

Resistance in potato varieties



This work was produced as part of the Scottish Government-funded PCN Action Scotland project.

- Potato varieties **resistant** to PCN can **protect** PCN-free ground and **clean** infested land.
- Varieties can be **highly resistant**, **partially resistant**, or **susceptible**.
- Many varieties are resistant to only **one species of PCN**.
- Only **highly resistant** potato varieties reduce PCN populations.

Resistance versus PCN population

In general terms, planting a susceptible variety in a field with a PCN infestation will increase the population, typically by at least 20-fold (Figure 1). This will increase the starting population for the next potato rotation and increase the risk that the yield of that crop will be reduced. Varieties with partial resistance will typically allow the PCN population to increase by between 3- and 10-fold. Either they maintain the population at its current level, or they allow the population to multiply, but at a lower rate than susceptible varieties (Figure 1).

Highly resistant varieties are key to fighting against PCN as they can actively reduce population levels (Figure 1). When such a variety is planted the nematodes hatch and will attempt to feed on the roots of the resistant variety; however, only about 1% are able to reproduce or complete their lifecycle. This means that with multiple rotations, growers can markedly reduce the PCN population on infested ground. Highly resistant varieties can reduce PCN populations to levels that are below detection by soil sampling tests and eliminate associated yield penalties.

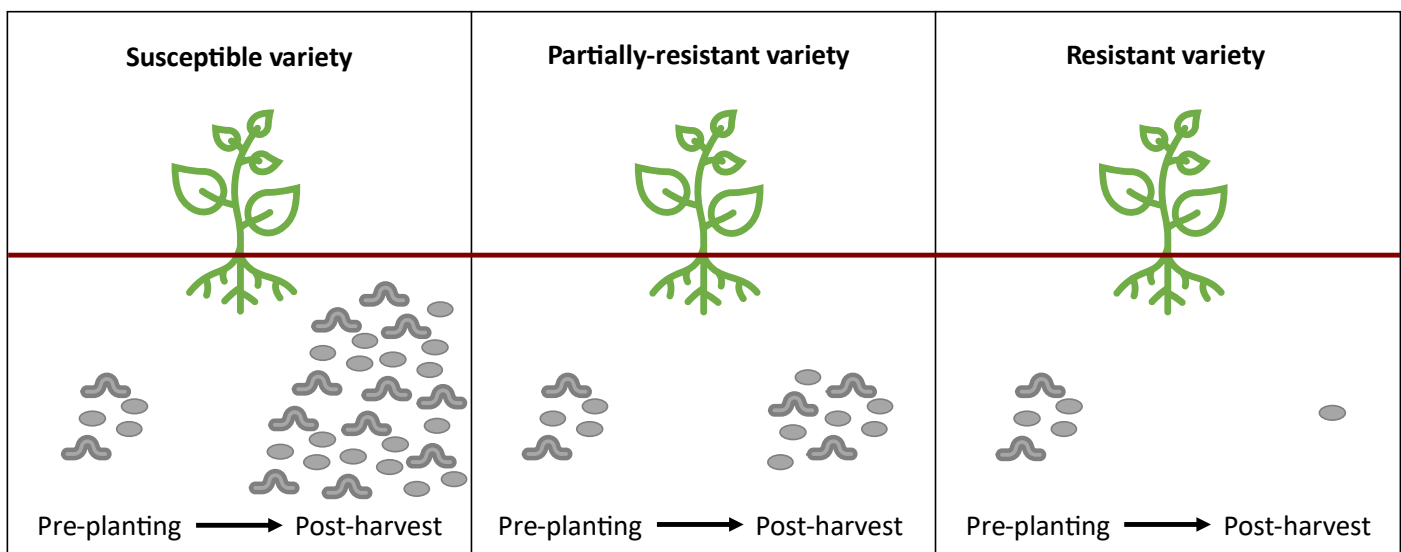


Figure 1 – Effects of PCN resistant varieties on PCN population. Left – Susceptible varieties will significantly increase the number of PCN. Centre – Partially resistant varieties maintain PCN populations but slow the rate of multiplication. Right – Resistant varieties reduce PCN populations.

Calculating resistance scores for new varieties

Resistance is scored on a scale between 1 and 9. Scores of 1 and 2 mean the variety is completely susceptible to PCN, while scores of 7–9 mean it is highly resistant. A score between 3–6 is considered partially resistant.

Resistance ratings are scored via pot trials, benchmarked against a susceptible variety such as Désirée. UK scores are generated from trials replicated at SASA and NIAB. The initial nematode population (P_i) is fixed at 5 viable eggs/juveniles per gram of soil. The final population (P_f) is determined by the number of PCN egg/juveniles per gram of soil after 3 months. The P_f/P_i ratio therefore determines the PCN multiplication rate. This testing follows EU [2007/33/EC](#) and EPPO standards. More info can be found here:

www.pcnhub.ac.uk/statutory-controls-pcn

The P_f score of the test variety is then compared to the benchmark to generate a relative susceptibility score (Figure 2). This is on an exponential scale – a variety with a score of 4 is about twice as resistant as a variety with a score of 3 and is about four times as resistant as a variety with a score of 2.

Resistance score	1	2	3	4	5	6	7	8	9
Relative susceptibility	>100%	50.1 – 100%	25.1 – 50%	15.1 – 25%	10.1 – 15%	5.1 – 10%	3.1 – 5%	1.1 – 3%	<1%

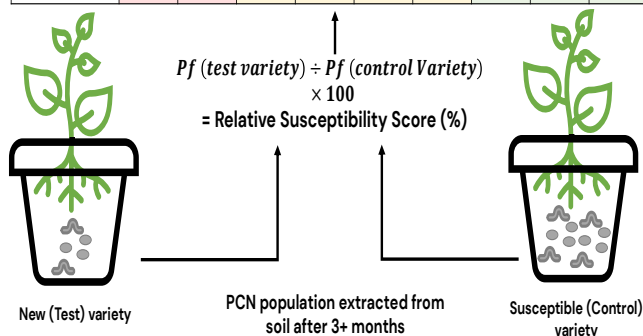


Figure 2 – How resistance scores are calculated. PCN are harvested from varieties after 3 months of growth. A relative susceptibility score is given by comparing the number of PCN found on the test variety to those on the susceptible control variety.

Trial data – Barnyards, Angus

The impact of varietal resistance on PCN populations has been assessed for both susceptible and resistant varieties by the PCN Action Group field trials at Barnyards Farm (Forfar, Angus).

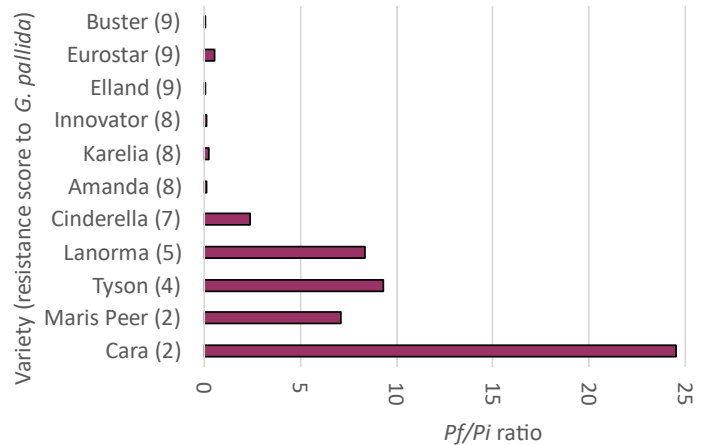


Figure 3 – Post-harvest (P_f)/Pre-planting (P_i) ratio showing the PCN multiplication rates for resistant and susceptible varieties. Resistance scores to *G. pallida* for each variety in brackets.

Only *G. pallida* was present in this field at a P_i averaging 31.5 eggs/g soil. Plots of potato varieties with a range of resistance scores were then planted. After harvest the P_f/P_i ratio for each variety was compared to their resistance scores (Figure 3):

- Cara (Score 2) **substantially increased** the PCN population from 31.5 to 500 eggs/g, a P_f/P_i ratio of 24.5!
- Lanorma (5) **increased** the PCN population from 31.5 to 291 eggs/g, a P_f/P_i ratio of 8.34.
- Elland (9) **decreased** the PCN population from 31.5 to 1.4 eggs/g, a P_f/P_i ratio of 0.05.

More details on the field trial results from Barnyards can be found here: www.pcnhub.ac.uk/project-outputs

Varietal choice has a far greater effect on post-harvest PCN populations than pre-planting treatments – nematicides protect yield but only hinder PCN's ability to feed and reproduce temporarily. Varietal tolerance also has a role to play when selecting varieties for PCN management. More info on tolerance can be found here: [Work Package 5 – Tolerance Factsheet \(pcnhub.ac.uk\)](#)