INTEGRATED CROP MANAGEMENT

A systematic approach to fight Virus Y and Leafroll

HZPC keeps you growing

STET



Edition 2026

HZPC ROYAL HZPC GROUP

This is a publication of Royal HZPC Group, representing its brands HZPC and STET.



RESILIENCE REVOLUTION

In our world, nearly half of all potential crops are lost in the field. Due to diseases, plant pests, and extreme weather conditions.

This must stop. We need to utilize the full potential of potato fields to respond to the **increasing food demand.**

To secure food, we must be more resilient. But one person alone cannot organize a **revolution**. It takes an entire industry. It will require closer collaboration, innovative technology, and **resilient potato varieties.**

A brighter future starts with a resilient revolution.

Potato production must transform to reduce its negative impact on the environment. It should help mitigate climate change, reverse biodiversity loss, and guarantee food safety. At the same time, it must contribute to producing food that is sufficient, safe, nutritious, healthy, and sustainable. This transformation should also ensure fairness and competitiveness, thereby strengthening the EU agricultural sector.

BUILDING RESILIENCE TOGETHER

Dear Grower,

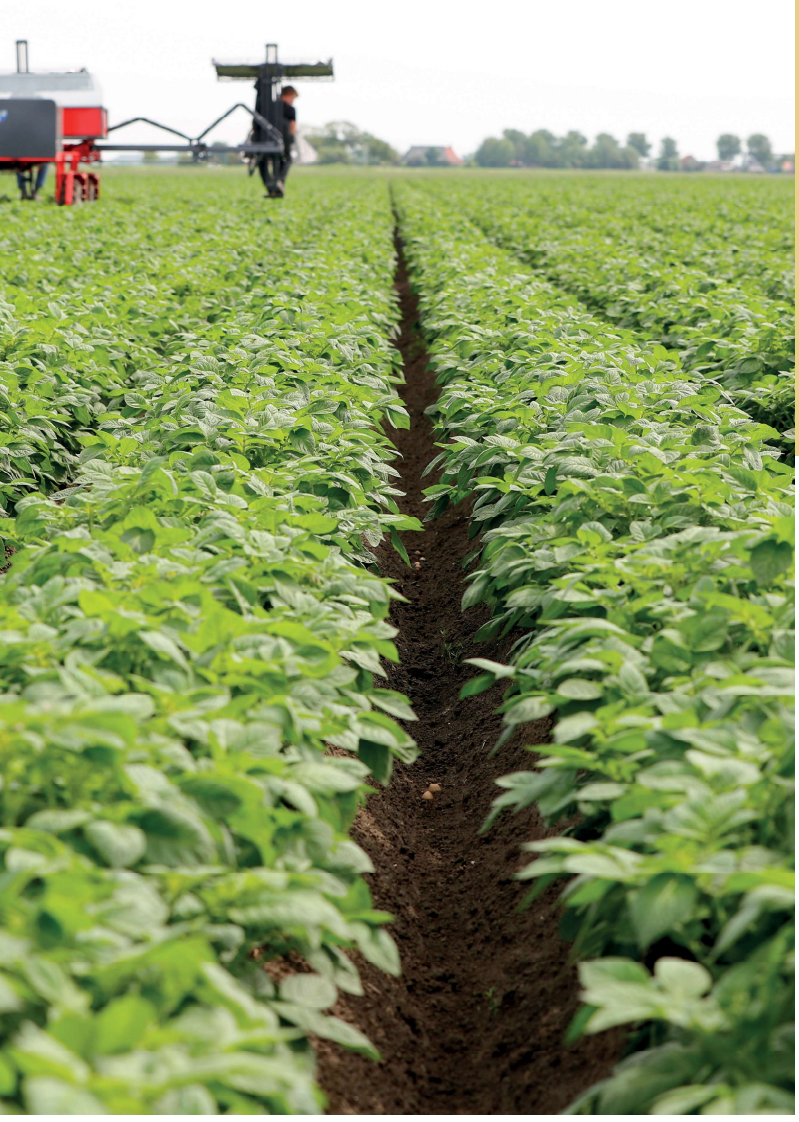
Together, you and HZPC and STET stand strong together in facing the virus challenge. By combining your practical field experience with our knowledge, monitoring, and variety development, we can reduce virus pressure and secure high quality seed production for the future.

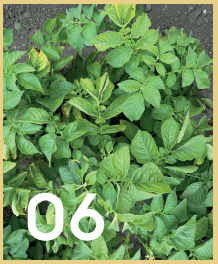
This challenge requires teamwork, transparency, and timely action, and we are committed to supporting you every step of the way. Thank you for your dedication and partnership as we work together to safeguard our seed potato crop and strengthen our sector.

To meet this virus challenge, we apply the ICM (Integrated Crop Management) systematic approach. This approach ensures that every measure in the field contributes to healthier crops and lower virus pressure. Instead of looking at individual measures in isolation, ICM systematically focuses on the entire production system.

In our ICM approach, we have created an overview of available measures and options for preventing virus damage. From here, we work through these options in a structured way to produce a practical and clear set of steps to take throughout the season.

In this booklet, HZPC and STET will inform you about the current steps, explain each measure, why it matters, and how and when you can apply it in your fields.















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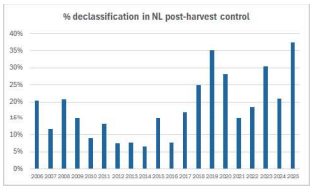
Leafroll blocks sugar flow,
causing rolled leaves and poor growth

VIRUS Y AND LEAFROLL

Most damaging viral diseases in potato production

Potato Virus Y (PVY) and Potato Leafroll Virus (PLRV) are two of the most damaging viral diseases in potato production. Both viruses reduce yield and tuber quality, and the severity depends on the virus strain and the potato variety. For seed potato growers, the consequences are significant: infected lots often face declassification or even rejection, leading to major financial losses.

The urgency of this issue is clear. Declassification rates have risen in recent years, and controlling these viruses has become more challenging. Effective chemical crop protection options are limited, while aphid populations, the main vectors, are increasing. Certification standards vary by country, but the goal is universal: keep seed lots as clean as possible to maintain access to pre-basic seed and ensure the ability to export high-class seed.



HOW THESE VIRUSES SPREAD

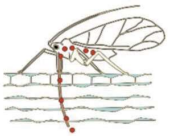
Virus Y is transmitted in a non-persistent manner by aphids. Due to this, the virus can spread quickly from plant to plant. Virus Y can also be transmitted through contact via machinery, clothing, or plant-to-plant contact, but this is far less efficient than aphid transmission.

Leafroll is transmitted persistently by aphids. Once an aphid acquires the virus, it can spread it for the rest of its life, after a delay of 24 to 48 hours. This makes Leafroll particularly difficult to control. More than 65 aphid species can transmit Virus Y, and 13 species can transmit Leafroll, with the green peach aphid *(Myzus persicae)* being the most important due to its population size and transmission efficiency.

When a plant is infected with Virus Y or Leafroll, all the daughter tubers are infected.



Non-persistent virus
Acquisition in a few seconds (PVY)



Persistent virus
Acquisition in hours (PLRV)

Illustration: M. Houlé, INRA, France

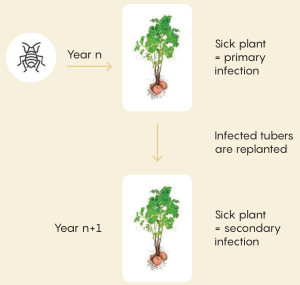
RECOGNIZING THE SYMPTOMS

VIRUS Y

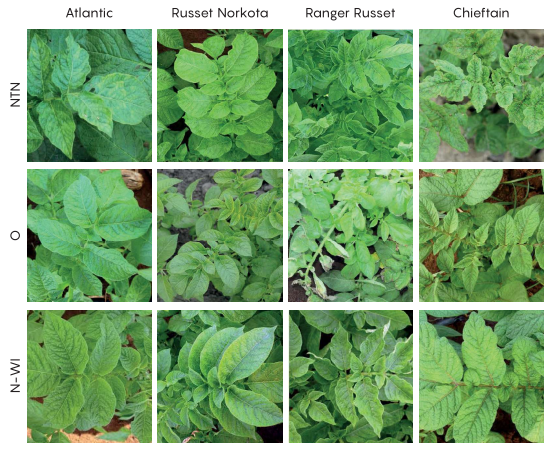
When a plant is infected by aphids, most of the time symptoms are mild and only visible late in the season. This is called "Primary infection".

When a plant emerges from an infected tuber, the symptoms appear earlier and are more severe and visible. This is called "Secondary infection".

Virus Y symptoms depend on the Virus Y strain and the potato variety.



PVY STRAINS ON DIFFERENT VARIETIES



Source: Cornell University

The most common Virus Y symptoms are:

- **Vein necrosis** and necrotic spots on the underside of the leaflets
- **Crinkling:** leaf deformation (crinkling) and size reduction with shiny appearance and mottling associated with pendulous growth habit and stunting of the plants
- **Rugose mosaic:** severe mosaic pattern and leaflets reduced in size, with large necrotic spots on the veins, dwarfing and severe plant deformation
- **Mosaic pattern or mottling:** alternating patches of light green and dark green areas without any leaf distortion

Several symptoms can be present on the same plant, making the detection more difficult. PVY$_{N}$ is the main strain in western Europe. It causes light mosaics which are difficult to see and select.


Vein necrosis
Source: Maries Elemans (NAO)


Crinkling
Source: Maries Elemans (NAO)


Mosaic patterns
Source: Maries Elemans (NAO)


Rugose mosaic
Source: Maries Elemans (NAO)

Tubers may develop necrotic rings with water-soaked tissue underneath. The PVY$_{NTN}$ strain is known for causing Potato Tuber Necrotic Ringspot Disease (PTNRD), although most recent HZPC and STET varieties are tolerant, meaning the virus can infect tubers without causing visible symptoms.


Source: Maries Elemans (NAO)

LEAFROLL

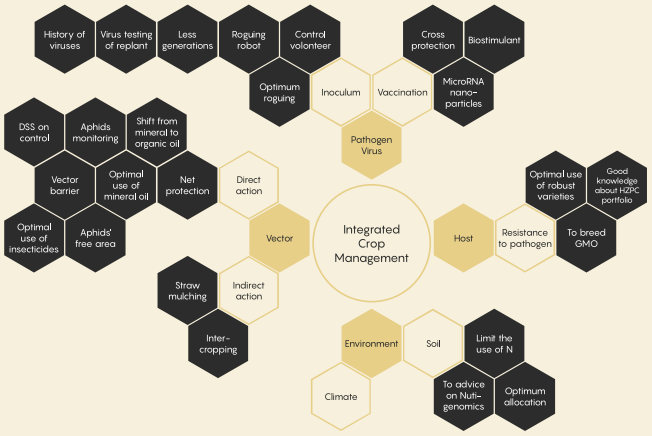
Leafroll affects the phloem and causes the accumulation of sugars in the foliage, leading to inward rolling of leaves. Infected leaves become stiff, leathery, and dry, often making a crackling sound when squeezed. Some varieties do not show rolling leaves but remain stunted, with upright leaves that may be discolored.

SYSTEMATIC ICM APPROACH FOR POTATO VIRUSES

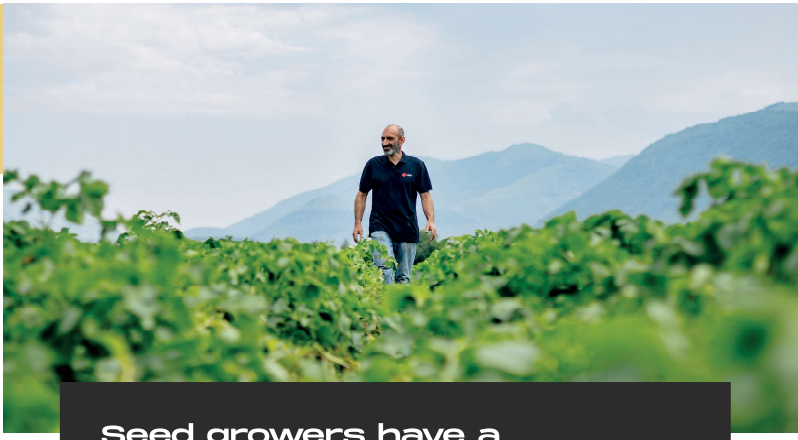
Potato production faces persistent challenges from Virus Y and Leafroll that significantly reduce yield and tuber quality. Unlike fungal or bacterial pathogens, viruses cannot be eradicated through chemical treatments, making prevention and integrated management essential for sustainable potato cultivation.

The Integrated Crop Management (ICM) approach provides a systematic framework to minimize viral risks by combining preventive measures, monitoring, and resilience strategies throughout the crop cycle.

By applying these principles, the systematic ICM approach shifts from reactive interventions to proactive, sustainable virus management. It helps growers protect yield, maintain quality, and reduce economic losses while supporting long-term environmental and crop health.



ICM Virus framework for a systematic approach based upon the approach of M.M. Riemens, University of Wageningen
Source: HZPC



Seed growers have a wide range of tools to fight Virus Y and Leafroll

Since the early days of seed potato production, farmers, researchers, and technicians have worked together to develop numerous strategies to control Virus Y and Leafroll. The diagram illustrates the different methods available.

These methods are diverse and target different aspects:

- **Reducing virus presence in the field (inoculum):** Avoid replanting infected seed lots, remove diseased plants (roguing), and control volunteer plants.
- **Strengthening the host plant:** Breed and use varieties that are less susceptible to infection.
- **Managing environmental factors:** Limit nitrogen fertilization to reduce plant vulnerability and produce seed potatoes in climates less favorable to viruses.
- **Controlling aphid vectors:** Apply chemical or physical measures to reduce aphid populations.

While you have many tools at your disposal, no single method is 100% effective against Virus Y and Leafroll. Success depends on combining several approaches in a well-planned strategy. This integrated approach is known as ICM VIRUS, using all available tools to achieve effective virus control.

Some methods and tools are already well- known to you, while others seem futuristic. In this brochure, we have chosen to present five key methods that are applicable and significantly improve plant protection.

ICM is an integrated approach

- Optimal use of Plant Protection Products (PPPs) for targeted control
- Netting for full, efficient protection against vectors
- Straw mulching to reduce aphid landings
- Maximizing the benefits of innovative resistant varieties

Optimal use of Plant Protection Products (PPPs)

MINERAL OIL

Mineral oil is a key tool against Virus Y

Mineral oil creates a coating on leaves, reducing aphid efficiency in transmitting Virus Y.

- Mineral oil does not kill aphids; only limits PVY transmission.
- Mineral oil does not prevent PLRV transmission.
- Only paraffin oil is allowed in the EU. Vegetable oils (e.g., sunflower oil) are less effective.

A future-proof solution?

In several European countries, mineral oil is considered bio-pesticide and is allowed for organic production. There doesn't seem to be any risk of usage restrictions in the coming years. However, mineral oil is derived from petrochemicals and may not be environmentally neutral.

WHAT IS THE OPTIMAL WAY TO USE MINERAL OIL

Mineral oil is a contact product. To ensure optimal protection, treatments must follow plant growth. In the first few weeks, new leaves appear daily, in addition to existing leaves.



Untreated plant | Treated plant (same day) | Treated plant (one week later)

During first weeks, new leaves appear every day on potato plants!
Source: Dupuis 2017

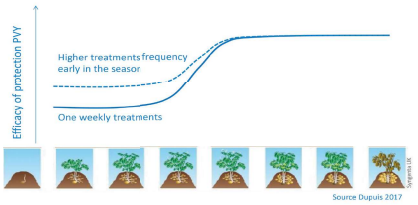
It is important to ensure full coverage of the leaf area. Begin treatments at plant emergence, which is a very sensitive phase. While conditions don't always allow for adequate protection of the new leaves that appear daily (wind, insufficient frequency, etc.), the combination of mineral oil and straw mulching helps overcome this difficulty.

HOW TO USE MINERAL OIL

Frequency

- Treatments should begin as soon as the first plants emerge.
- Treatments should be applied frequently in the first few days (every 48-72 hours).
- Once vegetation has stabilized, the frequency can be extended (every 5—7 days).
- Protection should be maintained until complete haulm destruction.

Oil spraying - the efficacy



Emergence is a sensitive phase, to increase frequency is a way to increase efficacy.

Source: Dupuis 2017

DOSAGE & CONDITIONS

Efficacy is proportional to the doses applied. In all cases, national regulations on plant protection products (PPPs) must be respected. Programs must be adapted to the risks, such as environment, inoculum, varietal susceptibility, and the objectives (pre-bases, bases, Class A).
However, reducing doses for economic reasons carries a significant risk of reduced efficacy.

To optimize treatment efficacy, it is necessary to:

- Maintain a maximum dilution of 3% (oil/water volume)
- Treat when there is no wind and no dew

Mineral Oil - Take home message

Efficiency on PVY	Efficiency on PLRV	Cost	Labour	Future proof solution	Environmental footprint
Good	No effect	Low	Low		Petrochemical

Optimal use of Plant Protection Products (PPPs)

INSECTICIDES

IMPORTANCE OF APHID CONTROL

Aphids are responsible for transmitting Virus Y and Leafroll. By reducing aphid populations, the severity of infections can be limited. However, these viruses have different transmission modes, which affects how effective insecticides are against them.

Insecticides have limited effect on Virus Y control
Insecticides are not the primary tool for managing Virus Y transmission. Virus Y is a non-persistent virus, meaning aphids can acquire and transmit it within seconds to minutes. For insecticides to prevent Virus Y transmission, they would need to kill or paralyze the aphid before it inoculates a new plant. Although insecticides are commonly used in practice, scientific studies show inconclusive results for Virus Y control.

Insecticides are essential for Leafroll
Insecticides are the preferred chemical solution for limiting Leafroll spread. Leafroll has been very rare in potato fields for nearly 20 years and has made a significant comeback since 2022. Any protection strategy must include Leafroll control.

Unlike Virus Y, Leafroll is a persistent virus. After an aphid acquires Leafroll, the virus needs to pass through its body before it can be transmitted. This process takes 1 to 2 days, creating a window where insecticides can act.

Green Peach aphid, Myzus persicae, enemy number one for seed growers!

Myzus persicae is a pest of global importance and has developed resistance to all the families of insecticides successively introduced.

Chemical Group	Active Compound(s)	First Reported Resistance
Dimethyl carbamate	Pirimicarb	1940s
Pyrethroid	Esfenvalerate, lambda-cyhalothrin, etofenprox, cypermethrin	1970s
Neonicotinoid	Acetamiprid, thiacloprid, thiamethoxam	1990s
Pyridine azomethine	Pymethroxine	1990s
Pyridine carboxamide	Flonicamid	2010s

Types of resistance developed by *Myzus persicae* Source: IRAG 2014; Bass et al. 2014

HOW TO USE INSECTICIDES

A future-proof solution?

Insecticides pose risks to human health and biodiversity, and many products have been banned in recent years (Neonicotinoids). New products on the market will need to have a very favorable profile, but it is undeniable that few insecticides will be available in the future.

HOW TO USE INSECTICIDES AGAINST APHIDS

1. Check regulations first
Always consult national legislation before using any PPPs. Ensure that the products you choose are authorized for use in your region and crop.

2. Choose the right insecticide
Prioritize insecticide families that are effective against the aphid species present in your field. If *Myzus persicae* (Green Peach Aphid) is dominant, avoid pyrethroids. Resistance to pyrethroids is widespread, and they are largely ineffective. Resistance to neonicotinoids and flonicamid is rare in potato crops in Western Europe, so these remain useful options.

3. Plan for multiple applications
Depending on the persistence of the product, several applications will be necessary during the season. Follow label recommendations for timing and intervals.

4. Protect beneficial insects
Select active ingredients that are safe for beneficial insects. If the product is authorized during flowering, spray at the end of the day to reduce the impact on bees. Never treat when bees are present in the field.



Insecticides - Take home message

Efficiency on Virus Y	Efficiency on Leafroll	Cost	Labour	Future proof solution	Environmental footprint
Medium	Good	Low	Low	Few insecticides will be available	Negative effect on biodiversity

Compliance/disclaimer: PPPs present risks to operators and the environment. They should only be used when their usefulness is proven and in compliance with your country's regulations. The purpose of this chapter is to list the main PPPs usable in Europe. Under no circumstances should this information replace current legal information. Each treatment must be adapted to the specific circumstances of your fields.

Innovative Solutions

NETTING

WHAT IS NETTING

Insect netting is a sustainable way to protect your crop from virus infections like Virus Y and Leafroll. These viruses are mainly spread by aphids. By covering your crop with fine mesh nets, you block aphids from reaching the plants. This technique is most commonly used for pre-basic seed production.

An effective solution

Aphids are the main carriers of Virus Y and Leafroll. They transmit these viruses when feeding on plants. The mesh size of insect nets is small enough to keep aphids out, reducing virus transmission by up to 99%. This makes netting one of the most effective non-chemical solutions for virus control.

A future proof solution

With netting, spraying mineral oil or insecticides is not necessary. Twenty years of pioneering farmers prove it! Strong and UV-resistant nets can be used for over 5 years. At the end of their lifespan, the nets can be recycled through a designated channel.

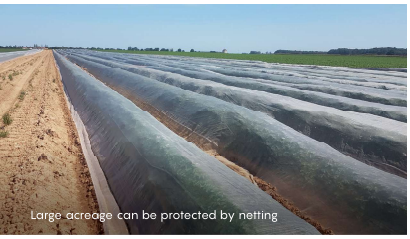
Treatments can be done as usual

Treatments against Phytophtora must be applied, and when carried out under normal conditions (including dose, pressure, flow rate) are very effective. The size of the mesh allows for good air circulation. Netting does not increase the risk of Phytophtora.

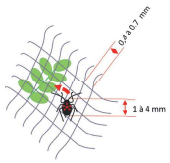
Selection is not possible. The field should be free of volunteers.

High quality nets are advised for security and long lifespan

- **Mesh size:** Max 0.4 × 0.7 mm
- **Weight:** Around 100 g/m² (too light = wind damage; too heavy = crop stress).
- **Durability:** Choose nets which are UV resistant and strong enough for several years of use. This is possible if they remain strong and intact.



Large acreage can be protected by netting

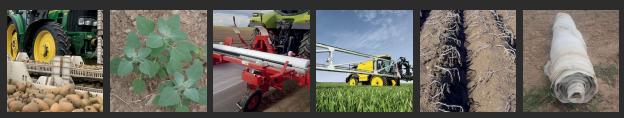


The mesh size allows for good air circulation, so using nets does not increase the risk of *Phytophthora*.

HOW TO USE NETTING

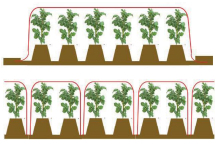
A SPECIFIC CULTIVATION SCHEDULE

Using net protection means a specific cultivation schedule.



Planting	Herbicide	Net installation	Fungicides	Haulm killing	Net removal
	Sprayed as usual	Before emergence	Sprayed as usual	Sprayed through the net	After total death

Although usable for very small acreage, manual installation is not suitable for the labor constraints of most farms. When properly buried, the netting is insect-proof and wind-resistant. Several designs and mechanization options exist.



Large nets
- Less m²/ha
- Less investment/ha
- Difficult to mechanize

Narrow nets
- More m²/ha
- Higher Investment/ha
- Easy to mechanize
- No pathway necessary



Large nets are cheaper but more difficult to mechanize



A bed (1.8 m) is covered with net in Normandy



It is important to roll the net properly to reuse it

Netting - Take home message

Efficiency on Virus Y	Efficiency on Leafroll	Cost	Labour	Future proof solution	Environmental footprint
Full	Full	High	High		

Innovative Solutions

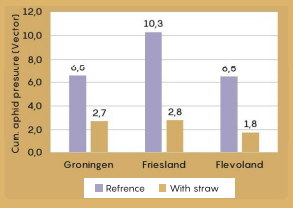
STRAW MULCHING

WHAT IS STRAW MULCHING

Straw mulching involves spreading a layer of straw over emerging potato crops to reduce the impact of aphids. The hypothetical principle behind this method is that aphids struggle to distinguish the contrast between plants and soil when straw is present, leading them to land on fewer plants. For 3 to 5 weeks, mulching reduces aphid populations by 50%. After that, once the plants close the rows, mulching is no longer effective.

This technique has been widely practiced in France for many years and is now gaining popularity in the Netherlands.

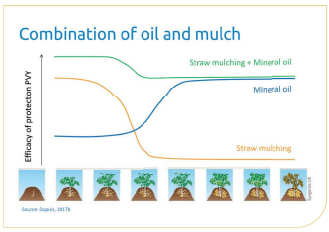
HZPC APHID MONITORING IN FIELD – DEMO 2022



Trials organized in the Netherlands have shown big effect on aphids

Straw Mulching + Oil

Used alone, straw mulching is not sufficient to control Virus Y. However, its action is highly complementary to mineral oil. The combination of mulch and oil provides enhanced protection against Virus Y, especially when aphid flights are early.





A sustainable solution
As a sustainable solution, straw mulching offers an environmentally friendly way to limit Virus Y transmission.



A plant is emerging, protected by straw mulch

HOW TO APPLY STRAW MULCHING

Which straw?

- Cut cereal straw (10 — 15 cm) provides good coverage
- Avoid using wet straw
- Straw must be free of herbicides, residues and weeds: own farm straw is the safest
- The efficiency of straw mulching is proportional to the quantity of straw. We advise spreading between 3 and 5 tons per hectare



Good results from spreaders designed for hen houses

Machinery and organization

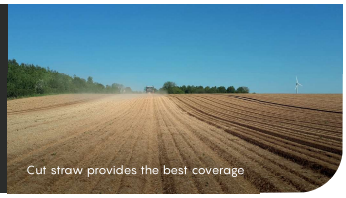
- Spreading 3 to 5 t per ha requires good resources: tractors, trailers, forklift
- When organized well, a spreader can be used by several growers
- Several straw spreader models can be used. Those used in hen houses work well



Local built spreaders can be used

Timing

- Straw mulch is susceptible to high wind. Application should be done as close as possible to potato emergence
- Soil must be dry enough to allow tractors to operate



Cut straw provides the best coverage

Straw mulching - Take home message

Efficiency on Virus Y	Efficiency on Leafroll	Cost	Labour	Future proof solution	Environmental footprint
Good in first weeks	Never assessed	Medium	Medium		

VIRUS Y RESISTANT VARIETIES



Solanum stoloniferum is a source of PVY resistance for potato breeders. Source: Wikipedia

Virus Y resistant varieties

Royal HZPC Group has made PVY resistance a breeding priority for several years. Our goal for 2030 is to have 75% of our new varieties resistant to Virus Y and *Phytophtora*. Leveraging the genetic diversity of cultivated and wild potato species, breeders have identified 10 PVY resistance genes. These genes provide Extreme Resistance (ER), meaning plants remain immune to Virus Y infection. This breakthrough has led to a new generation of resilient varieties in our portfolio, game-changing for seed growers.

Virus Y is a challenge in potato breeding

Royal HZPC Group manages a large portfolio of potato varieties, each with unique characteristics, particularly in their resistance to viruses. Virus Y is a well-known challenge, and varietal susceptibility varies widely. At an early stage of the breeding process, the existence of PVY resistance genes is tested. Later in the process, all varieties are tested under field conditions with aphids and infected plants. Some varieties are easily infected and classified as highly susceptible, while others show only minor infection and are considered less susceptible. For each variety, the "PVY susceptibility score" is available in the "Growing Instructions" leaflet.ions.

The PVY susceptibility rating thresholds are: 1—20 (Very susceptible), 21—45 (Susceptible), 46—90 (Slightly susceptible), and 91—99 (Resistant).

Leafroll is difficult to assess, but under review

Leafroll has been a minor threat in Western Europe for two decades, so varietal susceptibility was not previously evaluated. Today, our Breeding team is working on developing a reliable protocol for Leafroll assessment under experimental conditions. It's important to note that PVY resistance does not infer resistance to Leafroll.

New protection practices to build!

The introduction of PVY resistance genes will revolutionize seed potato growers' protection practices, as resilient varieties allow for a reduction in the use of plant protection products (PPPs) while guaranteeing impeccable quality. With resistant varieties, the use of mineral oil is no longer essential.

The use of these varieties is new and requires training for STET, HZPC and growers.

However, the presence of Leafroll is increasing rapidly in our producing countries. Specific protection to control this virus must not be neglected.

Protection strategy for Virus Y resistant varieties

	Virus Y protection	Leafroll protection
Pre-basic and basic seed	Weekly mineral oil treatment	· Insecticides · Straw mulching · Netting
Class A and Elite Seed	No protection is necessary	

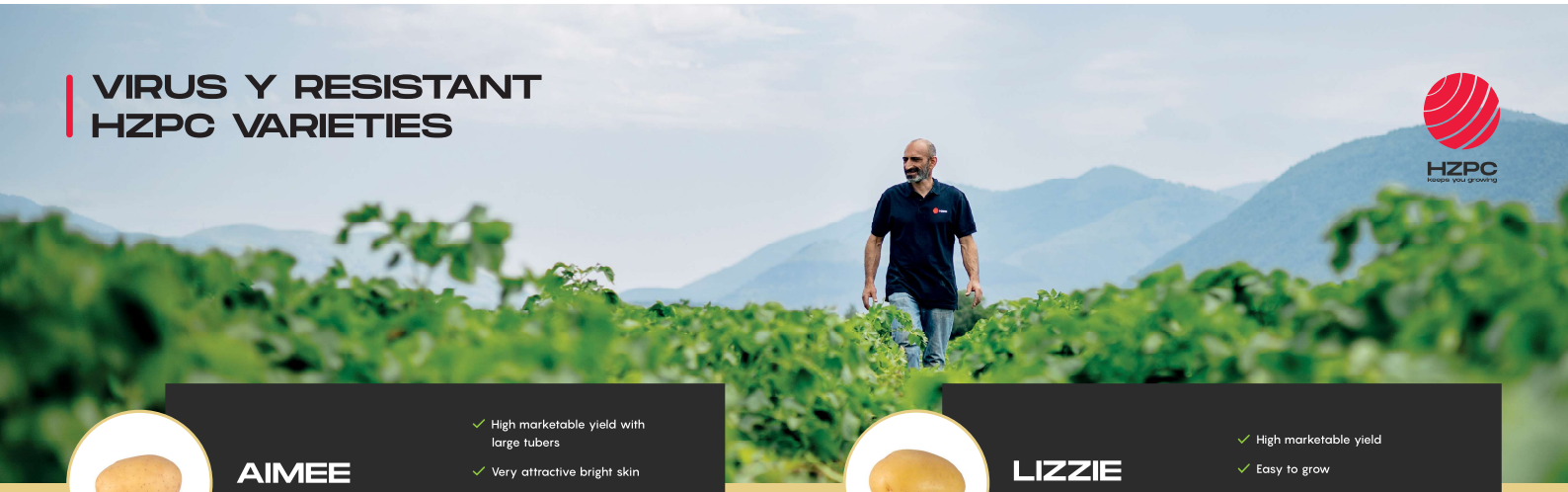


A resistant variety can be useful to make a barrier around a susceptible one. On the photo, Quintera and Innovator side by side.

Virus Y resistant varieties - Take home message

Efficiency on Virus Y	Efficiency on Leafroll	Cost	Labour	Future proof solution	Environmental footprint
Full	No effect	No extra cost	No extra labour		

VIRUS Y RESISTANT HZPC VARIETIES



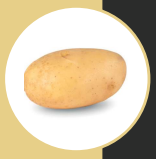
HZPC
Keeps you growing

AIMEE
HEG 93-3 X PANAMERA

- High marketable yield with large tubers
- Very attractive bright skin
- Consistent excellent frying quality
- Suitable for long term storage up to 9 month

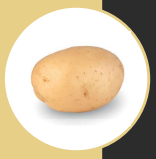
LIZZIE
BELANA X MARILYN

- High marketable yield
- Easy to grow
- Resistance against PVY
- Firm bite, excellent taste



ESTEBANA
OS 96- 77 X GAUDI

- Delivers high marketable yield with very large tubers
- Excellent disease resistance package: good tolerance to late blight & high resistance to scab
- Versatile usage, from boiling to frying



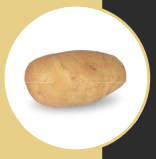
TAYCAN
SAGITTA X FARIDA

- Excellent disease resistance package
- Storable up to 6 months
- Delivers high marketable yield with attractive bright tubers
- Multipurpose usage including frying



INVICTUS
SAGITTA X HOT 08-7117

- Bulking variety with very high yield
- Low nitrogen requirement
- High resistance to *Phytophthora*
- Low carbon footprint



QUINTERA
SAGITTA X QUINCY

- Uniform and big size tubers
- Strong and versatile
- Early high yield



Strong and solid,
that's what you can expect from STET varieties.

Our potatoes add value at every step of the chain: offering stability for seed growers, robustness for ware growers, and high-quality end products for consumers. With focus and dedication, we carefully select varieties that help you succeed.

VIRUS Y RESISTANT STET VARIETIES



AISHA
The best bulker

- Nice cooking quality
- Stable dry matter content
- Very high yield
- Strong resistance to virus



CASTOR
Excellence in every fry

- Good QSR variety
- Reliable yield
- Perfect frying quality
- Good resistance to spraying



SH C 2030
Future proof crisper

- The sustainable variety
- Consistent high yield
- Low fertilizer input
- Long processing window
- Less sensitive to bruising



STORM
For tough growing conditions and top quality

- Strong under tough growing circumstances
- Consistent high yield
- Consistent high dry matter
- Low fertilizer input
- Virus resistance



DEVELOPING YOUR OWN STRATEGY

Each farm should develop its own strategy

Every year, starting in September, each seed grower receives their post-control results. It's a time of relief, disappointment, but also a time to renew the protection strategy for the coming season...

There is no universal protection advice. You must develop a protection strategy tailored to your farm. HZPC and STET field managers can support you to make the best choices.

Many factors must be considered when building a strategy, but a few are crucial:

- Production objective: Pre-basic? Basic seed? Class A or Elite for export?
- What is the susceptibility of the variety being produced? Very susceptible, Susceptible, Resistant?
- What is the "foreseeable" environmental pressure?
- Am I in a very favorable area (maritime climate, windy) or not?
- What have my results been like in recent years? Good? Bad?

STRATEGIES OF TARGETED CONTROL

To succeed against viruses, many actions must be combined: this is the principle of Integrated Crop Management (ICM). The following strategies of targeted control are possible.

	Advantages	Disadvantages	Efficiency on PVY	Efficiency on PLRV	Efficiency on PLRV combined with insecticides
Net protection	Full protection; Sustainable	Expensive; Needs labor	Full	Full	Not necessary
Straw mulching + intensive mineral oil treatment	Good protection from emergence to haulm killing	Needs labor	++	Aphids population are lower during first weeks	++
Intensive mineral oil treatment	Easy to mechanize	Efficiency is medium during first weeks; Needs high spraying capacity	+	High risk of PLRV infection	+
Regular mineral oil treatment	Cheap		Only for low pressure area		

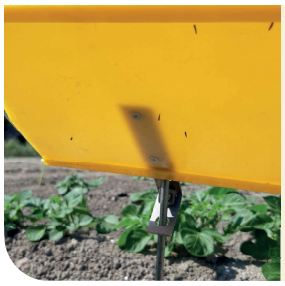
Upcoming solutions

DECISION SUPPORT SYSTEM

Working on upcoming solutions

Seed growers already have access to many solutions for controlling Virus Y and Leafroll. However, significant challenges remain. The ICM Virus team at Royal HZPC group is working on upcoming solutions.





More deliberate use, thanks to Decision Support Systems

Insecticides are a very useful tool in the fight against aphids. However, indiscriminate use has several drawbacks, including loss of effectiveness and harm to beneficial insects and biodiversity.

Since the number of insecticide applications is limited, choosing the right time and the right insecticide to spray is more important than ever. The effectiveness of crop protection depends on applying treatments at the precise moment when insect pressure is present.

Modern Decision Support Systems (DSS) help you do just that. These tools use weather data, insect monitoring, and crop information to predict when harmful insects will appear and when your crop is most at risk. With timely alerts and clear recommendations, you can plan sprays more effectively and avoid unnecessary applications.

In the Netherlands, companies like Agrifirm are developing advanced models that are now integrated into practical DSS tools for growers.

The result:

- Better timing
- More efficient use of insecticides
- Stronger, more sustainable crop protection

Decision Support Systems help you stay ahead by protecting your crop while saving time, effort, and input.

Upcoming solutions

DISEASE DETECTION BY AI

Detection Robot

Roguing is a traditional technique that remains highly effective. However, growers are facing new challenges.

- Leafroll and new strains of PVY (PVY$_N$, PVY$_{N-W}$) cause very mild symptoms.
- Farm sizes have increased, and it is difficult to find sufficient and skilled labor.
- Hot, sunny periods limit the available window of opportunity.

To address these challenges, several companies are working on developing detection robots. Royal HZPC Group is partnering with these companies to implement this method.

Robotic tulip roguing is already operational in the Netherlands. This gives us great hope for seed potatoes!



Roguing robots are already in action to support tulips growers.

Upcoming solutions

INTERCROPPING

Stronger fields through diversity

Intercropping is a multiple cropping practice that involves the cultivation of two or more crops simultaneously on the same field

Intercropping rapeseed with legumes is now a common practice. In autumn, the legumes protect the rapeseed from pests, and after the frosts, they provide nitrogen to the crop.

Like other organizations, Royal HZPC Group is working on seed potato intercropping. The sustainable solution seems promising, but several challenges remain:

- Choosing the companion plant that provides the best benefit.
- How/When/Where to soaw it?
- What is herbicide tolerance?
- How to manage yield losses due to competition between species?



Fava bean a good companion for seed potatoes?
Source: HZPC France

Future prospective

VACCINATION

Vaccine to protect plants against viruses

Similarly to humans and animals, plants can also be vaccinated against pathogens and specifically against viruses. In past years, a new generation of highly specific RNA-based vaccines (same principle as the recent Covid vaccines) have been developed and tested on plants to control disease caused by viruses.

This technology has been proven in field trials to be very efficient and represents a valid alternative to PPP and GMO plants. This vaccination can allow the simultaneous inactivation of multiple viruses at the same time by single or fewer applications and are harmless and innocuous to plants and other organisms. Application involves spraying the plants.



Response of Nicotiana benthamiana plants infected with Tomato Spotted Wilt Virus (TSWV) to different treaments based on our RNA technology.

Source: Spanish National Research Council



Research Centre Royal HZPC Group focuses on innovation and collaboration. Improving our variety portfolio and growing techniques every single day.

HZPC
ROYAL HZPC GROUP

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HZPC keeps you growing

STET



For the contact information of your local office, please see our websites:

www.hzpc.com

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