

## **Specific Certification Standards Potatoes (*Solanum tuberosum*)**

### **I. Explanation of General Standards as Applied to Potatoes**

1. The General Planting stocks (plantlet, micro-tuber, & minituber) Certification Standards as adopted are basic and together with the following specific standards constitute the standards for certification of potatoes.

2. Definitions

Field is the seed production area enclosed by natural borders such as ditches, tree lines, buildings, roads, or a minimum of a 5' clean and tilled break.

Approved Clean Plant Center is a designated facility which propagates, maintains and distributes virus-tested, virus-free material for expansion of Nuclear Stock in a controlled environment to prevent reinfection.

Micropropagation is the art and science of plant multiplication *in-vitro* by aseptic transfer of stem segments containing one to three nodes to sterile medium to produce Nuclear Stock Plants.

Micro-tubers are *in vitro* tubers, and are the same status as *in vitro* plants

Mini-tuber means a tuber produced in a greenhouse from nuclear stock

Post-Harvest Test means the test authorized by the Department for determining the disease content of recently harvested samples of seed potatoes. Each sample must represent a specific lot of seed potatoes in storage.

Representative Sample is the sample taken for the Post-Harvest Test which must be representative of the field and/or stored seed potatoes to be tested

Rogue means select and remove all plant material of a symptomatic plant.

U.S. Standards for Seed Potatoes is understood to be grades of potatoes as defined and issued by the U.S. Department of Agriculture.

3. Classes and sources of Certified Planting stocks are:

- A. Breeder Seed Stock is material entering the Micropropagation and Repository Unit (MPRU) at North Carolina State University (NCSU) or another approved Clean Plant Center, obtained by methods acceptable to the North Carolina Crop Improvement Association (NCCIA).
- B. Pre-Nuclear Stock Plant is a plant grown in tissue culture. This material is maintained under strict isolation by the MPRU or another approved Clean Plant Center. Pre-Nuclear Stock Plants may exist as *in-vitro* tissue culture plantlets. NCCIA inspections begin at the MPRU/ approved Clean Plant Center.
- C. Nuclear Stock Plant is a greenhouse plant or minituber, produced by the MPRU, another approved Clean Plant Center, or an approved Greenhouse facility from a Pre-Nuclear Stock Plant or propagated material from Nuclear Stock Plants.
- D. G1: G1 plantings are established from Nuclear Stock Plant plantlets or minitubers first exposed to an uncontrolled environment. Tubers produced during this first year in the field are designated as G1 tubers.
- E. G2: G2 plantings are established from G1 tubers. Tubers produced during this second year of field production are designated as G2 tubers.
- F. G3: G3 plantings are established from previous generation tubers. Tubers produced during this third year of field production are designated as G3 tubers.
- G. G4: G4 plantings are established from previous generation tubers. Tubers produced during this fourth year of field production are designated as G4 tubers
- H. G5: G5 plantings are established from previous generation tubers. Tubers produced during this fifth year of field production are designated as G5 tubers

#### 4. Seed Stock Eligibility

- A. Shall meet their Certification Requirements for the state for which the seed was derived Pre-Nuclear, Nuclear, and Field Inspection Requirements for the preceding generation seed lot
- B. Seed potatoes imported into the state shall meet all the requirements for certification under the North Carolina Seed Potato Certification Program, including the Post-Harvest Test requirements
- C. Must be tested and found free of Bacteria Ring Rot (*Clavibacter sepedonicus*)
- D. Must be free of Tobacco Rattle Virus
- E. Must be free of Root Knot Nematodes (*Meloidogyne spp.*)

### II. MPRU or Approved Clean Plant Centers Requirements for North Carolina

1. All Pre-Nuclear plants are to be inspected by NCCIA within 7 days of shipment to Nuclear greenhouse or growth chamber.
2. Inspection of MPRU or Approved Clean Plant Center greenhouse and plants will conform to greenhouse/ growth chamber requirements below.
3. Testing Requirements for Pre-Nuclear Plants demand a minimum of two plantlets for each clone tested with a maximum of 1% and found free from the following pathogens:
  - Viruses: PVA, PVS, PVM, PVY, PVX, PLRV, PotLV, PMTV, TRV
  - Viroid: PSTVd
  - Bacteria: *Clavibacter sepedonicus* (formerly known as *Clavibacter michiganensis subsp. Sepedonicus*), *Pectobacterium spp.*
4. Materials that test positive for any of these pathogens are ineligible for certification.

### III. Nuclear Plants Requirements for North Carolina Nuclear Plants

1. Inspection of Approved Greenhouse/ Growth Chamber and plants will conform to greenhouse/ growth chamber requirements below.
2. Testing Requirements for Nuclear Plants demand testing on 1% of plantlets with a minimum of 5 plantlets and a maximum of 50 plantlets, and found free from the following pathogens for each clone tested:
  - Viruses: PVA, PVS, PVM, PVY, PVX, PLRV, PotLV, PMTV, TRV
  - Viroid: PSTVd
  - Bacteria: *Clavibacter sepedonicus* (formerly known as *Clavibacter michiganensis subsp. Sepedonicus*), *Pectobacterium spp.*
3. Materials that test positive for any of these pathogens are ineligible for certification.

### IV. Greenhouse/ Growth Chamber Requirements for Pre-Nuclear and Nuclear Stock Plants

1. No potato field plants are allowed within 250 feet of the perimeter of the greenhouse.
2. Only approved Pre-Nuclear or Nuclear plants are allowed in the greenhouse; no other plants are allowed when potatoes are in the greenhouse.
3. Growing medium (e.g. soil), containers, etc. used in the greenhouse must be sanitized by a recommended method.
4. Different cultivars must be clearly identified and separated.
5. Doors must be kept locked when attendants are not present.

6. Yellow sticky traps or equivalent must be used to monitor aphids and other insects with one on each end no farther than 10 feet from the end and 50 feet thereafter.
7. Greenhouses must be clearly marked to warn workers that they must decontaminate before entering, i.e. washing hands and clean clothes.
8. A foot bath must be kept at the entrance for sanitizing shoes.
9. Aphids, whiteflies or other insects with sucking mouth parts must be controlled.
10. Equipment must be decontaminated frequently and between groups of plants.
11. Screens must be of such mesh to prevent entry of aphids and placed over all openings (vents, fans, windows, etc.).
12. Double doors or a single door with air screens are required for entry into greenhouse.

**V. Greenhouse/ Growth Chamber Inspections**

1. Greenhouse/ Growth Chamber Responsibility
  - a. Nursery will regularly inspect plants. All plants that are symptomatic of disease or etc. are removed and destroyed. The nursery will keep a log book recording cultivar and number of destroyed plants and make it available to NCCIA inspectors.
  - b. Nursery will inspect in and around the greenhouse perimeters to ensure isolation and weed standards are being met.
2. NCCIA Responsibility
  - a. NCCIA inspector approves greenhouses for production of Pre-Nuclear and Nuclear stocks plantings for the current growing season prior to production.
  - b. Two Inspections are required during the growing season when varietal characteristics are distinguishable. NCCIA may conduct additional inspections if problems are encountered
  - c. If a greenhouse fails an inspection it has 10 days to correct the problem; at that time it will be re-inspected. Plants symptomatic of disease are to be removed and destroyed. If a greenhouse fails two consecutive inspections, plants from that greenhouse cannot be certified.
3. General Requirements:
  - a. Unit of certification shall be the entire greenhouse or lots separated within.
  - b. Plant increase standards are described in Section I, C.
4. Plants/lots shall meet the tolerances specified in Field Inspection Requirements Table 1 and the testing requirements for Pre-Nuclear Plants (II, C.) and Nuclear Plants (III, B.)

**VI. Field**

**A. Land Requirements**

1. The field can only have potato plants that are to be certified.
2. Potato seed are not eligible for certification if produced on land which:
  - a. Has produced potatoes in the previous year.
  - b. Root-Knot Nematodes, Corky Ring Spot, or Bacterial Ring Rot has been found previous two years.
  - c. Has produced Tobacco within the past 5 years.
  - d. Is planted within 1,000 feet of a Tobacco field/ greenhouse.
3. Fields for production of certified potato seed should be 20 feet from other potato plants not in the certification program.

4. Different generations and cultivars (varieties) of plants must be clearly identified and separated by a minimum of 5' clean and tilled break.

**B. Inspections**

1. The certified seed grower inspects fields regularly and informs NCCIA if problems are found.
2. At least two inspections by NCCIA inspector during the growing season when varietal characteristics are distinguishable. NCCIA may conduct additional inspections if problems are encountered
3. The certified seed grower may rogue symptomatic plants.

**C. Specific Field Plant Requirements**

1. Unit of certification for production is a field.
2. Field Inspection Requirements

Factor†	Pre-Nuclear/ Nuclear	G1	G2	G3, G4, G5
Spindle Tuber Viroid	None	None	None	None
Mosaic Viruses <sup>1</sup>	None	0.05%	0.1%	2.0%
Potato Leafroll Virus	None	0.05%	0.1%	1.0%
Total Visible Virus <sup>2</sup>	None	0.1%	0.2%	3.0%
Black Leg <sup>3</sup>	None	0.1%	0.2%	2.0%
Bacteria Ring Rot	None	None	None	None
Root Knot Nematodes	None	None	None	None
Cultivar Mixture	None	0.02%	0.05%	0.2%

<sup>1</sup> Potato disease caused by potato virus A, potato virus X, potato virus Y, potato virus M or a combination of potato viruses A, X, M and Y visual at inspection.

<sup>2</sup> Total is the combined percentage of potato leafroll, mosaic and all other viral, viroid and phytoplasmas (including Zebra Chip (*Candidatus Liberibacter*))

<sup>3</sup> Determination of blackleg disease is based on a visual plant symptom of an inky black stem originating from the seed tuber.

<sup>4</sup> If other severe factors are observed at time of inspection, rejection of all or a portion of a field may occur

**VII. Storage Requirements**

1. One storage inspection is made by NCCIA made after harvest and before certification tags are issued.
2. Different certified cultivars and generations must be property labeled and stored in a manner that comingling does not occur
3. Seed potatoes certified by NCCIA must be separated in storage houses from other potatoes and properly identified and must not be exposed to dust from grading and packing area.
4. No previous year material is to be stored during the storage of the certified crop
5. An official certificate or tag will accompany each sale of certified seed potatoes.
6. A complete record of certified seed potato sales will be maintained and made available to NCCIA. The record will include (a) class, (b) kind and cultivar, (c), (d) date of shipment, and (e) weight of seed tubers shipped.

7. Seed potatoes must pass the greenhouse, field, and seed storage standards to be eligible for Certification.

**VIII. Post-Harvest Testing Requirements**

1. Certified seed potatoes must be subjected to a post-harvest test and meet prescribed standards to be eligible for re-certification at subsequent Generations or sale.
2. Under certain circumstances a greenhouse grow-out or an approved Testing Laboratory will be substituted for the over wintering post-harvest field test to meet eligibility requirements for certification.
3. Seed lots are disqualified for certification if seed-borne chemical injury in excess of 5% is found during post-harvest testing
4. All post harvested samples shall be laboratory tested for Bacteria Ring Rot and Mosaic Viruses.
5. Representative samples will be lab tested at the following rates: 200 tuber sample for 0-4.9 acres, 250 tuber sample for 5-40 acres, 250 tuber sample plus 10 tubers for each addition acre over 40 acres. The sample(s) must be representative of the field and/or stored seed potatoes tested.
6. All Post Harvest Tested material shall meet the tolerances specified in Field Inspection Requirements Table 1 along with the following:

<b>Factor</b>	<b>Nuclear</b>	<b>G1</b>	<b>G2</b>	<b>G3,G4,G5</b>
Corky Ring Spot	None	None	None	None
Wet/Soft Rot	None	1.0%	1.0%	1.0%
Insect damage	None	5.0%	5.0%	5.0%

7. U.S. No. 1 seed potato grade certificate required to issue Certified Tags for the sale of certified seed lots with the following exceptions:
  - a. No minimum diameter requirements
  - b. Grade shall meet all the requirements of conditions established by a buyer/seller agreement.
  - c. The size range should be determined between buyer/seller

[https://www.ams.usda.gov/sites/default/files/media/Seed\\_Potato\\_Standard%5B1%5D.pdf](https://www.ams.usda.gov/sites/default/files/media/Seed_Potato_Standard%5B1%5D.pdf)

**IX. Other regulated diseases. Potato Mop Top Virus, Tobacco Rattle Virus**

- a. Potato Mop Top Virus (PMTV) and Tobacco Rattle Virus (TRV) will be regulated according to the October 25, 2004 Management Plan. This plan is incorporated in these rules by reference.

[https://www.aphis.usda.gov/plant\\_health/plant\\_pest\\_info/potato/downloads/pvy/NecroticVirusManagementPlan.pdf](https://www.aphis.usda.gov/plant_health/plant_pest_info/potato/downloads/pvy/NecroticVirusManagementPlan.pdf)