

Table 1  
Pathogenicity of PVY isolates on *Nicotiana tabacum* and serological testing against two monoclonal antibodies<sup>a</sup>

Isolate <sup>b</sup>	Strain on <i>Nicotiana tabacum</i>	Monoclonal antibody tested <sup>a</sup>			
		Adgen N	Adgen O/C	ELISA Result	PCR Result
PVY-N-RB	N	+	–	N	N
v951156-1	N	+	–	N	N
v951218	N	+	–	N	N
PVY-N	N	+	+	O+N	O+N
v9412490	N	+	–	N	N
v951156-2	N	+	–	N	N
v951204 (Mix)	N	+	+	O+N	O+N
Slov 94	N	–	–	–	N
S-RB	N	+	–	N	N
S-RB-96	N	+	+	O+N	O+N
S-NTN	N	–	–	–	N
PVY-NN-UK (Mix)	N	+	+	O+N	O+N
53-29	N	+	–	N	N
53-46	N	+	–	N	N
53-47	N	+	–	N	N
53-49	N	+	–	N	N
N-Pet	N	+	–	N	N
Hung 95	N	–	+	O	O
O-Des	O	–	+	O	O
O-Gov	O	–	+	O	O
<sup>b</sup> v951204 (O)	O	–	+	O	O
<sup>b</sup> v951204 (N)	N	+	–	N	N
<sup>b</sup> PVY-NN-UK (O)	O	–	+	O	O
<sup>b</sup> PVY-NN-UK	N	+	–	N	N

<sup>a</sup> A positive result designated when the  $A_{405}$  following 1 h of incubation with substrate, reached 2x the mean of the healthy control. Isolates in bold show discrepancy between ELISA and strain designation on *N. tabacum*.

<sup>b</sup> Single infections following passage through *C. quinoa*.

fluorescences of the two dyes were read on a fluorescent plate reader (Labsystems Fluoroskan II). Fluorescein is read at an excitation wavelength of 485 nm and an emission wavelength of 538 nm. Rhodamine is read at excitation and emission wavelengths of 544 nm and 590 nm respectively.

### 3. Results

#### 3.1. Strain designation and serological testing

When the isolates were tested on tobacco, typical symptoms were observed; isolates of PVY<sup>N</sup> caused necrotic vein banding, followed by leaf death and the isolates of PVY<sup>O</sup> caused mild mot-

ting, rugosity and eventually chlorosis. When the isolates were tested serologically by ELISA (Table 1), most of the isolates were split into the two main strains, giving the same result as indicated by symptomology on *N. tabacum*.

However, four isolates (PVY-N, v951204, S-RB-96 and PVY-NN-UK) were shown to be mixed infections by ELISA and PVY<sup>N</sup> by symptoms on *N. tabacum* (PVY<sup>O</sup> symptoms are masked by the more severe PVY<sup>N</sup> symptoms). Two of the mixed infections (v951204 and PVY-NN-UK) were separated by inoculation onto *C. quinoa* and back inoculation of local lesions onto *N. tabacum*. The resulting isolates were confirmed as single infections of either PVY<sup>O</sup> and PVY<sup>N</sup> by symptomology and ELISA. Three further isolates (Slov 94, S-NTN and Hung 95) showed dis-