



Inspection of seed potatoes



INSPECTION OF SEED POTATOES



The potato is an important crop in arable farming in the Netherlands. Of a total acreage of about 150,000 ha, each year between 35,000 and 40,000 ha are grown as seed potatoes.

It would be impossible to grow good, healthy potatoes without high quality seed. Dutch seed growers are able to supply the most suitable seed for virtually all parts of the world. Thanks to great efforts in research and quality control, potato breeders have succeeded in building up an abroad range of potato varieties.

Conditions for the production of high quality seed are favourable: professional growers, very suitable soils and a good climate, generally resulting in a low incidence of aphids.

Quarantine aspects

Member states of the European Union (EU) have to meet the requirements of the EU Phytosanitary Directives. The basic Directive (2000/29/EG) contains general provisions for a number of crops. For seed potatoes, important organisms with quarantine status are potato cyst nematode (PCN), PSTVd, brown rot, ring rot and wart disease.

EU-Phytosanitary provisions have to be incorporated in the legislation of individual member states. Additional stricter national requirements can be added. In the Netherlands, for example, farmers are bound to a maximum potato share in a crop rotation scheme.

The National/Dutch Plant Protection Service (PPS), an agency of the Ministry of Agriculture, Nature and Food Quality is responsible for monitoring, control and eradication of quarantine organisms. The NAK (Dutch General Inspection Service for Agricultural Seeds and Seed Potatoes) inspections include quarantine aspects under responsibility and supervision of PPS. If all quality and quarantine requirements are met, the NAK issues a "Plant passport". This document combines the phytosanitary certificate and the NAK certificate. Additional inspections are done for export to non-EU countries. Under PPS authority, the NAK issues phytosanitary certificates. All potato lots are

subject to a brown rot and ring rot test, according to EU protocols.



Common diseases

Viruses and blackleg (*Pectobacterium* spp., *Dickeya* spp.) are common diseases that require continuous attention by growers and inspectors of the NAK. Other organisms that cause diseases, like late blight and tuber rots, are mainly fungi.

In accordance with statutory regulations, all potato plots are mapped. This is done in order to ensure compliance with the mandatory crop rotation system.

Production and Classification System

A vast part of the Netherlands consists of marine deposits. Seed potato cultivation is concentrated on marine clay soils, close to the sea, which offers the benefit of a low aphid pressure.

Some 1,500 qualified seed potato growers produce more than 900,000 tonnes of seed annually. Farm holdings vary in seed potato acreage, from less than 1 ha to more than 100 ha. Most seed potato farmers are members of a trade company. These are either cooperatives or private enterprises. Seed potato growers are highly qualified specialists. They benefit from extensive scientific research, the Agricultural Advisory Service and the experience of seed companies. Skill is necessary, taking into account that more than 300 varieties are grown. Seed potato production is partly (about 10%) based on the system of clonal selection and mainly on tissue culture material (about 90%).

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Using clonal selection, healthy looking, high yielding and true to type plants are selected from clone fields (high standards of health). These (mother) plants are harvested separately and propagated as separate clones (PB1 - PB4) for a maximum period of 4 years.

Field generations 1 and 4 can be classified as class PB (PB1 - PB4).

Seed potatoes are divided into three categories, with subdivisions into classes:

- **prebasic seed:** origination from mini tubers and clonal selection, class PB
- **basic seed:** classes S, SE and E
- **certified seed:** classes A and B.

Every year seed crops are automatically downgraded one class. In this way regular use of healthy seed is stimulated. Depending on inspection results, further downgrading or rejection may occur. Class PB and S seed stocks find their way to other seed potato growers, who propagate this high class material for another two or three years. Schematically the classification system is as follows:

Class	Generation (max.)
PBTC (minitubers/microplants) Mother plant (clonal selection)	G0
PB 1	G1
PB 2	G2
PB 3	G3
PB 4	G4
S	G5
SE	G6
E	G7
A	G8
B	G9
Category Prebasic	
Category Basic	
Category Certified	

Quality control

The quality of the seed potatoes (and agricultural seeds) is closely monitored by the NAK. The NAK operates under the direction and supervision of the Ministry of Agriculture, Nature and Food Quality. However, the NAK is not a governmental (public) organization, but an independent foundation, founded in 1932.

The board is composed of representatives of all organizations, active in the field of seed crops and seed potatoes: breeders, growers, merchants and users. The NAK organization employs a total staff of 219 people, of which 82 field staff.



NAK inspection regulations are based on the National Seed Law. Seed potatoes must satisfy the EU-minimum standards. For most aspects Dutch seed potato standards are stricter than the EU standards.

The main aspects of quality control are:

- field inspection
- post-harvest tests for viruses and bacterial diseases
- lot inspection.

The final classification is based on inspection results and, of course, the class of the planting material that was used.

Field inspection

The inspection season starts in spring (May) with the web based application for inspection, involving registration of plots, starting material used and a check on the original documents.

Seed potato crops are inspected at least 3 times during the growing season, starting at the beginning of June. Special attention is given to:

- tuber-born diseases
- general appearance and development - trueness to variety
- varietal purity.

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Varietal identity is monitored at the Central Clone Field of the NAK, where samples of 2nd year crops of all varieties are planted.

These samples are also subject to a national survey on quarantine organisms, operated by the Plant Protection Service. Clones not true to type are rejected. More than 20.000 clones are inspected individually each year.

Field inspection tolerances (%)

	PB/S	SE	E	A	B
Severe mosaic/ leafroll	0.025	0.05	0.1	0.25	2
Blackleg (Pectobacterium /Dickeya)	0	0	0 ^{*)}	0.03	0.1
Off-types	0	0	0.025	0.1	0.5

^{*)} sporadic: 1 plant per ha

Lifting dates

Aphids can be notorious carriers of viral diseases. Therefore it is necessary that the foliage of seed potato crops be destroyed before possible virus infections have reached the tubers. For this reason a schedule of haulm killing dates is fixed. Haulm killing before these dates can result in exemption from a post-harvest virus test for classes E, A and B.

These dates depend on PVY susceptibility of a variety, infection pressure in the field, aphid flights and crop maturity.

Yellow water traps in potato plots throughout the country are used to catch aphids. In addition, suction traps at three locations are installed.

The daily counts of aphid species that can spread potato viruses, are transformed into a so-called *Vector Pressure*.

For haulm killing, farmers usually apply a combination of mechanical and chemical haulm destruction. After haulm killing, the plants must not exhibit any further (re-)growth. The inspectors of the NAK watch this very close.

In the beginning of July haulm killing starts for early and PVY-susceptible varieties.

Between two and four weeks after haulm killing the seed crops are harvested.

Post-harvest test for viruses and bacterial diseases

All crops are sampled for a test on ring rot and brown rot (200 tubers), using EU protocols. This test is carried out under the responsibility and supervision of PPS. Since brown rot and ring rot have a quarantine status in the EU, a zero tolerance is applied. The same tubers are used for the virus test, using PCR. This sensitive technique allows (cost effective) bulking of 50 tubers per reaction. This means classification is based on 4 reactions (200 tubers), as indicated below.

# Positive reactions	Maximum class
0 (0%)	PB or S
1 (0.6%)	SE
2 (1.4%)	A
3 (2.7%)	A
4 (not determinable)	-



After completing the post-harvest tests, the definite grade can be established.

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Lot inspection

Seed potatoes are usually graded on the farms, but also at central grading stations. Before marketing can take place, each seed lot is checked for:

- tuber diseases
- defects
- weight (of the container unit)
- tuber size
- contamination (e.g. adhering soil).

In case of, samples from adhering soil are taken and analysed for PCN-cysts (potato cyst nematode), a specific importing country requirement. This test is an extra check, in addition to the official field test for PCN, that is required before planting.



In assessing the potatoes for defects, the inspector looks out for (quarantine) diseases, sprouting, bruising, damage, misshapen tubers, and low temperature damage. During the grading process, the inspector visits the farm daily.

After a seed lot has been approved, it is certified. Under the inspector's supervision a NAK certificate is attached to each package or container. The certificate states the particulars of the lot and is the evidence of approval. The NAK certificate is also a "plant passport" of the EU (NAK certificate is combined with the plant passport in one document) and the evidence that all the standard national and EC phytosanitary requirements are met.

Any additional requirements of countries outside the European Union, that exceed the NAK tolerances and standard phytosanitary requirements, are provided for by the export inspections, carried out by the NAK under supervision of the Ministry of Agriculture, Nature and Food Quality. As a proof of meeting the phytosanitary requirements, a phytosanitary certificate is issued.



The Dutch standards have to comply with the requirements laid down in the EU marketing directive for seed potatoes and in the EU phytosanitary directive.

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Lot inspection tolerances

This table shows the Dutch tolerances for lot inspection and the European standards. Dutch tolerances are more strict.

Disease or defect	Tolerance the Netherlands (NAK)	Tolerance European Union
Rhizoctonia	PB/S/SE: max 10% mild E/A: max 25% mild ¹⁾	PB: max. 5% (weight) with > 1% surface cover Other: max. 10% (weight) with > 10% surface cover
Scab	Scab scale 2.5 (max. 1/8 surface cover)	Max. 5% (weight) with > 1/3 surface cover
Wet rot	Practically none ¹⁾	0.2% (weight)
Dry rot	Practically none ¹⁾	0.2% (weight) in PB 0.5% (weight) in Basic and Certified
Phytophthora	Practically none ¹⁾	Included in tolerance for rots
External defects	4 to 12 tubers per 50 kg ²⁾ ; mild defects not taken into account	3% by weight
Soil etc.	1%	2%

¹⁾ 1 tuber per 250 kg

²⁾ depending on size

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