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**ECONOMIC COMMISSION FOR EUROPE**

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Working Party on Agricultural Quality Standards  
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Item 6(a) of the Provisional Agenda

**Revised UNECE Standard for Seed Potatoes (S-1)**

**Note by the secretariat:** This document contains the second part (from Annex III) of the revised UNECE Standard for Seed Potatoes (S-1) as agreed by the Specialized Section and recommended to the Working Party on Agricultural Quality Standards for adoption. The first part is contained in TRADE/WP.7/2003/3.

Changes to previous versions have been marked with underline for new text and strike-through for deletions.

**Annex III**

**MINIMUM QUALITY CONDITIONS FOR LOTS OF SEED POTATOES**

**A.** Tolerances for defects and disease allowed for seed potato tubers:

1. Presence of earth and extraneous matter
 

-	pre-basic TC	1 per cent by weight
-	pre-basic	1 per cent by weight
-	basic and certified	2 per cent by weight
  
2. Dry and wet rot, where not caused by *Synchytrium endobioticum*, *Clavibacter michiganensis* *Spp. sepedonicus* (Spieck. and Koth.) Skapt. and Burkh., *Ralstonia solanacearum* (E.F. Smith) E.F. Smith
 

-	pre-basic TC	0 per cent by weight
-	pre-basic	0.2 per cent by weight
-	basic and certified	1 per cent by weight
  
3. External defects (e.g. misshapen or damaged tubers)
 

-	pre-basic TC	3 per cent by weight
-	pre-basic	3 per cent by weight
-	basic and certified	3 per cent by weight
  
4. Common scab<sup>1</sup>: Tubers affected over a specified per cent of their surface (see Annex VIII)
 

-	pre-basic TC (0% surface cover)	0 per cent by weight
-	pre-basic (> 10% surface cover)	5 per cent by weight
-	basic and certified (> 33.3% surface cover)	5 per cent by weight

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<sup>1</sup> *Reservation by Sweden: (> 33% surface cover) for common scab, (> 10% surface cover) for rhizoctonia and 6 per cent by weight as total tolerance would be acceptable.*

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Powdery scab<sup>2</sup>: Tubers affected over a specified per cent of their surface

- pre-basic TC (0% surface cover) 0 per cent by weight
- pre-basic (> 10% surface cover) 1 per cent by weight
- basic and certified (> 10% surface cover) 3 per cent by weight

6. Rhizoctonia : Tubers affected over a specified per cent of their surface

- pre-basic TC (0% surface cover) 0 per cent by weight
- pre-basic (> 1% surface cover)<sup>3</sup> 1 per cent by weight
- basic and certified (> 10% surface cover) 5 per cent by weight

Total tolerance for items 2 to 6 :

- pre-basic TC 3 per cent by weight
- pre-basic 5 per cent by weight<sup>3</sup>
- basic and certified 6 per cent by weight

**B.** The seed potatoes shall be free from *Globodera rostochiensis* (Woll) and *Globodera pallida* (Stone), *Synchytrium endobioticum* (Schilb.) Perc., *Clavibacter michiganensis* Spp. *sepedonicus* (Spieck. and Kotth.) Skapt. and Burkh., and *Ralstonia solanacearum* (E.F. Smith) E.F. Smith.

#### Annex IV

### MINIMUM CONDITIONS TO BE SATISFIED BY DIRECT PROGENY OF SEED POTATOES

#### 1. Pre-basic seed

(a) The proportion, in direct progeny, of plants of other varieties should be 0 per cent for Pre-Basic TC class.

The proportion, in direct progeny, of plants not true to the variety and of other varieties should not exceed 0.01 per cent for Pre-Basic Class.

(b) The proportion, in direct progeny, of plants showing symptoms of mild or severe virus diseases should not exceed:

- 0 per cent for Pre-Basic TC class

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<sup>2</sup> *Reservations: Belgium, in favour of 0 per cent for pre-basic.  
Belgium and Romania need further consultations with the trade on tolerances for basic and certified.  
Greece in favour of a 1% tolerance for basic and certified seed.*

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- 0.5 ~~0.1~~ per cent<sup>3 4</sup> for Pre-Basic class

2. **Basic seed**

- (a) The proportion, in direct progeny, of plants not true to the variety and of other varieties should not exceed 0.25 per cent. ~~The proportion, in direct progeny, of plants of other varieties should not exceed 0.1 per cent.~~
- (b) The proportion, in direct progeny, of plants showing symptoms of virus disease should not exceed 2 per cent, with not more than 1 per cent showing severe virus disease, for Basic I class seed and 4 per cent, with not more than 2 per cent showing severe virus disease, for Basic II class seed.

3. **Certified seed**

- (a) The proportion, in direct progeny, of plants not true to the variety and of other varieties should not exceed 0.5 per cent. ~~The proportion, in direct progeny, of plants of other varieties should not exceed 0.2 per cent.~~
- (b) The proportion, in direct progeny, of plants showing symptoms of virus disease should not exceed 10 per cent, with not more than 5 per cent showing severe virus, for Certified I class seed and 10 per cent showing severe virus for Certified II class seed. Mild mosaic symptoms of discoloration and no leaf deformation should be ignored in categorizing virus for Certified II class seed.

4. The tolerances allowed under points 1 (b), 2(b), and 3. are applicable only where the virus diseases are caused by viruses already prevalent in countries applying the UN/ECE Standard for Seed Potatoes.

5. The incidence of virus in the direct progeny may be determined by testing a sample of tubers from the crop for virus. Annex X describes the principles of developing a sampling regime for this purpose.

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<sup>3</sup> *Reservation by Belgium, France and Portugal requesting 0.5 per cent tolerance.*

<sup>4</sup> *Reservations by ~~the delegations of Germany and Poland~~ as regards the proportion, in direct progeny, of plants showing symptoms of mild or severe virus diseases.*

## **Annex V**

### **LABEL**

#### **A. Required particulars**

1. Nature of the contents: "**Seed potatoes**"
2. The certification authority or its recognized initials
3. Country and/or region of production
4. Reference number of the lot, including where appropriate the producer's identification number
5. Month and year of closing
6. Variety
7. Category and Class and, where appropriate, record of field generation
8. Size
9. Declared net weight

#### **B. Minimum dimensions**

110 X 67 mm.

## **Annex VI**

### **ORGANIZING THE INSPECTION OF CROPS GROWN FROM SAMPLE LOTS OF SEED POTATOES** (certified according to the standard)

#### **I. PURPOSE OF THE INSPECTION**

The examination of seed potatoes in crop tests enables the quality (vigour, purity, healthiness, productivity) of home-grown and imported lots put on the market to be checked at random.

#### **II. ORGANIZATION**

##### **1. *Place of sampling***

Depending on the mode of transport (road, rail or waterway), the sample should preferably be taken when the lot arrives at its destination.

##### **2. *Organs responsible for the sampling***

The sampling shall be done by an official department.

3. ***Sampling***

(a) The lot as defined in annex VIII is the unit represented by a sample. If the lot is a large one, the number of samples shall be increased to :

- One sample per wagon or vehicle, in the case of transport by rail or road;
- One sample for every 50 tonnes, in the case of transport by ship.

(b) A sample consists of 110 tubers, taken from different places in the container or from at least 10 sacks.

(c) The sample shall be placed in a sealed sack; its label shall bear the number of the wagon or the name of the ship, in addition to the information mentioned in annex VI.

4. ***Preservation of samples***

Samples shall be preserved in a uniform manner in favourable conditions.

5. ***Trial fields***

(a) The land must be suitable for potato growing.

(b) Planting should be done in plots of 100 plants. The plots should be grouped by variety in order to facilitate comparison.

(c) Manuring must be adapted to the needs of the crop, but moderate; the use of nitrogen during growth should be prohibited.

(d) The usual cultural care must be conducive to keeping the field clean and the foliage intact.

6. ***List of plots***

A nomenclature of all the samples planted in the same field with the number of the plot concerned shall be sent to the organs responsible for evaluating them.

7. ***Evaluation of the crop inspection***

In order to be accurate, the evaluation shall in principle be carried out in two stages, with an interval of 10-15 days between them. Primary virus infections should not be taken into consideration.

## Annex VII

### DEFINITIONS OF TERMS APPLICABLE TO THE STANDARD

The definitions provided herein apply specifically to certified seed potatoes moving into international trade under provisions of this standard and their meaning may therefore differ from their classical meaning.

Incorporation of the terms in this glossary signifies their unique use by countries which have adopted the standard.

**Blackleg:**

Commonly used name of a bacterial disease of potatoes, generally caused by *Erwinia carotovora* subsp. *atroseptica*. Similar symptoms may, however, be caused by *E. carotovora* subsp. *carotovora* and *E. chrysantemi*.

**Certification:**

An official control procedure which aims at ensuring the production and supply of seed potatoes which satisfy the requirements of this standard.

**Certification authority:**

Organization or agency designated and empowered by national legislation to administer the certification of seed potatoes.

**Consignment:**

A quantity of seed potatoes consisting of one or more lots which have been consigned to one commercial party and is covered by one set of documents.

**Contaminated field:**

A field made subject to regulatory action because of the presence of a designated pathogenic organism in the soil.

**Disease:**

Any disturbance of a plant caused by pathogenic organisms which interferes with its normal structure, function or economic value.

**Field:**

A defined area of land used for cultivation of seed potatoes.

**Free from:**

Not present in numbers or quantities that can be detected by the application of appropriate sampling, inspection and testing procedures.

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**Generation number**

The generation number is defined by the number of growing cycles since the first introduction in the field after micropropagation or selection.

**Homogeneous:**

Uniform in composition and appearance.

**Initial Stock**

The initial pathogen tested microplants produced and maintained under an official control programme.

**Inspection:**

Visual examination of plants, tubers, units of presentation, equipment or facilities by an authorized person, to determine compliance with regulations.

**Lot:**

A quantity of seed potatoes bearing the same reference number, which has been prepared for marketing and being of the same variety, category, class, size and origin.

**Mild mosaic:**

Disease symptom, caused by a virus, characterized by foliage discolouration or mottle and not easily discernible by visual inspection.

**Origin:**

Officially defined area where a lot of seed potatoes was grown.

**Phytosanitary provisions:**

Provisions in accordance with the International Plant Protection Convention.

**Primary virus infection:**

Infection occurring during the current growing season and not arising from the seed tuber.

**Quality:**

The sum of all characteristics that determine the acceptance of seed potatoes in relation to the specifications of this Standard.

**Quality Control:**

The control by the certification authorities of all activities encountered in the process of producing and marketing seed potatoes in conformance with the Standard.

**Quality pest:**

A pest carried by planting material, subject to official regulatory control, but not a quarantine pest.

**Quarantine pest:**

A pest of potential national economic importance to the country endangered thereby and not yet present there, or present but not widely distributed and being actively controlled.

**Regulated non-quarantine pest:**



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A non-quarantine pest whose presence in plants for planting affects the intended use of these plants with an economically unacceptable impact and which is therefore regulated with the territory of the importing part.

**Sampling:**

The procedure of drawing at random a number of tubers, plants or parts of plants which may be taken as representative of the lot or the field.

**Seed Potatoes:**

Tubers which are certified by an official certification authority as meeting specified requirements and being suitable for reproduction.

**Severe Mosaic:**

Disease symptom caused by a virus, characterized by discolouration and distortion of foliage and easily discernible by visual inspection.

**Sprout inhibitor:**

Chemical substance, applied either to the plants during the growing season or to the tubers after harvest which suppresses or prevents the normal development of sprouts.

**Substantially free:**

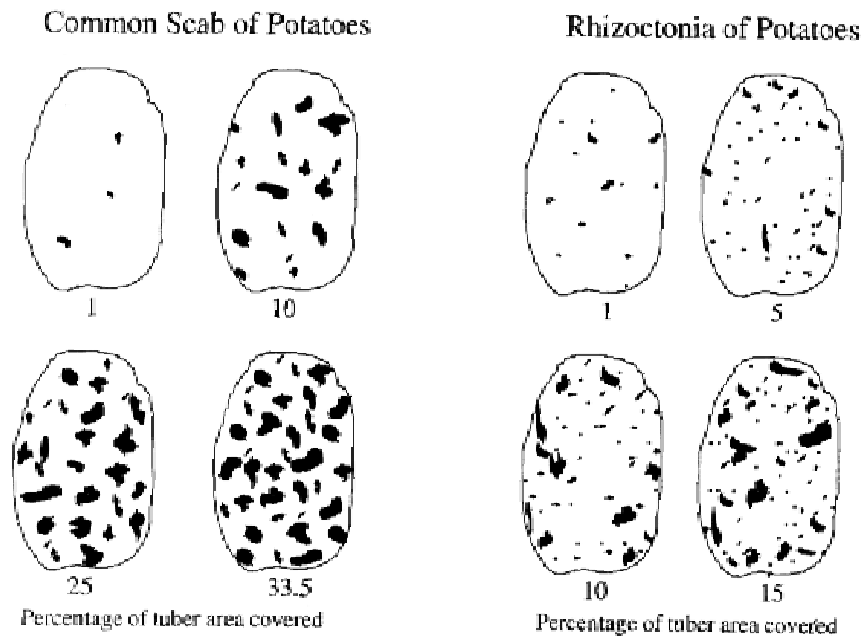
Not present in numbers or quantities in excess of those that can be expected to result from and be consistent with normal handling and good cultural practices employed in the production and marketing of the commodity.

**Testing:**



The use of one or more procedures for determining the presence or absence of a pathogenic agent.

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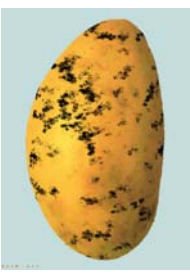
**Annex VIII:**  
**Assessment Key for percentage tuber surface area coverage of blemish diseases**





**Assessment key for percentage tuber surface area coverage of blemish diseases such as black scurf  
(rhizoctonia)**

1% surface area coverage	
	
Homogeneous	Concentrated

10% surface area coverage	
	
Homogeneous	Concentrated

33.3% surface area coverage	
	
Homogeneous	Concentrated

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## **Annex IX** **SAMPLING tubers for VIRUS testing**

### **Introduction**

In testing seed stocks for the incidence of virus, it is seldom feasible to test the entire stock, so a test is done on a sample from the stock. Ideally, only seed stocks with infection levels below the tolerance would be accepted and those above the tolerance rejected. However, taking a sample from a stock means that only an estimation of the actual incidence of virus can be made.

The reliability of this estimation will vary with the size of the sample, relative to the size of the lot, and the population standard which is set for the test. Defining an acceptable population standard for any sample entails two types of risk.

The first is that of rejecting a stock containing less virus than the tolerance and is often described as the "grower's" risk. The risk of accepting a stock containing more virus than the tolerance is known as the "buyer's" risk. From the point of view of classification authorities, this could also be described as the risk of passing a stock which fails to meet the official tolerances.

Such testing makes a number of important assumptions, which are, primarily, that the infected tubers are distributed homogeneously in the stock and that tubers are sampled randomly. In addition, the choice of the size of sample to be tested will need to be balanced by other practical factors such as cost, available facilities, labour, logistics of handling samples, seed stock size, etc.

The following tables and graphs illustrate some of the principles involved in sampling tubers for testing for virus.

### **Confidence limits**

Testing different samples from the same seed stock will give a range of results which, statistically, will lie within a specific interval with a certain percentage confidence. This interval is known as the confidence interval.

The acceptable level of confidence or probability should be decided before the testing is conducted but 95% confidence/probability is normally used. The accuracy of the estimation can be improved by increasing the sample size and by adjusting the allowable number of infected tubers in the sample, i.e. the sample tolerance (Table 1).

For example, the size of the confidence interval for a sample tolerance of 4% (4 allowable tubers) is 8.8% based on a sample of 100 tubers but, on a sample of 200 tubers, the interval decreases to 6% i.e. 7.7-1.7. The effect on the confidence interval of increasing the sample size does, however, become smaller at the larger sample sizes. Increasing the sample size from 100 to 200 tubers improves the accuracy of the estimation by 32 %, i.e. confidence interval reduced from 8.8 to 6.0%, whereas increasing the sample size from 300 to 400 tubers only gives an improvement of 15%.

In practice, therefore, the benefits of increasing the sample size have to be weighed up against the additional cost of the testing. The accuracy of the estimation can also be affected by changing the allowable number of infected tubers in the sample ( table 1). For example, by decreasing the number of allowable tubers from 4 to 3, i.e. changing sample tolerance from 4 to 3 %, the confidence interval is decreased from 8.8 to 7.9 % and the confidence limits themselves become lower. Decreasing the allowable number of infected tubers in the sample also has a significant effect on the probability of classifying at higher tolerances than those allowed in the sample as illustrated in the next paragraph.

**Table 1:** Confidence limits, at a probability of 95%, for various sample tolerances of virus in relation to the size of the sample.

Tolerance(%) for virus in a seed stock	Size of sample	Allowable No of infected tubers	Confidence limits	
			Lower	Upper
4	100	4(3)	1.1(0.6)	9.9(8.5)
	200	8(7)	1.7(1.4)	7.7(7.1)
	300	12(11)	2.1(1.8)	6.9(6.5)
	400	16(15)	2.3(2.1)	6.4(6.1)
10	100	10(8)	4.9(3.5)	17.6(15.2)
	200	20(18)	6.2(5.4)	15.0(14.0)
	300	30	6.9	13.8
	400	40	7.2	13.4

#### Probability of classifying stocks to meet specified tolerances

From the confidence intervals, it can be seen that classifying stocks based on a sample will contain a risk that some stocks, which fail a test, do, in fact, meet the tolerance and others, which pass, should fail. Table 2 and Figure 1 show the effect of varying sample size and the number of virus infected tubers allowed in the sample on the probability of classifying seed stocks with different incidences of virus infection. For example, in a test on a sample of 100 tubers where 3 virus infected tubers were allowed, there would be a 14% chance of classifying a stock containing 6% virus as meeting a tolerance of 4%.

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**Table 2:** Probability of classifying seed stocks at two tolerances for virus based on a laboratory test in relation to the size of sample and the allowable number of virus-infected tubers in the sample:

Tolerance (%) for virus in a seed stock	Size of sample	Allowable no of infected tubers	Probability of acceptance or classification						
			% infected tubers in stock						
			0.5	1	2	4	6	8	10
4	100	3	100	98	86	43	14	4	1
	200	7	100	100	95	45	8	1	0
	300	11	100	100	98	46	5	0	0
	400	15	100	100	99	46	3	0	0
10	100	8	100	100	100	98	85	59	32
	200	18	100	100	100	100	97	75	37
	300	30	100	100	100	100	100	91	55
	400	40	100	100	100	100	100	94	54

**NOTE:** The allowable number of tubers is, often, set at a lower level than the overall seed stock tolerance of 4 and 10% respectively, particularly in the case of a relatively small sample size. By lowering the tolerance in a sample the 'buyers risk' is reduced.

**Figure 1:** Probability of classifying seed stocks with different incidences of virus as meeting a tolerance of 4% or 10% for virus in a laboratory test in relation to the size of sample and the allowable number of virus infected tubers in the sample.

tolerance up to 4%

tolerance up to 10%

Figure 1a  
**BASIC SEED (4%)**  
Probability of classification

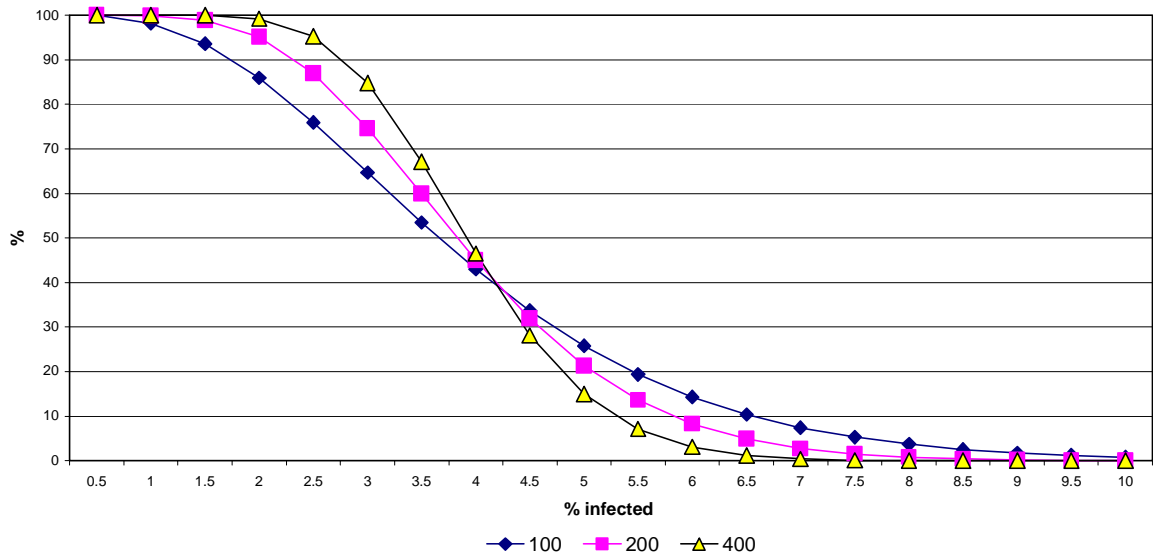
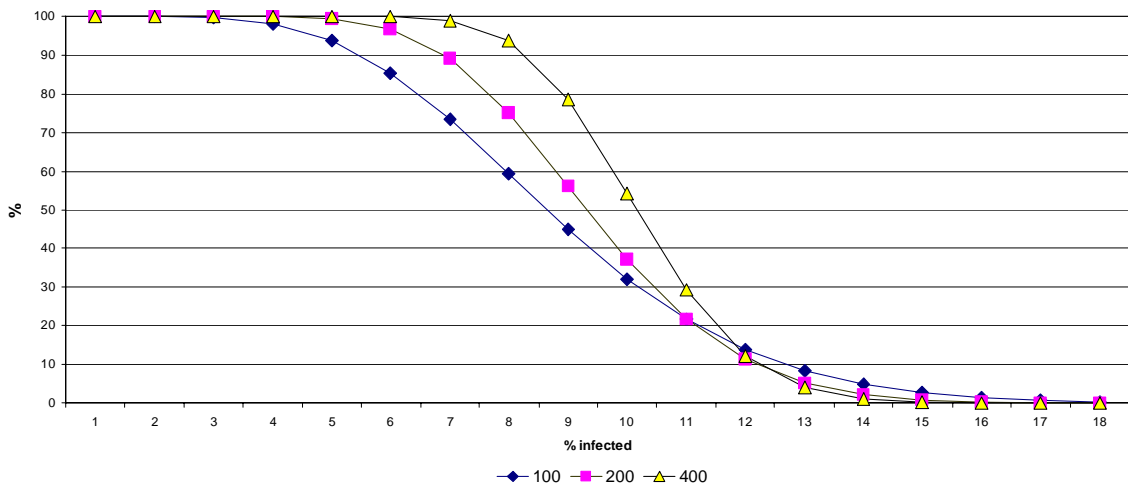


Figure 1b  
**CERTIFIED SEED (10%)**  
Probability of classification



**ANNEX X:  
UNECE STANDARD FOR SEED POTATOES (SUMMARY OF TOLERANCES)**

	<b>PRE-BASIC TC</b>	<b>PRE-BASIC</b>	<b>BASIC CLASS I</b>	<b>BASIC CLASS II</b>	<b>CERTIFIED CLASS I</b>	<b>CERTIFIED CLASS II</b>
<b>1. CROP TOLERANCES</b>						
Globodera rostochiensis (soil tolerance)	0	0	0	0	0	0
Globodera pallida (soil tolerances)	0	0	0	0	0	0
Black leg (%)	0	0	0,5	1	1,5	2
Synchytrium endobioticum	0	0	0	0	0	0
Clavibacter michiganensis	0	0	0	0	0	0
Virus tolerance	0	0,1	0,4 (0,2 severe)	0,8 (0,4 severe)	2 (1 severe)	10 (2 severe)
Other varieties & off types	0	0,01	0,25	0,25	0,5	0,5
<b>2. LOT TOLERANCES</b>						
Earth & extraneous matter (%)	1	1	2	2	2	2
Dry & wet rot (not caused by synchytrium e. Clavibacter m. Ralstonia s.) (%)	0	0,2	1	1	1	1
External defects	3	3	3	3	3	3
Common scab	0	5 (10)*	5 (33,3) *	5 (33,3) *	5 (33,3) *	5 (33,3) *
Powdery scab	0	1 (10) *	3 (10) *	3 (10) *	3 (10) *	3 (10) *
Black scurf	0	1 (1) *	5 (10) *	5 (10) *	5 (10) *	5 (10) *
Total tolerances (%)	3	5	6	6	6	6
Globodera rostochiensis	0	0	0	0	0	0
Globodera pallida	0	0	0	0	0	0
Synchytrium endobioticum	0	0	0	0	0	0
Clavibacter michiganensis	0	0	0	0	0	0
<b>3. DIRECT PROGENY TOLERANCES</b>						
Other varieties & off types	0	0,01	0,25	0,25	0,5	0,5
Virus (%)	0	0,5	2 (1 severe)	4 (2 severe)	10 (5 severe)	10
The figure in brackets is the allowable % surface area covered: a tuber is deemed to be affected by the disease only if surface area affected exceeds the specified allowable surface tolerance						