



Improved management for root disease of hydroponic lettuce – project update

Hydroponic systems can provide potential gains in crop productivity per area of farmed land in the order of 15 times that of field production. The use of recirculated nutrient systems and the general water efficiency obtainable in hydroponics compared with soil production makes this industry highly productive on a water resource basis.

Root diseases, however, can have a major impact on crop health and consequently production when they establish in the hydroponic system. Losses may be up to 20-30% and complete crop loss can occur.

Root diseases (in particular those caused by various species of the water moulds *Phytophthora*, *Pythium* and *Ovipidium*) are a key production issue for growers across Australia.

Many growers look towards a range of growth stimulants and oxidising products that are on the market as a way to prevent crop loss from these diseases or as a last resort to save crops.

The project – *Improved management for root diseases of hydroponic lettuce – VG04012*, is attempting to validate the efficacy and value of these products in the management of root diseases and provide clear guidelines on options and prevention strategies available to hydroponic lettuce growers.



Good practices are critical in managing root diseases in hydroponics

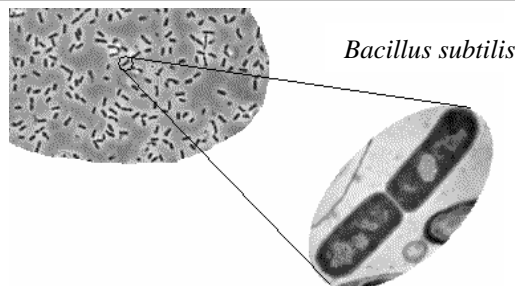
New guidelines for effective disease management in hydroponic lettuce systems have been developed by Len Tesoriero and will be available soon. These guidelines set out the various options and strategies that are available to growers to prevent or minimise crop loss due to root diseases including:

- Effective disinfection & sanitation of tanks, pipes, channels and surrounding areas
- Recommendations for producing seedlings
- Appropriate disposal of diseased plants and plant material
- Managing pests which can carry and spread diseases, for example, fungus gnats
- Importance of managing the temperature of nutrient solution
- Importance of managing moisture stress

- Planning a farm layout to provide separation between plants of different ages
- The tolerance or susceptibility of particular lettuce cultivars to key diseases
- Which and how microbial biological controls could be used as part of a disease management program

For even more information on effective greenhouse and hydroponic hygiene practices to prevent crop diseases, a new national project is beginning in October 2007. This project will be preparing a definitive greenhouse hygiene manual and providing self-help audits to assist growers to implement a preventative disease management practices and reduce crop loss. For more information email Jeremy Badger-Parker: jeremy.badgery-parker@dpi.nsw.gov.au

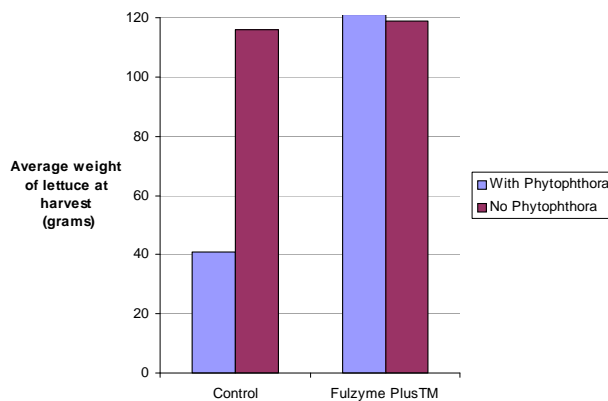
Beating diseases with a beneficial bacterium



Biological control products may have a useful role as part of an integrated disease management program for root rots caused by certain *Phytophthora* and *Pythium* species in hydroponic lettuce production. Commercial products are beginning to become available to growers.

Trials with one product, containing the beneficial bacterium, *Bacillus subtilis*, marketed as Fulzyme Plus™, have produced some good results.

In a recent trial with *Phytophthora drechsleri* using the cultivar *Red Ferrari*, the addition of Fulzyme Plus™ to nutrient solutions at 2 mL/L when *Phytophthora* was present gave the same average weight of lettuce as an uninfected crop.



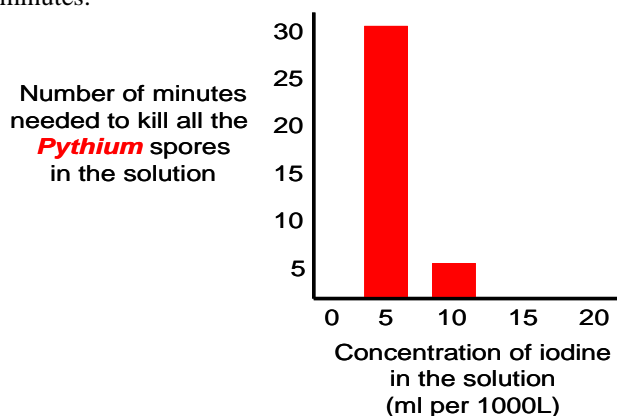
Disinfecting nutrient solutions with chemical options

As a hydroponic lettuce grower, you may be turning to one of a range of commercially available products to prevent crop loss and even to try to save a crop as a last resort when root diseases get out of control.

There are several chemical products commercially available that are being used by growers to disinfect nutrient solutions to manage root diseases.

Laboratory trials were conducted to see how effective iodine is in disinfecting water. Colonies of key pathogen isolates (*Phytophthora drechsleri*, *Pythium aphanidermatum*, *Fusarium oxysporum* and *Thielaviopsis basicola*) were established on small squares of cloth. These colonies were then dipped in an iodine solution. Three different concentrations of iodine were tested (up to 10 ml per 1000 L) and four different treatment periods (up to 10 minutes). Unfortunately, none of these treatment combinations proved effective in killing these pathogens.

Another trial used suspensions of spores to investigate the effect of iodine on two key pathogens (*Pythium aphanidermatum* and *Fusarium oxysporum*). In this trial, spores (the 'seeds' of fungi) are put in water to make a suspension, similar to spores floating in the nutrient solution in hydroponic channels. Again different concentrations of iodine were tested (up to 20 ml per 1000 L) and different treatment periods were used (up to 30 minutes). To kill all the *Pythium* spores, a concentration of iodine of 5 ml/1000 L was needed for 30 minutes or 10 ml/1000 L was needed for 5 minutes.



The *Fusarium* is basically twice as tough. To kill all the *Fusarium* spores, a concentration of iodine of 10 ml/100 L was needed for 30 minutes or 20 ml/1000 L was needed for 5 minutes.

Growers, however, need to be cautious because when iodine was applied to the nutrient solution in which hydroponic lettuce plants were growing 5 ml per 1000 L was found to be phytotoxic. Plant growth was stunted and roots were discoloured.

The disinfectant Sporekill® when used at 10 and 20 ml/1000 L, reduced plant weights indicating some phytotoxic effect. After an initial setback Sporekill® treated plants did show signs of recovery with new white roots forming. Both *Phytophthora* and *Pythium* were still present in the solution, but at lower levels. This suggests that while Sporekill® may still suppress these pathogens, it is unlikely to have any

curative effect and the rates required will adversely affect plant growth. Further work is being conducted using Sporekill® in nutrient solutions. Sporekill® can be used to clean equipment and channels but it is not registered as a pesticide for control of root pathogens in hydroponic lettuce.

Agral® is a non-ionic surfactant commonly used in combination with certain pesticides. It was tested at two rates (15 ml/100 L and 20 ml/1000 L) but it did not reduce infection or disease symptoms. Agral® is not registered as a pesticide for control of root pathogens in hydroponic lettuce.

PythOff® is another commercially available disinfectant which was tested. At rates of 10 and 20 ml in 1000 L of nutrient solution *Phytophthora* root rot was not controlled. Further trials will examine rates of 40 ml up to 80 ml/1000 L. This product is sold as a sanitising agent to 'maintain a hydroponic nutrient solution'. PythOff® is not registered as a pesticide for control of root pathogens in hydroponic lettuce.



The plant growth stimulant Hydrozyme® was tested on hydroponic lettuce at a rate of 1 L/1000 L of nutrient solution with no significant affect on plant growth compared to untreated

plants, and pathogens were still detectable in plant roots in the treated systems.

Lights...Sound...and disinfection!

Sound and light may offer an effective method of disinfection for hydroponic system. A combined ultra violet (UV) and sonication unit (from Omni Environmental Pty Ltd) was trialled for its effect on *Pythium aphanidermatum*, *Fusarium oxysporum* and *Thielaviopsis basicola*. Two flow rates of water were assessed. At 3.6 L/minute the treatment was effective against all three pathogens. With a faster flow rate (18 L/minute), the treatment was effective against *Pythium* and *Fusarium* and 97% effective against *Thielaviopsis*.

A separate ultra violet (UV) unit used on a commercial farm was assessed in a separate trial. At a water flow rate of 60 L/minute, the treatment was found to be effective against both *Pythium* and *Fusarium*.

The final phase for this project is to complete trials with varying rates of Fulzyme Plus™ and some disinfectants for disease control on a range of lettuce cultivars.

Lettuce Fungicide Permit Extended

PER8819 – FILAN FUNGICIDE containing: 500 g/kg BOSCALID as the only active constituent.

Valid from 10/10/05 to 31/10/09 to control Sclerotinia Rot (*Sclerotinia spp*) and *S. minor* applied at the rate of 800-1000 g/ha. DO NOT harvest for 14 days after application