National variety list admission criteria for varieties with virus yellows tolerance in the Netherlands

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Introduction

In 2019-2021, the IIRB Virus Yellows project group developed trial protocols to test varieties for BMYV-, BChV- or BYV- tolerance. These type of trials have been implemented into the Dutch official variety testing system since 2022. Based on the results from the trials in 2022, two admission criteria for the Dutch National variety list have been defined and agreed on in 2023. These criteria are:

1) relative financial yield level under healthy conditions should be at least 95 (tested on standard variety trials);

2) financial yield performance under infected conditions should be at least 10% higher than the average performance of the standard varieties under infected conditions.

Materials and methods

Plants were infected with virus loaded aphids at BBCH12-14. For BMYV and BChV, 2.5% of the plants were infected. For BYV, 10% (2022) or 6% (2023) of the plants were infected.

Fig. 1 Trial field in 2022 for testing virus yellows tolerance.

Results and discussion - Admission criterium 1

Yield from the tolerant varieties was calculated as a relative value under healthy and infected conditions, in which the healthy standard varieties were put on 100% (e.g. as for BChV-infection as shown in Fig. 2). Based on the data from 2022, the best BChV-tolerant variety would only be profitable for a farmer if more than 36% of the field would be infected (Fig. 3).

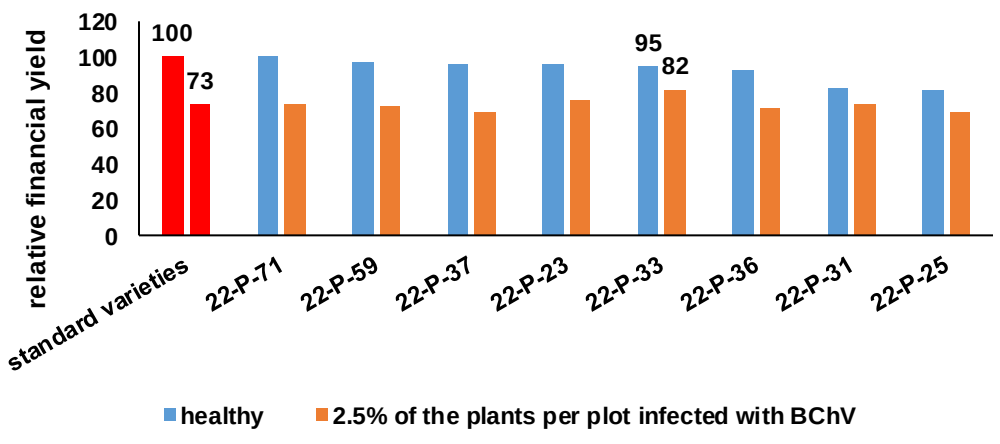

Fig. 2 Relative financial yield of varieties tested in 2022 for BChV-tolerance under healthy (blue) and infected (orange) conditions. 100% = average yield of healthy standard varieties.

Such high incidences with virus yellows are usually not seen in practice in the Netherlands. Therefore, the required relative financial yield level under healthy conditions was set to 95 (criterium 1), assuming to be needed for commercial feasibility of a variety with virus yellows tolerance.

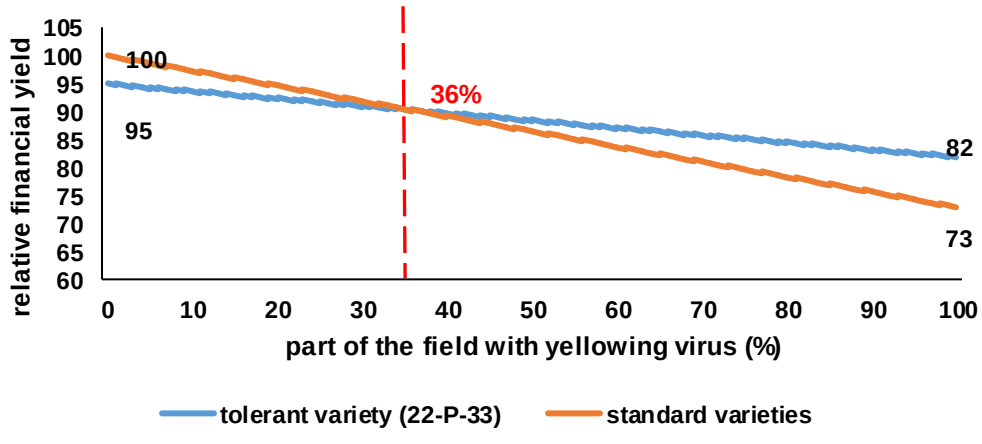

Fig. 3 Relative financial yield of best BChV-tolerant variety versus one of the standard varieties under increasing area of infection.

Results and discussion - Admission criterium 2

For criterium 2, the relative yield value of each of the tolerant varieties under infection was subtracted from the relative yield value of the standards. This was done for each of the three viruses (BChV, BYV and BMYV). Differences are indicated in Table 1 as "Δ". Under infection, the best tolerant variety performed only 5.3% better on average than the standard varieties, which was below the desired tolerance level. In 2023, neither of the tolerant candidate varieties did meet criterium 2.

Fig. 4 Two varieties under 2.5% BChV infection in 2022.

Table 1 Calculations for a scoring system for assessment of tolerant varieties under infection with different yellowing viruses. Results are shown for the best three varieties for the individual viruses in 2022.

variety	healthy	infected (2.5% BChV)	Δ	infected (10% BYV)	Δ	infected (2.5% BMYV)	Δ	average score of Δ (%)
standard varieties	100	73		44		61		
22-P-71	100	73	0	46	2	65	4	2.0
22-P-23	95	75	2	53	8	58	-2	2.7
22-P-33	95	82	9	51	6	62	1	5.3
LSD (5%)	7.4	5.9		7.2		7.5		

Conclusions

Criteria have been accepted for admission of varieties with virus yellows tolerance to the Dutch National variety list. In 2022 and 2023, some candidate varieties have shown to meet criterium 1. However, no candidates were able to meet criterium 2. It has proven to be difficult to obtain varieties with the required tolerance against all three virus types.

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