Photos credits

Pages 6-8 - SASA: Science and Advise for Scottish Agriculture, Edinburgh, United Kingdom, chlorosis (left) Dr. Amber Moore, University of ID and stem lesion (left) Dr. Rob Wilson, University of CA

Appendix - Dr. Stewart Gray USDA-ARS and Dr. Nina Zidack Montana State University