A survey of *Allium* diseases in New Zealand

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Introduction

A survey of potential plant pathogens in *Allium* spp. crops (onion, garlic, shallot, rakkyo) was completed to determine if undetected regulated pests were present in New Zealand. The survey assessed bacteria, fungi, phytoplasmas and viruses in a representative group of 18 *Allium* spp. crops in Auckland and Marlborough during the summer of 2004-05.

Method

Field surveys

For each crop the entire field was walked in a 'W' pattern and 100 leaves were randomly collected and grouped in lots of 10 for virus assays and to estimate virus incidence (Fletcher 1993). In addition any plants showing symptoms of bacterial, fungal or phytoplasma disease were collected **(Figure 1)**.

Laboratory assays

Specimens for bacterial analysis were macerated and streaked onto nutrient agar (NA) and King's medium B (KB). Representative single colonies were checked for fluorescent pigment formation on KB, sub-cultured, and maintained on NA at 4°C. Pathogenicity tests were carried out on the onion cultivar Pukekohe Longkeeper (PLK). Isolates that caused rotting in excised onion bulb pieces were identified using the ®Biolog Bacterial ID System.

Fungal pathogens were identified by field symptoms, laboratory assays and microscopic examination.

For Phytoplasma analysis, DNA was extracted from leaves and roots using the method of Gardiner et al. (1996), and PCR assays were performed using the method of Andersen et al., (1998).

Virus identification and incidence were determined using direct and indirect ELISA, herbaceous host inoculation and PCR (Wei et al. 2006).

Figure 1 Crop survey of an onion crop, South Auckland, New Zealand.

Figure 2 Onion white rot *(Sclerotium cepivorum)* on garlic cv Printanor.

Figure 3 Mixed virus symptoms on garlic cv Printanor (OYDV GVA GCLV).

Results

None of the *Allium* crops in Auckland and Marlborough was infected with phytoplasmas or regulated bacteria.

Bacterial species were only detected in Auckland crops and include: *Pseudomonas marginalis, Erwinia carotovora* and *Pseudomonas viridiflava* **(Table 1)**. No regulated bacteria (such as *Burkholderia cepacia, Erwinia chrysanthemi pv. chrysanthemi, Erwinia rhapontici* or *Pseudomonas xanthochlora)* were detected.

Fungi

Onion white rot (caused by *Sclerotium cepivorum*) **(Figure 2)** was observed in one Auckland garlic crop and an onion crop, which had white rot incidences of 1-3% and 5% respectively.

In Marlborough, white rot was observed in a shallot and a garlic crop (5% incidence) along with *Alternaria porri, Penicillium* spp., *Aspergillus* spp. and *Puccina allii*, all at low incidence rates.

Phytoplasma

None of the surveyed *Allium* crops in Auckland or Marlborough were infected with phytoplasmas such as Aster yellows phytoplasma, Garlic decline phytoplasma or Onion yellows phytoplasmas.

Viruses

The survey confirmed the presence of all *Allium* viruses previously recorded in New Zealand, and in some cases detected viruses on new hosts **(Table 2).**

Table 1 Bacterial species from *Allium* spp in Auckland.

Field Location	Crop	Bacterial species isolated (number of plants infected)
Onewhero	Onion	*Pseudomonas marginalis* (3)
Pukekawa	Red onion	*Pseudomonas marginalis* (1), *Erwinia carotovora* (1)
Pukekawa	Onion	*Pseudomonas marginalis* (12), *Erwinia carotovora* (2), *Pseudomonas viridiflava* (1)

Table 2 Summary of the presence and estimated incidence of viruses of *Allium* crops surveyed around Auckland (December 2004) and Marlborough (January 2005) from serological assays or PCR of *Leak yellow stripe virus* (LYSV).

crop species	Virus * GCLV	GVA	GVB	GVC	GVD	OYDV	LYSV (GYSV strain)	SLV	SMbLV	SYSV
A. cepa (onion)				1%					2%	
A. cepa										1%
A. cepa										
A. cepa						1%				
A. cepa		7%	5%		2%					
A. cepa		7%								
A. cepa								1%	2%	
A. sativum (garlic)	1%	9%			2%		+			
A. sativum	3.5%		1%		3.5%	2%	+			
A. sativum					1%	2%	+			
A. chinense (rakkyo)	2%	100%	1%							
A. ascalonicum (shallot)		2.5%								
A. ascalonicum	3.5%				1%					
A. ascalonicum									3.5%	
A. sativum				1%			+		1%	
A. sativum				2%			+			
A. sativum	2%			3.5%			+		1%	
A. sativum	5%	3.5%		3.5%	1%		+			

**Garlic common latent virus* (GCLV) *Garlic virus A* (GVA), *Garlic virus B* (GVB), *Garlic virus C* (GVC), *Garlic virus D* (GVD), *Onion yellow dwarf virus* (OYDV), *Shallot latent virus* (SLV) *Shallot mite-borne latent virus* (SMbLV), *Shallot yellow stripe virus* (SYSV).

For the first time in New Zealand we detected the regulated viruses:

- *Garlic virus A* in *A. cepa, A. chinense, A. ascalonicum* and *A. sativum* (Incidence 2.5-100%).
- *Shallot mite-borne latent virus* in *A. cepa, A. ascalonicum* and *A. sativum* (Incidence 1-3.5%).

Most viruses occurred in mixed infections on onion, garlic and shallot crops in both the North and South Island **(Figure 3)**.

All crops sampled were infected with at least one of the viruses we tested for, although it is highly likely that other viruses not tested for were also present in some of these crops.

No *Iris yellow spot virus* (IYSV), *Impatiens necrotic spot virus* (INSV) or *Tobacco rattle virus* (TRV) were detected in this survey.

Further work is continuing to confirm the observations of regulated viruses *Shallot yellow stripe virus* (SYSV) in *A. cepa*, and *Onion mite-borne latent virus* (OMbLV) and *Sint-Jans onion latent virus* (SJOLV).

Update

- Twenty-eight further crops were surveyed in 2008 to verify the presence or absence of a number of viruses infecting *Allium* crops.
- We confirmed the presence of *Garlic virus A* , and *Shallot mite-borne latent virus*, (synonym *Shallot virus X*) in New Zealand.
- We detected *Iris yellow spot virus* for the first time in New Zealand (Ward et al. 2008).
- We confirmed that there is no evidence to show that SYSV, SJOLV, or TRV are present in New Zealand *Allium* crops.
- We were also unable to establish the presence or absence of OMbLV in New Zealand.

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Acknowledgements

This work was funded by MAF Biosecurity New Zealand.
We also acknowledge the generous cooperation of the *Allium* crop growers of Auckland and Marlborough, New Zealand.

production and design by Photography & Design Team C&FR:20197 Month 2008

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