

Aphid vectors and transmission of Potato virus Y strains

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Control of PVY in the Netherlands

- Field inspections
 - Trained inspectors
 - Symptom recognition
- Laboratory testing
 - ELISA tests
 - Field controls following year
- Aphid monitoring
 - Suction traps/ yellow traps
 - Spp. and # of aphids caught



Aphid monitoring

- 11 most important PVY transmitters
- PVY transmission factor is weighed :
- Relative Efficiency Factor (REF *Myzus persicae* =1)
- Cumulative aphid number, x REF, is used for setting haulm destruction date



REFs of the 11 counted species

Species	REF	Species	REF
<i>Myzus persicae</i>	1.00	<i>Macrosiphum euphorbiae</i>	0.10
<i>Myzus certus</i>	0.44	<i>Acyrtosiphon pisum</i>	0.05
<i>Aphis nasturtii</i>	0.42	<i>Rhopalosiphum</i> spp.	0.03
<i>Aphis frangulae</i>	0.42	<i>Brachycaudus helichrysi</i>	0.01
<i>Phorodon humuli</i>	0.15	<i>Metopolophium dirhodum</i>	0.01
<i>Aphis fabae</i>	0.10		

Increasing problems with PVY

- Number of aphids caught shows a gradual decline since 1994
- Growing number of PVY infections since 2002

Comparison of catches with a yellow water trap

Aphid species	1984 (W)	2006 (T)
<i>Acyrtosiphon pisum</i>	32	1
<i>Aphis fabae</i>	154	6
<i>Aulacorthum solani</i>	12	0
<i>Brachycaudus helichrysi</i>	3	0
<i>Capitophorus hippophaes</i>	104	0
<i>Cavariella aegopodii</i>	149	0
<i>Hyalopterus pruni</i>	12	1
<i>Macrosiphum euphorbiae</i>	363	0
<i>Metopolophium dirhodum</i>	57	40
<i>Myzus certus</i>	711	0
<i>Myzus persicae</i>	1184	2
<i>Phorodon humuli</i>	9	0
<i>Rhopalosiphum insertum</i>	10	7
<i>Rhopalosiphum padi</i>	115	1
<i>Sitobion avenae</i>	47	0



Questions

- What PVY strains are important in the field ?
- Are the aphid REF values still valid ?
- Other aphid species involved ?

How to determine REFs?

- In 1980s: catching of individual aphids
 - Conical net
 - Aphids were allowed to acquire PVY N
 - Transmission to potato cv. Bintje
 - Determination of transmission
 - Determination of aphid species(van Harten, de Bokx, Piron)



Setting up a new system for measuring REF

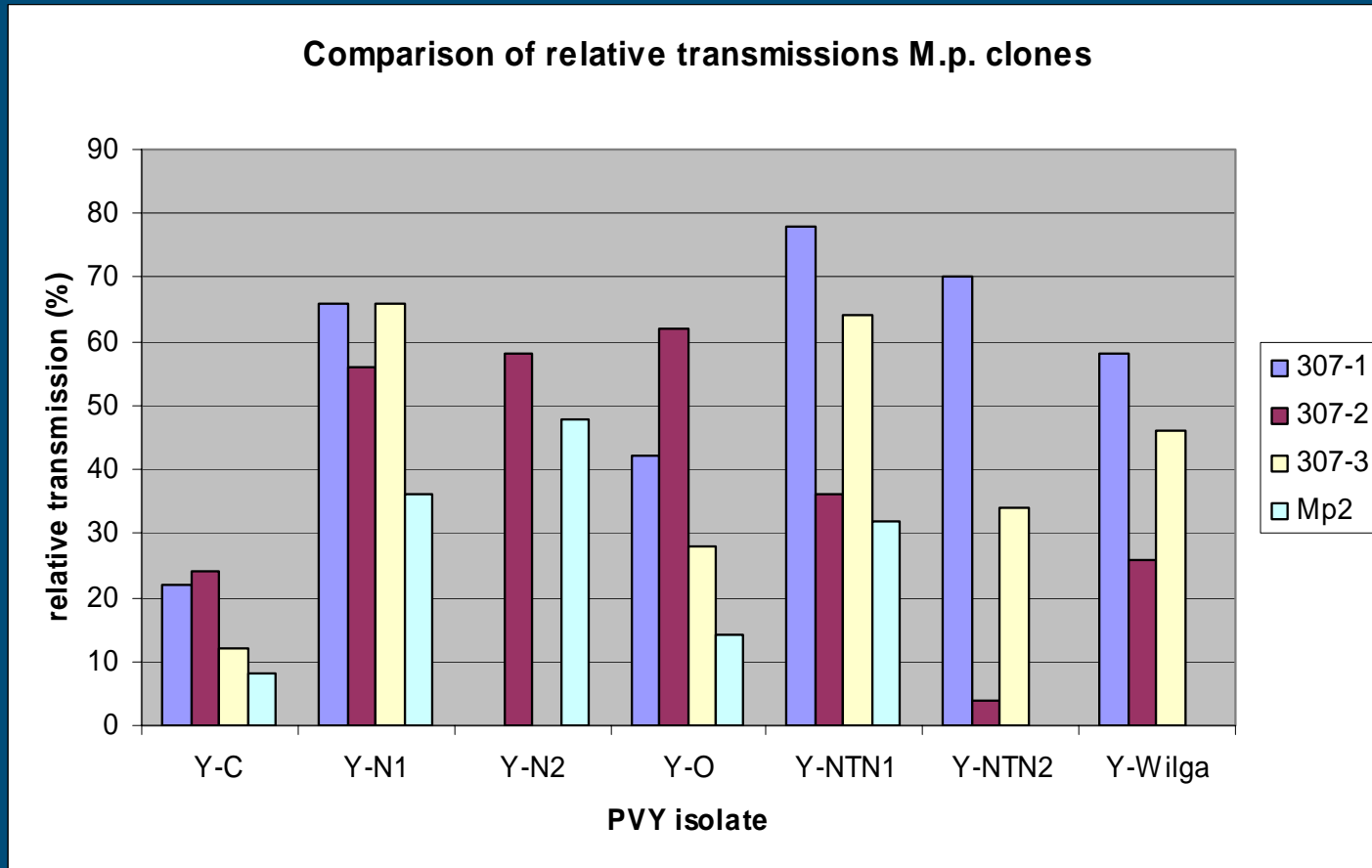
- Rear clones of aphids on their host plants
- Transfer aphids to an infected potato leaf
- Acquisition access period 2½ minutes
- Transfer 50 aphids individually to *Physalis floridana* seedlings
- Count nr. of infected plants after 2 weeks



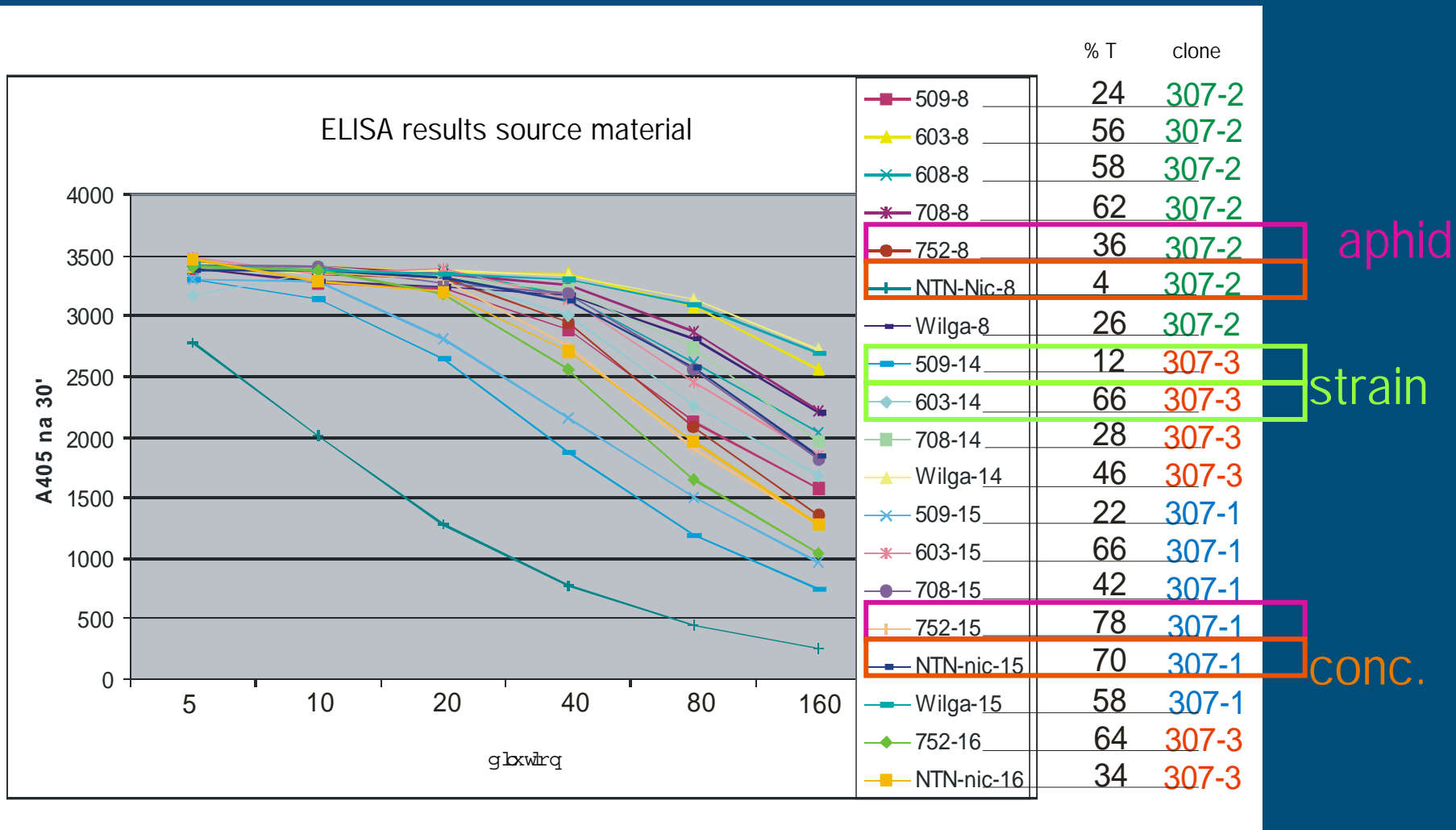
Setting up the system



Relative transmissions of different M.p. clones



Transmission experiments *Myzus persicae* clones

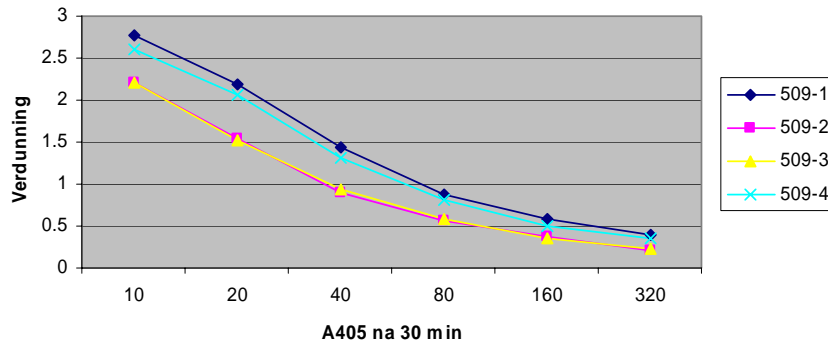


Conclusions

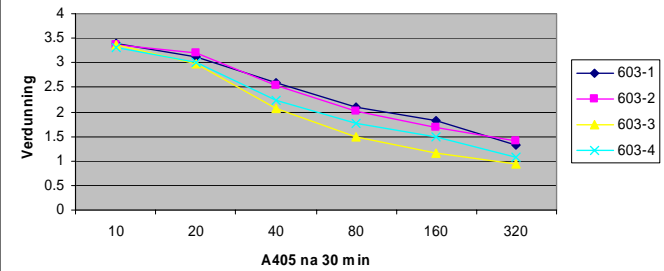
- PVY transmission efficiency is determined by
 - aphid, not only species but also clone within the species
 - PVY strain / isolate
 - virus concentration in the source leaf

Virus concentrations in leaflets of one leaf

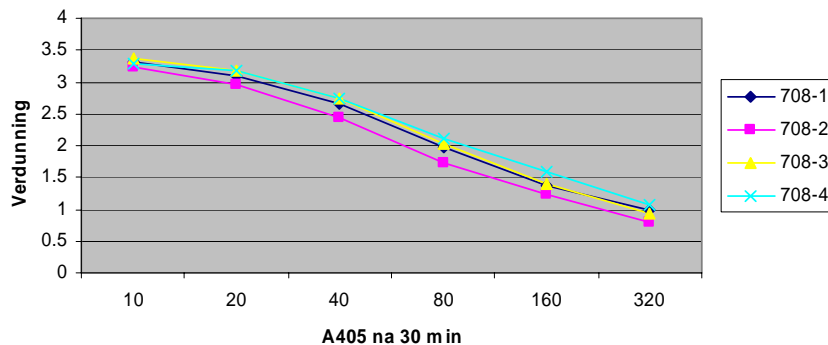
509 PVY-C vergelijking 4 posities 1 samengesteld blad



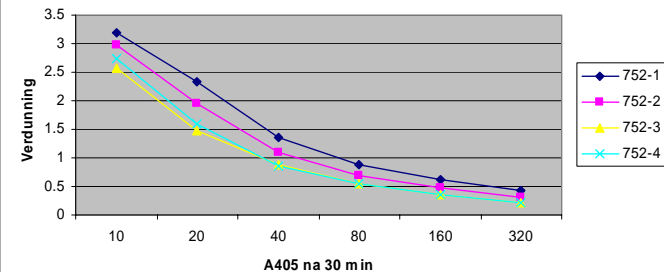
603 PVY-N(tn) vergelijking 4 posities 1 samengesteld blad



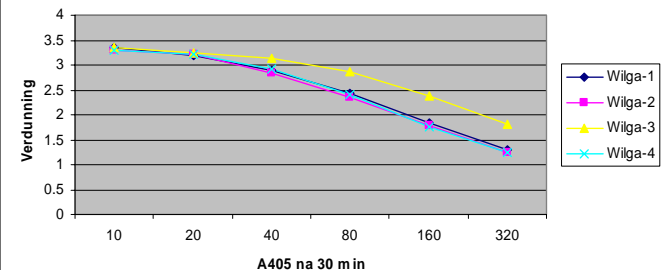
708 PVY-O vergelijking 4 posities 1 samengesteld blad



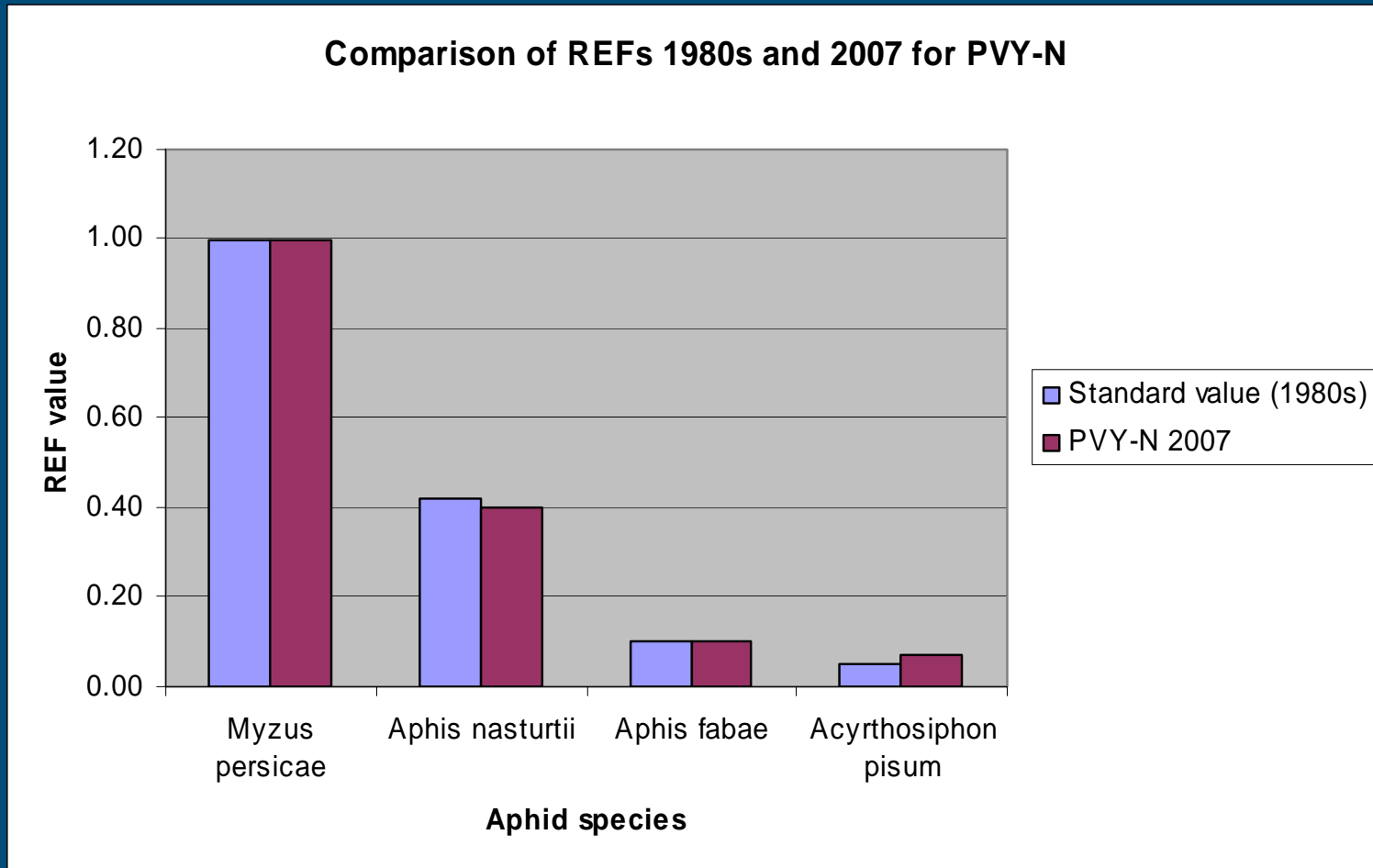
752 PVY-NTN vergelijking 4 posities 1 samengesteld blad



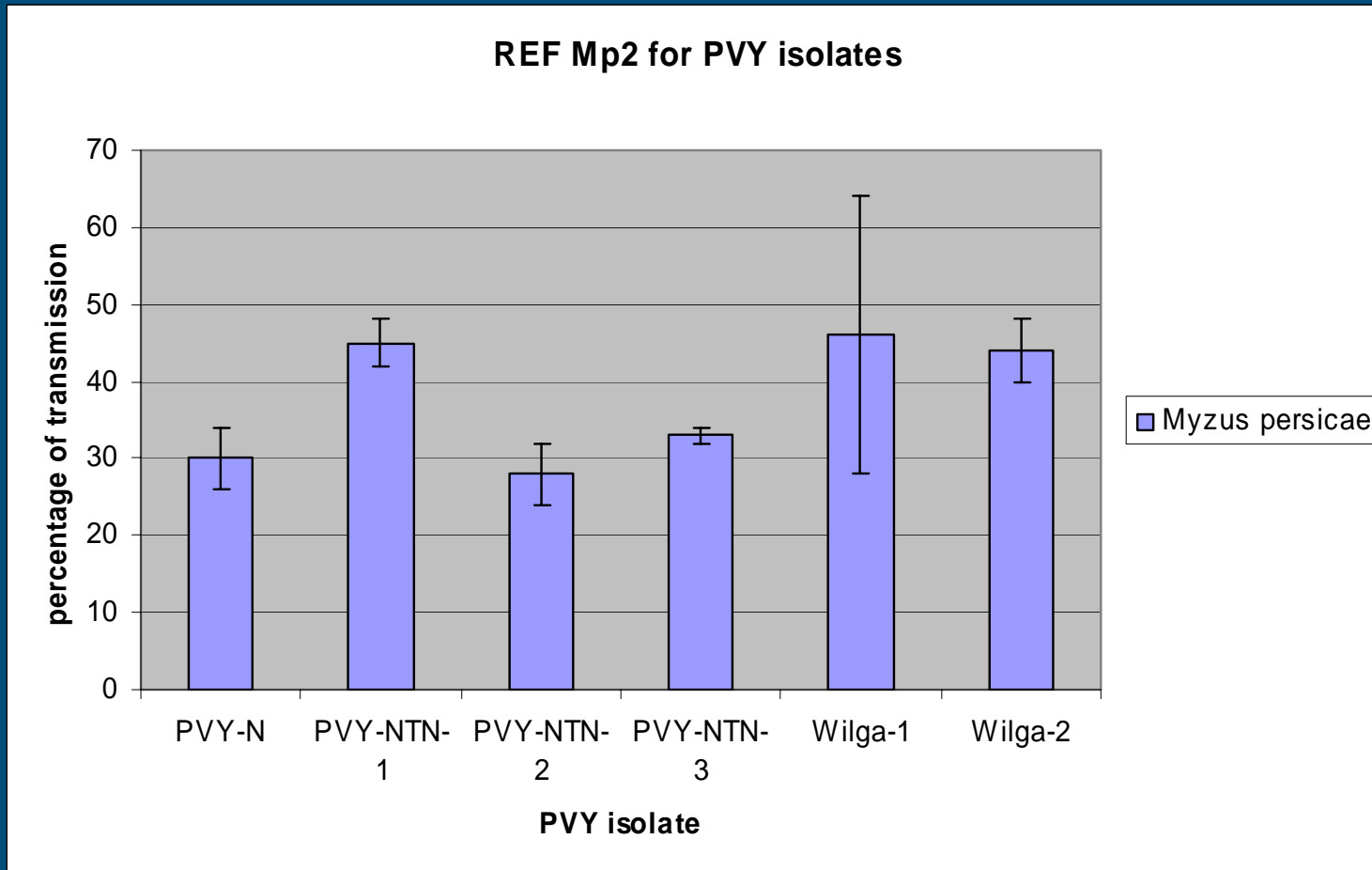
PVY-WILGA vergelijking 4 posities 1 samengesteld blad



Comparison of REFs determined in 1980 and 2007



% transmission for different PVY strains / isolates



Conclusions

- PVY transmission efficiency is determined by
 - aphid, not only species but also clone within the species
 - PVY strain / isolate
 - virus concentration in the source leaf
- New system for determination of REFs is working
- REFs as determined for 4 aphid spp for PVY N is the same as set in 1980s
- Transmission efficiencies for some NTN and Wilga strains seem to be higher (experiments still in progress)

Thank you !



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