

Rhizomania: spread of and research on resistance breaking BNYVV tetrad types in the Netherlands

Bram Hanse & Elma Raaijmakers

Introduction

Since 2004, rhizomania symptoms caused by BNYVV infection are observed in Rz1 (Holly) resistant sugar beet varieties on fields in the Netherlands infested with the BNYVV A-type. Since then, the number of fields increased gradually, monitored by the Diagnostic Service of the IRS (Institute of Sugar beet Research) [1]. All those fields had in common that rhizomania symptoms were found in Rz1 resistant sugar beet varieties. The resistance breaking of the AYPR P25 67-70 amino-acid tetrad variant was confirmed a few years later [2]. This AYPR tetrad of the BNYVV A-type is the most abundant tetrad among the samples in the Diagnostic Service. The degree of infestation of those fields varies from a small spot to severe infestation of the whole field.

Materials & methods

Soil samples from commercial and trial fields as well as sugar beet samples in the IRS Diagnostic Service expressing rhizomania symptoms were analysed for P25 67-70 amino-acid tetrad composition.

Field trials were conducted on 7 fields slightly to severely infested with the AYPR tetrad variant of the A-type, from 2012 to 2015 to compare yield levels of varieties with different rhizomania-resistances. Besides the field trials a resistance test in climate rooms was developed following the method previously described [2].



Figure 1. Spread of the Rz1-resistance breaking tetrad variants AYPR, TYPR and VYPR in the Netherlands. Based on 253 samples (2003-2015).

IRS Institute of Sugar Beet Research
P.O.Box 32
NL-4600 AA Bergen op Zoom
www.irs.nl
hanse@irs.nl



Figure 2. Field trial on a field severely infested with AYPR and VYPR P25 tetrad variants, Biddinghuizen (2014).

Results

Out of 660 samples positive for rhizomania, 253 had a Rz1-resistance breaking tetrad variant (AYPR, TYPR and VYPR). The locations are shown in figure 1. The results of the field trials (figure 2) are summarised on rhizomania resistance level in table 1. The results of a climate room resistance test is shown in figure 3.

Table 1. Results of 7 field trials (2012-2015) on AYPR, TYPR and/or VYPR P25 tetrad variant infested fields in the Netherlands.

rhizomania resistance	relative sugar content*	relative sugar yield*	financial yield*	blinker (%)
Rz1	95	93	91	72
Rz1Rz2	100	100	100	2

* Rz1Rz2 set 100%.

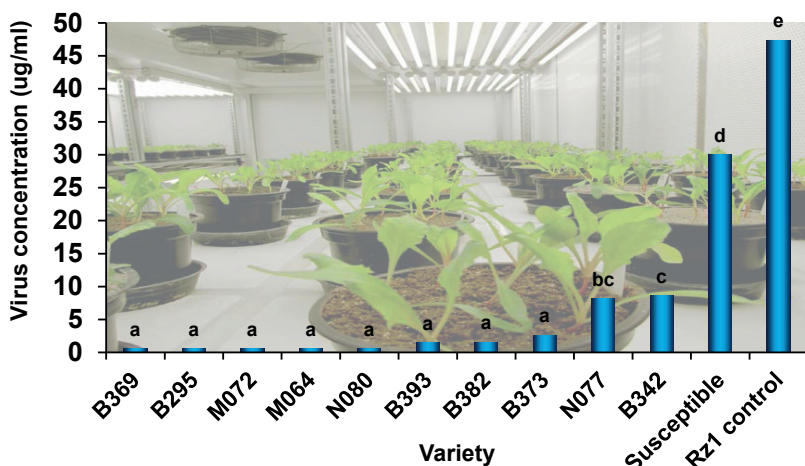


Figure 3. Results of the resistance test in the climate rooms (2012). LSD 5% = 4.82 ug/ml.

Conclusions

- Resistance breaking tetrad variants are widely spread in the Netherlands.
- Rz1+Rz2 resistant varieties perform better compared to Rz1-resistant varieties on those fields.
- The climate room resistance test is a suitable tool to test the level of resistance towards resistance breaking variants.

References

1. Raaijmakers, E., Hanse, B., Wilting, P. and Van Oorschot, E. Sugar beet Diagnostic Service: A winning system for all involved. *Proceedings of the 74th IIRB conference, Dresden (D)* 1-3 July, 2014.
2. Bornemann, K., Hanse, B., Varrelmann, M. and Stevens, M.: Occurrence of resistance-breaking strains of Beet necrotic yellow vein virus in sugar beet in northwestern Europe and identification of a new variant of the viral pathogenicity factor P25. *Plant Pathology* 64: 25-34, 2015.