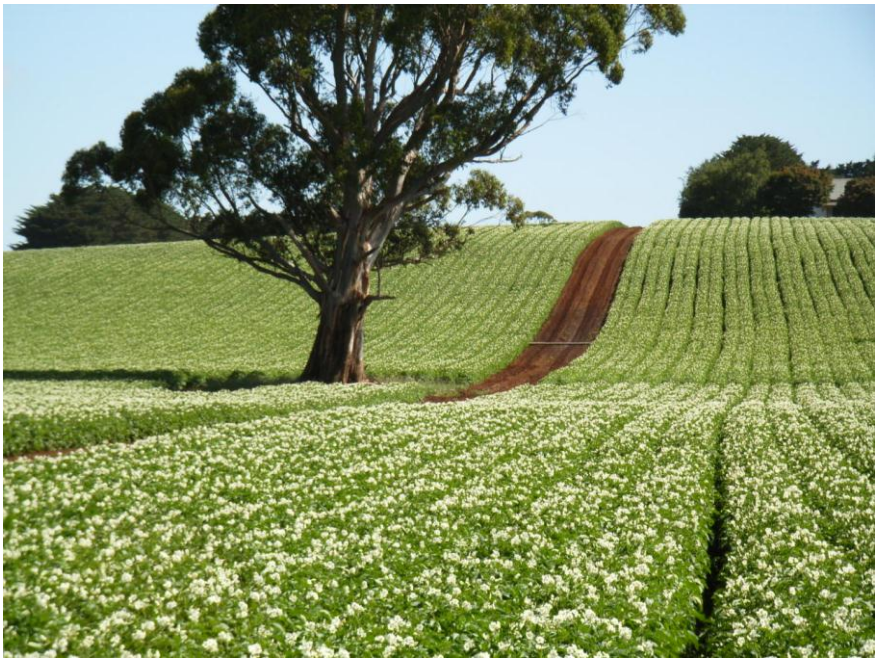
NATIONAL STANDARD FOR CERTIFICATION OF SEED POTATOES



Approved by AUSVEG
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Information also accessable on the web at
www.vicspa.org.au
and
www.ausveg.com.au

Potato R&D
Your national potato levy at work

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Forward

AUSVEG is pleased to endorse the National Standard for the certification of seed potatoes. The Standard which took two years to develop, in consultation with seed growers and other sectors of the potato industry has, enhanced the reputation of Australian-produced seed both domestically and internationally. The National Standard (NS) replaced five separate State-based standards with a single, uniform set of minimum field and tuber production standards for disease, trueness to type and defects and also includes operational procedures to accompany these standards.

The National Standard benefits all sectors of the potato industry:

- Seed growers
- Seed buyers
- Exporters and
- Technologists

AUSVEG is responsible for the implementation and future development of the NS. A national coordinating group, to be chaired by AUSVEG will:

- Coordinate the various State-based agencies which certify seed crops
- Develop a national training program for certification inspectors , and accredited production facilities, and
- Provide a forum for the review (annually) of the standard, to meet industry needs and expectations

Certification of seed potatoes will continue to be undertaken by existing inspection staff operating for current certification authorities in each state. The NS provides a number of important benefits for all sectors of the industry. These include:

- Minimum standards for the presence of disease, and tuber quality
- Common terminology
- Uniform national labelling for both domestic and export certified seed potatoes, and
- Uniform rules and guidelines for seed production, including; rotations, hygiene, seed
- grades, field inspections of crops, tuber inspections, crop isolation, packaging, and transport procedures.

The NS provides greater commercial flexibility to the industry, and:

- Facilitates movement of certified seed between states
- Fast tracks production of new varieties for special markets
- Promotes buyer confidence with a uniform label for all certified seed
- Develops export markets through recognition of a single Australian export label, and
- Enhances buyer confidence in the quality of the product

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INTRODUCTION

The Australian potato industry recognises the need for a National Seed Potato Certification Standard, as a prerequisite for positioning itself to capitalise on the opportunities for domestic and international growth of the industry.

GENERAL PURPOSE OF THE STANDARD

The purpose of the following National Standard, is to ensure that irrespective of the State of origin of seed potatoes, buyers will receive seed which has met an agreed standard. The introduction of a National Standard will, for the first time, afford domestic and export buyers a level of quality assurance, which has hitherto been impossible to provide.

DEFINITION OF TERMS

Accreditation

Accreditation means the official process in which laboratories are approved by AUSVEG to produce planting material for further multiplication.

Accredited Laboratory

Accredited laboratory means a laboratory approved by AUSVEG to produce minitubers, microtubers and plantlets for further multiplication.

AUSVEG

AUSVEG – the peak industry authority ultimately responsible for the administration and operation of the **National Standard**.

Certification

Certification of seed potatoes is strictly limited to the act of endorsing that the seed potatoes have been produced in accordance with these National Standards for Certification of Seed Potatoes.

The method of determining compliance with these standards is visual inspection of the growing crop and inspection of random samples of the graded product.

The National Standard does not require that the certifying authorities test for varietal purity. When zero tolerances are applied, certification does not mean that the lot is free of disease, but that none was visually observed during the routine inspections.

No warranties, expressed or implied, of quality factors not specified in the National Standard for Certification of Seed Potatoes or merchantability or fitness for any particular purpose is given by the certifying authority in respect to Certified Seed produced other than that as required by law. The certifying authority disclaims all responsibility and liability for any incorrectness and inaccuracy caused or contributed to by any circumstances beyond its control. While the certifying authority diligently endeavours to certify the crops in accordance with published standards, there are numerous matters which influence the ability of certification as defined in the scheme such as weather conditions, plant fertility, late insect infestation, latent defects, contamination and light conditions. Whilst all best practices are used by the certifying authority, certification is not an exact science and does not constitute a warranty by the certifying authority regarding the quality or freedom from disease of the seed potatoes beyond the express representation that the seed potatoes were produced and inspected under the scheme and qualified at the time of inspection that the seed potatoes meet the standards.

Certification Authority

Certification Authority means the authority in each State, in which responsibility for maintenance of the **National Standard** has been vested by AUSVEG. Currently these are; NSW Agriculture, AGWEST Plant Laboratories, ViCSPA, and the Department of Primary Industries and Water Tasmania.

Defect
Defect means a non-infectious tuber abnormality caused by such things as insects, mechanical damage, or other factors causing abnormal features.

Disease
Disease means a condition caused by an infectious agent such as a fungus, bacterium, nematode, or virus.

Disease/Defect Tolerances
Disease/defect tolerances means the maximum permitted incidence of disease, or plant defect present in either the growing crop, or on harvested tubers, to meet a defined quality standard.

Inspector
Inspector means a designated and appropriately accredited officer of a certifying authority responsible for certifying seed.

In Vitro
In vitro means potatoes grown in tissue culture in the laboratory.

Label
The official certification tag attached to each unit of certified seed.

Pathogen
Pathogen means a disease causing agent (eg. fungus, bacterium, nematode, virus).

Pathogen Tested
Pathogen tested means potatoes tested for, and found to be free of disease causing agents as listed.

Quality Assurance
The systematic control of quality factors of a product through the whole production process to ensure that it meets market specifications. It applies to the growing, harvesting, grading, packing, transporting and marketing of certified seed potatoes to satisfy the needs of the customer.

Scheme
Scheme means the procedures whereby the National Standard is implemented.

Tuber Rating
The assessment of the health/defects of harvested tubers, by the certifying authority.

ViCSPA
The Victorian Certified Seed Potato Authority Incorporated.

THE NATIONAL STANDARD

INITIAL STOCKS

1. All potato stocks (existing and new cultivars) acquired from whatever source for use as starting material in this Certification Scheme must be visually free of all diseases before being pathogen tested for the presence of the following diseases, either in quarantine, or by any other testing authority approved by AUSVEG:

- Blackleg and related soft rots caused by *Erwinia spp*.,
- Bacterial wilt, caused by Ralstonia solanacearum (formerly Pseudomonas solanacearum),
- Ring rot, caused by *Clavibacter michiganense* pv *sepodonicum*,
- Powdery scab, caused by *Spongospora subterranea*,
- Black scurf, caused by *Rhizoctonia solani*,
- Silver scurf, caused by *Helminthosporium sp*.,*
- Gangrene, caused by *Phoma exigua*,
- Wilt, dry rot, caused by *Fusarium spp*.,
- Wilt, caused by *Verticillium spp*.,
- Black dot, caused by *Colletotrichum coccodes*, and
- Potato leafroll virus (PLRV), potato virus A (PVA), potato virus M (PVM), potato virus S (PVS), potato virus x (PVx), potato virus Y (PVY), tomato spotted wilt virus (TSW), and potato spindle tuber viroid. (PSTV)
- Calico, caused by *Alfalfa Mosaic Virus* *
- Late blight, caused by *Phytophthora infestans* *
- Common scab caused by *Streptomyces sp* *

* these diseases have only been tested for since 1st July 2001

The aim of this scheme is to ensure that the stock provided for further multiplication has been tested and found to be free of these diseases.

Such pathogen-tested stocks must be maintained *in vitro* by the testing authority under conditions of high security (to minimise the risk of re-infection), and must be re-tested for the presence of contaminating fungi and bacteria, prior to their release to accredited laboratories for further multiplication. The *in vitro* material is not necessarily re-tested again for the specific pathogens listed above. Accredited laboratories can maintain stocks for further multiplication and, if necessary, re-apply to the testing authority for new stocks.

LABORATORY MULTIPLICATION OF STOCKS

2. All laboratories and associated facilities (eg. glasshouses etc.) which accept pathogen-tested stocks from approved repositories, to produce Generation O (G0) seed – ie. minitubers, microtubers, plantlets, or other defined propagules must be accredited.
3. Accreditation of laboratories is vested by AUSVEG, in state agencies. The accreditation standards shall be those currently implemented by ViCSPA in Victoria and other participating States. Further details of the accreditation process maybe found at www.vicspa.org.au
4. Accredited laboratories will be inspected annually, by the approved agent of the AUSVEG sub-committee, to ensure that standards are being maintained.

"CERTIFIED" SEED GENERATIONS

5. Any generation of seed may be sold as "Certified" provided it meets the minimum field rating of 3. Seed, which does not meet the minimum rating of 3, can not be further multiplied for certified seed, and can not be certified. See rules 23 & 26.

DEFINITION OF GENERATIONS

Generation O (GO)

6. This material must be produced by accredited laboratories.
7. This material may be sold directly for commercial use, or for subsequent multiplication through one or more field generations (such material may include minitubers, microtubers, plantlets, or other defined propagules).

Generation 1 to 5 (G1 – G5)

8. This material is produced in the field for a maximum of five multiplications, as follows:

Table 1. Multiplication of Certified Seed

Generation Product	Multiplication	Product
G0 (in the laboratory)	1	Minitubers, microtubers, plantlets, or other defined propagules
G1 – G5 (in the field)	1 - 5	Tubers

FIELD MULTIPLICATION

Selection of Paddocks – Disease

Status Bacterial Wilt

9. Seed can be produced only on properties where the certifying authority is satisfied that there is no apparent risk of bacterial wilt affecting the crop.

Potato Cyst Nematode (PCN)

10. Seed can be produced only on properties where the certifying authority is satisfied that there is no apparent risk of PCN being present (See Rule 27). Export crops must be tested according to the prevailing phytosanitary requirements of the importing country.
11. Where PCN testing is required, seed can only be grown on land where a negative result has been obtained from a soil testing program using a PCN detection protocol similar to that detailed in Appendix 1, or as approved by the Australian Quarantine and Inspection Service. Under no circumstances can seed be grown on land, which has previously grown bulbs, corms, or tubers introduced from areas where PCN is known to occur.

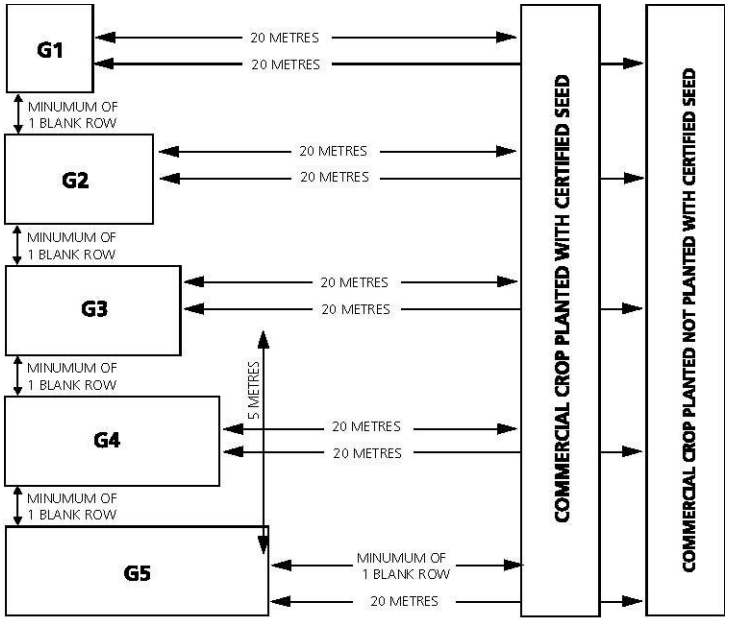
Rotations

12. Land on which seed generations one to three (G1 – G3) are produced, must not have grown potatoes for a minimum of five years. Land on which subsequent generations are produced (ie. G4 and G5) must not have grown potatoes for a minimum of three years.
13. The certifying authority must be satisfied that the land on which the seed crop is to be grown does not have a cropping history which would increase the risk of disease carryover.

Crop Isolation

14. Crop isolations are as presented in Fig. 1.
15. No ware potatoes of the same variety as submitted for certification, are to be planted on any farm (including leased land) that grows certified seed without the approval of the certifying authority.

FIGURE 1. ISOLATION RULES



FIELD CROP INSPECTIONS

16. ***Crops, which fail to meet the standards (Table 2), will not be certified.*** There will be a minimum of two inspections of the growing crop by inspectors from the certifying authority.

17 he first, post-emergence, will be made close to or at flowering and preferably before row closure.

18. The second, pre-senescence, will be made close to, but before the crop starts to mature, or just prior to top removal.

19. All rogued material (tops and tubers) must be removed from the field and destroyed.

20. Rogueing levels shall be at the discretion of the certifying authority. However, as a general guide, a maximum rogueing level of 1% above the defined tolerance should be achievable in a certified crop.

21 Group 1 diseases (i.e. those which are specifically excluded – see Rule 27) automatically preclude the crop from being certified.

Crop Standards

22. Irrespective of the generation, crops will be rated from 1 to 3, according to the following tolerances for foreign varieties, viruses, and other diseases:

Table 2. Maximum Tolerances for Diseases and Foreign Varieties

% of Plants	Rating 1		Rating 2		Rating 3	
Inspection	1st	2nd	1st	2nd	1st	2nd
Foreign Varieties	0.05	0.00	0.10	0.01	0.10	0.10
Virus Diseases	0.10*	0.01	0.25	0.10	1.00	1.00
Other Diseases	0.25	0.10	0.50	0.25	2.00	2.00
Total Diseased Plants	0.25	0.10	0.50	0.25	2.00	2.00

* 0.10% = 1 plant in a thousand

23. Any generation of seed intended for further multiplication in a seed scheme must be of a rating that is equal to or higher than that of the next generation. [Seed with a rating of 2, for example, can not be upgraded to a rating of 1 in the subsequent generation]. Any seed having a field rating of 3 can not be further multiplied for certified seed**.**
24. The highest number rating in any category shall determine the overall rating for that crop. (Eg. for a foreign variety rating of 1, virus rating of 2, and other diseases rating of 3, then the overall rating = 3).

TUBER INSPECTIONS

25. Certified seed shall be graded by size, weight, or number of tubers.
26. Certified seed shall be graded A, provided it does not exceed the maximum prescribed tolerances in Tables 3 and 4.

Disease/Defect Tolerances

Three groups of diseases/defects are recognised for the purposes of tuber inspections:

Group 1 – Excluded Diseases
Group 2 – Diseases/Nematodes – Table 3
Group 3 – Insect Damage/Defects – Table 4

The following tolerances apply to each group of diseases/defects:

Group 1

27. A **ZERO TOLERANCE** will apply to the following diseases, which automatically precludes the crop from being certified.

a. Potato Cyst Nematode (PCN) (*Globodera rostochiensis* or G. *pallida*)
b. Bacterial wilt (*Ralstonia solanacearum*)
c. Potato spindle tuber viroid

The discovery of any quarantinable disease automatically rejects the crop for Certification.

Group 2 Diseases/Nematodes

Tolerances are based on the sample as inspected.

Table 3. Disease/Nematode Tolerances

	Rating (% by tuber count) A
Dry rots *(Fusarium sp., Phoma sp.)*	2.0
Black scurf *(Rhizoctonia sp.)*	-*
Silver scurf *(Helminthosporium sp.)*	-*
Black dot *(Collectorichum sp.)*	-*
Common scab *(Streptomyces sp.)*	2.0**
Powdery scab *(Spongospora subterranea)*	2.0
Root knot nematode *(Meloidgyne sp,)*	2.0
Soft rots *(eg. Pythium sp.)*	0.25
Pink rot *(Pythophthora sp.)*	0.25

* The tolerance for these diseases may be negotiated between the seed grower and the seed buyer. The tolerance should relate to the number of tubers in a sample, with levels of disease present as depicted by styles in the publication "Product Description Language – Potatoes" (ISBN 0 7311 4357 4).

** In Tasmania, the tolerance for domestic seed may be negotiated between the seed grower and the seed buyer.

28. The maximum total permitted tolerance for all diseases in Group 2 is 2%.

Group 3 Tuber Defects Table 4. Defect Tolerances

	Rating (% by tuber count) A
Insect damage	1.5*
Malformed tubers	2.0
Mechanical damage	2.0
Stem end discolouration	2.0
Miscellaneous (eg. sunburn)	1.0
Foreign cultivars	0
Oversize	1.0
Undersize	2.0

* An additional 2% of tubers may show minimal feeding damage (ie. where these tubers have no more than 2 feeding holes/tuber, not more than 3mm deep, containing no soil, and the damaged skin is healed). Tuber eyes must not be damaged.

29. Assessment of Group 2 and 3 diseases/defects will be based on visual inspection of **unwashed tubers**.

30. Tubers shall be **practically free** of soil.

31. The total acceptable tolerance for Group 3 will be 2.0%.

32. Irrespective of the generation assessed, seed will be graded A provided it does not exceed the maximum prescribed tolerances in Tables 3 and 4

Summary of Seed Grades Seed sold to other seed growers

Generations can be transferred and/or traded (1 to 3 in a 4 year scheme, or 1 to 4 in a five year scheme) between registered Certified seed growers and/or contracted producers, with an official "black" label.(See rule 33). Such seed will have a field rating of 1 or 2, and a tuber rating of A.

Table 5. Summary of Seed Grades

Generation			Overall Rating (Field & Tubers) (can not be multiplied for certified seed)
(in a 5 year scheme)	G1	1A or 2A	3A
	G2	1A or 2A	3A
	G3	1A or 2A	3A
	G4	1A or 2A	3A
	G5*	-	1A , 2A or 3A

*Generation 5 can not be further multiplied

Examples of levels of tuber-borne diseases

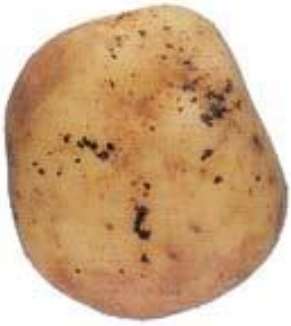
Dry rots (Fusarium sp., Phoma sp.)

Style A

Style B

Style C

Black scurf (Rhizoctonia sp.)



Style A - Slight
(less than 5% of surface area)

Style B - Moderate
(approx. 10% of surface area)

Style C - Severe
(approx. 20% of surface area)

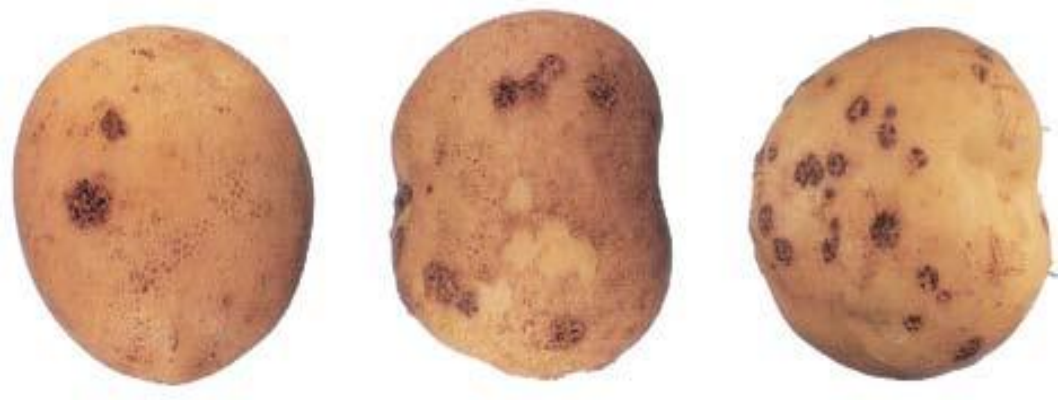
Silver scurf *(Helminthosporium sp.)/* Black Dot *(Colletotrichum sp.)*

Style A - Slight
(less than 5% of surface area)

Style B - Moderate
(approx. 10% of surface area)

Style C - Severe
(approx. 20% of surface area)

Common Scab (Streptomyces sp.)



Style A – Slight
(approx. 2 lesions)

Style B – Moderate
(approx. 7 lesions)

Style C – Severe
(approx. 20 lesions)

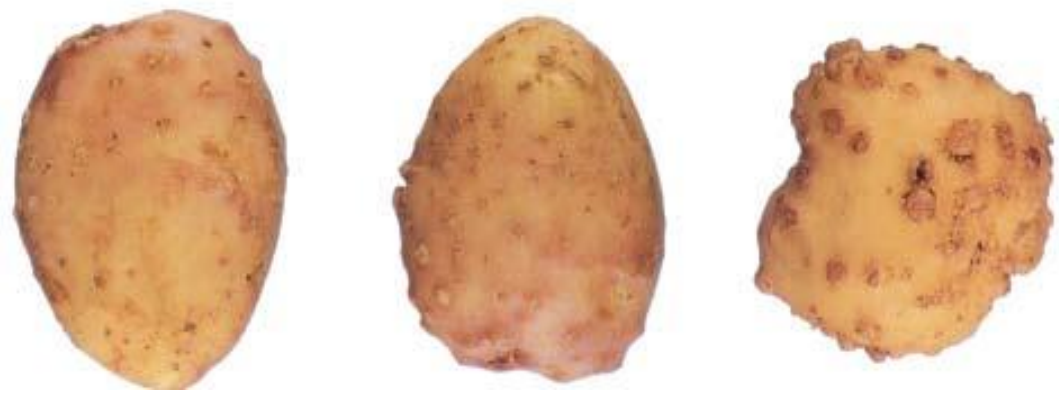
Powdery scab *(Spongospora subterranea)*

Style A – Slight
(approx. 2 lesions)

Style B – Moderate
(approx. 7 lesions)

Style C – Severe
(approx. 20 lesions)

Root knot nematode (Meloidogyne sp.)



Style A
Slight Infestation

Style B
Moderate Infestation

Style C
Severe Infestation

Soft rots *(eg. Pythium sp.)*

Pink rot (Phytophthora sp.)

Style A

Style B
Immediately after cutting

Style C
Approx. 20 minutes after cutting

Insect damage -*Potato Moth*

Surface Damage (larva)

Cross-section (larva arrowed)

Style A

Slight soil adhesion

Style B

Moderate soil adhesion

Style C

Severe soil adhesion

Seed sold as Certified seed

Generations 1 to 5 can be sold as Certified seed, with an official "red" label (see Rule 34). Such seed will have a tuber rating of A, a minimum field rating of 3, and will be sold as "Certified A". The label will be over stamped with the generation.

Seed growers who use Quality Assurance (QA) programs must comply with the specifications outlined in current operating manuals approved by the certifying authorities.

LABELS

Domestic

33. A "black" label must accompany all seed sold for further multiplication within the seed scheme. Except for "G O" black labels must have the crop field rating.

34. Certified seed intended for production of ware crops must be accompanied by a red label.

35. Labels will be of a standard size and design as determined by the AUSVEG sub-committee and will include the following details:
    - Variety
    - The approved certifying authority
    - Generation
    - Endorsement by the certifying authority
    - Definition of Certification, and grower's declaration
    - State of origin may be indicated

    The label may also include grower and date packed.

Export

36. Labels used for export seed will comply with AQIS standards and will include the following details :

    - EXPORT SEED – Produce of Australia
    - Lot No. (only if required) or registered crop number
    - Variety
    - Generation
    - Month harvested
    - Month packed
    - Size
    - Approved certifying authority
    - Endorsement by the certifying authority
    - Definition of Certification, and grower's declaration
    - Weight

37. All labels (domestic and export) must be serially numbered as proof of certification.

Delivery Note/Documentation

38. A delivery note or other appropriate documentation must accompany every batch of seed sold. Export seed must comply with the phytosanitary requirements of AQIS and the importing country.

39. The following details will be provided :
    - Variety
    - State of origin

- Size category/No. of seed pieces
- Rating (optional)
- Generation
- Approved certifying authority
- Date/s of planting
- Date of top removal or month of senescence
- Date of harvest
- Date of inspection
- Postharvest fungicide/insecticide treatments applied to the seed
- Storage conditions (i.e. cool store (degrees C), or ambient)
- Any other relevant details

PACKING AND TRANSPORT OF SEED

40 Seed may only be packed and transported in new sacks, bulk bags, or bins (or used bins, or bulk trucks if accompanied by a cleanliness declaration certificate).

41 Seed that has been repacked will not be recognised as certified seed unless such packing maintains the identity and integrity of the seed as approved by the certifying authority.

STORAGE OF SEED

42. Each generation of seed must be separated, to prevent lines from being mixed.

43. Seed potatoes must be separated from ware potatoes.

44. Seed lots (generations and varieties) must be clearly and accurately labelled.

NOTES ON RULES

INITIAL STOCKS (Rule 1)

Principle of Pathogen Testing

The production of high quality horticultural planting material is dependent on the use of pathogen tested stocks to ensure that only high health material is released for further multiplication. The benefits of using pathogen tested material is that it ensures a constant source of disease-free stock as the basis for further multiplication.

Potato stocks may originate from a number of sources, including :

- New material imported either as tubers or in tissue culture from overseas which has been pathogen tested by the Australian Quarantine and Inspection Service (AQIS), and
- New potato varieties either selected or bred by agencies in Australia.

Pathogen Tested Stocks (Rules 2, 3 and 4)

Pathogen tested stocks of all the varieties in the scheme are maintained *in vitro* at either the Department of Primary Industries at Toolangi, Victoria, or by The Tasmanian Department of Primary Industries and Water at Devonport. This *in vitro* collection is derived from stock tested for the diseases listed on page 8.

Tubers are microscopically inspected for the presence of powdery scab before being tissue cultured.

The *in vitro* collection is not retested again for specific pathogens. The presence of contaminating fungi and bacteria is tested for annually on non-selective media when the

material is multiplied for release to accredited laboratories.

Accredited Laboratories

Pathogen tested stock may be multiplied to produce plantlets and/or minitubers and microtubers in any laboratory accredited by AUSVEG or its agents.

Laboratories in four States (New South Wales, Victoria, South Australia and Tasmania) are currently accredited to produce minitubers, microtubers, and plantlets. These are listed on www.vicpsa.org.au.

Protocol for Accreditation

Details of the protocols for accreditation of laboratories can be found at www.vicspa.org.au.

HOW THE STANDARD OPERATES (Rules 5, 6, 7, 8, and 33)

Certified seed potatoes are derived from minitubers, microtubers, plantlets or other approved planting material produced in accredited laboratories from pathogen-tested stocks maintained in tissue culture.

Seed potatoes can only be multiplied for up to a maximum of five generations, of which any generation may be sold as “Certified” seed provided it meets the standard. The National Standard permits seed to be certified in only a single quality class designated A. Applications for inspection of crops within the requirements of the National Standard must be made to the relevant certifying authority within each State.

Certification will only be accorded if, (i) tubers pass inspection by inspectors of the certifying authority, after the produce has been graded and packed; or, (ii) by the seed grower according to his own QA Manual, where there is an accredited Quality Assurance (QA) system in place. (QA systems currently operate only in Victoria and Western Australia. Growers wishing to participate must apply to and be approved by either ViCSPA or AGWEST Plant Laboratories).

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Disease Status of Selected Paddocks (Rules 9, 10, and 11)

Seed can only be produced on properties where the certifying authority is satisfied that there is no apparent risk of bacterial wilt and/or potato cyst nematode. This will be established from historical records, appropriate soil sampling surveys (where required), and detailed knowledge of production practices on the farm and the surrounding catchment area and district.

Paddock Rotations (Rules 12 and 13)

Crop rotation is undertaken to maintain high health status of certified crops. Minimum rotational standards are required to reduce the risk of carryover of soilborne diseases from hosts such as weeds, solanaceous species or other crops. The certifying authority must be satisfied that there is no apparent risk to the seed crop.

Growers must keep proper records, including whole farm plans, which show:

- The paddock boundaries with paddock numbers or names.
- Where all potatoes are planted each year, and
- Fence line/boundary changes.

Crop Isolation (Rules 14 and 15)

The isolation requirements for each certified seed generation are as presented in Figure 1.

Isolation requirements are the same for generations 1, 2, and 3.

All plots are to be clearly marked with pegs showing the variety, and the seed generation.

There must be clear separation between varieties when they are planted in the same row.

Field Crop Inspections (Rules 16 to 24)

Growers are responsible for notifying the certifying authority when their crop/s are at a suitable stage of growth for inspection. As a guide, inspectors must be able to see the base of plants in the fourth row when looking across the crop at the first inspection.

Certified seed crops must be inspected by an officer of the certifying authority at least twice during their growth:

- Close to or at flowering and preferably before row closure, and
- Close to, but before the crop starts to mature, or just prior to top removal.

The recommended sample size is:

Crop Area (ha)	Sample Size
< 4	At discretion of Certifying Officer
> 4	500 plants/ha, with a minimum of 2,000 plants

Counts should include a traverse across the crop as well as along the rows.

All areas on the property on which potatoes are grown must be disclosed and shown to the inspector at the time of the first inspection.

All plots should be clearly labelled to define variety and generation.

Crops will be rejected if there is any evidence of bacterial wilt, potato cyst nematode (PCN), or spindle tuber viroid (Group 1 diseases), or where the field rating is greater than 3.

Crops may be rejected if they show poor strike, unthrifty plants, undue growth of weeds, severe hail, flood or frost damage, severe damage caused by or suspected to be caused by chemicals, or are too advanced for inspection.

Self sown plants are considered to be foreign plants.

At the time of inspection crops must not exceed the listed permitted tolerances.

Crops submitted for inspection may be rejected at any stage of growth.

In certain circumstances the certifying authority may order destruction of foliage to avoid transmission of diseases.

Plant samples may be required for laboratory testing for pathogens, and these may be at the grower's expense. The results of these tests can be used as the basis of crop rejection.

In the event that only a part of a paddock is accepted as certifiable, then the rejected plants must be removed from the property before the harvest of the remaining crop. Alternatively, the certifiable part must be harvested, graded, packed and labelled before the harvest of the rejected part with the approval of the certifying authority.

Undesirable plants (self-sowns, variety off types and diseased) must be removed from crops as soon as they are sufficiently advanced to be identified as such. The whole plant, tops and tubers, must be removed from the paddock.

Under exceptional circumstances the certifying authority may approve the upgrade of seed rated as 3, to produce a further generation of seed.

Certification (Rules 25 and 26)

The grower must notify the certifying authority when the tubers are ready for certification. An officer of the authority will inspect the unwashed tubers for diseases and defects by examining random samples from each lot of produce presented for inspection. In the case of bulk containers, inspect a sample of 100 tubers and, in bagged lots, inspect all the tubers in the bag. The sample size* will be determined as follows:

Lot Size	No. Samples to Inspect	Pass/Fail Rate
Less than 10 tonnes	2 to 3 samples	All samples must pass
10 to 20 tonnes	minimum of 3 samples	Accept 1 borderline sample
20 to 30 tonnes	minimum of 4 samples	Accept 1 borderline sample
30 to 60 tonnes	minimum of 5 samples	Accept 2 borderline samples

If the potatoes meet tuber standards at the time of inspection, the seed lot will be approved for final certification and sale.

Seed growers participating in approved QA programs are delegated the responsibility for all post-harvest quality control procedures leading to final certification of seed in accordance with their own QA Manual.

Tubers are to be practically free of soil, and must be of good characteristic shape for the variety.

There is a nil tolerance for presence of the disease bacterial wilt (*Ralstonia solanacearum*), potato cyst nematodes (*Globodera rostochiensis* or *G. pallida*), and potato spindle tuber viroid.

The standard method of grading certified seed potatoes is now based on size dimensions, using a square hole template. Unless otherwise agreed to by buyer and seller prior to delivery, seed shall be graded to a standard of 35 mm to 75 mm. If grading is to be by weight, then tubers will usually be graded within the limits of 35g to 250g, unless otherwise agreed to by the buyer and seller.

Unless an agreed level of presence of the diseases Rhizoctonia (*Rhizoctonia solani*), silver scurf (*Helminthosporium solani*) and blackdot (*Colletotrichum coccodes*) is negotiated between the buyer and the seller and specified in a written contract, their presence on tubers will not be included as tuber defects.

Tuber samples may be taken for disease testing in the laboratory, at the grower's expense.

When a seed lot is rejected or re-graded, it is the grower's responsibility to return used labels to the certifying authority.

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Growers may choose to retain identified samples of certified seed and grow then for variety and disease identification purposes. Such plots are to be identified in the field and treated as commercial crops for isolation purposes. The produce from these crops is not to be sold as seed.

Tolerances (Rules 27 to 32)

Examples of the severity of disease listed as "Group 2 Diseases/Nematode" (Rule 28) and "Damage/Defects" (Rule 29) are as represented in the publication "Product Description Language – Potatoes", ExpHORT 2000 Publication No 71 (ISBN 0 7311 4357 4). Tuber

accorded a quality rating of A for disease/Nematode must not exceed the maximum tolerances listed in the Table 3.

Similarly insect damage, malformed tubers, mechanical damage, stem end discolouration, or greening must not exceed the maximum tolerances listed in Table 4.

Tubers shall be practically free of soil (as a guide should not exceed the level of cover as depicted by Style A – see Section 2.3).

LABELS (Rules 33 to 37)

Growers must contact the certifying authority before grading and packing, to request certified seed labels for the seed lots to be certified.

Labels must be attached to each container of seed intended for certification, at the time of grading and packing.

Sacks of seed potatoes must be sealed by sewing an official certification label into the mouth of each sack in such a way that other seed can not be introduced or substituted without damaging the label.

When certified seed is packed into bulk containers and then loaded into a bulk truck the following conditions apply:

- Truck cleanliness – The bulk truck should be treated as a bulk bin and have a signed cleanliness declaration certificate.

- At loading of the bulk truck the labels are to be removed from the containers and only one label is to be given to the driver, to represent that lot of certified seed. The seed grower keeps a record of the label numbers used.
- All labels removed from the containers are to be cut in half and retained for audit purposes.

Official certification labels must be securely attached to prevent loss during transport.
Records must be kept of label numbers used for each seed lot.
Labels must include all the details listed.
Official labels must be destroyed after use.
Growers are responsible for the safe storage and correct use of official labels. The use of official labels for other purposes than those intended may result in exclusion of the grower from the certification process.

Delivery Note (Rule 38)

A delivery note must accompany every batch of seed and provide information relevant to the seed lot.

STORAGE OF SEED (Rules 42 to 44)

Seed potatoes must be isolated from any ware tubers, and stored under conditions, which are approved by inspectors of the certifying authority.

The National Standard is based on the maintenance of high health status between generations of seed. It is important that seed generations be physically separated and that, wherever possible, bin covers be employed where bins are stacked to minimise contamination between upper and lower bins. Ideally, different generations/varieties should be held in separate storages.

Seed that has been repacked will not be recognised as certified seed unless such packing maintains the identity and integrity of the seed as approved by the certifying authority.

Certified seed which has been packed in bulk containers will be recognised only if the integrity of the lot can be verified.

GENERAL OPERATIONAL PROCEDURES

Certification Procedures

Certification of seed potatoes will be undertaken by inspectors of the authority in each State. Responsibility for implementing the National Standard has been vested in these authorities, by AUSVEG. Operational procedures (eg. application for certification, timeliness of requests for crop inspections, documentation, etc.) may vary slightly between States but, nevertheless, will comply in all respects with the National Standard.

New Growers

New growers must demonstrate their ability to meet the requirements of the National Standard to the satisfaction of the certifying authority.

Access for Inspectors

Inspectors from the certifying authorities may inspect crops unaccompanied and without an appointment. However, inspectors will endeavour to make appointments whenever possible.

Testing Procedure for Potato Cyst Nematode (PCN)

Random fork testing of unthrifty plants may be undertaken at the final field inspection of seed crops.

(In Victoria there is a current requirement for PCN testing – the protocol is listed in Appendix 4). This protocol should be adopted by other States if and when required.

Grading and Packing

Seed potatoes intended for certification must be harvested, transported, graded, packed, and stored in such a way as to preserve their identity and limit cross contamination by diseases or varieties.

Seed graded on a harvester may be presented for inspection for certification if the tubers are practically free of soil. Paddock picked and hand graded seed potatoes are only eligible for certification if approved by the certifying authority.

Tubers with sprouts longer than 20mm are not eligible for certification.

Grading Seed Off-Farm

Approval to grade seed off-farm may be granted by the certifying authority if the following requirements are met:

- Each container of potatoes that is to be moved to the other grower's shed must be clearly labelled showing the grower's name, the variety and the generation.
- The grader (all parts thereof) and surrounding floor area be cleaned of all loose soil, debris and potatoes prior to and after grading of the other grower's produce.
- The grader is to be washed and disinfected prior to and after grading the other grower's produce.
- All grading waste and soil collected under the grader are to be returned to the grower.
- Floor sweepings are to be disposed of in a dedicated pit or refuse tip, and
- QA growers who are given permission to grade potatoes from another grower are to present such lots for normal tuber inspection.

Records

Detailed records must be kept and made available to the certifying authority as required. The produce may not be accepted for certification if accurate records are not maintained. These include such details as; source of seed and proof of purchase, variety, time of planting, paddock history, fertiliser and chemical applications, and harvest date.

Hygiene Management

- Seed growers and Certification Officers must ensure that a level of hygiene is adopted which will facilitate the production of high quality certified seed.
- Access to seed crops should be limited to personnel authorised by the grower.
- All operations to be performed on seed crops of different generations should be undertaken such that work commences on the crop of the highest health status (ie. G2 before G4). Personnel and machinery should never move from a crop of lower status to a crop of higher status without hygiene precautions being implemented.
- Travelling irrigators should not be used where they would pass from seed crops sown with G3, G4, or G5 seed to seed crops sown with G1 or G2 seed, unless sufficient unplanted area is left for the irrigator to pass through without contact by wheels or hoses.
- The headlands normally left for machinery movement must not be planted, and must be kept free of weeds.
- The packing shed should have a concrete floor.
- Lighting over the grading table should be to the satisfaction of the certifying authority.
- Agricultural chemicals and produce are not to be stored in the same area.
- Sprout suppressants are not to be used or stored in or near the seed potato grading or storage areas.
- The shed surrounds are to be kept tidy, free of rubbish and weeds.
- Soil and crop debris is not allowed to accumulate in sheds. Waste potatoes, soil and crop debris are to be regularly removed from the shed and surrounding areas and disposed of in a dedicated pit or waste disposal facility.
- Waste should not be returned to potato paddocks.
- All containers used for storage (eg. bins) of seed should be washed between seasons, or more frequently as required.
- Machinery should be cleaned with a hospital grade disinfectant (approved sterilant) as required.
- A designated area should be provided for cleaning and disinfection of machinery and equipment.
- Packing sheds and machinery should be thoroughly cleaned between seasons.

Variety Selection

Registered seed growers who have a selection program for the maintenance and improvement of varieties, may grow small plots of such seed potatoes up to generation 10 (G10) providing:

- The plots meet the visual health and varietal purity standards specified.
- The plots are clearly identified and kept separate by two blank rows from G4 seed plots, and 20 metres from G2 and G3 seed plots.
- The area grown and varieties under selection are recorded on the application form, and
- The produce is not sold as certified seed.

Failure to Observe Requirements of the National Standard

Growers who fail to observe the requirements of the National Standard governing the production of seed potatoes, or who act in any way against the successful implementation of the standard, may be excluded from the scheme.

Growers whose crops fail to meet the required standards for certification either partly, or wholly, in two successive years may also be excluded from the scheme.

Appendix 1.

Protocol for PCN Testing

The following protocol is based on recognised international procedures and is currently accepted by Australian certifying authorities.

A sample of soil is collected and the soil assessed for the presence of PCN at a laboratory approved by the certifying authority. A seed lot can not be certified until the result of the test from the area in which it was grown has been received with a negative result for the presence of PCN.

- Staff or other persons authorised by the certifying authority will supervise sampling. Soil will be collected on a 10 metre by 10 metre grid. The soil collected from 2 hectares will be aggregated and assessed as one sample.
- The preferred sampling time is just before, or soon after planting.
- It is the grower's responsibility to notify the contractor that he/she is ready for sampling.
- All areas of all generations G1 to G5 must be sampled.
- Potatoes from areas which have been sampled can be certified only after written results confirming that no PCN was found, are received from the laboratory.
- The certifying authority may request documented proof of rotation.
- Each sample collected must be clearly identified to enable an accurate "trace back" to where the sample was collected.
- ViCSPA has a current requirement for PCN testing of all crops.

Appendix 2.

Future adoption of higher Standards

In the future, should AUSVEG wish to implement a higher rating for tuber quality (i.e. AA standard) as part of the National Standard, the following maximum tolerances for tuber quality may be applied as shown in the following Tables:

Group 2 Disease/Nematode Tolerances

Tolerances are based on the sample as inspected.

Table 1. Disease/Nematode Tolerances

	Rating (% by tuber count)	
	AA	A
Dry rots *(Fusarium sp., Phoma sp.)*	1.0	2.0
Black scurf *(Rhizoctonia sp.)*	1.0	-*
Silver scurf *(Helminthosporium sp.)/*	0.5	-*
Black dot *(Collectorichum sp.)*	0.5	-*
Common scab *(Streptomyces sp.)*	1.0	2.0**
Powdery scab *(Spongospora subterranea)*	0.0	2.0
Root knot nematode *(Meloidgyne sp,)*	1.0	2.0
Soft rots *(eg. Pythium sp.)*	0.1	0.25
Pink rot *(Pythophthora sp.)*	0.0	0.25

* The tolerance for these diseases may be negotiated between the seed grower and the seed buyer. The tolerance should relate to the number of tubers in a sample, with levels of disease present as depicted by Styles A to C in the publication **"Product Description Language – Potatoes"** (ISBN 0 7311 4357 4).

** In Tasmania, the tolerance for domestic seed may be negotiated between the seed grower and the seed buyer.

The maximum permitted tolerance for all diseases in Group 2 is 1% for AA, and 2% for A (4% in Tasmania only).

Group 3 Tuber Defects

Table 2. Defect Tolerances

	Rating (% by tuber count)	
	AA	A
Insect damage	0.7	1.5*
Malformed tubers	1.0	2.0
Mechanical damage	1.0	2.0
Stem end discolouration	1.0	2.0
Miscellaneous (eg. sunburn)	0.5	1.0
Foreign cultivars	0	0
Oversize	0.5	1.0
Undersize	1.0	2.0

*An additional 2% of tubers may show minimal feeding damage (ie. where these tubers have no more than 2 feeding holes/tuber, not more than 3mm deep, containing no soil, and the damaged skin is healed). Tuber eyes must not be damaged.

The total acceptable tolerance for Groups 2 and 3 will be 1.0% for **AA**, and 4.0% for **A**.

Irrespective of the generation assessed, seed will graded **AA**, or **A**, where **AA** is superior to **A**.

Appendix 3.

Diseases and Tolerances to be included in Field inspections 1 and 2.

	Causal organism	Final inspection rating R3	R2	R1
Zero Tolerance Diseases (Quarantine Diseases from National Potato Industry Biosecurity Plan)				
Brown rot	Ralstonia solanacearum	0%	0%	0%
Ring rot	Clavibacter michiganensis sepedonicus	0%	0%	0%
Potato Cyst Nematode	Globodera rostochiensis or pallida	0%	0%	0%
Late blight A2 mating strain	Phytophthora infestans	0%	0%	0%
Potato Spindle Tuber Viroid	Pospiviroidae	0%	0%	0%
Potato Wart	Synchytrium endobioticum	0%	0%	0%
Potato Mop Top virus	Mop Top Virus	0%	0%	0%
Smut	Angiosorus solani	0%	0%	0%
PVM	Potato Virus M	0%	0%	0%
Phoma leaf spot	Phoma andina	0%	0%	0%
Tobacco Rattle Virus	Tobacco Rattle Virus	0%	0%	0%
PVS (Andean strain only)	Potato Virus S	0%	0%	0%
BCTV	Beet Curly top virus	0%	0%	0%
PVV	Potato Virus V	0%	0%	0%
Skin Spot	Polyscytalum pustulans	0%	0%	0%

This list of zero tolerance diseases will by necessity have to change if the status of any diseases on the list changes. Such changes will be notified by Plant Health Australia and communicated to growers through Potatoes Australia.

	Causal organism	Final inspection Rating R3	R2	R1
Fungal Diseases –				
Fusarium Wilt	Fusarium sp	2%	0.25%	0.1%
Verticillium wilt	Verticillium dahliae / albo-atrum	2%	0.25%	0.1%
Bacterial Diseases –				
Blackleg	Erwinia carotovora ssp.	2%	0.25%	0.1%
Vine Rot	Erwinia sp.	2%	0.25%	0.1%
Total fungal and bacterial diseases#		**2%**	**0.25%**	**0.1%**

#Bacterial and fungal diseases are treated in the same category and have a maximum allowable tolerance

Reportable fungal diseases *		
Rhizoctonia	Rhizoctonia solani	To be noted at field inspection. Assessed at tuber inspection
Pink Rot	Phytophthora erythroseptica	To be noted at field inspection. Assessed at tuber inspection
Late / Irish Blight	Phytophthora infestans	To be noted at field inspection. Assessed at tuber inspection
Leak	Pythium sp.	To be noted at field inspection. Assessed at tuber inspection
Sclerotinia	Sclerotinia sclerotiorum	To be noted on field inspection report
Target Spot	Alternaria solani	To be noted on field inspection report
Reportable bacterial diseases *		
Common Scab	Streptomyces scabies	To be noted at field inspection. Assessed at tuber inspection

Virus Diseases – if virus diseases are noted in the field the results can be confirmed by serological testing

	Final inspection Rating R3	R2	R1
Potato Leaf Roll Virus	1%	0.1%	0.01%
Potato Virus Y	1%	0.1%	0.01%
Potato Virus X	1%**	0%	0%
Potato Virus A	1%	0.1%	0.01%
Potato Virus S	1%**	0%	0%
Potato Virus T	1%	0.1%	0.01%
Tobacco Mosaic Virus – Serological testing required	1%	0.1%	0.01%
Potato Yellow Dwarf Virus – Serological testing required	1%	0.1%	0.01%
Tomato Spotted Wilt Virus	1%	0.1%	0.01%
Purple top Wilt	1%	0.1%	0.01%
Total virus diseases	**1%**	**0.1%**	**0.01%**
Total diseased plants	**2.0%**	**0.25%**	**0.1%**

Insect Pests – if the following pests are detected in the paddock serological virus screening can be carried out.

Aphids	Myzus persicae etc	Noted on field inspection report
Thrips	Thrips tabaci etc	"
Leaf hoppers	various	"

Diseases and Tolerances to be Included in Tuber Inspections
All counts are % by number

	Causal organism	A
Fungal diseases		
Black dot	Colletotrichum coccodes	***
Powdery Scab	Spongospora subterranea	2%
Fusarium Dry Rot	Fusarium sp.	2%
Gangrene Dry Rot	Phoma exigua var foveata	2%
Late / Irish Blight	Phytophthora infestans	2%
Pink rot	Phytophthora erythroseptica	0.25%
Rhizoctonia	Rhizoctonia solani	***
Silver Scurf	Helminthosporium solani	***
Bacterial diseases		
Soft rot	Erwinia sp	0.25%
Common Scab	Streptomyces scabies	2% / 4% (Tasmania only)
Nematode		
Root Knot Nematode	Meloidogyne sp.	2%

* Reportable diseases – these diseases will not necessarily result in crop rejection or down grading. However, the Certifying Authority reserves the right to reject the paddock based on poor crop performance as a result of these diseases.

** Latent viruses show no or limited visual symptoms in the paddock and serological testing is only capable (within practical limits) of detecting 0.34% using a 300 leaf sample.

*** The tolerance for these diseases may be negotiated between the seed grower and the seed buyer. The tolerance should relate to the number of tubers in the sample, with levels of the disease present as per the guide in the publication "Product Description Language" (ISBN 0 7311 4357 4)