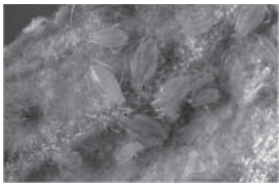




Aphids and viruses

It is well known that aphids are involved in the transmission of some viruses into potato crops. This feature article summarises some recent research looking at aphid control, spread of virus in potato crops and two new viruses that infect potatoes.



Peach aphid (*Myzus persicae*). Photo: R. L. Lamberts, Crop & Food Research.

The research described in the first paper (van Toor et al.) investigated insecticide resistance in 72 green peach aphid (*Myzus persicae*; primary vector of potato leafroll virus (PLRV)) lineages collected from Pukekohe, Canterbury and the West Coast of New Zealand. Using molecular techniques, biochemical tests and dose bioassays, the study found that the lineages could be grouped into 23 genotypes. Of these, 60% contained one or more mechanisms that confer resistance to insecticides, primarily organophosphates, but also including carbamates, pyrethroids and neonicotinoids. However, other traits that may confer decreased biological fitness, such as low responses to the aphid alarm pheromone (E)-beta-farnesene, were also identified in some lineages. Pest management methods to exploit these traits and minimise the development of insecticide resistance are discussed.

In the second paper (Alvarez et al.), the resistance of potato cv. Kardal to green peach aphid was studied. Young leaves appeared to be resistant regardless of PLRV infection, but mature leaves were more attractive to aphids when the plant was infected with PLRV. The probing and feeding behaviour of the aphids seemed to be affected by PLRV infection.

The transmission of Potato virus S (PVS) and Potato virus X (PVX) within potato seed crops (Russet Burbank) during the growing season was studied in four commercial fields in Tasmania, Australia (Lambert et al.). The results suggested that there was limited spread of either of the two viruses.

The fourth paper (Kirk et al.) describes how a new potato disease, corky ringspot, is caused by tobacco rattle virus (TRV). Sap from infected potato tubers could infect tobacco plants and cause typical symptoms. TRV is transmitted by stubby root nematodes. The disease has now been found on potatoes in California, Colorado, Florida, Idaho, Washington, Oregon and Michigan in the USA.

Yet another virus has been found on potato (Souza-Dias et al.). Discovered in Sao Paulo, Brazil, on cv. Agata, tomato severe rugose virus (ToSRV) causes leaf deformation and mosaic symptoms.

Turn on, tune in, peg out

The annual Glastonbury music festival in the UK attracts 175,000 people, most of whom camp at the site. However, there is concern that any metal pegs left behind may damage the cows that are the permanent residents on the farm. The solution has been to ask campers to use a "very stout" biodegradable peg made of potato starch. Different prototypes have been tested and it is expected that the pegs will break down over several months.



Insecticide resistance and genetic composition of *Myzus persicae* (Hemiptera : Aphididae) on field potatoes in New Zealand. van Toor et al. (2008) Crop Protection 27: 236-247.

Infection of potato plants with potato leafroll virus changes attraction and feeding behaviour of *Myzus persicae*. Alvarez et al. (2007) Entomologia Experimentalis et Applicata 125: 135-144.

Spatiotemporal spread of Potato virus S and Potato virus X in seed potato in Tasmania, Australia. Lambert et al. (2007) Plant Health Progress: 1-5.

First report of corky ringspot caused by Tobacco rattle virus on potatoes (*Solanum tuberosum*) in Michigan. Kirk et al. (2008) Plant Disease 92: 485.

Tomato severe rugose virus: another begomovirus causing leaf deformation and mosaic symptoms on potato in Brazil. Souza-Dias et al. (2008) Plant Disease 92: 487-488.



Powdery scab

Powdery scab is caused by the pathogen *Spongospora subterranea*. The three papers described below investigate relationships between soil contamination and disease incidence and severity, as well as looking for potentially resistant cultivars.

► **Factors affecting the incidence and severity of *Spongospora subterranea* infection and galling in potato roots.** Potato plants cv. Estima were grown in controlled environmental conditions with different levels of artificially added inoculum. Root galling was severe at 17°C but did not occur at 9°C. The level of soil inoculum (5, 15 and 50 sporosori/g soil) did not affect the incidence and severity of visual root symptoms, but the incidence of infection (determined by molecular techniques) tended to be greater at high levels of inoculum. There was no correlation between the occurrence of galls on roots and powdery scab on tubers. *van de Graaf et al. (2007) Plant Pathology 56: 1005-1013.*

► ***Spongospora subterranea* soil contamination and its relationship to severity of powdery scab on potatoes.** This study was carried out on 29 potato fields in Hokkaido, Japan. Direct measurement of spore ball density in soil (using a molecular technique) was not strongly related to powdery scab disease severity at harvest. By contrast, the infection potential of each soil, as determined by a molecular assay of infection on the roots of bait plants (tomato seedlings), was positively correlated with disease severity. This method will be useful for determining the disease potential of a soil. *Nakayama et al. (2007) Journal of General Plant Pathology 73: 229-234.*

► **Susceptibility of potato cultivars to *Spongospora subterranea* under field conditions.** Six potato varieties (Sante, Diamant, Cardinal, Desiree, Faisalabad White and Faisalabad Red) were screened for resistance to powdery scab in a naturally infested field at Sharan in the Kaghan valley, Pakistan. The lowest incidence and a low severity of disease was found on Desiree. Differences in tuber weight and numbers between cultivars were seen but were not correlated with disease incidence and severity. *Iftikhar et al. (2007) Pakistan Journal of Botany 39: 1329-1333.*

Rhizoctonia

The pathogen *Rhizoctonia solani* is associated with black scurf and stem canker diseases in potatoes. The following three papers investigate the variability of *Rhizoctonia* isolates in Finland and New Zealand and examine the effectiveness of a biocontrol agent in pot trials.

► **Biological diversity of *Rhizoctonia solani* (AG-3) in a northern potato-cultivation environment in Finland.** *Rhizoctonia* isolates (n=119) were taken from stem canker lesions, stolon and root lesions, hymenia on stems or black scurf on tubers. All isolates, except for three, belonged to anastomosis group 3 (AG-3). The isolates varied considerably in their sensitivity to the fungicide flutolanil (EC50 values: 0.14-0.75 µg active ingredient/ml) and their growth rate (5-15 mm/day). Disease severity in 99 isolates was 1-60%. Only two of the isolates that caused severe symptoms showed low sensitivity to the fungicide. The work has shown that there is considerable variability in the disease-causing isolates of *Rhizoctonia* in Finland. *Lehtonen et al. (2008) Plant Pathology 57: 141-151*

► **Determination of the anastomosis grouping and virulence of *Rhizoctonia* spp. associated with potato tubers grown in Lincoln, New Zealand.** Fifty-eight isolates of *Rhizoctonia* spp. were taken from potato tubers showing black scurf disease symptoms in Lincoln, New Zealand. These were assigned to 11 different anastomosis groups (AG) and put through pathogenicity tests on radish, carrot, lettuce, onion, tomato and hemp. All isolates were virulent at varying degrees to the six plant species, but isolates from AG-3 and AG-D had highest disease severity and those from AG-8 and AG-Ba the lowest disease severity on all six species. Based on tests with all *Rhizoctonia* isolates, tomato plants were most resistant and radish was the most susceptible plant species. *Farrokhi-Nejad et al. (2007) Pakistan Journal of Biological Sciences 10: 3786-3793.*

► **Dynamics of soilborne *Rhizoctonia solani* in the presence of *Trichoderma harzianum*: effects on stem canker, black scurf and progeny tubers of potato.** This paper investigated the relationship between the biological control fungus *Trichoderma harzianum* and potato diseases caused by *Rhizoctonia solani*. *Trichoderma harzianum* reduced the severity of stem lesion symptoms during the first 7 days post-inoculation but at later stages the antagonistic effect was overcome. However, the severity of black scurf on progeny tubers was reduced by *T. harzianum*. The biocontrol treatment also reduced the number of progeny tubers, the proportion of small (0.1-20.0 g) tubers and the numbers of malformed and green-coloured tubers. *Wilson et al. (2008) Plant Pathology 57: 152-161.*

Weeds

► **Effect of hairy nightshade (*Solanum sarrachoides*) on potato nematodes, diseases, and insect pests.**

Hairy nightshade is a common weed in potato crops. This paper describes the many reasons for controlling hairy nightshade, as it is a host to some important potato parasitic nematodes, diseases and insect pests. For example, Columbia and northern root-knot nematodes, and stubby root nematode are all found in hairy nightshade, and the latter can transmit tobacco rattle virus, the cause of corky ringspot disease. Hairy nightshade is also a host of potato leaf roll virus, and green peach aphids preferentially land and readily reproduce on the weed. Virus transmission from hairy nightshade to potato was four times greater than from potato to potato. *Boydston et al. (2008) Weed Science 56: 151-154.*

► **A comparison of flumioxazin and rimsulfuron tank mixtures for weed control in potato.**

More than 90% control of hairy nightshade was shown in field trials in Idaho, USA, with either flumioxazin or rimsulfuron in two-way tank mixes with metribuzin, EPTC, pendimethalin, S-metolachlor or ethalfluralin. However, control of redroot pigweed, common lambsquarters, and green foxtail was better with the rimsulfuron two-way mixes than for flumioxazin, unless the mix was metribuzin. Three-way mixes are also discussed in the paper. *Hutchinson (2007) Weed Technology 21: 1023-1028.*

► **Suppression of volunteer potatoes with maleic hydrazide applications.**

This paper studied the regrowth potential of four potato cultivars at three tuber sizes (<57, 57–113, 113–284 g) after the plants had been sprayed with maleic hydrazide (3.4 kg ai/ha). Cv. Shepody tubers had higher maleic hydrazide residue than cv. Russet Burbank, Ranger Russet and Russet Norkotah tubers. Residue concentration decreased with tuber size. Maleic hydrazide significantly reduced emergence from tubers of all cultivars and all sizes, but suppression was least in the smallest tuber category. *Newberry & Thornton (2007) American Journal of Potato Research 84: 253-258.*

Patent Application

Proteins involved in after-cooking darkening in potatoes (WO 2008/046189 A1). *Inventors: G Wang-Pruski, P Murphy & DM Pinto (24 April 2008), Nova Scotia, Canada.* This patent application describes proteins that are associated with increased after-cooking darkening. The proteins may be used in diagnostic assays for this characteristic, while inhibiting or activating the proteins may regulate the after-cooking darkening process.



► **Book: Pests and Diseases of Potatoes – A Colour Handbook**

The authors of this book are well known potato specialists Stuart Wale and Bud Platt, who have worked with professional photographer Nigel D. Cattlin. There are around 235 great colour photographs of affected potato crops, which, along with the informative text, will help to rapidly and accurately identify pests and diseases. The book includes clear and concise descriptions of the symptoms and cycles of diseases and disorders, describes the distribution and importance of pests and diseases and offers advice on control measures. This book will be an excellent practical reference source for potato scientists, growers, students and others involved in potato production, handling and storage. For further details on the contents and information on ordering the book, go to www.potatonews.com/knowledgecenter/books.asp.

www.spudman.com

► **M&M Heath Farms.** This article describes an organic potato farm in Idaho that produced its first crop of potatoes in the mid 1980s. Despite a lack of profitability in the initial years, Mike Heath continued to work on developing markets and now produces 16 varieties. His crop rotations are longer (typically 5-7 years) than conventional potato growing systems but this is an advantage as the variety of crops he produces helps to spread the seasonal workload. *January 2008, p. 10.*

► **Quality cooperation.** The efforts of a North Dakota potato grower, a Michigan University plant breeding lab and a mini-tuber seed grower to improve the quality of red potatoes are described in this article. Much of the focus is on trying to eliminate the poor characteristics of existing varieties and this is done by culling tubers with undesirable qualities from test plots. The process is expensive and labour-intensive, but is very important for visual characteristics, such as eliminating the pink colours sometimes found in Dark Red Norland tubers. *January 2008, p. 22.*

► **The search for Zebra Chip.** This disorder was first noticed in Mexico in 1994 and found in Texas in 2000. It is characterised by dark stripes through the tuber, which are the result of increased sugar content. All



cultivars appear to be susceptible. Vectors for the disorder have not been established but it is thought that the causative micro-organism may be vectored by an insect. The top suspect is potato psyllids (specifically *Bactericera cockerelli*), very tiny insects that feed on the phloem of plants. *January 2008, p. 26.*

► **Healthy attributes.** This article discusses the range of beneficial compounds found in potatoes by a group of researchers from the ARS and Washington and Oregon State Universities. Studying 100 wild and commercial potato varieties, the team has found over 60 different phytochemicals and vitamins, with many different health benefits. For example, five different types of kukoamines have been isolated and these compounds have been associated with lowering of blood pressure. *January 2008, p. 30.*

Press Release

New potato center to help global research in agriculture.

China, the world's biggest producer and consumer of the tuber, will soon set up a potato research center for the Asia-Pacific region. The center will be part of the Peru-based International Potato Center, which operates under the Consultative Group on International Agricultural Research (CGIAR), and will be set up in conjunction with the Chinese Academy of Agricultural Sciences. Seven CGIAR centres have been set up in China since 1984 and they have produced excellent research results. For example, 95% of the hybrid rice varieties grown in China have CGIAR parental material, and a CGIAR-Chinese partnership, which has bred a potato variety named 'Cooperation-88', has been instrumental in increasing Chinese potato production and consumption.

03 December 2007; Source: China Daily.

Snippets from www.potatonews.com

Listed below are a small selection of the articles that are posted on the Global Potato News website. Please visit the site for further details or follow the links.

► **United Kingdom: Prioritise potato seed for *Rhizoctonia* protection.** In December, industry experts in the UK cautioned growers to avoid cutting corners with *Rhizoctonia* control. Despite the current low levels of black scurf on tubers, it only takes the right soil conditions in the following season to initiate a strong disease cycle. The threshold of 1% infection is only an approximate guideline and is difficult to establish by visual inspection. New liquid seed

treatments, although operationally challenging to establish, offer significant advantages over on-planter dust treatments. *January 2008: News Headlines.*

► **Growing organic potatoes: It takes a new management system...** An article produced by Guenther et al. (http://thepgi.com/resources/organic-july_2007.pdf/) from the University of Idaho, examines the market and production issues for organic potatoes. The market is growing but since the overall supply is small relative to total potato production, growers must be careful not to flood the market, which would result in a large drop in produce price. It is difficult and expensive to grow organic potatoes, so this situation must be avoided. *January 2008: Feature Article.*

► **United Kingdom: Food intolerance experts said potato the safest food in Britain.** Food intolerance experts YorkTest.com tested 8000 people in the UK and found that, for potato, fewer than 1% were in the highest intolerance bracket. What is so remarkable about potato is that it is such a highly consumed food, contributing up to 20% of the diet. Other foods that cause few adverse reactions were grapefruit, apricot, apple, barley and lemon. *February 2008: News Headlines.*

► **Australia: Water shortages lead to rise in potato imports by Simplot Australia.** A report from ABC Rural notes that Simplot Australia will have to import a third of its potatoes this year, mainly from New Zealand and Canada. Not enough Tasmanian farmers are able to sign supply contracts due to concerns over water shortages rather than prices. *February 2008: News Headlines.*

► **New Zealand, United States: Neo-infrared scanner spots diseased potatoes.** Auckland company Taste Technologies has developed a sorting method that can detect whether tubers have zebra chip disease before they are sent to the processor. During the disease process some of the starch is converted to soluble sugar. When the potato is cooked, the sugar burns and goes black, causing zebra-like stripes. The NIR technology works by shining a light on the potato, and the ratio of absorbed to reflected light will change with altered sugar content. Infected tubers can be detected and removed from the crop. Taste Technologies has developed similar methods for testing the sweetness of apples and kiwifruit. *February 2008: News Headlines.*



Mana Kai Rangahau