

Horticulture Innovation Australia

Final Report

Mushroom Industry Knowledge Training Project

Greg Seymour
Australian Mushroom Growers Association Ltd
(AMGA)

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Fax: (02) 8295 2399

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Summary

The Mushroom Industry Knowledge Training project was structured to address the needs of the industry under the Capacity Building and Risk Management Objectives of the industry's 2011-2016 strategic plan.

The Australian mushroom industry at its current size experiences difficulty in finding and retaining sufficient committed and capable staff with the knowledge and skills to manage the various aspects of the mushroom growing process. As the industry expands it is expected that labour and skills shortages will become more limiting. Currently there is no regular, ongoing mushroom specific training available in the Australian industry above entry-level training.

The future sustainability of the mushroom farm, and the return on investment from industry marketing programs are not only dependent on the quantity produced, it is also dependent on the quality and integrity (e.g. food safety) of the product. Farm managers and their staff have the responsibility for attending to the level of detail required, and their success is dependent on their capacity to monitor and manage the crop appropriately.

The training courses are structured and delivered to provide the skills, confidence and network support to enable participants to deliver outcomes at farm level on a consistent basis. The delivery of courses on a regular basis is designed to provide the industry with an increasing pool of suitably trained people to support continued growth.

The main training delivered was Pest and Disease Training including modules on Disease Recognition and Spot Treatment, Hygiene Awareness training and Safe and Effective Pesticide Use. During the project the training delivery needed to adapt to changes in the industry operating climate (namely lower prices and farms less able to release staff for off site training) and e learning emerged as a valid method to supplement face to face training.

Short Courses on Compost and Growing delivered by experienced Dutch trainers in July 2013 and September 2015 were well supported. Industry based training courses such as these focus more on WHY and HOW inputs impact on the crop and complement farm training that focuses more on WHAT to do.

A number of training resources were developed or identified as applicable during the project that once refined should assist key farm staff supplementing their knowledge and response to a 'moment in need'.

Keywords

Mushrooms; industry development; capacity building; risk management

Introduction

The Mushroom Industry Knowledge Training project was structured to address the needs of the industry under the Capacity Building and Risk Management Objectives of the industry's 2011-2016 strategic plan.

The Australian mushroom industry at its current size experiences difficulty in finding and retaining sufficient committed and capable staff with the knowledge and skills to manage the various aspects of the mushroom growing process. As the industry expands it is expected that labour and skills shortages will become more limiting. Currently there is no regular, ongoing mushroom specific training available in the Australian industry above entry-level training.

The future sustainability of the mushroom farm, and the return on investment from industry marketing programs are not only dependent on the quantity produced, it is also dependent on the quality and integrity (e.g. food safety) of the product. Farm managers and their staff have the responsibility for attending to the level of detail required, and their success is dependent on their capacity to monitor and manage the crop appropriately.

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Methodology

Element 1: Mushroom Industry Pest and Disease Training

The initial project intention was to deliver training to multiple farms at a central location in each state. This had worked quite successfully in the past. Soon after the project began, it was established that the operating climate of the industry had changed significantly (namely low prices and low profitability). This change meant that the original approach needed to be modified, as farms were not in a position to have many key farm staff absent from their farms at a given time.

As a result of this finding the decision was taken for the Trainer (Judy Allan) to visit as many farms as possible to deliver the training in Year 1 and raise awareness of the project and its component activities and establish the key players that will be involved in 'remotely delivered' follow up training.

This multiple delivery of shorter 'modules' of the topics (i.e. 1.5 hours instead of 3 hours) at larger sites has allowed more key farm staff to be exposed to the training. In some instances all pickers were able to attend the Disease Recognition and Spot Treatment course. This was an excellent development considering that disease usually expresses during picking and that pickers are the 'eyes of the farm'.

Topics delivered included:

1. Disease Recognition and Spot Treatment Techniques

Target audience: picking supervisors, picker trainers, and trainee growers, growers.

This course was designed to address the underpinning knowledge applicable to the nationally endorsed competency units on pest and disease. In the future it will also serve as a thorough introduction to new growers and key farm staff, and as a review for the more experienced. Participants were expected to describe their farm's standard operating procedures for spotting and treating diseases and were given an opportunity to identify areas for improvement during the session.

2. Farm Hygiene Awareness Training for Staff Involved in Production of Mushroom Compost

Target audience: key farm staff on sites producing phase I and phase II compost. This course is also suitable for supervisors, trainee growers and growers wanting to gain a greater awareness of the holistic management required for the prevention of disease and pests throughout the growing cycle.

This course was designed to address the underpinning knowledge applicable to the nationally endorsed competency units on pest and disease. Participants were expected to describe the standard operating procedures for farm hygiene for their workplace and were given an opportunity to identify areas for improvement during the session.

3. Safe and Effective Pesticide Use

Target Audience: growers, trainee growers, owners, managers, supervisors and key farm staff with responsibility for using pesticides and disinfectants.

This course was designed to address the underpinning knowledge of the nationally endorsed competency units on pest and disease. Participants were expected to describe the standard operating procedures for farm hygiene for their workplace and were given an opportunity to identify areas for improvement during the session. The session on Reading and Understanding a Pesticide label and MSDS was delivered associated to this topic.

Element 2: Train -The -Trainer

One workshop per year of mushroom industry specific supervisor training was planned however the mushroom industry operating climate had changed significantly since the concept of the project had been written and this element proved to be very challenging to get sufficient engagement from training staff from the farms. Mentoring on training was delivered on farm face to face in Year 1. A workshop was delivered in Year 2 (May 2014) and although the attendees provided positive evaluations only 6 people attended. In year 3 the decision was taken to channel activity into resource identification and development to support basic pest and disease training that may be utilized by trainers and supervisors on farm.

Element 3: Growing and Composting Courses delivered by experienced trainers from Holland.

A 3 day course on Mushroom Growing and a 3 day course on Compost production using experienced trainers from The Netherlands was organised on 2 occasions, the first being in July 2013 in Windsor and the second in September 2015 in Adelaide and Merbein. The concept behind the initiative is to make internationally recognized training available in Australia on a regular basis by bringing trainers to Australia to deliver it. The course set up costs are subsidized by the project and the participants paid for their own travel and accommodation and venue costs.

Training delivery occurred in a classroom but also during visits to farms and compost yards. Often it is the visits to other facilities that are the most interesting to the participants, as many people haven't had the opportunity to visit a site other than the one they are employed on. The trainers are very experienced and were able to factually discuss relevant topics in situ as points of interest presented during the visits. They very effectively reinforced lecture topics with explanations on how different equipment, facilities, materials AND management can impact on the production process and mushroom yields and quality.

Outputs

PEST AND DISEASE TRAINING: Year 1

On farm training was delivered on 18 farms located in Victoria, South Australia, Western Australia, Queensland and NSW. The number of sessions delivered associated with this project is summarized in Table 1.

Pest and Disease Training-for 12-month period ending 30/8/13

Module	Total Attendance	Total Number of Sessions
Disease Recognition and Spot Treatment	227	24 <small>N.B. Multiple sessions were delivered on farms when applicable to keep numbers per session to <20</small>
Hygiene principles for Substrate Staff	30	2
Reading and Understanding a MSDS	81	14
Safe and Effective Pesticide Use	15	4
OVERALL TOTAL	353	44

In addition to the 18 farms where on-farm training was delivered, 9 other farms were visited when the trainer was in the locality. During that visit the trainer discussed pest, disease and pesticide issues and visually inspected pesticide storage facilities, pesticide application procedures, general housekeeping standards and standard operating procedures for pesticide use and spot treatment of disease.

A set of Disease Recognition and Spot Treatment Photos were provided to farms hosting/participating in training sessions. These photos were utilised in the sessions and the example of their use provided a model for trainers and managers/owners present for future use and integration into their own on-farm training.

No train The Trainer Workshop was delivered in Year 1. Pest and Disease training delivery methods were discussed on site visits and mentoring was provided. PowerPoint slides, as well as a brief session plan and handout were provided to farms who hosted the 'Reading and Understanding a label and MSDS' session. The session was kept very simple. Once a manager or trainer had participated in the session it was very easy to adapt for his or her own use.

A set of Risk Management Pesticide Use publications/articles were selected and uploaded onto www.emushrooms.org as a resource to farms to use to review and upgrade their pesticide use procedures.. These publications were printed off and handed to farms where training was delivered on or visits made.

PEST AND DISEASE TRAINING: Year 2

Wall charts-With regard to disease control and minimizing pesticide use in the mushroom industry it is acknowledged that early disease recognition and spot treatment are VERY important steps. 2 laminated A3 wall charts have been developed and distributed to farms to highlight key issues. One is on Dry Bubble Disease Management and the other is Cobweb Disease Management. These wall charts were published and promoted in the Summer 2014 edition of the AMGA Journal and copies direct mailed to every Australian mushroom farm December 2014.

A model **E Link** on Dry Bubble Recognition and Spot Treatment has been designed to support content delivered in Disease Identification and Spot Treatment.

A series of 3 **webinars** was prepared and delivered October –December 2014. A presentation titled 'Evolving Towards E Learning' was made to the annual mushroom industry conference in September 2014 prior to delivering these webinars as it was considered farm principles and managers needed to become more familiar with the E learning developments in the Training Project to understand how it could be utilized in their businesses.

A Webinar on Management of Bubble Disease was delivered live October 2014 and is now available 'on demand' through the AMGA's Pest and Disease website (www.emushrooms.org)

Webinar on Safe and Effective Pesticide Use With Emphasis on Fungicide Use-delivered live November 2014 and is now available 'on demand' through the AMGA's Pest and Disease website (www.emushrooms.org)

Webinar on Management of Cobweb Disease delivered live December 2014 and is now available 'on demand' through the AMGA's Pest and Disease website (www.emushrooms.org)

Pest and Disease Training in Year 3 continued to explore programming, delivery methods and information packaging. In essence Year 1 topics were introductory and the Year 3 topic/delivery was more holistic and integrated. A new format was piloted successfully that used the most common fungal disease Dry Bubble and was designed to integrate recognition, methods of spread and control into a half-day session.

3 sessions were delivered on large farms in NSW October 2015 where the total attendance was 24. What was more significant than the numbers attending was the fact that the groups at each farm represented upper management, middle management and supervisors and that the event enabled a review of farms methods and developed a whole farm action plan. The follow-up activity revolved around using selective agar touch plates to highlight disease transmission routes.

A session was designed and delivered at the Growing Course held in Adelaide in September 2015 (attendance 15 from 9 farms representing over 60% of Australia's production). Delivering the session here allowed the technical content to be delivered but also it enabled the AMSAFE and PDMS activities and capability to be highlighted and contextualized in a very farm oriented way.

Composting and Growing Training Courses Delivered by Dutch Trainers

In Windsor in July 2013 there were 19 participants from 14 different production sites in the compost course and there was 20 participants from 15 farms in the growing course.

In Adelaide in September 2015 there were 11 participants in the compost course and 9 participants in the growing course with a further 6 people doing both courses (total number = 26 from all states of Australia). In terms of numbers of farms represented in each course: there were 9 sites represented in the compost course and 9 sites represented in the Growing Review and Update. We worked out that the estimated weekly production of the farms represented was approx. 750 tonnes of mushrooms / week which is approx. 60% of the weekly production of mushrooms in Australia (the estimated weekly production of mushrooms in Australia currently is 1250 tonnes per week or 65,000 tonnes per year). During an introductory exercise we calculated that the range of years working in the industry for the participants was 25 years at the high end down to 5 months and the low end, and that the total years of experience added up to 192.5 for the participants. This type of information illustrates the diversity of most groups assembled and the need for the training to not only cover the basics, but to also serve the function of being an update for the more experienced.

Outcomes

- Larger pool of trained personnel available to mushroom businesses
- Training courses offered on a regular basis –allowing mushroom business and individuals to plan ahead re training expenditure and training goals. Also caters for the turnover and changing roles of employees in the industry.
- Participants problem solving and risk management skills enhanced because they have a better understanding of the basics and the options available.
- Risk of pesticide misuse in industry reduced and information flow between Pest and Disease Management Service gets into more routine and regular contact
- Easier for industry personnel to pursue accreditation as industry specific course available to add to their underpinning knowledge and equip them for assessment
- Training options tested and methods updated to accommodate current operating climate in the mushroom industry
- E learning capability developed for the mushroom industry- 3 webinars delivered and now available 'on demand'
- Information packaging to support training courses explored and resource development commenced (includes wall charts, E Links)

Evaluation and Discussion

Pest and Disease Training

Year 1: In year 1, the project enabled direct contact with 27 farms (large AND small in size) that represented an estimated 40% of the industry's production. This level of engagement was an excellent sample to establish a benchmark for where farms were at with their knowledge and practice in relation to pest and disease and to assess the applicability of the session content. Unfortunately, the travel component and time required for the trainer to do this was not sustainable, nor was sufficient funds available in the budget to continue at this intensity.

The follow up remote tutorial concept did not work as well as hoped due to business pressures of farms (low prices meant that farms focus was staying afloat and training became a lower priority), not enough people on farms being experienced at using Skype, different system versions (of Skype) and difficulty with connection speeds for some remote areas. For those reasons it was established that it was not possible to effectively deliver tutorials remotely so it was not pursued any further. Resources in the project were then directed to developing capacity to deliver webinars and video based resources.

Year 2 activities: 18 mushroom businesses (which is estimated to be over 30% of the industry) asked for connection details to the webinars and very good feedback has been received regarding the webinars particularly that this technology option has now been embraced and included as a delivery mechanism. The first webinar had the best 'attendance' but once growers came to realize that the webinars were also available on demand it seemed to decrease numbers of people attending 'live'. This is not considered a bad outcome since the farms are now more aware of the nature of the resources available to them. The mushroom industry is such that it does not tend to train for the sake of training but use training in 'a moment in need' if and when a problem (for example a disease outbreak) occurs. The content of the 2 webinars on the main diseases was prepared in such a way that suited 'moment in need learning'.

Although there was a capacity for interaction within the webinars the number of questions submitted via message at the designated times during the session were minimal. This was not unexpected when participants are not very familiar with the process. The major focus in this round was to record the information presented for 'on demand' use. Getting more participation online 'live' is one of the aspects that can be further developed in the future.

Year 3 continued to explore delivery methods and information packaging and how to raise awareness within the farms about the training activities and resources available. Although the delivery 'occasions' in Year 3 was less, sessions were delivered to people from farms representing over 70% of Australia's production and a network of contacts was established. While in Year 2 the annual mushroom conference was used, as the venue to explain and

promote the webinar series it would appear that the growing and composting training courses provide the best opportunity to develop a training and training contact network.

Even though e learning capacity has been explored it was never anticipated that there would be no face-to-face training. The fact that the number of people accessing the 3 webinars 'on demand' has been minimal reinforces that training delivery should not be only delivered electronically but that there needs to be events that personalizes the training and 'connects' the industry to the resources and services.

The farm visits associated with this project have provided a unique opportunity for supervisors, trainers, managers and owners to be part of sessions that review their current practices and engage in a process that will lead to improved practice. The farm visits have also provided the opportunity for the trainer to become more aware of current farm practices and industry risks in terms of pesticide use. This information will be fed back to the annual AMGA Pest and Disease Strategic Review process.

Pesticide Use

In terms of Safe and Effective Pesticide Use in the Mushroom industry this project is about contextualizing safe and effective pesticide use, promoting risk management principles and packaging and raising awareness of the content of existing information such as material safety data sheets and the knowledge base contained in the mushroom industry pest and disease website www.emushrooms.org (Agora).

Indications are that the premise that improving the knowledge and skill of key farm staff to be more effective at recognizing and spot treating disease at an early stage (before it has an increased presence and major economic impact) will decrease the impact of disease and the need for an increased pesticide use response, is correct. This feedback reinforces the need to ensure training remains a core element if the industry's risk management capability.

Train-the –trainer

In the mushroom industry the number of people with formal training in delivering training is extremely limited. The main training they receive on farm is WHAT to do and not necessarily WHY they should do it. The methods of delivery of information in the farm based training is often limited by their lack of experience and knowledge about good training techniques. The original expectation was that this project would run one workshop a year with the target audience of farm staff who have training as their responsibility. In Year 1 this topic was addressed via a mentoring process during and after farm visits by the project trainer. This provided valuable insights as to the content and general level of documentation of on farm training delivery.

In Year 2 (May 2014) a Train-The-Trainer workshop was designed and delivered in Windsor NSW and attended by 6 people from farms in NSW, Victoria and Queensland.

In year 3 a decision was taken to channel activity into resource identification and development to support basic pest and disease training that may be utilized by trainers and supervisors on farm rather than repeat the train-the-trainer-workshop.

Composting and Growing Training Courses Delivered by Dutch Trainers

A summary of some of the key feedback from participants of the 2013 courses was published in the AMGA Journal Winter 2013 and is included as Appendix 2.

In September 2015 the participants in the Compost Course rated:

Course Technical Information: 8.4 out of 10

Relevance to Understanding Mushroom Production in General: 8.8 out of 10

Relevance to Work Duties: 8.4 out of 10

Motel Accommodation: 8.8 out of 10

Course Venue: 9.5 out of 10

In September 2015 the participants in the Growing Review and Update rated:

Course Technical Information: 9.9 out of 10

Relevance to Understanding Mushroom Production in General: 9.6 out of 10

Relevance to Work Duties: 9.4 out of 10

Motel Accommodation: 8.9 out of 10

Course Venue: 9.4 out of 10

An article on this course was published in AMGA Journal Spring 2015 and is attached as Appendix 5.

The networking attached to attending these courses is very significant to attendees for both knowledge and personal development and should not be underestimated. As well, connections and increased awareness of Australian industry initiatives such as AMSAFE, the pest and disease website emushrooms.org.au and the Pest and Disease Management Service occur.

The concept of offering the same course more than once seems to have been relevant given the participation rates on both occasions has been high, and that in numerous cases the same companies have sent different people to both courses. Clearly, if those farms who invested in their staff to send them in 2013 weren't satisfied with the results of their investment, they would not have enrolled people in 2015.

Recommendations

Pest and Disease Management Training

1. The 3 overview topic areas of Disease Recognition and Spot Treatment, Farm Hygiene Awareness and Safe and Effective Pesticide Use remain relevant and should be continued to be delivered on a regular basis. The industry training courses emphasise WHY things need to be in a certain way and provide deeper knowledge and better outcomes for the farms.
2. An Annual delivery plan should be developed. It must cater for progressive training as well as basic training. The training delivery should be a mix of face to face AND remote (e.g. webinar)
3. A Concept of the purpose of resources developed to support on farm training should be developed and a navigation system for resources set up and communicated to the industry. An example of categories is below:

NEW (Learning for the First Time)

- Principles of Farm Hygiene (slide show with voiceover)
- Introduction to Pest and Disease (slide show with voiceover)
- Reading and Understanding a Pesticide Label and Safety Data Sheet (slide show with voiceover)

Learning MORE (Expanding the Knowledge Base)

- Bubble Spot Treatment (slide show with voiceover)
- Cobweb Spot Treatment (slide show with voiceover)
- Effective Use of Fungicides (slideshow with voiceover)
- The Main Mushroom Flies (slideshow with voiceover)

APPLY: (Applying what has been learned.)

These products contain chunks of key info that can be accessed on a mobile device such as a smartphone. In other words , a mushroom specific equivalent to a 'How To' video that you find on You Tube.

- Video on Spot Treating a Bubble disease spot
- Video on Spot Treating a Cobweb disease spot
- Video on Disease transfer on hands demonstration or test.
- Video on Collecting Flies to send off to get identified.

4. Training should be provided on how to utilize the training resources .The training could be a brief video that is mobile friendly and can be messaged to the person
5. The www.emushrooms.com website should be evaluated for how friendly it is for mobile devices as peoples electronic use patterns have changed. Indications are that it isn't user friendly for android users and that in 'a moment of need' people are using their phone not their computer and then even if they are able to get through the step remembering their password it is too hard to read the info on the site.
6. A supplementary structured training course on 'Pesticide Use in the The Mushroom

Industry ' should be considered. By law at least one person on each mushroom farm needs to have attended accredited pesticide training however it would appear that the impact of these courses is limited by the emphasis they have on broadacre agriculture. The Mushroom orientated course should deal specifically with pesticides registered for mushrooms and target mushroom pests and diseases.

7. Webinar structure: Webinars have been demonstrated to be a useful delivery tool but they shouldn't be the only mode of delivery and recordings should be reviewed annually and updated or replaced at least every 2 years. The duration of the first series of 3 webinars was approximately one hour each, and the system that they were recorded on dictate that you have to watch the whole hour and you can't select particular topics of interest and go straight to that, and you can't pause or replay during the recording. In the next generation of webinars for 'on demand' use it is recommended the information should be split up into 'chunks' or 'chapters' of information so that viewers can stop and start as required and select the key section they wish to go back to. This may mean that the sessions are delivered 'live' but not recorded 'live' and the information is reorganized and recorded as a separate step.
8. Wall charts/ Booklets/Information Packaging. Packaging of information in different (non electronic) formats including wall charts should be continued. As well as more wall charts, a small booklet of photos suitable to assist the process of disease recognition should be considered that is suited to personal use of picking supervisors. This booklet should include the range of symptoms and should be delivered with a small training module (i.e. slide show with voice over that can be accessed on phone) that teaches key terminology to describe symptoms and some examples of symptom description of the photos in the booklet. The booklet simply represents a different package that creates an opportunity to present the same information in a different way but it is also low cost and because of that individuals can have their own personal copy.

Training on Composting and Growing Delivered by Experienced Overseas Trainers

1. This initiative should be continued every 2 years.
2. Training courses delivered by DLV (formerly C Point) in MU 12001 have evaluated well but there are other training organisations in Holland that have the credentials to be able to deliver similar courses to DLV and by changing the organization delivering there is a good chance farms who believe want something 'new' or 'different' will reconsider and send key staff. AMGA has utilised DLV (formerly C Point) for approx. 5 years now so the recommendation is to evaluate the credentials of the people on offer as trainers and choose the most appropriate for developing the training courses into the future.

Scientific Refereed Publications

Nil

IP/Commercialisation

Not applicable

References

Not Applicable

Acknowledgements

Not Applicable

Appendices

1. Spring 2014 AMGA Journal item- Training Project
2. Summer 2014 AMGA Journal item –Webinars and Wall charts
3. Spring 2015 AMGA Journal item –Dutch Trainers Come Down Under September 2015
4. Pickers and Disease –Villain or Vector –presentation from Adelaide training Course September 2015 by Warwick Gill

Technology for communication and training in the mushroom industry

by Jenny Carroll



9

Those of you who attended the AMGA conference or the HAL Grower or Substrate training program's held earlier in the year may remember that we have been investigating opportunities to take advantage of technology that is available via mobile phones, tablets and computers.

The versatility of smart phones and computers and the relatively easy access to application development (apps for those who are still catching up with the computer age) these days as well as the expansion of the National Broadband Network (NBN) is opening up a range of tools that have potential to support training and communication between industry members, service providers and consultants.

In this article we will review some of the tools available to record work activities.

Why would you want to record work practises?

There are many uses for photographs and video in the workplace, they can save a lot of time if you have to describe exactly how a job has to be done or you want to explain a production problem over the phone to a consultant.

If you want to:

- demonstrate the best practice standard for doing a task like mushroom picking, crop watering, treating disease or other tasks.
- monitor staff members completion of a task to provide feedback during training or up-skilling
- provide photographic detail of a crop problem to a consultant remotely so you can get ahead of any potential production problem.

There are various ways of recording besides the traditional camera; here are some of the considerations when selecting the right option for your specific needs:

Point of View (POV) Glasses



These glasses have an in-built camera either in the centre of the glasses or on the arm; they can capture photos, movie footage and sound. A built-in microphone and memory card allow you to record and store up to an hour of movies (depending on the size of the memory card).

These glasses were originally developed so potential shoppers could be tracked as they made their way around a retail store. The glasses capture where customers look as they travel down the aisle; this helps in-store design by identifying the premium areas on the shelves.



POV glasses are lightweight, simple to use and depending on the resolution and light sensitivity can produce very high quality images.

Helmet cams as used in car racing, mountain biking, surfing etc use a similar technology.

POV glasses have made their way into the training sector where they have been used to record the demonstration of a work-related activity or for assessment when students have to provide evidence of on-the-job skill development. Learners can put the glasses on, turn on the camera and record themselves doing a work task, download the footage onto their computer or mobile device and send it to their assessor via the Internet; much easier and more relevant than writing an essay on how to do a particular job!

Which glasses to buy?

POV glasses range in price from \$30.00 to \$700.00; we have tested low and middle range versions and both were useful however the \$300.00 version had more features such as:

- High Definition video
- Adjustable focus for close up (to see the detail on a button mushroom surface) and longer range (to see the coverage of a crop across the bed of example)
- 2 high definition settings (760 & 1080)
- Light adjustment for low and available light
- A choice of lenses (clear which is useful on low light growing rooms as well as tinted for outdoor use)

SOUTH AUSTRALIA MUSHROOMS

are looking for a mushroom grower experienced with Phase 1,2 & 3 compost.

All applications will be treated with strictest confidence.

Contact Nick Femia
Email nick@samushrooms.com.au

Tel 61 8 8280 6443

For more information on
South Australia visit

www.southaustralia.com

Image using \$49-00 glasses (5 meg but not high definition)



Image using \$300 glasses





To operate the glasses

All of the control features are housed in the arms of the glasses; depending on the model some glasses also have a remote control and wireless downloading available as well.

Don't forget to read the manual to see how to adjust resolution, focus, still and movie recording options.

1. Some glasses require manufacturer's software to be installed on your computer or mobile device so you can view the footage later but most will download into QuickTime or similar programs without special software.
2. The glasses have to be charged before you begin just like a mobile phone or camera.
3. Most come with a memory card but you may need to purchase one. If you plan to take a lot of video a 16Gig card will hold a lot of data before you have to download it.
4. You may need a supplementary light source especially in the growing rooms. A baseball cap with attached lights (available for around \$2 in the "el cheapo" stores) or a hand held LED light will work. You will just need to experiment a little to see how close to hold the light so you can get enough light and keep the detail you need.
5. Turn the glasses on
6. Hit the recording switch and you are away!
7. Don't forget that you will be recording sound as well as images so be careful what you (or others nearby) say! Some background noise like fans, compressors or music will be picked up too but as the mic is in the glasses themselves they are more likely to pick up the voice of the wearer as the primary sound.
8. Once you have finished, stop recording
9. Turn the glasses off
10. Use the USB cable to download the footage to your computer, tablet or phone (or if our glasses have a wireless connection you can follow the transmit function to see your footage).
11. Some models need the power switch to be turned on before you can download the footage.

Mobile devices

(Smart phones and tablet computers produced in the past three years or so)

These devices have the advantage of an in-built modem for Internet connection that means you can email or upload images and video directly from the device. Most recent mobile devices have a reasonable quality camera that can take still and video with sound recording. Many also have flash attachment.

You also have the option of livestreaming which means you can connect with one or more people to have a live video conference. If you use this feature you can talk face-to-face with other people and even switch from a front facing camera to a rear camera to show the other participants what you can see (your mushroom crop for instance) during your conversation.





This can be a great way of discussing production issues with a consultant that can save time isolating potential problems when it is not so easy for them to get to your farm. Most mobile devices have a built-in live chat application but there are also many other options available in both Android and Apple based apps.

Apps that allow you to draw on photos can also be useful if you want highlight details without writing a long email. Example pictured right.



Digital Cameras (produced in the past three years)

Digital cameras record images onto a memory card rather than onto film and this means that most recent cameras can record still and video images. Cameras are classified by the lense range (often described as in terms of the magnification factor (for example 3x) and by the amount of information that can be collected by the processing chip inside the camera (measured in megapixels). It depends on the type of images you are planning to take how long a lense you need. A 20x lense can be great if you want to take an image of a player on the footy field but it wont allow you to get an in-focus close-up of mushrooms. Many camers these days have a zoom rather than a fixed lense which gives you a range of focus lengths with some compromise in quality at each end of the zoom range. Don't forget to test any camera you plan to buy on the type of images you want to take before you buy.

A 6 megapixel or higher camera will produce images of around A4 size (a little bigger than the traditional 10' by 8' of the pre- metric era) with reasonable detail but if the megapixel count is too high the file size will take up a lot of room on your storage device. How much memory is needed to record each image also depends on factors such as file type, overall dimensions of the image (length by width) and the resolution measured in Pixels per Square Inch or PSI.

Still and video formats can vary a little between brands and models; for stills RAW, Tiff and Jpeg (also known as JPEG or jpeg) are the most commonly used formats. RAW files are the best quality but they also produce a large amount of detail that is really more relevant if you were trying to produce a book or top quality magazine image. In most cases Jpeg is the most useful. If you use a high PSI the total file size will be high and this will take up more space on your computer or mobile device and take longer to upload via the internet. A PSI of 200 to 300 is usually preferred to produce a good quality A4 image for printing but you can go as low as 50 PSI for images to be displayed on the internet on a website.

Video quality has improved considerably with High Definition (HD) video now available on many cameras. There are several formats available in video recording and you will need to take into consideration what formats your computer or mobile device will recognise if you plan to download the footage. There are plenty of movie converter apps available which can recognise a wide range of formats if you find your computer doesn't recognise your movie footage. As with still images, the longer the video and the higher the quality (HD 1080 is the higher quality commonly available) the larger the file which can be slow to upload to the internet as well as take up a lot of computer memory. So you may find (at least until NBN is available near you) that it is best to record lower quality video. Many devices allow you to upload smaller files by asking you to select the type of device that it will be viewed on so a file for a mobile device is smaller (and the viewing dimesions is also smaller) than a file type for a computer. The good news is that you can dowload for a mobile device to reduce the file size even if you plan to watch it on a desktop computer.



	Advantages	Disadvantages	Price range
POV Glasses	Portable, can record the scene from the wearer's view	You have to wait until you download the footage to see if what you have taken is useful. Cheaper models have limited light sensitivity and low resolution which is not good for close-up detail without an external light source.	Are relatively low cost from \$29.00 - \$300.00. Top of the range \$700.00
	Are unobtrusive to the user and others so are less intimidating than a regular camera	Require a memory card	
Mobile Devices	Portable	Not ideal for hands free demonstrations (tripods and other mounts are available but they may not be ideal when you want to record crop features without disturbing the beds.	From \$400.00- \$800.00 depending on memory size and internet connection.
	Have direct Internet access so you don't need to go through a download step to access video and images.	If you want to attach one of the lenses you may need a special phone or tablet cover or fitting to hold the lense in place.	
	Current models have a reasonable camera lense quality (some even have a flash).	If you attach a lense you will lose some of the available light so you may need an external light source.	
	There are cheap (\$5.00 - \$80.00) accessory lenses available for close up detail.	Internet connection may be difficult in growing rooms due to interference	
	A range of apps available to allow you to see and speak to colleagues and consultants internationally, share information and images as well as work on documents in real time.	You will have to pay for internet connection if not using a free wireless hotspot.	
	Most mobile devices have front and rear cameras so that you can switch from live videoconferencing to showing the scene that you are seeing to your viewers.		
Digital cameras	Even cheaper end cameras with a 6 megapixel resolution or higher lense will generally produce better quality images than mobile devices or POV glasses.	You have to transfer the images to a computer or mobile device to use them in most cases.	From \$100.00 to \$600.00 with average of \$300.00 for a reasonable quality camera with a fixed lense.
	Specialist lenses and ring flashes are available for SLR cameras to give the best results when high quality detail is needed.	Video and voice recording only available on some models.	SLR cameras with interchangeable lenses start at \$400.00 up to \$30,000.00
	Some now allow you to transfer images wirelessly to a computer or mobile device. Most take video as well as still images	You need a tripod to avoid camera shake in low light situations..	
		Although self-timers can be used it is not so easy to take images or video of yourself completing a task as some of the other options.	

Deciding which device is the most useful to you will depend on:

1. Where you will be recording (indoors or outdoors, in available or artificial light)
2. Whether you need direct internet access
3. What you are planning to record (fine close-up detail on mushrooms, bigger items such as machinery or people performing work related duties)
4. How the images or video will be used (as a training tool, to communicate in real time with others or on your own website)

I hope this article encourages you to try some of these devices; next time we'll look at video



Mushroom Training Courses July 2013

by Judy Allan

One got the impression that planes, trains and taxis, hire cars and finding the venue, provided their fair share of travel anxiety to people booked into the training courses held near Windsor in July. Many were first time travelers to attend interstate training and many were new to specific industry training and were acutely aware that these opportunities do not come along very often, so I thought that it was understandable! With those challenges of getting away from the workplace and arriving to the venue conquered, the participants settled in well to some intense days filled with lectures, visits and networking. It did amuse me one morning when I asked someone how their evening had been at- the -bar and they said 'good, but we never stopped talking about mushrooms!' It didn't surprise me but I was amused it surprised them!

6 days of training was presented by Erik Polman and Jan Gielen from DLV Plant (formerly C Point) with the program similar to the course they present in The Netherlands. The course set up costs and trainers costs were subsidized by the HAL funded Mushroom Industry Knowledge Training Project MU12001, the concept behind the activity being to make internationally recognized training available in Australia by bringing the trainers to Australia to deliver it.

The Compost Course spanned Monday 15, Tuesday 16, and Wednesday 17 July and there were 19 participants from 14 different production sites. As always there was a range of experience and years employed in the industry. Some quick adding up after the introductory session told us that the combined years of experience in the industry of the participants was a whopping 244 years and the range of years in the industry was <1 year to 33 years with an average of 10 years. These statistics certainly challenge the notion that this training is just for 'beginners'.

Included in the program was a visit to a Phase 1,2,3 facility (Elf Farm Supplies) and to Sylvan Spawn Laboratory. These visits were the highlight for many as they had never been on a compost yard other than the one they are employed on, and, an even greater proportion of the group had never seen how a spawn laboratory operated.







When it came time for participants to fill out their evaluation form these were some of the things they said:

Table 1: Feedback from Participants of the Compost and Tunnel Course. (1 persons answer to the 3 questions constitutes the row)

To the Question: What did you hope to gain from this course?	To the question: 'List 3 'take home messages from the course	To the question: What aspects did you like most about the course?
'To better understand Phase 1 and fuel my interest into Phase 1,2 and 3'	'I have a better understanding of Phase 1, 2 and 3 and a better understanding of airflow'	'Interaction with experienced, knowledgeable, enthusiastic fellow compost makers'
'Knowledge on how composting works'	'Importance of Hygiene Necessity of accurate control, Importance of Phase I compost'	'Excursions to back up the theory. Good speaker with easy clear information'
'Work knowledge of bulk phase 1,2 and 3'	'Still taking it all in'	'The 3 days length is the most we can handle. Meeting others in the industry'
'Understanding the process of Phase 1,2 & 3 compost'		'Got all the information I was looking for and more on temperature, oxygen, filling tunnels etc'
'Update knowledge'	'Networking always is worthwhile. Industry cooperation is beneficial to us all. The presenters are great.'	'Jan Giles presentation'
'To learn more about composting'	'Well presented. Good knowledge. Very helpful'	'Composting'
'Learn more about tunnels'	'More about cleaning tunnels. Different ways to put in nets. About air distribution'	'How spawn was made'
'More technical information on my Phase 1,2 & 3 process'	'Stay on top of hygiene. Do the best you can with the tools you have got. Give more attention to detail.'	'Interaction and farm walk'
'More info on Phase 3 tunnel design and Phase 2 tunnel controls'	'Cooling coil placement in Phase 3 tunnel. Ammonia measurement at Phase 2. Compost analysis understanding.'	'Good clear discussions (networking) with other students.'
'Bunker and tunnel knowledge.'	'Tunnels have problems. Transport needed for Phase 3 compost. Consistent raw materials.'	'Friendly atmosphere'
'Knowledge in all aspects of compost'	'Measure and record all ingredients i.e. straw moisture' How to follow analytical info. What to change if analytical results out of specification.'	'Site visit to Elf Farm Supplies'
'Better understanding of specific parameters and practical comparison with others'	'Input quality determines quality of compost. Hygiene discussions and practical advice.'	'Interactive discussions. Measureable (practical) parameters.'
'Knowledge of tunnel systems'	'Data info of compost. Cleaning.'	'Compost yard and spawn run visit'
'Increased knowledge of Phase 1,2&3 process.'	'Maintaining high level of hygiene. Regular checking of levels. Understanding microorganisms growth.'	'Hearing how other compost producers overcome certain problems.'
'Updating my mushroom growing / compost knowledge'	'Physics of air. Mollier diagram. Understanding of what type of air should be injected into the tunnel.'	'Jan Gielen's session on air'
'More experience hearing about other farms and composting techniques.'	'How to convert compost sooner at the start of the cycle. The bunkers and tunnels.'	'Finding out how other compost yards work.'
'Knowledge about Phase 1 2 and 3 and	'Ventilation. Open verses closed systems / farms /	'Farm visit and talking with other people about



The Growing Course was held Thursday 18 July, Friday 19 July and Saturday 20 July. Most people attended either the compost course OR the growing course but a few were enrolled in both. Overall, there was 20 participants from 15 farms for the growing course. It was the usual scenario of some experienced growers in attendance and some people with only 1-2 years experience, but most people realize that it is nearly impossible to split the groups further and maintain a sustainable cost structure.

At Premier Mushrooms



Still talking mushrooms at dinner



At Greenhills Mushrooms

HAL

This project has been funded by HAL using the mushroom industry levy and matched funds from the Australian Government



When it came time for participants to fill out their evaluation form these were some of the things they said about the growing course:

Table 2: Participants Feedback from Growing Course (1 persons answer to the 3 questions constitutes the row)

To the Question: What did you hope to gain from this course?	To the question: 'List 3 take home messages from the course	To the question: What aspects did you like most about the course?
'A better understanding of why something is done so no guessing. A few tips.'	'Heat, energy, RH, g/kg calculations very useful. Temperature and fan speed for recovery period.'	'Flushing/pinning. Effectiveness of temp and CO2 etc. Farm Visits'
'To learn about casing and crop stagger and grow better quality mushrooms.'	'When to water the flush. When to cool down. How to get spread on 2 nd flushes.'	'The farm visits'
'Better understanding of RH, CO2 and air temperature-block temperature.'	'Hygiene. Make sure RH, Co2, air temp and block temp are compatible. I have to start implementing a lot more of what I have learnt. Importance of casing correctly.'	'Farm tours. Well covered topics.'
'I hoped to get more info and more understanding on RH and when to clean off flushes.'	'When to clean off flushes. Understanding RH. Watering.'	'Pin heading, Watering and RH sections. Learning from other growers.'
'New ideas to fine tune growing plus I wanted to interact with other growers.'	'Better understanding of mollier chart. Watering on pins/ mushrooms. Better use of outside conditions.'	'Vast knowledge and experience of instructors.'
'Info of growing specifics e.g. temperatures, depth of casing etc.'	'Need to control evaporation better. Importance of climate control generally. The range in techniques used in mushroom growing.'	'Farm visits, informal contacts and conversations. Information sessions especially on Day 3.'
'Some theory behind growing and a chance to see and hear what other growers do'	'The importance of watering with Phase 3 compost. There are always more things to try. The importance of hygiene on the farm.'	'The farm visits to see what growers do compared to what is being taught.'
'More of an understanding of growing and disease management.'	'Hygiene is important. Evaporation plays a big part. Air flow distribution.'	'Growing section'
'A broader knowledge within the mushroom growing field.'	'Scratching the surface of the Phase 2 compost. Tightening hygiene practices and policies. Trying a softer change over.'	'I liked the extensive information and the ability of both instructors to answer questions.'
'Theoretical knowledge on how to grow mushrooms'	'The importance of airflow. The importance of RH,cooling/heating. The need for a good watering cycle.'	'Good speakers. Easily understood information. Informative. Good farm walks.'
'Better knowledge.'	'Disease management. Growing. Climate control.'	'Knowledge of presenters'
'Knowledge about growing and controlling climate.'	'How to give water in correct manner. How to prepare better casing. Disease control.'	' Growing and controlling climate.'



Pest and Disease Management Service

E-Learning Resources Being Developed on Pest, Disease and Pesticide Management

By Judy Allan

The HAL funded mushroom industry knowledge training project (MU 12001) is now in its 3rd year. This project was established to try and provide continuity in the availability of mushroom specific training as previously industry training has been intermittent.

In the first year of the project there was face-to-face delivery of modules on Disease Recognition and Spot Treatment, as well as Safe and Effective Pesticide Use. In addition there was a 3 day course on compost and a 3 day course on growing delivered by C Point Trainers in June 2013.

In the second year of the project some redesign of the project became necessary to stay in step with the current and emerging operating climate of the industry and tactics were developed for remote delivery of core topics. We just commenced Year 3 and the final year of this project. Planning has commenced for further C Point training to be offered in 2015 (specific dates to be announced).

A presentation was made to the national mushroom industry conference held in Melbourne in September 2015 and the pilot E Learning Program for October –December 2015 was announced.

This article provides some background to those who were not at conference and provides some more detail on how to sign up.

What is e learning?

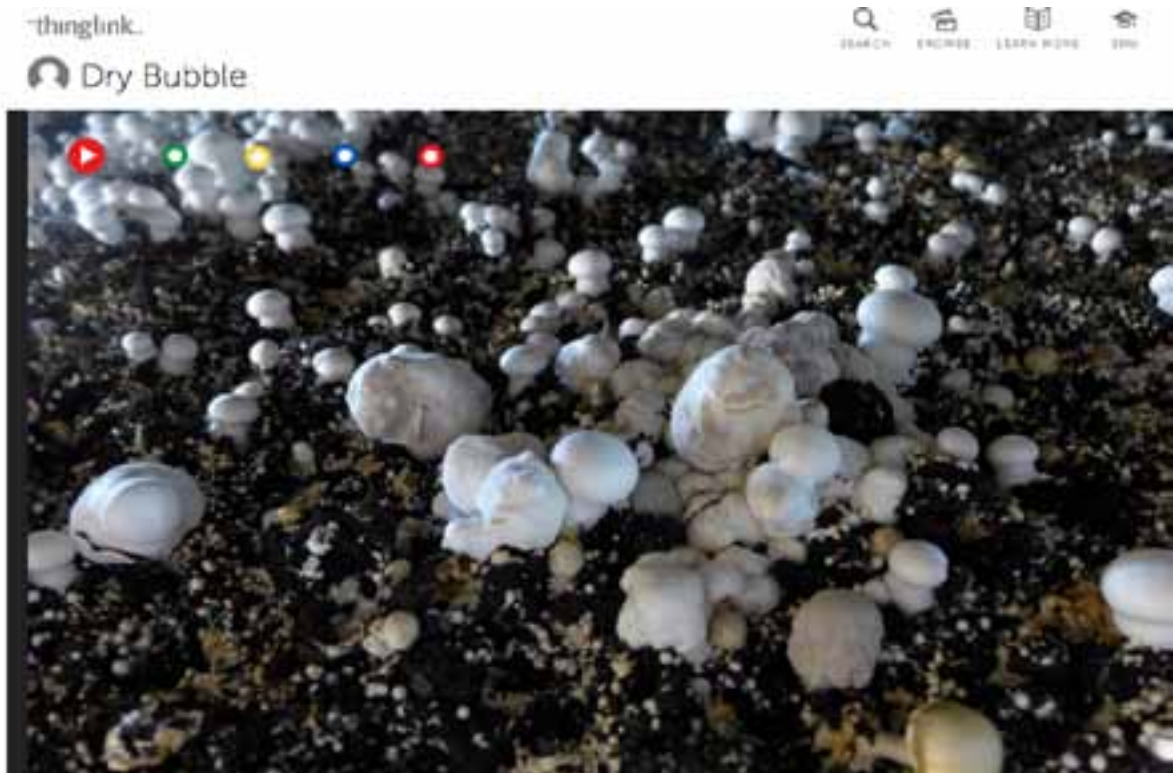
At a simplistic level ,e learning involves the use of computer technology to deliver education or training courses to learners. Such courses may be studied online, off line, or by any mixture of those modes and may also involve blended modes where there is interaction with a live or virtual teacher or trainer. E-Learning need not be a formal course .It could also use technology to provide informal, unstructured information.





A good example of technology available to provide information electronically is a thinglink®.

Those attending my mushroom industry conference presentation in Melbourne saw the first e link created using a thinglink® on the disease. 'Dry Bubble' demonstrated. This has now been placed on the noticeboard of Agora so please log onto Agora and have a look.(If you have lost your password please contact Sheri at the AMGA office). When you press on the link the following page will load.



Each of the icons sitting on the top left hand corner link directly to different aspects of information about the disease. When you press on the first icon (the red arrow) you will be taken to a little movie on spot treating labelled 'Bagging Bubble'. When you press on the green dot icon you will be taken to a PDF file that describes the disease and its development and spread. When you press on the yellow dot you will be taken to a PDF file that describes Spot treatment. When you press on the blue dot icon you will be taken to a PDF file describing a dust experiment. This file resides on Agora but is still relevant even though it was written many years ago. The final icon, the red dot has a PDF file behind it that lists the registered and permitted Fungicides.

This electronic tool is a tool chosen to package and highlight some key information on various pest, disease and pesticide topics. This methodology is not intended to replace the Agora knowledge base its just looks more modern!. Additional e links using thinglink® will be developed in the next 10 months so keep an eye out for when they are announced.

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Two product lines **new** mushroom machinery

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Training Resources Being Developed

The e learning resources for the mushroom industry will be organized and developed according to the 'Five Moments of Need' model described by B. Mosher and C. Gottfredson (2011) in Innovative Performance Support : Strategies and Practices for Learning in the Workflow .

Their 5 Moments of Need for Learning are described as:-

1. When people are learning to do something for the first time (NEW)
2. When people are expanding the breadth and depth of what they have learned (MORE)
3. When people need to act on what they have learned, which includes planning what they will do, remembering what they may have forgotten, or adapting their performance to a unique situation (APPLY)
4. When problems arise, or things break or don't work as they were intended (SOLVE)
5. When people need to learn a new way of doing something, which requires them to change their skills and/or practices. (CHANGE)



Source: Are You Meeting All Five Moments of Need Learning by Conrad Gottfredson, Bob Moshner June 18,2012 (off the internet)



PDMS Contact

Judy Allan

Phone: (02) 6767 1057

email: judyallan@bigpond.com



AGORA: emushrooms.org

To use Agora, the AMGA's Pest and Disease website, you need a password. It has come to our attention that some people can't find their passwords to use to log on. If you fall into this category or have some new members of staff who would benefit by having access to the site then please contact Sheri at the AMGA office. If you have your password and would like a phone tutorial on using Agora then please email or phone Judy Allan to arrange a mutually suitable time.

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Some stand alone training resources/products on have been developed already and some will be utilized during the webinars or pre and post webinar. **By the end of January 2015** the product list grouped using the criteria of the above mentioned model will include:-

NEW (Learning for the First Time)

- Principles of Farm Hygiene (slide show with voiceover)
- Introduction to Pest and Disease (slide show with voiceover)
- Reading and Understanding a Pesticide Label and Safety Data Sheet (slide show with voiceover)

Learning MORE (Expanding the Knowledge Base)

- Bubble Spot Treatment (slide show with voiceover)
- Cobweb Spot Treatment (slide show with voiceover)
- Effective Use of Fungicides (slideshow with voiceover)
- The Main Mushroom Flies (slideshow with voiceover)

APPLY: (Applying what has been learned.)

These products contain chunks of key info that can be accessed on a mobile device such as a smartphone. In other words, a mushroom specific equivalent to a 'How To' video that you find on You Tube.

- Video on Spot Treating a Bubble disease spot
- Video on Spot Treating a Cobweb disease spot
- Video on Disease transfer on hands demonstration or test.
- Video on Collecting Flies to send off to get identified.

Webinar Trials : October-December 2014.

The word webinar is short for **WEB**-based sem**INAR**. Webinars can be in the form of a presentation, lecture, workshop or seminar that is transmitted over the internet using video conferencing software. A key feature of a Webinar is its interactive elements -the ability to give, receive and discuss information.

We have already trialled some methods of delivery and have been faced with numerous challenges sharing information back and forward so some patience might be required in the first instance. Technology is great when it works but at times it doesn't work and this can get very frustrating.

It is recommended that each farm assemble interested people and participate in the webinar as a group so that the people more familiar with computer use can help the people who are less familiar. Pre webinar instructions will be provided. Although the webinar will be recorded for later use on demand this option will NOT be available until early next year as we still need to develop appropriate infrastructure. We would like as many people as possible to participate in these webinar trials as your feedback will be considered as we formulate our e learning activities into 2015.

The following webinars are scheduled:

- Thursday 16th October 2014 11am-12noon : Webinar on Bubble
- Thursday 13th November 2014 11am-12noon : Webinar on Safe and Effective Pesticide Use with emphasis on Fungicide Use
- Thursday 11th December 2014 11am-12noon : Webinar on Cobweb

Mushroom Fly Control

Biological Control using Entomopathogenic Nematodes (ENs)

Targets the larvae to stop the breeding cycle



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- Seek out prey
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- Combat chemical resistance
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Webinar



Thursday 16th October 2014 11am-12noon (Eastern Standard Time)

Topic: Management of Bubble Disease

Thursday 13th November 2014 11am-12noon (Eastern Standard Time)

**Topic: Safe & Effective Pesticide Use with
emphasis on Fungicide Use**

Thursday 11th December 2014 11am-12noon (Eastern Standard Time)

Topic: Management of Cobweb Disease



Pest and Disease Management Service

Webinars Now Available 'On Demand'

By Judy Allan

By the time you receive this issue of the AMGA Journal 3 webinars will have been delivered as part of the HAL funded Training Project.


The first one was delivered in October on the Management of Bubble Disease. The second one was delivered in November on Safe and Effective Pesticide Use with Emphasis on Fungicide Use. The topic of the final webinar for 2014 is Management of Cobweb Disease.

These webinars were recorded and are now available through the Agora website.

Agora's web address is www.emushrooms.org

You will need a user name and password to log on. AMGA member farm owners all have been issued one so if you are unable to gain access using their details then you will need to contact Sheri at the AMGA office (as specified on the log on page below), or in her absence then contact Judy Allan.

[Contact](#)
[Login](#)
[mushroom members](#)


AGORA

HOME

AGORA ...is The Australian Mushroom Growers' Association pest and disease knowledge management and communication system. It was launched October 1st 2003 and has been helping the Australian Mushroom industry manage it's Pest and Disease issues ever since.

The system is comprised of a knowledge base with many reference articles and has a facility to submit a diagnosis request for expert feedback.



For information on how to gain access to this site or you have forgotten your password or username please contact the Australian Mushroom Growers Association on +61 2 4577 6877 or email Sheri LeFeuvre on sherl@emushrooms.org.

Login

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Once you have logged on go to the E Learning Drop Down menu (see below)



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AGORA

INFORMATIONKNOWLEDGE BASEDIAGNOSIS REQUESTSE-LEARNINGMEMBER INFORMATION

e-Learning

Management of Bubble Disease

Webinar on Management of Bubble Disease

A session delivered as part of project MU12001 Mushroom Industry Knowledge Training

[Click here](#)

Safe and Effective Pesticide Use with Emphasis on Fungicides

Webinar on Safe and Effective Pesticide Use with Emphasis on Fungicides.

A session delivered as part of project MU12001 Mushroom Industry Knowledge Training

[Click here](#)

When you click on the webinar you want to access you will be asked to complete one more step and that is to fill out your contact details.

Australian Mushroom Growers Association

"Don't be in the dark about the power of mushrooms."

Australian Mushroom Growers Association

Safe and Effective Pesticide Use with Emphasis on Fungicides

Thursday, 13th Nov 2014, 11:00am AEDT
Please register to access the webcast.

First Name:*

Last Name:*

E-Mail:*

Company:

Submit

Submitting this form indicates your acceptance of the Privacy Statement.

[Click here to test your system](#)



Wallcharts

By Judy Allan

Sheri dispatched laminated copies of the new wallcharts to farms recently. The topic of green wallchart is Dry Bubble Disease Management and the topic of the pink wallchart is Cobweb Disease Management.

If your farm has not received the wallcharts by now please contact Judy Allan on judyallan@bigpond.com

DRY BUBBLE

Lecanicillium fungicola var. fungicola
(formerly Verticillium fungicola var. fungicola)

Disease Management




Version 1 September 2014

LOOK

CONTAIN

MONITOR



DO

1. Train pickers what to look for and what to do if they find disease
2. Instruct pickers to change their gloves if they touch disease
3. Only have trained personnel touching and removing disease as spores are sticky and easily spread
4. Remove disease spots using hand in a plastic bag and cover the area with salt to contain the spread
5. Spot treat until the crop is terminated
6. Follow the correct sequence when picking and move from younger to older crops
7. Keep doors of growing rooms closed
8. Have signage to warn people if disease is present in a room before they enter
9. Clean picking tools every day. Disinfect them after cleaning and rinse off disinfectant after it has had 'time to kill'
10. Use foot dips and avoid climbing on beds
11. Prevent flies spreading from old to new rooms

DON'T

1. Don't touch disease without correct precautions to minimize spread
2. Don't leave disease untreated. Once a disease is on the farm the main source of contamination is from the diseased crops
3. Don't water onto a diseased area unless it has been spot treated
4. Don't use pesticides or disinfectants on the disease spot as that contravenes the Pesticide Act
5. Don't use a high pressure hose to clean the floor of a diseased room as it will spread the

• Record numbers of flies

• Check pathogen levels in shared areas

• Record disease incidence on beds

• Check effectiveness of crop termination





PDMS Contact

Judy Allan

Phone: (02) 6767 1057

email: judyallan@bigpond.com



AGORA: emushrooms.org

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Phone: (02) 6767 1057 or Email: [<judyallan@bigpond.com>](mailto:judyallan@bigpond.com)

COBWEB

Cladobotryum (formerly *Dactylium*)

Disease Management

LOOK



Cobweb spotting



Mature, sporulating cobweb mycelium on casing surface



Cobwebbing



Discolouration of mushrooms due to colonization by cobweb mycelium



Mushroom cap pitting



Advanced colonization of mushroom caps by cobweb mycelium

CONTAIN



Cover the spot carefully with damp paper to suppress airborne spores and then apply salt



Spot treatment is a two-step process requiring a follow up treatment



Incorrect technique on 2 counts – firstly, no paper was used. Secondly, not all the disease was covered

MONITOR



Disease spot needs to be found at 'immature' stage



This spot is too large and mature – procedures need to be reviewed



If the identity of the cap spotting causal organism is in doubt, isolate by touch plate sampling and identify



Version 1 October 2014

DON'T

1. Don't harvest crops that have not been inspected and treated
2. Don't apply salt directly to the diseased area (cover with damp paper first)
3. Don't water or handle untreated areas of disease as this will disperse the aerial spores
4. Don't leave fans on while watering if there is a risk of undetected Cobweb on the beds. This will minimize disease spread to areas around any undetected patches
5. Don't use pesticides or disinfectants on the disease spot as this contravenes the Pesticide Act
6. Don't use a high pressure hose to clean the floor of a diseased room as that can spread the disease

DO

1. Identify any patches of disease as early as possible while they are small
2. COVER COBWEB-affected mushrooms and areas of casing very carefully as soon as they appear, using wet paper followed by salt
3. Train pickers what to look for, and what to do if they find disease
4. Keep growing room doors closed
5. Have signage to warn people if disease is present in the room before they enter
6. Check and treat affected crops daily, including those non picking days
7. Spot treat crops right up until the crop is terminated as the disease multiplies rapidly. If disease is severe, consider early termination
8. Follow the correct sequence when picking and move from younger to older crops or alternatively, disease free to diseased rooms
9. Clean picking tools every day. Disinfect them after cleaning and rinse off disinfectant after it has had 'time to kill'
10. Avoid low evaporation and humid conditions as this tends to favour disease development
11. Compare when fungicides are applied and when the disease pressure is – there is a Permit that allows a split application use pattern of prochloraz

Dutch Trainers come Down Under September 2015

by Judy Allan

6 days of training was presented in Adelaide and Merbein by Erik Polman and Jan Gielen from DLV Plant (The Netherlands) from Monday 14th September 2015 to Saturday 19th September 2015. The course set up costs and trainers costs were subsidized by the HIA/AMGA Mushroom Industry Knowledge Training Project MU12001 and the participants paid for their own travel and accommodation and contributed toward running costs via a course registration fee. The concept behind the initiative is to make internationally recognized training available in Australia by bringing trainers to Australia to deliver it. An equivalent course was delivered under similar funding arrangements in 2012 in Windsor in NW Sydney. The other objective behind this initiative in this Project was to try and make training REGULAR as prior to this there has been no continuity in this kind of specialized training being offered in Australia.

The Mushroom Composting and Tunnel Management Course started Monday and finished Thursday afternoon and the Growing Review Update started Tuesday and finished Saturday afternoon. A few common lectures and visits for both groups in the middle of the week was a deliberate tactic to increase awareness of the fact that substrate and growing are so 'connected' and how EVERY step of the cycle is important.

There were 11 participants in the compost course and 9 participants in the growing course with a further 6 people doing both courses (total number = 26 from all states of Australia). We worked out that the estimated weekly production of the farms represented was approx. 750 tonnes of mushrooms / week which is approx. 60% of the weekly production of mushrooms in Australia (the estimated weekly production of mushrooms in Australia currently is 1250 tonnes per week or 65,000 tonnes per year).

During an introductory exercise we calculated that the range of years working in the industry for the participants was 25 years at the high end down to 5 months and the low end, and that the total years of experience added up to 192.5 for the participants. Another 124 years of industry experience could be added to the total of the group when the years in the industry for Judy Allan (33), Jan Gielen (31), Erik Polman (30), and Warwick Gill (30).





Group photo taken at Merbein Mushroom Farm.

Before we move on from statistics it seems appropriate to quote the numbers from the collated evaluations completed at the end of the course.

The participants in the Compost Course rated:

Course Technical Information: 8.4 out of 10

Relevance to Understanding Mushroom Production in General: 8.8 out of 10

Relevance to Work Duties: 8.4 out of 10

Motel Accommodation: 8.8 out of 10

Course Venue: 9.5 out of 10

The participants in the Growing Review and Update rated:

Course Technical Information: 9.9 out of 10

Relevance to Understanding Mushroom Production in General: 9.6 out of 10

Relevance to Work Duties: 9.4 out of 10

Motel Accommodation: 8.9 out of 10

Course Venue: 9.4 out of 10

Training delivery occurred in a classroom but also during visits to farms and compost yards. Often it is the visits to other facilities that is the most interesting to the participants as many people haven't had the opportunity to visit a site other than the one they are employed on. The DLV trainers are very experienced and were able to factually discuss relevant topics in situ as points of interest presented themselves during the visits. To be able to visit 3 different compost yards and farms during the week was very powerful as it demonstrated how different equipment, facilities, materials AND management can impact on the production process. The overall quality of mushrooms produced in South Australia is generally high so to get an insight into how the 3 farms approached producing quality was very interesting.

What follows is a small selection of photos and insights from the visits to the compost yards and farm during the courses.



SA Mushrooms

We were honoured to be the first 'mushroom industry group' to visit this recently commissioned compost yard. Our hosts on the day were Nat Femia and Brian Tipper. Brian worked in the South African mushroom industry ~18 years and then at Meadow Mushrooms in New Zealand for 5 years before coming to work for SA Mushrooms. Brian attended the compost course!



"As with all composting sites, the process begins with wetting of the straw. All of our wetting is by sprinklers. In the first 4–7 days the bales are laid out on a flat concrete slab and much of the time is dedicated to intense hydration of the straw followed by some natural heating. The bales are then moved to an aerated slab for the next 7 days. During this period the bales are aerated from underneath to assist in heating. Once the bales have reached the required temperature range the aim is to keep them there by cooling with water, which again increases the overall moisture content. In the background is the goody water collection and reticulation system."





"The compost yard is situated in an area where there is no commercial electricity supply available. All of our power requirements are fulfilled by power generated on site. We have 2 diesel generators – one running and one for back-up. Pictured is Jan Gielen taking a closer look at our generators."

Closely linked to the generators is the AEM control system which controls all of our fans and pumps. In order to keep the sizing of the generators to a reasonable output, AEM were able to assist us in setting up a programme which allows us to limit the amount of power off-take from the generators at any time. We are able to prioritise which of the fans and pumps run first and which ones have a lower priority. The control system then turns on the pumps and fans based on priority, as and when there is sufficient power available."



This is the view to the right just before you arrive at the compost yard. "One of our key ingredients is really readily available. Our neighbour (from whom the Femia's bought the property that we now operate from) empties chicken houses and composts the litter down before selling it off. A quick phone call and a few truck loads are conveniently redirected to our side of the composting facility. We are also timeously kept up to date with any changes within the local chicken industry."



"The compost is only in ricks a short time – they are made up on a Monday morning, turned and sent to the farm for phase 2 on a Wednesday morning."

Phase 2



"Phase 2 is a standard 6 day tunnel phase 2 completed on the SA Mushrooms farm site . Compost is filled on a Wednesday, pasteurisation is usually on the Thursday and the tunnel is emptied on a Tuesday for filling the rooms. Where our process differs from normal is that the construction of the tunnel is a spigot floor as opposed to the conventional grid floor with a plenum. The filling density is currently around 800–900 kg's per metre square."



DLV Trainers Erik Polman and
Jan Gielen with Nick Femia
from SA Mushrooms

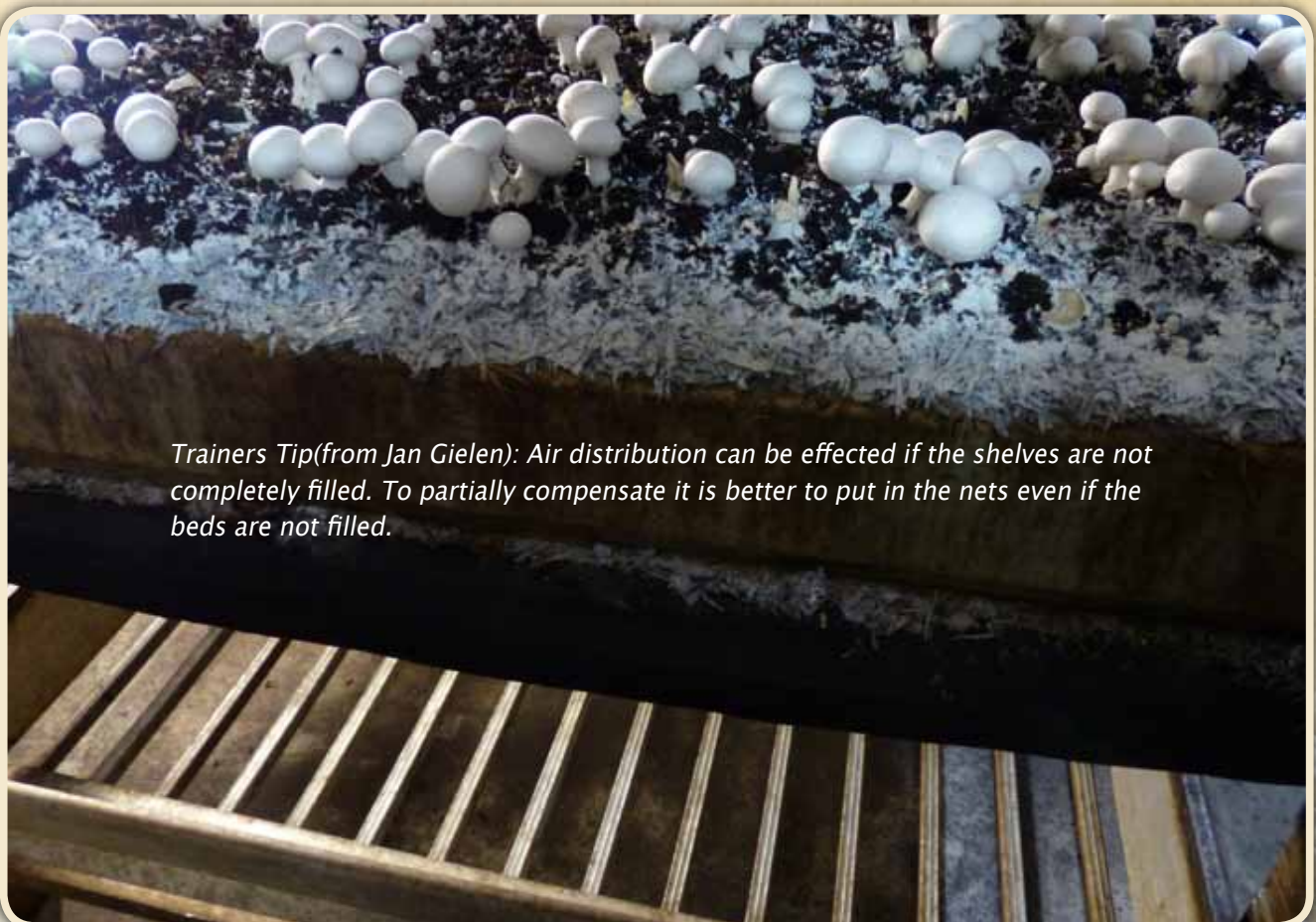




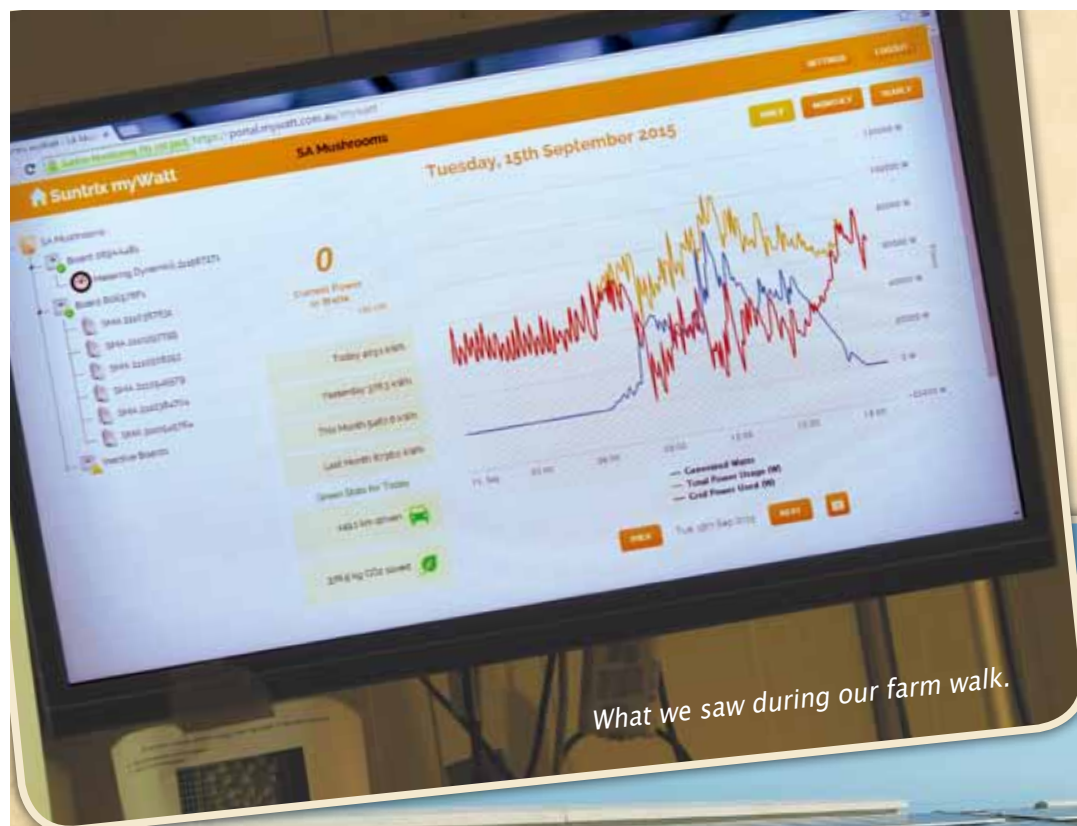
Trainers Tip (from Jan Gielen): Directing smoke into the return duct can give you a quick scan of the air distribution.



Trainers Tip(from Jan Gielen): When you want to see the detail you put the smoke across the bed. You look at the direction of the air and the velocity of the air and you do this on all levels. Editors Note :This machine was a fog machine purchased from Dick Smiths.



Trainers Tip(from Jan Gielen): Air distribution can be effected if the shelves are not completely filled. To partially compensate it is better to put in the nets even if the beds are not filled.



What we saw during our farm walk.



"A large investment has been made into trying to reduce our energy bills. Last year a 100KW solar system was installed on our roof. This by no means comes close to supplying all of our electricity needs. However there is a huge benefit in reducing our daily peak demand (the rate at which we are charged for all of our electricity). Electricity demand for running fans and chillers is relatively constant over a 24 hour period (chillers do go up in summer during the day). Where the solar system is of benefit is supplying electricity for running machinery that generally only happens during the day."

A trip to Adelaide Markets and pizza for breakfast at the SA Mushrooms stand on Friday morning was a unique experience enjoyed by all.



Merbein Mushrooms

We arrived at Merbein Mushrooms about 3 pm on Wednesday afternoon to be greeted by farm owner Geoff Izard before we were given a quick farm orientation tour before moving up to the compost yard. Lectures had been from 7am until 9am in Adelaide (well more precisely Mawson Lakes conference centre) and then it was onto the bus for the ~400 km trip to Merbein, make the visits, and then attend the course dinner at our motel in Mildura. No wonder a person responded to the course evaluation question What did you like least about the course? by writing 'The early starts and the late finishes' because the program WAS quite busy!

Merbein Mushrooms schedule is that Phase 2 tunnels are filled on a Tuesday, spawned 6 days later on a Monday and the 17 day spawn run tunnels are emptied on a Thursday so the timing of the visit was organized to ensure we got to see the Phase 3 being emptied, filled and cased on the Thursday morning before we departed back to Adelaide. In his welcome remarks Geoff stated his goal is to have good quality



*"Bale wetting starts Monday night or Tuesday morning and finishes Friday (some urea is used).
We let the bales stand until Monday until they are moved into the shed."*



"We call the next stage in the shed our prewet. The 4 ricks have air lines under them and we turn twice for blending."



Compost Maker Lee Crane explaining the process to the group.



We all remarked on how clean the compost turner was!



"The compost is then moved into fully aerated bunkers and flipped 3 times while being moved from one bunker to another while adding water."

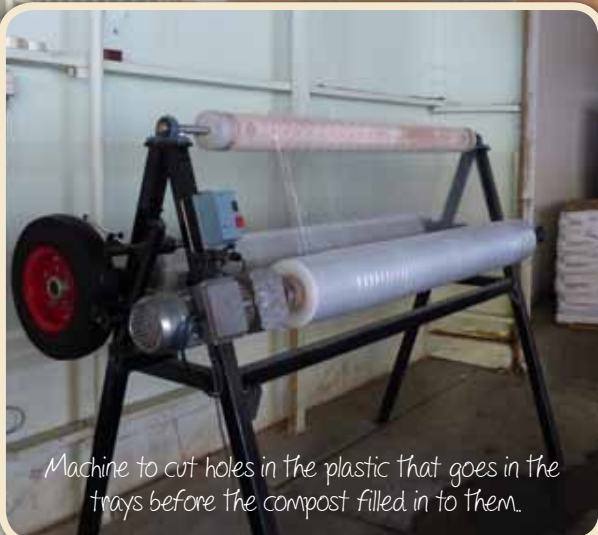


Thursday morning Michael Tisler showed us the tunnel complex. Erik was pleased to be able to show people the Phase 3 structure before it changed during the handling process.





The casing line was stopped and in they moved...if you think I sometimes take some weird photos you should watch what they look at and photograph.

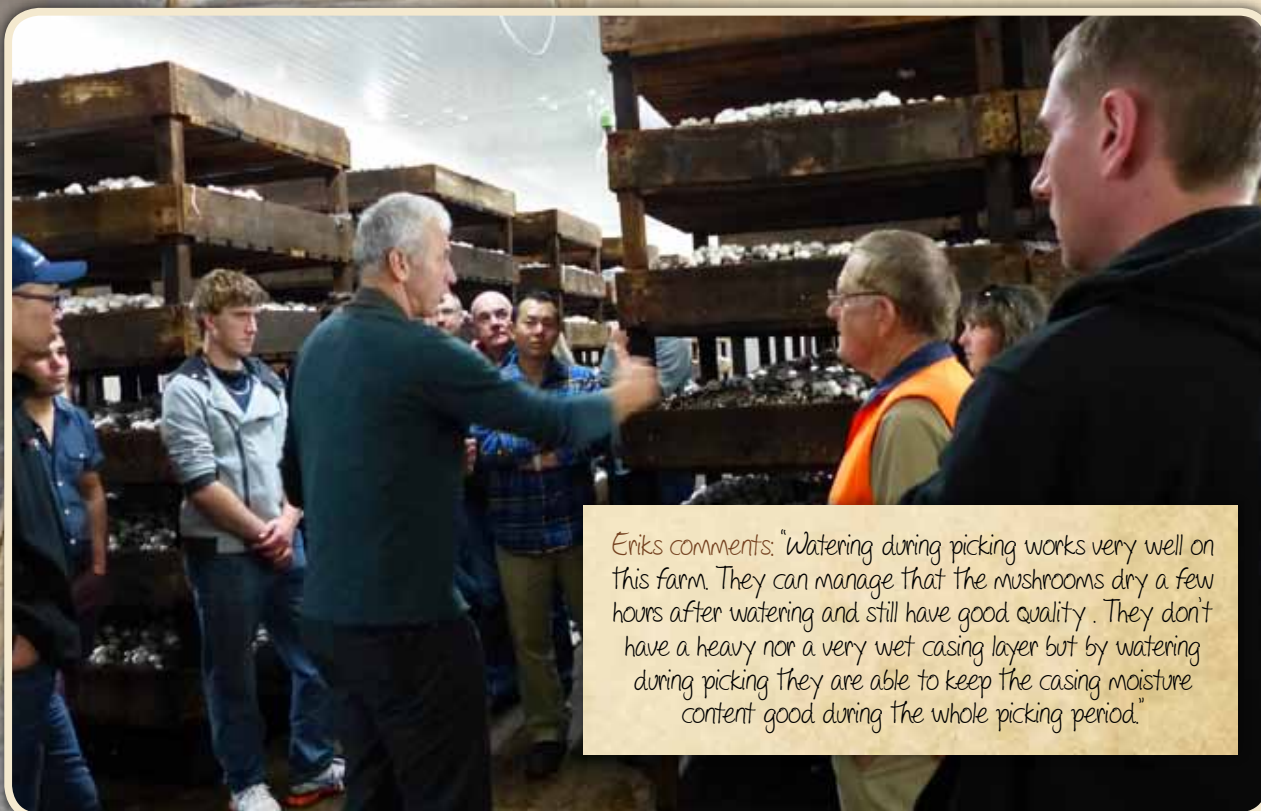


Machine to cut holes in the plastic that goes in the trays before the compost filled in to them.





Eriks comment: "The yellow lines make it well organized and safe and the forklift drivers know where people might pass."



Eriks comments: "Watering during picking works very well on this farm. They can manage that the mushrooms dry a few hours after watering and still have good quality. They don't have a heavy nor a very wet casing layer but by watering during picking they are able to keep the casing moisture content good during the whole picking period."



Vacuuming the floors after watering is sometimes necessary due to poor floor drainage.



Jan's comment: The current position of the trays is 90 degrees to air tube. You could make a different air distribution system by splitting the duct and having a duct every other row (left and right) to try and create a better air distribution system.





Adelaide Mushrooms

If it seems there are less photos of the visit to Adelaide Mushroom it is not because it was a bad visit –it is because there needs to be a limit to how many photos I use of the training course ! Once again the host farm was very cooperative and did a great job of illustrating topics discussed in the classroom.



Eriks comment: Todays process allows them to do more mixing. The day before filling the tunnel they remove all compost from the bunker to cool it down and to allow more mixing.





Eriks comment: To try and quantify structure and how long the compost is, take a handful and shake it 3 times and decide together whether it is long or short . Take a photo to refer back to.





Automatic Watering.



Erik's Comment: Automatic picking trolleys are not just good for a better pick rate because multiple passes over the beds are easy -they are even better for logistics. Note how there isn't many pickers in the room and they don't have to pass each other (on the same shelf).



Pickers and Disease

Adelaide September 2015

Pickers and Disease

1



2



3



4



5



6

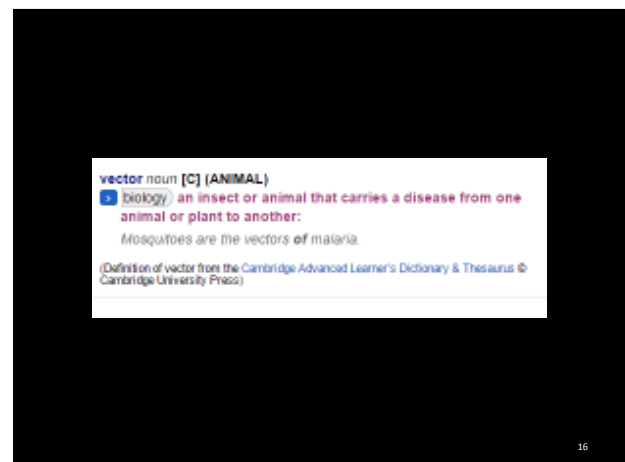
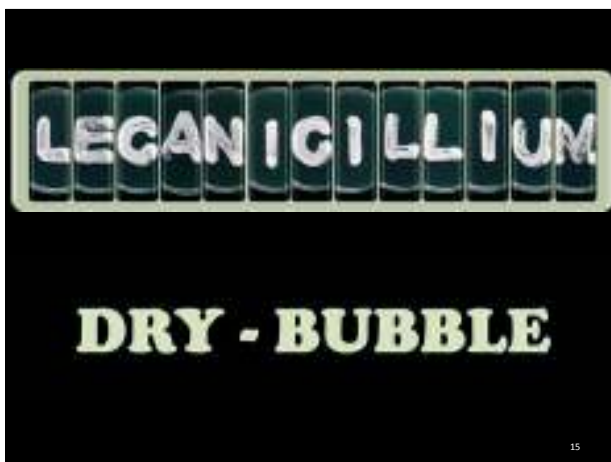
Pickers and Disease

Adelaide September 2015



Pickers and Disease

Adelaide September 2015



Pickers and Disease

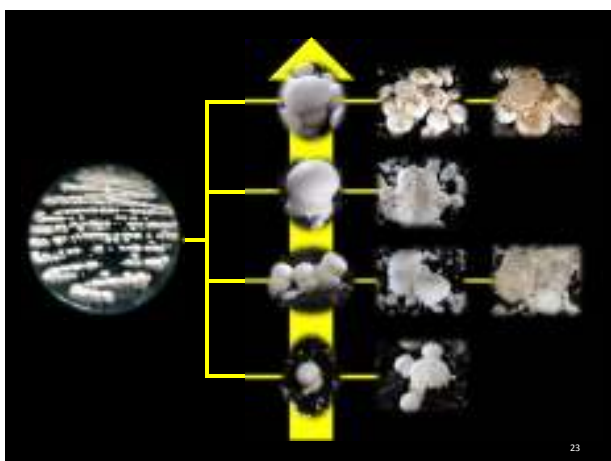
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Case Study – Farm Survey

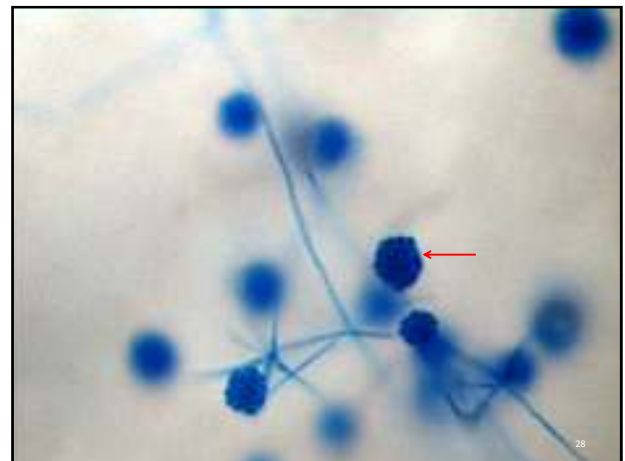
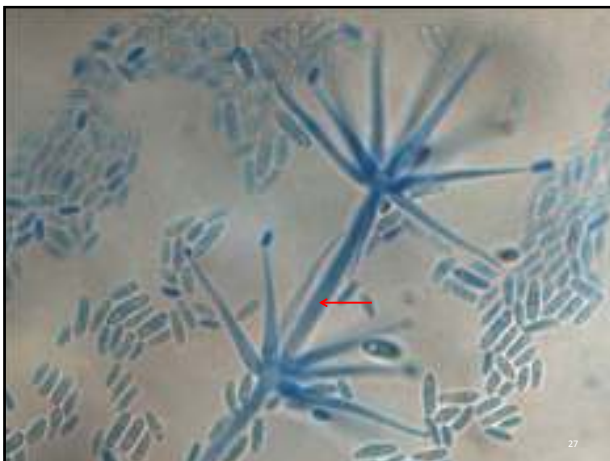
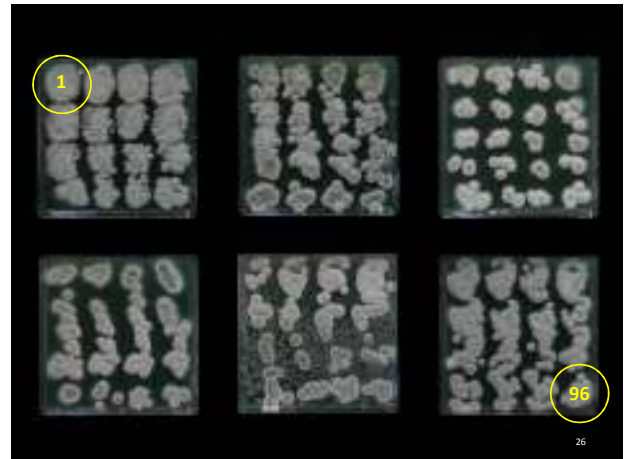
Table 1 Comparative results for initial and follow-up *Lecanicillium* surveys

	Nov 2013 High disease pressure	Feb 2014 Low disease pressure
Diseased-Affected Room		
Mushroom touch plate	+	+
Casing touch plate	+	+
Salt bucket handle	+	+
Broom handle	+	+
Personnel touch plate	+	+
Service Corridor		
Picking trolley	+	–
Recycled boxes	+	–
Grower's Office		
Disease team flashlight	+	–
Tea Room		
Tea room label box	+	–



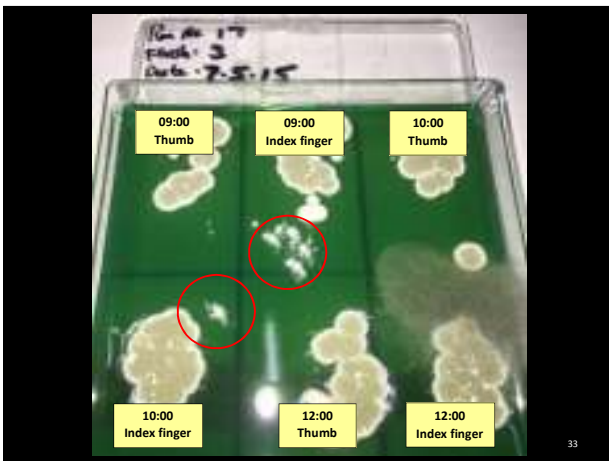
Pickers and Disease

Adelaide September 2015



Pickers and Disease

Adelaide September 2015



Picker	Room 14				Room 13				Room 6			
	Date	Flush	Sample 1 ¹		Sample 2		Sample 1		Sample 1		Sample 2	
			1	2	1	2	1	2	1	2	1	2
A	190815	3	+	+	+	+	+	+				
B	190815	3	+	+	+	+	+	+				
C	190815	3	+	+	+	+						
D	190815	3	+	+	— ¹	+						
E	190815	3	+	+	+	+	—	+				
F	190815	3	+	+	+	—						
G	190815	3	+	+	+	+	+	+				
H	190815	3	+	+	+	—						
I	190815	3	+	+	+	+						
J	190815	3	+	+	+	+	+	+				
K	190815	3	+	+	+	+	+	+				
L	190815	1							—	—	—	—
M	190815	1							—	—	—	—
N	190815	1							—	—	—	—
O	190815	1							—	—	—	—

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