Barnyards PCN field Trials 2023

Research summarised below has been carried out as part of the Scottish Government-funded PCN project, in collaboration between Scottish Agronomy and SRUC.

In 2023 the third year of field trials were conducted to provide information on the integrated control of *Globodera pallida*. The full report "*A field trial investigating the resistance and tolerance characteristics of eight potato varieties to Globodera pallida in Scotland*" can be found on www.pcnhub.ac.uk under work package 7.

The field trial was planted at Barnyards Farm on 03/05/2023 – at a location with a moderate-high PCN population. The trial consisted of 8 potato varieties (Maris Piper, Elland, Eurostar, Buster, Amanda, Karelia, Lanorma, and Paradox) with varying levels of resistance to both *G. pallida* and *G. rostochiensis* (Table 1). Replicates of each variety were treated with either Nemathorin 10G (30 kg/ha, a.i. Fosthiazate), Velum Prime (0.625 L/ha in furrow a.i. fluopyram) or left untreated.

A public open day to demonstrate these varieties was hosted on the 22nd of August (Figure 1).

Figure 1 - Resistant potato variety discussion at Barnyards farm field trial site in 2023.

Variety assessments

Initial PCN population (Pi) at planting (Viable cyst/eggs per gram of soil)

Initial PCN population (Pi) averaged 9.37 eggs/gram of soil (low-moderate population). Only *G. pallida* was observed in these soil samples.

Crop growth and development

Although individual varietal differences were observed at certain sampling dates, neither treatment with Nemathorin or Velum prime resulted in significantly improved emergence or groundcover development overall. There was a significant difference in stem number between untreated (31.4/3m) and Velum prime (34.2/3m) treated plots.

Percentage dry matter

For three varieties (Buster, Karelia and Lanorma) the dry matter was under 18%. This is consistent with the results from 2022. Paradox, Eurostar, and Elland all sit between 18-19%. A high dry matter content was seen for Maris Piper (20.12%) and Amanda (20.88%). No significant differences in dry matter were observed due to Nemathorin or Velum Prime treatment.

Post-harvest PCN population (Pf) (Viable cyst/eggs per gram of soil)

The highly resistant varieties Elland, Amanda and Buster all gave Pf/Pi ratios of under 1 across all treatments. This shows these varieties reduce PCN populations (between 0.3-6.3 eggs/g soil post-harvest). Karelia, Eurostar, and Paradox gave Pf/Pi ratios between 1 and 4 across treatments (between 6-31.3 eggs/g soil post-harvest).

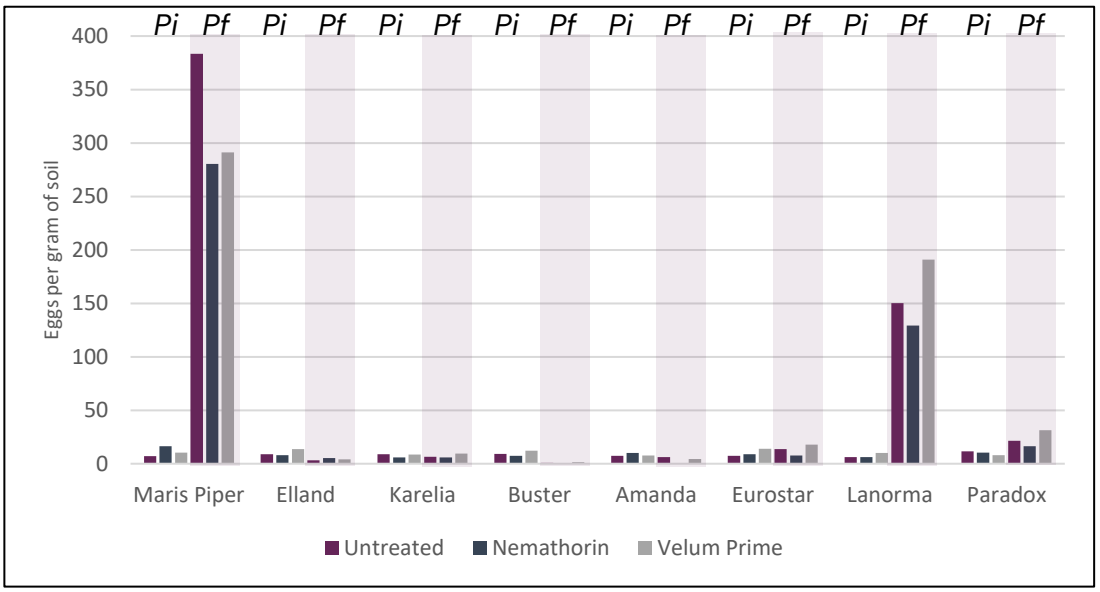

Figure 2 - Pre-plant (Pi) versus Post-harvest (Pf - highlighted in transparent purple boxes) PCN levels (eggs per gram of soil) for resistant and susceptible varieties treated with Nemathorin, Velum Prime, or untreated replicates.

Lanorma (resistance score of 5) gave a Pf/Pi ratio between 19-24 across the different treatments (between 150/191 eggs/g soil post-harvest). This demonstrates that partially resistant varieties allow the PCN population in-field to increase but at lower rates than susceptible varieties. In comparison the susceptible variety Maris piper gave a Pf/Pi ratio of 54.76 in the untreated plots, equating to an increase from 7 eggs/g soil pre-planting to 383.3 eggs/g soil post-harvest. The PCN Action Scotland group advises use of varieties with a resistance score of 8 or 9 where possible.

Tuber yield

Generally there is a trend that use of either Nemathorin or Velum Prime produces an increase in total yield (tonnes per ha) when compared to the untreated plots. There was a statistically significant difference between the untreated and the Nemathorin treated plots for Elland, Karelia, and Buster. A trend of increased tuber numbers in plots treated with either Velum Prime or Nemathorin is also observed, however, only Velum Prime treatment of Elland gave statistically significant results.

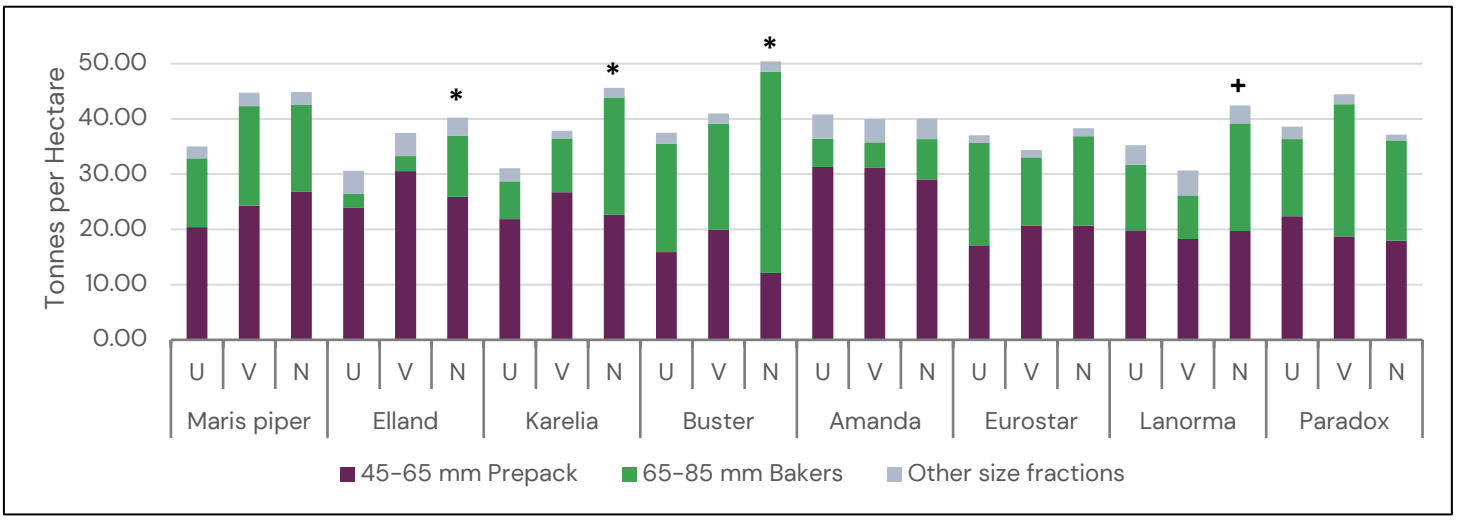

Figure 3 - Total yield (tonnes per ha) of untreated (U), Velum Prime (V), and Nemathorin (N) treatments for each variety. Varieties with a significant difference in total yield between a treatment and the untreated control is indicated by an asterisk. A significant different between treatments (Velum Prime & Nemathorin) is indicated with a +.

Conclusions

- The results from this field trial continues to show the benefit of using highly resistant varieties in reducing PCN populations.
- The varieties Elland, Buster, Amanda, and Karelia resulted in a Pi/Pf ratio of less than 1, **actively reducing PCN populations.**
- Neither Velum Prime (fluopyram) or Nemathorin (fosthiazate) treatment had an impact on pest reduction regardless of variety.
- This trial data showed a significant yield increase (Tonnes per Ha) when Nemathorin was used on Elland, Karelia, and Buster. A general trend of increased tuber numbers was also observed although most fell short of statistical significance.
- Resistance is a powerful tool in the management of PCN populations and varietal choice should be treated as the most important method implementing PCN population reduction.

Table 1 - Summary of variety performance from 2022 and 2023 trials data.

Variety	Resistance to PCN		Comments
	G. pallida	*G. rostochiensis*	
Cara	**2**	**9**	Fully susceptible and tolerant control variety. Low yield due to short season.
Maris Peer	**2**	**2**	Fully susceptible and tolerant control variety.
Maris Piper	**2**	**9**	Maincrop with high yield and *G. rostochiensis* resistance. Relatively tolerant.
Elland	**9**	**3**	Early maincrop with full resistance to *G. pallida*. Relatively tolerant. Moderate yield. Suitable for prepacking.
Innovator	**8**	**2**	Second early with full resistance to *G. pallida*. Considered to be intolerant. Widely grown for French fry production. Skin finish is unsuitable for prepacking.
Eurostar	**9**	**9**	Maincrop with dual resistance. Shown to be intolerant in this trial. Moderate yield. Suitable for prepacking and general use.
Buster	**9**	**9**	Late Maincrop with dual resistance. Emergence delayed. Shown to be intolerant in this trial. High yield. Considered suitable for prepacking.
Amanda	**8**	**9**	Medium early with dual resistance. Shown to be intolerant in this trial. High yield. Considered suitable for prepacking.
Karelia	**8**	**8**	Medium early with dual resistance. Shown to be relatively tolerant in this trial. High yield. Considered suitable for prepacking.
Cinderella	**6**	**9**	Early with partial resistance to *G. pallida*. Shown to be relatively tolerant in this trial. Lower yield. Considered unsuitable for prepacking due high dry matter content.
Lanorma	**5**	**9**	Early maincrop with partial resistance to *G. pallida* and less suitable than fully resistant varieties in population management. Shown to be relatively tolerant in this trial. High yield. Suitable for prepacking.
Paradox	**8**	**2**	High yielding maincrop with *G. pallida* resistance. Suitable for French frying and fresh use.
Tyson	**4**	**1**	Maincrop with partial resistance to *G. pallida* and less suitable than fully resistant varieties in population management. Shown to be intolerant in this trial. Moderate yield. Suitable for prepacking.