TOMATO TOPICS

NEWS and INFORMATION
FOR THE PROCESSING TOMATO INDUSTRY

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6th World Congress on the Processing Tomato & 9th ISHS Symposium on the Processing Tomato

The 6th World Congress on the Processing Tomato and 9th ISHS Symposium on the Processing Tomato is looking like an event not to be missed by anyone involved in the processing tomato industry. The congress/ISHS is being organised in conjunction with the Australian Processing Tomato Growers, with financial assistance from Horticulture Australia Ltd. The principal sponsor of this event is Visy Industries, a company owned by the Pratt family, established in Melbourne, Australia in 1948. It has grown to become one of the world's largest privately owned packaging and recycling companies. The updated program for both the congress and ISHS along with complete sponsor details is available from the congress web site www.worldtomatocongress.com.au

Registrations may be accepted either via the online registration form or via post. An additional registration form is available for Australian growers, processors, researchers and crop scouts/agronomists interested in attending part of the event. Please contact Liz Mann for a copy.

Following the Congress/ISHS in Melbourne the post congress tour will be based in Echuca, visiting a number of sites of interest on the Friday, Saturday and Sunday. This event has already attracted over 110 registrations from a number of countries including the USA, Canada, Italy, China and New Zealand. Approximately half of the delegates to date have also registered to participate in the post congress tour to Echuca. All local people involved in the Australian Processing Tomato Industry are welcome to participate in the post congress tour events. Please contact Murray Lanyon for additional information on these.

The congress program presents a number of key speakers involved in the world processing tomato industry. The congress will culminate in a facilitated workshop session to predict the position of the world processing tomato industry 10-15 years from now. Some of the key speakers from across the world include:

- **Dennis Moon** (APTG, Australia)
- **Louis Chirnside** (APTG, Australia)
- **Ross Siragusa** (President/CEO, CTGA, USA)
- **Armando Gandolfi** (President, Gandolfi S.R.L, Italy)
- **Shunji Nakauchi** (Manager, Purchasing Department, Kagome Co., Ltd)
- **Dale Smith** (Manager - Global Seed Business, Heinz Seeds, USA)

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Inside This Issue

Soluble solids – this season's work plans

by Serve-Ag and Co-operators

The work will is based on requests by growers and processors and last season's results and experiences.

Evaluation of nitrogen sources

It is not well understood whether the type of nitrogen (N) fertiliser has an influence on yield and solids, if the total amount of N applied is the same. Three main N forms are available in fertilisers.

Nitrogen form	Plant availability	Comments
Nitrate (NO_3)	Can be taken up with water, very fast acting	Losses due to leaching possible (e.g. when over-watering)
Ammonium (NH_4)	Usually converted to nitrate first, which makes it a bit slower than nitrate	Plants can take up ammonium but most agricultural crops prefer nitrate. Ammonium has an soil acidifying effect; this may be useful on alkaline soils.
Urea ($CO(NH_2)_2$)	Needs to be converted to nitrate prior uptake – speed of availability depends on weather and soil conditions (microbial activity); generally the slowest availability of N-forms listed here	Cheap, losses as ammonia gas may occur during conversion depending on conditions.

Most tomato crops used to be grown with urea. In the past few years other fertilisers which are suitable and easy to use with drip irrigation, mainly Green-N and Eazy-N have been used. Both are mixes of all three nitrogen forms from the above list.

Nitrogen trials

A fully replicated trial will compare the major fertilisers used in the industry plus a nitrate & humic acid mix as per the following tables. Mono-potassium phosphate (MKP) has been included to confirm the positive observations made by growers last season. Seeing the effect on colour and vigour, growers wondered whether it improved N –uptake and asked for this t be investigated.

Fertiliser List – replicated trial

Product Name	Nutrient Composition	Nutrient Concentration	Formulation
Urea	Nitrogen	46%	Prilled (max. Biuret 1%) can also be applied in irrigation water
Green-N®	Nitrogen	42%	Ammonium, urea and nitrate mix designed for injection into fertigation equipment, providing three release patterns of nitrogen.
NitroPlus®	Nitrogen Calcium Magnesium	13.3% 18.3% 0.2%	Nitrate nitrogen and calcium for fertigation and foliar application. Non-acidifying on the soil. Nitrate is fast acting.
Nitro-Humus 323™	Nitrogen Humic acid as potassium humate	32% 3%	Nitrate nitrogen plus humic acid claiming improved uptake
MKP (mono-potassium phosphate)	Phosphorus Potassium	52% 34%	From technical grade phosphoric acid and potassium chloride. Low pH, low salt index, free of chloride and sodium. MKP should not be mixed with calcium

Treatment List

No.	Product	Rate		Application Schedule
		Product (L/ha) or (kg/ha)	Nutrient (kg/ha)	
1	Urea drip	Rates and application schedules will be prepared based on a tomato nitrogen budget (crop uptake figures), soil test and N-check results.		
2	Green-N®			
3	NitroPlus®			
4	Nitro-Humus 323™			
5	Urea + MKP (mono-potassium phosphate)			
6	Green N + MKP (mono-potassium phosphate)			

The replicated trial will be located at Mooroopna, on Fillippe Mei's property. Fillipe has prepared a site especially for the trial and will set up 24 plots, which can be fertilised separately as required. Using a trial site rather than a commercial crop is the only way of running a fully replicated trial with full control over treatments. In previous fertiliser trials we had to overlay treatments over commercial programs and did not get significant treatment effects. The trial variety will be Hz 9614, supplied by Bryce Merrett, Heinz. The trial will be planted in late early November.

Darryl Rathjen has offered to set up a further trial with the two major fertilisers, urea and Green-N, and two replicates in a paddock he can divide into four irrigation blocks. The variety has to be confirmed.
Rob Hosking offered a comparison of two commercial crops in the Boort area, which will be treated identically, apart from the nitrogen fertiliser source. Even though this is not a trial, but part of the monitoring part of the project, observations and measurements may be useful

We will also try to set up a trial in NSW, details still have to be finalised.

We will also be looking for a student to work on the physiological effects of nitrogen forms in a pot trial.

Crop monitoring
The crop-monitoring module this season will be set up to better capture crop information. Growers will be asked permission to consult their agronomists and/or processor for some of the additional information. All information gathered by the project team will be kept confidential and not published or discussed in any way in connection with grower names. Without permits pertaining to the kind of data allowed to be accessed, signed by growers, information will not be collected.

As some publications claim that high sap brix levels reduce the risk of insect attack, we will test brix levels on all monitored crops. The above mentioned crop information (e.g. on scouting) will be important for rejecting or accepting the claim. We also want to check the relationship between sap brix and fruit brix (= soluble solids) again.

Updates on the soluble solids project will be published in coming issues of Tomato Topics.

Growers who have suggestions or questions regarding the 2004/05 programs on soluble solids should contact
Doris on phone number: 03-6427 0800.

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- **Sikke Meerman** (Agricultural Products Development Manager, Unilever)
- **Chris Rufer**, CEO, The Morning Star Co.
- Duncan Blake, Chairman WPTC and CEO Merko
- **Juan Jose Amezaga**, President of AMITOM and Managing Director of Alsat
- **Liang Zhongkang**, Chairman of China Canned Food Industry Association (CCFIA)
- **Professor David Burch**, Science, Technology and Society, Griffith University, Australia

All people are encouraged to participate in all/portions of the 6th World Congress on the Processing Tomato and 9th ISHS Symposium on the Processing Tomato. This is a once in a life time opportunity to hear first hand about the latest developments in the international processing tomato industry and network with key processing tomato industry personnel from across the world, without leaving Australia.

Tomato Spotted Wilt Virus in Australian Potato Crops: What is Driving These Epidemics?

Charles Jericho, Jr. & Calum Wilson, *Tasmanian Institute of Agricultural Research*
New Town, Tasmania

What is tomato spotted wilt virus?

Tomato spotted wilt virus is a serious disease affecting more than 1000 known plant species. It affects potato crops in Australia to an epidemic proportion. The disease is sporadic and infrequent, but losses can be considerable when epidemics occur.

Symptoms of the disease in potato vary according to cultivars and may be mistaken for the common early blight fungal pathogen *Alternaria solani* and therefore, lead to an underestimation of the disease, and consequently, inappropriate control responses.

On shoots in susceptible cultivars (e.g Shepody, Riverina Russets), brown blotches, ring spots may appear which in time coalesce leading to early death of the leaves. Brown streaks may also be evident on stems.

In tubers, scattered dark brown necrotic patches are present internally, which render them unsuitable for processing or consumption. In moderately resistant cultivars or those that translocate the virus poorly to tubers (like Russet Burbank), only occasional internal spots and flecks may appear.

How is it spread?

Tomato spotted wilt virus (TSWV) is transmitted to potato and many other horticultural crops and non-cultivated plants (weeds) by thrips, tiny slender sap-sucking insects only a few millimeters in length. Thrips acquire the virus during the immature stage of their development as they feed on potato plants and other hosts. These immature stages (larvae) are capable of transmitting the virus and continue to do so as adults. Virus may also be introduced to a crop through planting of infected potato seed.

Why is it important to understand the causes of TSWV epidemics in Australian Potato crops?

Observations in the field, prior research and other historical information, all suggest a steady increase in the frequency and intensity of TSWV epidemics since the first report of the disease in Australian potato in 1935.

Over the past two seasons (2001/2002 and 2002/2003) epidemics of tomato spotted wilt virus (TSWV) in Southern Australian potato crops have been monitored with funding from Horticulture Australia limited (HAL). This has the aim of assessing the risk factors associated with epidemics and developing an early warning system for potato growers which may allow better decisions regarding cropping patterns and sequences and disease control strategies in space and time.

But what could be behind these sporadic epidemics?

As in many other cropping systems there is more than one factor responsible for the observed epidemics of TSWV in Australian potato crops. Information gathered so far suggest a complex combination and interaction of factors involving close biological relationships between the virus, thrips vectors and plant hosts under the influence of environmental (weather) and human interferences (cropping systems, crop management, etc).

And how do we unravel this tangled web?

For the past two seasons, research has been conducted on potatoes in Tasmania, Victoria, South Australia, and New South Wales (during the last season), to determine the role played by factors such as potato seed health, weeds as virus sources, thrips vector activity, virus levels and patterns of infection in crops over time, weather data and potato plant resistance to TSWV infection and translocation.

Which thrips species transmit TSWV in potatoes?

While several thrips species are found in potato crops, only onion thrips (*Thrips tabaci)* and tomato thrips (*Frankliniella shultzei)* are known vectors of TSWV and thus responsible for the observed TSWV epidemics in potatoes. Although Western flower thrips is an important vector of TSWV in other crops within regions where surveys have been conducted during the past two seasons, the species is yet to be observed on traps within and adjacent to potato crops, and does not play a role in driving the epidemics. This is significant given the virus transmission competency of this species in other crops. The competences of some of the two vector thrips species in acquisition and transmission of TSWV in potatoes requires investigation but preliminary evidence suggests tomato thrips may have a greater capacity for virus spread in potato, particularly from infected potato sources.

Thrips populations are affected by weather elements such as rainfall, temperature and relative humidity. Peak thrips populations have been recorded in potato crops in early summer but no significant association was found between TSWV outbreaks and population oscillations of any specific thrips species.

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UPCOMING EVENTS

October 7th-8th, 2004
2004 Australian Innovative Farming Conference
National Convention Centre, Canberra
More information visit www.nuffield.com.au

October 11th - 13th, 2004
2004 ANCID Rivers of Dreams Conference, South Australia
More information visit www.ancid.org.au/events/upcoming_events.html

October 14th - 16th, 2004
Tall Poppies,
Celebrating the achievements of women in rural industries
Lake Hume Resort, Albury
More information visit www.ruraldevelopmentservices.com
Or contact Liz Mann (0427 857 578)

Monday 18th October 2004,
Goldacres Conference Series on Crop Spraying for People,
Profit and Environment, Ballarat.
More information contact: conference@organisedsuccess.com

November 15th-18th, 2004
6th World Congress on the Processing Tomato
&
9th ISHS Symposium on the Processing Tomato
Crown Entertainment Complex, Melbourne
www.worldtomatocongress.com.au
Day registrations are available to people involved in the
Australian Processing Tomato Industry, please contact Liz Mann for registration details.
As November is a busy time for the Australian Processing Tomato Industry, no late fee is applicable to individual day registrations. Your attendance at any part of this event will be greatly welcomed.

November 19th -21st, 2004
Post Congress Tour, Echuca
Contact Liz Mann or Murray Lanyon (0419 875 130) for additional information
All people involved in the Australian Processing Tomato Industry are welcome to participate in any portion of this tour.

November 22nd-26th, 2004
Integrated Farm Assurance Conference
Hotel Grand Chancellor, Hobart
More information contact Jane Lovell (jane.lovell@tqainc.com.au)
A Primary Producer discount is available

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Where is the virus coming from?

There are two infection patterns of TSWV in potatoes in Australia, one involving primary transmission which occurs as thrips acquire the virus from a source external to the crop, become adults and then fly into potato crops, the second is where virus is introduced to the crop in infected seed (which is often found in seasons following prior epidemics).

External sources may be any number of weeds, or alternate crops. Some weeds growing within and adjacent to potato crops which have been found to be infected with TSWV include Marsh mallow *(Malva parviflora)*, and Cape weed (*Actotheca calendula),* Hare's foot clover *(Trifolium arvense)* Blackberry nightshade *(Solanum nigrum),* Treeflower nightshade *(Solanum triflorum),* Fat Hen (*Chenopodium album),* Clammy goosefoot *(Chenopodium pumilio),* Wild melon/Bitter melon *(Citrullus lanatus),* Wire weed *(Polygonum avicutare),* Prickly sowthistle *(Sonchus asper)* and Salvation Jane/Paterson's curse *(Echium plantagineum/ E. lycopsis).*

Where external sources provide the majority of infections the disease is characteristically clustered or appears on the edges of the crop. This scenario renders chemical control largely ineffective as the thrips only require a short period of time to transmit the virus once they land on the crop plant. Furthermore, only small numbers of thrips are required to effectively transmit the virus within the crop. Subsequent spread from infected potato to potato may be limited.

Alternately, if infection has mainly been through planting of infected potato seed, the disease will appear as random loci of infections spread throughout the crop.

Do Potato Varieties respond similarly to TSWV infection?

Data gathered on more than 20 potato varieties from glasshouse and field experiments, respectively, during the last two seasons has supported the conclusion that there are varying levels of reactions by different potato varieties, both to virus infections and thrips feeding preferences. This resistance to vector thrips could be useful in breeding programs and is a subject of further study. The variety, Royal Blue, was highly susceptible to thrips feeding damage. At the susceptible end of the scale are varieties like Shepody and Victoria, which was susceptible both in the field and glasshouse and translocate the virus through to tubers comparatively more easily. Data analysis to confirm these results is currently in progress.

What role does the weather play in epidemics?

Beside promoting the survival of the first larval stages of thrips, during which they acquire the virus, weather patterns within regions surveyed account for the relative availability of host weeds, a prerequisite for vector breeding and infection waves.

What then can be done to control TSWV epidemics in Potato crops?

1. ***Use of resistant potato cultivars.*** The use of potato varieties with high levels of resistance to TSWV presents the best option in view of the role played by vector thrips carrying the virus from external sources thereby rendering chemical control less effective.

2. ***Use of certified potato seed***. Potato seed health is also crucial in minimizing TSWV epidemics. *(Tomato seed is not thought to act as a source of infection)*

3. ***Monitoring thrips and infected plants within the crop***. Regular paddock inspection to monitor thrips and getting vector species identified is essential to minimize damage both through the feeding activity of thrips and transmission of the virus to the crop from external sources. Remove and destroy any virus infected plants to limit secondary spread of the disease.

4. ***Chemical control***. This option should be used sparingly, to control thrips causing feeding damage. The method is not particularly effective if the source of the virus is external to the crop or paddock.

5. *Weed control* ***around potato paddocks.*** Thrips are reluctant to cross bare ground. A minimum of 10m (ideally 20-50m) of bare ground, closely mown grass, stones or some other hard surface will discourage thrips from moving into your crop.

As TSWV affects many other crops, an investigation and analysis of the whole farming and cropping system within each region could provide a clearer understanding of what triggers TSWV epidemics and therefore allow effective use of an integrated disease management approach, as shown by the experience in South Africa. A single switch in the rotation of paprika and potato crops, both which are hosts of TSWV, halted the epidemics.

A good understanding of TSWV epiphytotics within non-cultivated ecosystems that may serve as epicenters of epidemics is essential and recommended.

Funded by the potato industry and the Commonwealth Government. Project started in January 2001.

Thrips and TSWV in Processing Tomatoes

Alan Clift, Senior Research Fellow, Agricultural Entomology, Faculty of Agriculture, McMillan Building, University of Sydney, NSW 2006

Surveys and sampling of the incidence of thrips, TSWV and related plant diseases has been done throughout South-Eastern Australia since the early 1990's. The vector species present in Victoria and NSW are western flower thrips (WFT), onion thrips and tomato thrips: they have all been associated with significant incidence of TSWV at various times and in various crops.

It is important for growers to know that it is only first and possibly young second instar thrips that can acquire TSWV, hence thrips must breed on plants that are infected with the virus: After acquisition, the virus replicates, initially in the midgut tissues, then in the salivary glands. It is the adult that transmits the virus and once infected, the thrips retains the virus for life. TSWV is basically an insect virus that has extended its host range to plants.

In the case of processing tomatoes, although WFT has recently (2002/03 season) been found, it is important for growers to be aware that tomato thrips, on their own, can cause up to 80% TSWV infection in tomatoes. Unlike onion and tomato thrips, WFT does not move very much: movement is mainly on infested plant material. Since it is the immature stages that acquire the disease, the thrips must breed on infected plants, so thrips that migrate are less likely to be infected. Hence the very sporadic nature of TSWV infection in former years. However, based on the Sydney experience, even low numbers of WFT can rapidly increase the incidence of TSWV, once it has been introduced onto the farm, usually by one of the other vector thrips species.

As a result of the surveys and samplings done, it is possible to divide the incidence of TSWV in Australia into four situations:

1. Thrips move from drying weeds or an older, adjacent crop, carrying the virus with them.
2. Widespread migration of infected thrips into an entire area, covering hundreds of km sq.
3. Migratory infected thrips bring the virus onto a farm, then an endemic population of WFT acquire the disease and effectively transmit the problem within the farm.
4. Infected transplants, either brought in or grown on the property.

There is evidence for processing tomatoes of situations 1, 2 and 4. The incidence of TSWV during the 1994/95, 2001/02 and 2002/03 were probably part of situation 2, with tomato thrips as the vector. In 1997/98 there was a smaller incidence of TSWV in the Jerilderie area, associated with a large migration of onion thrips, i.e. situation 2. One of the main characteristics of this situation is the disease is widespread within the crop, rather than showing higher incidence near a local source of the virus and declining with distance from the source.

The occurrence now of WFT has opened the possibility of situation 3, when either onion thrips or tomato thrips introduces TSWV onto a property and WFT acquire the virus in the following generation, spreading it around the farm.
In the 1995/96 season there was a widespread problem in southern NSW with up to 80% infection in some crops. TSWV levels in the northern areas of Victoria on processing tomatoes rarely exceed 3% as recently as 1998. Jerilderie and Darlington Point areas in the MIA experienced up to 60% infection levels in solanaceous vegetables with TSWV during the 2001/02 season, with lower levels found in Victoria. Both onion thrips and tomato thrips were present, but based on previous experiences in the area in 1994/95, I believe it was the tomato thrips that brought the TSWV into the area. No WFT were present during 2001/02.

The 2002/03 season was a good year for thrips and TSWV in NSW. There were major levels of TSWV in processing tomatoes in the MIA, especially Jerilderie and Yanco in NSW. Average TSWV incidence in these areas was 40%. However, in contrast to previous seasons, growers around Echuca experienced 25% infection levels, reducing to about 10% at Rochester and Boort in Victoria. These figures should be compared to the less than 3% found in the same area during the last major outbreak, in 1995/96. WFT was found in the area during the 2002/03 season, but there is no evidence they were involved in disease transmission. The vector was tomato thrips, the same vector from the 1995/96 season.

If WFT become widespread in the Processing Tomato production area, incidence of TSWV is likely to increase and be far more difficult to manage. Tomato thrips is susceptible to insecticides and so as a vector is easily controlled; WFT is clearly a different situation.

There are some host plants, especially some Brassica-type weeds (eg wild radish) and clovers that favour WFT in most situations. On other host plants, WFT does not compete well against other thrips species in unsprayed situations. Management of flowering non-crop hosts is essential to minimise incidence of WFT. Although onion thrips can migrate long distances, weed management is important in minimising thrips numbers within the property. Managing TSWV hosts is also important: main TSWV weed hosts include most thistles, nightshades and capeweed. Available evidence suggests weeds become infected after the crop, but having a source of the virus on the property is not a good idea.

Cultivar Improvement Program

Trial sites for the coming season.

	Early	Mid paste	Mid Whole-peel
NSW	Amaro (d/s)	Rorato (d/s)	Stillard (drip)
Vic	Chirnside (t/p)	Moon (t/p)	Hosking (d/s)
	Lehmann (d/s)	Ellis (t/p)	Selwood (t/p)
Mechanical Harvest			
	Kooba Stn (d/s)	Gugliotti (t/p)	Pike (d/s)

Proposed cultivars for replicated plots:

Early:	Midseason Paste	Midseason Wholepeel
ENP 113	Heinz 9035	Falcorosso
CXD 204	Davo	TOP 3929
Heinz 8704	NDM 553	Heinz 9614
Heinz 3002	U941	Heinz 3402
TSH 4	Heinz 4001	RG 15
TSH 18	TOP 2193	RG 31
TOP 2312	Heinz 3402	FG 9936
C250	Record	TSH 8
FG00119	NDM 0098	Hypeel 696

Field days for all sites will be advertised prior to harvest. If you are particularly interested in trialing a variety on your farm this season please contact Bill Ashcroft on 03 5833 5253 to see if he has any surplus seed available.

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