Issue No.44 VEGIE BITES October 2012

National Vegetable Industry Centre Newsletter

Australian Garlic Industry

Tony Napier, NSW DPI, Yanco

The Australian Garlic Industry Association (AGIA) was first formed 21 years ago and in the beginning had over 300 members. Unfortunately the industry has been in decline over the last 10 years and the association was near collapse. Thankfully an enthusiastic group of people led by Leon Trembath rallied together to resurrect the association. Leon is quick to recognise the tireless work of Henry Bell and Roger Schmitke over the last 20 years. He is keen to acknowledge how much effort they have put into the association and how important they have been to AGIA. Since the formation of the new board, the association has been actively trying to build up member numbers again. One of the first major activities the association has achieved is to hold an AGIA conference which was held on 27 and 28 July at Tooleybuc on the Murray River.

The new AGIA executive members

Australian garlic conference

The two day conference was held over the last weekend of July with about 40 people attending. There were a number of workshops and presentations on a variety of subjects including marketing, crop nutrition, weed control and post harvest management. One of the highlights of the conference was the field day to a local grower's property. The grower was Peter Hackett who did a fantastic job in giving a detailed overview of his operation and spent the whole afternoon showing people around his farm. Peter has had many years experience in growing garlic and it was very beneficial to be able to pick up some of the finer points of growing garlic. The marketing sessions by Ben White and Rosie Mackinnon were also a highlight of the first day with a message about building a brand for your own product. At the end of the conference three new executive members were elected to the board. These include Peter Hackett, Matthew Bailey and Libby Morgan who will be joining Leon Trembath, James Beeby, Kirsten Jones and Richard Casley-Smith

Garlic field day at Tooleybuc

Australian garlic industry

The world production of garlic is about 12 million tonnes annually. It is difficult to get accurate figures on Australian production but it is reported to be close to 1,000 tonnes annually. The harvest season in Australia starts in Queensland in early September and can go as late as February in Tasmania. With curing and storage, the bulk of Australian garlic is marketed from early November through to the end of May. With Australian consumption now over 10,000 tonnes per year, 90% is being imported. The majority is coming from China but large volumes are also coming from Argentina, Mexico, Africa, Taiwan and USA.

For more information on the AIGA, you can contact Kirsten Jones on 03 5664 8353 (after 7.30pm) or email info@garlicaustralia.asn.au

NSW Department of Primary Industries

Garlic Research in the Riverina

Tony Napier, NSW DPI, Yanco

During the 2011 season, three garlic trials were undertaken by NSW DPI in the Riverina. The trials were conducted within a grower's commercial crop in the Murrumbidgee Irrigation Area of NSW. The three trials were drip irrigated and sown in mid-March 2011. A seed size trial and herbicide evaluation trial were sown with three replications in a randomised block design. A variety trial was sown only as an observation trial with one plot per treatment (variety). The trials were treated the same as the surrounding commercial crop for all fertilizer, irrigation and pest management requirements.

Garlic seed size trial

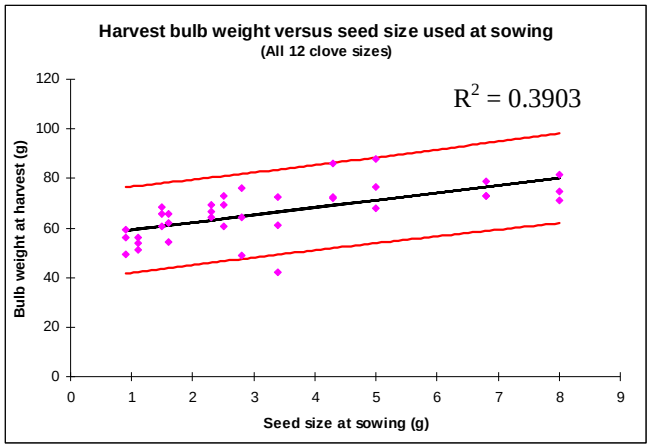
Garlic is grown by sowing cloves from the previous year's crop. There are a number of different cultivars sown in the Riverina with mid-season purple hard neck varieties being the most common type. Bulb and clove size varies within each variety. Most purple varieties have a bulb size ranging from 40 to 90g. Each bulb comprises of various size cloves with larger cloves surrounding the outer ring and much smaller cloves clumped in the middle of the bulb. The trial was established to determine how much influence clove size at sowing has in determining bulb size at harvest. The variety evaluated in this trial was New Zealand Purple. Garlic bulbs were collected for seed and separated into individual cloves prior to sowing. Table one shows the twelve weight sizes obtained for the trial.

Table One: Clove sizes used in 2011 garlic seed size trial.

Cloves collected from the inside of bulbs			Cloves collected from the outside of bulbs		
No	Average weight (g)	Description	No	Average weight (g)	Description
1	0.9	Inside – Very small	7	2.8	Outside – Very small
2	1.1	Inside – Small	8	3.4	Outside – Small
3	1.5	Inside – Small medium	9	4.3	Outside – Small medium
4	1.6	Inside – Medium	10	5.0	Outside – Medium
5	2.3	Inside – Medium large	11	6.8	Outside – Medium large
6	2.5	Inside – Large	12	8.0	Outside – Large

The trial was harvested on 1 November 2011 (the same week the grower commenced harvesting his surrounding commercial crop). All bulbs were put in storage to cure and assessed 24 days later. All bulbs from each plot were weighed after removing the leaves and roots (commonly known as "top and tailing"). An average bulb weight was determined from each plot from the average of all eight bulbs within each plot. Figure one show the results of the trial.

Figure One: Bulb weight achieved at harvest from all 12 seed sizes.



The regression is highly significant at P = 0.01%.

The results showed that the seed size used at sowing will affect bulb size at harvest. When analysing results from all clove sizes, a highly significant trend was found between clove weight at sowing and bulb weight at harvest. The seed size in this trial explained 39% of the variability of the bulb harvest weight. If analysing only the larger cloves collected from the outer ring of the bulbs (cloves 2.8g or larger) the trend becomes less significant. In practical terms this means when obtaining cloves for seed you should avoid the small cloves found on the inner ring and only use the larger cloves found on the outer ring.

Garlic herbicide trial

Garlic is sown as cloves in early autumn then the plant develops slowly over winter. Even though garlic is grown from cloves and has more seedling vigour than other alliums grown from seed, it is still very prone to weed competition. A weed control program is essential when growing garlic. There is a limited range of pre and post emergent herbicides that can be used for weed control in garlic. A trial was established to assess some of the pre-emergent and post-emergent broadleaf herbicides currently registered or have a permit for use in NSW. The post-emergent grass herbicides (class A herbicides) were not evaluated in this trial.

The garlic variety used in the trial was New Zealand Purple with nine weed control treatments evaluated including three pre-emergent herbicides and two post-emergent herbicides. There were two unsprayed treatments with one being hand weeded while the other unsprayed treatment was not hand weeded and left untouched allowing weeds to grow unhindered. The three pre-emergent herbicides evaluated were Stomp®, Dacthal® and Surflan®. Stomp® has a permit for use from 0.75 to 2.0 L/ha, Dacthal® is registered for use from 5.0 to 12.5 kg/ha and Surflan® has a permit for use at 4.5 L/ha. The two post-emergent herbicides evaluated were Juggler® and Tramat®. Juggler® has a permit for use from 1.0 to 3.0 kg/ha and Tramat® had a permit for use from 0.6 to 1.2 L/ha. Table Two shows the nine treatments evaluated.

Table Two: The nine treatments used in the 2011 garlic herbicide trial.

No	Treatment	Active	Type
1	Stomp® at a low rate	Pendimethalin - (440g/L)	Pre-emergent
2	Stomp® at a high rate	Pendimethalin - (440g/L)	Pre-emergent
3	Dacthal® at a low rate	chlorthal-dimethyl - (900g/kg)	Pre-emergent
4	Dacthal® at a high rate	chlorthal-dimethyl - (900g/kg)	Pre-emergent
5	Surflan®	Oryzalin - (500g/L)	Pre-emergent
6	Tramat®	Ethofumesate - (500g/L)	Post-emergent
7	Juggler®	Methabenzthiazuron - (700g/kg)	Post-emergent
8	Unsprayed	NA	No weed control
9	Unsprayed	NA	Hand weeding

Weed counts were taken one month after the last spray treatment on 30 May 2011. Assessments were conducted on a 2m length of bed in the middle of each 5m plot. The entire trial was harvested on 2 November 2011 which was conducted during the same week the grower commenced harvesting his surrounding commercial crop of New Zealand Purple. 12 bulbs were harvested from each plot and put in storage to cure and assessed seven weeks later on 21 December 2011. All bulbs collected from each plot were measured for average bulb width. An average bulb width was determined for each plot from the average of all 12 bulbs collected from each plot.

Results of the pre-emergent herbicides

Surflan® gave the best results of the three pre-emergent herbicides and gave statistically better weed control than Stomp® and Dacthal®. Stomp® and Dacthal® demonstrated some level of weed control at the higher rates, but not as good as what was achieved with Surflan®. There was a rate effect detected with both Stomp® and Dacthal® with the higher rates demonstrating a trend for better weed control when compared to the lower rates. The low rate of Dacthal® demonstrated no level of weed control.

Results of the post-emergent herbicides

Juggler® gave the best results of the two post-emergent herbicides and gave significantly better weed control than Tramat®. Using Tramat® also effected the growth of the garlic with obvious symptoms of twisting and plant damage observed in all three plots. Tramat® was the only herbicide treatment to have an effect on yield and produce smaller bulbs at harvest compared to all other spray treatments.

Summary of results

In this trial Surflan® demonstrated the best pre-emergent weed control. Stomp® and Dacthal® demonstrated some weed control at higher rates but appeared to give poor results when used at lower rates. Juggler® gave excellent post-emergent weed control and demonstrated better weed control than Tramat®. After this trial was completed, Tramat® had its permit for use in garlic withdrawn. Therefore growers in NSW can no longer use Tramat® for weed control in garlic.

Authors note: Stomp® and Juggler® are commonly used for weed control for garlic grown on the heavier soil types of the Riverina. When used at the appropriate rates, they have shown to give excellent results. The addition of a registered class A herbicide in the weed control program is also required for the best overall weed control.

Garlic variety trial

There are a range of garlic varieties grown in the Riverina including both purple and white types. An observation trial was sown in 2011 for an indication of how each of the varieties will perform in the Riverina. The garlic variety evaluation was conducted within a grower's commercial crop on a property in the Murrumbidgee Irrigation Area of NSW. The trial was sown in mid-March 2011 with only one plot sown per variety and 20 plants per plot. The garlic varieties were evaluated for different plant characteristics and separated into three categories including "Purple soft necks", "Purple hard necks" and "White soft neck". Observations of the 2011 garlic variety trial are recorded below.

Purple soft neck types

Glenn Large and **Southern Glenn** are early purple soft neck types. Both had very good early vigor with an estimated harvest time from mid to late October. Both were low yielding and produced small un-symmetrical and lumpy looking bulbs.

Italian Red is a mid season purple soft neck type. Good early vigor with an estimated harvest time in early November. Medium sized bulbs with a deep purple colour were produced. The bulbs had a similar look to the two "Glenn" types with non-symmetrical and lumpy bulbs.

Dynamic Purple is a late purple soft neck type. Slow growth early with an estimated harvest time in late November. It appeared to be low yielding with small bulbs produced. Some post harvest breakdown was seen two months after harvest.

Purple hard neck types

New Zealand Purple, **Italian Purple, Purple Hardneck, Mammoth Purple, Early Purple** and **Monaro Purple** are all mid season purple hard neck types. They all had good early vigor with an estimated harvest time from early to mid November. Large size bulbs were produced from all these varieties

Oriental Purple is also a mid-season purple hard neck type. It had good early vigor with an estimated harvest time in mid-November. Small size bulbs were produced with some post harvest breakdown seen two months after harvest.

White soft neck types

Early White is an early season white soft neck type. It had slow growth early and an estimated harvest time in early to mid-November. Medium sized bulbs were produced.

Italian White is a mid season white soft neck type. It had a good early growth with an estimated harvest time from mid to late November. Medium to medium large sized bulbs were produced.

Australian White is a mid-season white soft neck type. It had slow early growth with an estimated harvest time from mid to late November. Medium to medium large sized bulbs were produced.

Garlic Cream is a late season, white soft neck type. Slow growth early with an estimated harvest time in late November. Small creamy white bulbs were produced with thin cloves.

Silverskin is a late season, white soft neck type. Slow growth early with an estimated harvest time in early December.

Biotechnology awareness workshop

Tony Napier, NSW DPI, Yanco

A Horticulture Australia funded workshop was held last June to increase awareness in the use of biotechnology in horticulture. The workshop was held at the CSIRO Discovery Centre, Canberra and designed for people with little or no exposure to biotechnology. The use of biotechnology in plant breeding is rapidly increasing world wide and is a very efficient way of getting a desirable trait (such as insect resistance) into an existing crop line. Using biotechnology allows the plant breeders to introduce a desirable trait by transferring only one or two genes into a target line in a more controlled process than traditional breeding techniques. Unfortunately biotechnology is very expensive and currently costs about ten times the amount to produce a new variety than by conventional breeding.

Fifteen years ago the production of Genetically Modified (GM) crops was in its infancy with virtually none grown around the world. In 2011 around 160 million hectares was grown world wide and is increasing by about 10 million hectares per year. Soybeans are the most commonly grown genetically modified crop in the world with large areas of maize, cotton and canola also grown. Genetically modified vegetables grown around the world include onions, squash, potato, tomato and sweet peppers. The two most common traits desired for use in GM crops are herbicide tolerance and insecticide resistance. Crops with genetic resistance to glyphosate have the ability to tolerate Roundup® making weed management much easier. Crops that have a genetic resistance to caterpillar pests are much easier to grow where heliothis is a problem and far less insecticide applications are required.

In Australia there are currently only two genetically modified crops commercially grown which includes cotton and canola. GM cotton was trialled for five years in Australia before being commercially grown in 1997. Now in 2012 over 90% of all cotton grown in Australia is genetically modified. One interesting fact told at the workshop was that the oil produced from these crops (cotton seed oil and canola oil) do not contain genetic material. This means that there is no difference between GM oil and conventional oil. As there is no detectable difference, there is no test available to determine if oil has been produced from a conventional or GM plant. There are no GM crops grown in South Australia or Tasmania as both these states currently have a blanket ban on growing GM crops.

Delegates at the biotechnology workshop

A comprehensive regulation process also provides confidence about this new technology. Biotechnology research in Australia is regulated by the Office of the Gene Technology Regulator which carries legislative power for all activities involving gene technology. For any commodity to be released for commercial production it must get the tick of approval from this agency. The only criteria they take into account is the risk aspect, they take no account of the benefits involved

At the end of the two day workshop people had a much better understanding of biotechnology and the benefits it can bring. GM technology is not a futuristic concept but as current innovation helping to improve agricultural productivity. Australian consumers will soon see a lot more GM commodities being produced in Australia. The commercialisation of GM wheat and GM sugar may only be five to seven years away for Australian growers. We (the consumer) can already obtain genetically modified food here in Australia with 37 GM products currently available for purchase on our supermarket shelves.

Growing Better Beets

Stephen Wade, NSW DPI, Bathurst

Processing beetroot growers can improve their crop yields and factory pack outs through variety selection and better row spacing according to the latest Horticulture Australia Ltd (HAL) research on beetroot stand management. Beetroot seed has 2 to 6 seeds in a small fruit called a seed ball. As some or all of these seeds may germinate at once, it can be difficult for growers to get evenly spaced plant stands in their crops. Having too many seeds germinate results in smaller, misshapen beets. Even plant stands are crucial if growers are going to meet the processing standards for beetroot size.

While the old processing standard wanted 100 mm diameter beetroots, which were good for canning and hamburgers, the new processing standard seeks smaller 50-75 mm diameter beetroots suitable for plastic refrigerator packs and restaurant use. Reducing the number of seedlings per seed ball and spacing the seed balls more evenly in the crop makes it is easier to achieve more uniformly sized beets. Several beetroot varieties, which produced only 1 to 2 seedlings per seed ball, were identified in the research project.

The field trials in the four year project at Cowra showed that crop row spacing affects beetroot size. Beetroot crops with the closer 37 cm row spacing's grew more of the smaller 50-75 mm diameter beets, while crops with the wider 60 cm row spacing's yielded more of the larger 76 mm diameter beets. The research showed you can adjust crop row spacings to suit specific beetroot sizes and so reduce the number of under- and over-size beets.

The trials also showed that 4 to 10 cm seed ball spacings along the crop rows had little effect on beetroot yields. When the seed balls were sown closer together along the rows there are higher seedling losses due to more seedling competition. As a result of these higher losses, fewer plants survived to produce the final crop yield. The research showed that beetroot growers could sow less seed at wider plant spacings for the same crop yields and reduced sowing costs.

Nigel Hazell, beetroot grower, Alan Boulton, NSW DPI Technical Officer and Stephen Wade, NSW DPI District Horticulturist, inspect a beetroot variety trial in the beetroot stand management research project (Photo: Donald Irving

The final report for HAL Project VG 06117 "Beetroot Stand Management" is available on the website http://www.horticulture.com.au. For further information on this research project, contact Stephen Wade on 02 6330 1216 or stephen.wade@dpi.nsw.gov.au.

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