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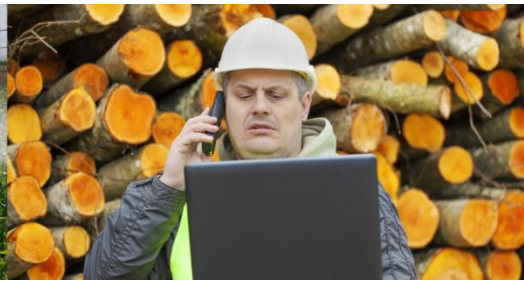
Valorising European Research for Innovation in Agriculture and Forestry





VALERIE Stakeholder Trials:

Potato brown spot issues in the supply chain in northern Poland: testing the susceptibility of potato varieties to Tobacco Rattle Virus

The problem

Brown spots on potatoes are a major problem for the growers and the impact can be felt across the whole value chain. This is particularly the case for potatoes grown in northern Poland for the French fries supply chain as processors and retailers require blemish-free white flesh and long potatoes. Innovator is one of the varieties that meet these requirements, but this variety is susceptible to Tobacco Rattle Virus (TRV), which causes internal brown spots in the tuber flesh. The vectors for TRV are nematodes, especially *Trichodorus* spp. Infection rates vary but in some years the damage can be >25%. For this reason growers look for alternative varieties, which are not as susceptible to TRV.

Proposed solution

Stakeholders and VALERIE project scientists scanned the scientific literature for solutions to this issue. Previous research in Scotland and the Netherlands found that other varieties were less susceptible to TRV. Based on this, the stakeholders decided to test other varieties for susceptibility to TRV in the northern Poland context so that they could meet their clients' requirements. Stakeholders also wanted to find out more about how to assess and manage infestation levels of their fields

Stakeholders

DLV/Delphy working with the VALERIE project has brought together stakeholders from the French fry industry in northern Poland. The Farm Frites company produce French fries in this region for a number of clients, like McDonalds. They produce potatoes partly on their own farm and partly from 60 contract growers in the region. These, together with potato seed producers (owners of the potato varieties), represent the supply chain stakeholders engaged with the project in identifying and testing solutions to the brown spot/TRV problem.

Potatoes with a high percentage of brown spots are rejected by the factory and this represents a big loss for farmers. The interest of the seed potato company is also clear, as persistent problems with the Innovator variety mean the acreage will decline. As there are no good alternative varieties for this specific market, the whole value chain has a great interest in solving the problem, although the factory and the growers are most interested in the outcomes. The factory provides a list of varieties they accept and the farmers chose from these.

Aims and method

The aim of the trial was to find out the susceptibility of current and potentially new varieties for specific strains of Tobacco Rattle Virus (TRV) transmitted by nematodes (*Trichodorus* spp.).

A field experiment was set up to test susceptibility in five varieties at the Farm Frites farm in Bobrowniki. Nematodes are not usually evenly spread over the field but are present in clusters so the first stage was to identify infected areas by soil sampling and analysis for nematodes. The experiment was then set up on two spots infected with *Trichodorus primitivus*, an important vector for TRV.

Five varieties: Innovator (standard), Zorba, Ludmilla, Ivory Russet, and Russet Burbank were planted.

The design was alternating a row with Innovator and a row with the tested varieties, with five tubers of each variety in each row. There were five replicates.

Data collected

After harvesting, tuber quality was assessed for all varieties. They were monitored for the symptoms of infestation with TRV - brown spots in the tuber flesh. The analysis of the tuber samples took place in the laboratory of Farm Frites.

A demonstration plot was also set up at the same site testing 11 varieties on a heavily infected spot with just one replicate. Assessment was made of the tuber quality of all the tested varieties together with the stakeholders on open field days.

Results

Field experiment results

Variety	% tubers with symptoms	
Innovator	5.4	B*
Ivory Russet	0.0	A
Ludmilla	0.0	A
Russet Burbank	2.2	AB
Zorba	6.0	B
gemiddeld	3.6	
F prob**	0.002	
LSD 5%***	4.7	

Table1. Percentage of tubers with symptoms of TRV, Bobrowniki (Polen) Field Experiment 2015-2016

Notes

*Differences are significant if objects do not have the same letter. In this case Ivory Russet (A) and Ludmilla (A) are significantly better than, Zorba (B) and Innovator (B).
**if F prob. is lower than 0.05 (5%) the variety effect is statistically reliable
***Difference between objects needed to be significant. Ivory Russet and Russet Burbank is 2.2, less than 4.7 and therefore not significant.

Significant differences in percentage of tubers infected with TRV were found between varieties in the field experiment, shown in Table 1.

Ludmilla and Ivory Russet did not show any symptoms on any of the plots, whereas Innovator showed an average 5.4% of tubers infected with TRV. The spread between the plots and samples was substantial, with Innovator showing between 0- 50% tubers infected with TRV, this indicates an uneven spreading of the nematodes within the trial plot.

Demonstration plot results

Variety	% tubers with symptoms	
New 1	2.1	A
New 2	1.1	A
New 3	0.0	A
Fontana	3.3	A
Innovator	32.3	C
Ivory Russet	14.3	ABC
Ludmilla	0.0	A
Markies	1.1	A
Russet Burbank	17.8	ABC
Santana	24.6	BC
Zorba	9.4	AB
gemiddeld	9.6	
F prob.	0.04	
LSD 5%	21.0	

Table 2. Percentage of tubers with symptoms of TRV Bierkowo (Polen) Demonstration Trial 2015-2016.

Notes – see Table 1

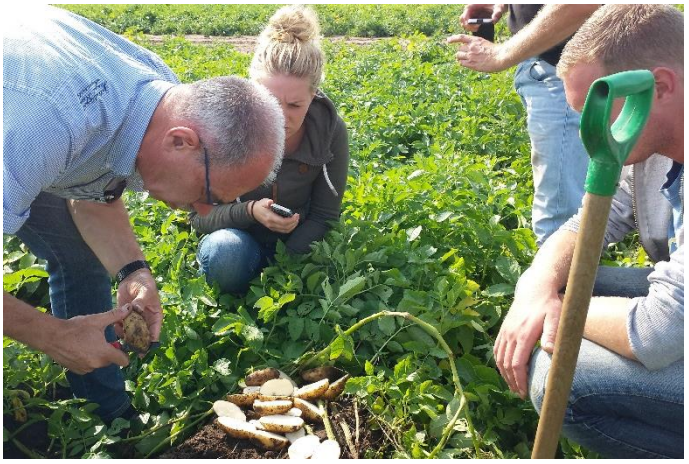
In the demonstration plot significant differences were also found between the varieties. The high percentage of TRV symptoms in Ivory Russet was an interesting outcome, although these were very light symptoms which are acceptable for the industry. This prompted the question: Is a specific strain of the TRV at stake or something else?

Some new varieties (new 1-3) showed promising low infection rates with TRV. These will be tested further for other agronomic characteristics.

These are useful results although as the stakeholders pointed out, TRV susceptibility is only one of the important characteristics of a variety. Ivory Russet and Ludmilla have a lower yield potential and Ivory Russet yield is particularly affected by dry and warm weather. This complicates the choice of variety for stakeholders.

Overall stakeholder involvement and feedback

Stakeholders identified the issue for investigation and were involved from the beginning of the field trial which was conducted on the Farm Frites farm. They visited the trial and discussed the results on a regular basis, and visited the demonstration plot after the growing season when the results became clear.



All stakeholders found the results interesting and will consider them in the variety planning for next year. The results help the growers decide which variety and field combinations are possible and less risky. Stakeholders agreed that these trial results can offer a solution for fields with a dense *T. primitivus* population infection, and that part of the Innovator acreage could be replaced by the less susceptible varieties. Also some of the new varieties possibly can replace Innovator in the coming years. However stakeholders were also reminded that other characteristics of the alternative varieties (yield capacity, susceptibility to warm and dry weather and storability) are potential barriers to their widespread use, compared to Innovator, a popular high yielding variety.

The results also prompted discussion about strategies for managing the nematode population and the virus load of the nematodes by taking specific agronomic measures, such as the choice of green manures and cover crops.

Key findings

- Stakeholders identified brown spot caused by TRV infection as a big problem throughout the supply chain
- A trial and a demonstration plot was set up to assess susceptibility of five varieties in comparison to the standard, Innovator
- Ivory Russet and Ludmilla are good alternative varieties to Innovator with less susceptibility to TRV, however other variety characteristics need to be considered as well
- Some new varieties show little susceptibility to TRV in the demonstration trial. These varieties will be tested further, looking at infection and other characteristics
- The nematode control strategy needs more attention on the farms of the contract growers. Most of the growers do not have good information about the infestation levels of their fields
- Choice of cover crop and green manure affects the population of nematodes and the virus load of the nematodes –this is a topic for future research

Further reading

VALERIE Fact Sheet: Integrated management of Tobacco Rattle Virus (TRV) in potato production (1): General information

VALERIE Fact Sheet: Integrated management of Tobacco Rattle Virus (TRV) in potato production (2): Control methods

VALERIE Fact Sheet: Integrated management of Tobacco Rattle Virus (TRV) in potato production (3): Which cultivar to choose? - Focus on the French fry production

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