Welcome to

‘Better Brassicas’

Brassica Disease Workshop

12th October - Wanneroo, Western Australia

DEPARTMENT OF
PRIMARY INDUSTRIES

Clubroot Prevention and Management

Caroline Donald, Denise Wite and Ian Porter
Department of Primary Industries, Knoxfield centre
Western Australian Collaborators: Rachel Lancaster and David Tooke
Department of Agriculture, Western Australia

Integrated control of clubroot

Recognising clubroot

Look for wilting, stunting, changing foliage colour, root galling

Infection depends on:

A source of *P. brassicae* spores
High soil moisture
Acidic soil (pH less than 7)
Warm conditions

Key elements in the development of an integrated control strategy

- **Estimating disease risk**
- **Good farm and nursery hygiene**
- **Cultural control**
- **Manipulation of soil pH**
- **Useful nutrients**
- **Fungicides or fumigants**
- **Strategic application**
- **Action plan**

Estimating disease risk using farm records

The first step towards developing an effective integrated control strategy is accurately estimating disease risk

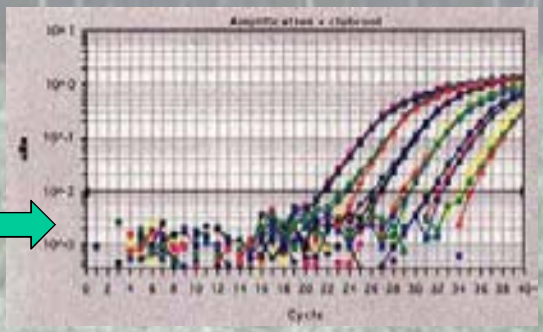
- Have you ever seen clubroot on the property?
- How large is the area affected?
- Determine if the risk is high, medium or low.

		LOW RISK	MEDIUM RISK	HIGH RISK
1	Severity of last observed clubroot infection	Mild	Moderate	Severe
2	Time since last observed clubroot infection.	More than 7 years	2-5 years	0-2 years
3	Intended sowing time for brassicas.	May-Aug	March/April and Sept/Oct	Nov-Feb
4	Have brassica weeds been seen on the site since last infection?	Never	Infrequently	Often
5	Intended crop	Non-brassica	Broccoli, Brussel sprouts, cabbage, other Asian veg brassica	Cauliflower, Chinese cabbage
6	Soil pH	7-8	6-7	Less than 6
7	Source of planting material	Cell grown transplants – reputable nursery	Seed bed on farm	Direct seeded onto site
8	Variety	Tolerant/resistant	Susceptible	Highly susceptible
9	Drainage	Excellent	Fair	Poor
10	Soil type	Sand	Loam	Clay

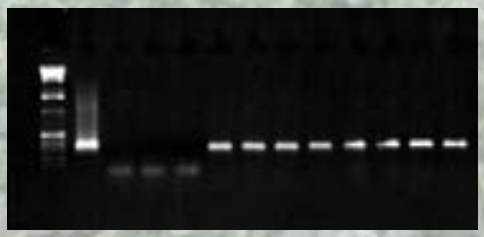
Molecular methods to estimate disease risk

1. **Detection**

2. **Quantification**



3. **Rapid on farm assessment**



Farm and nursery hygiene

Top 3 hygiene risks

Farm

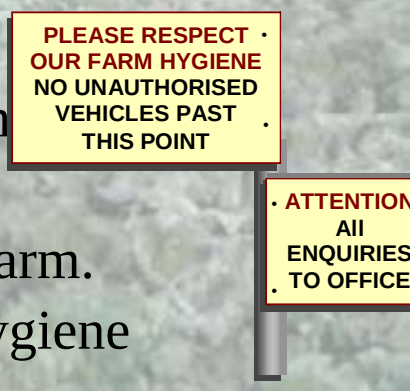
1. Dirty machinery moving from site to site.
2. Shared equipment and labour with an associated organic (dirt) load.
3. Irrigation with water from dams receiving runoff from affected paddocks.

Nursery

1. Reusable plastic seedling trays returning from farms to the nursery
2. Water stored in dams (mainly a problem for small ‘on-farm’ nurseries).
3. Soil carried into the nursery on delivery vehicles, visitors, birds, rodents and wind blown dust.

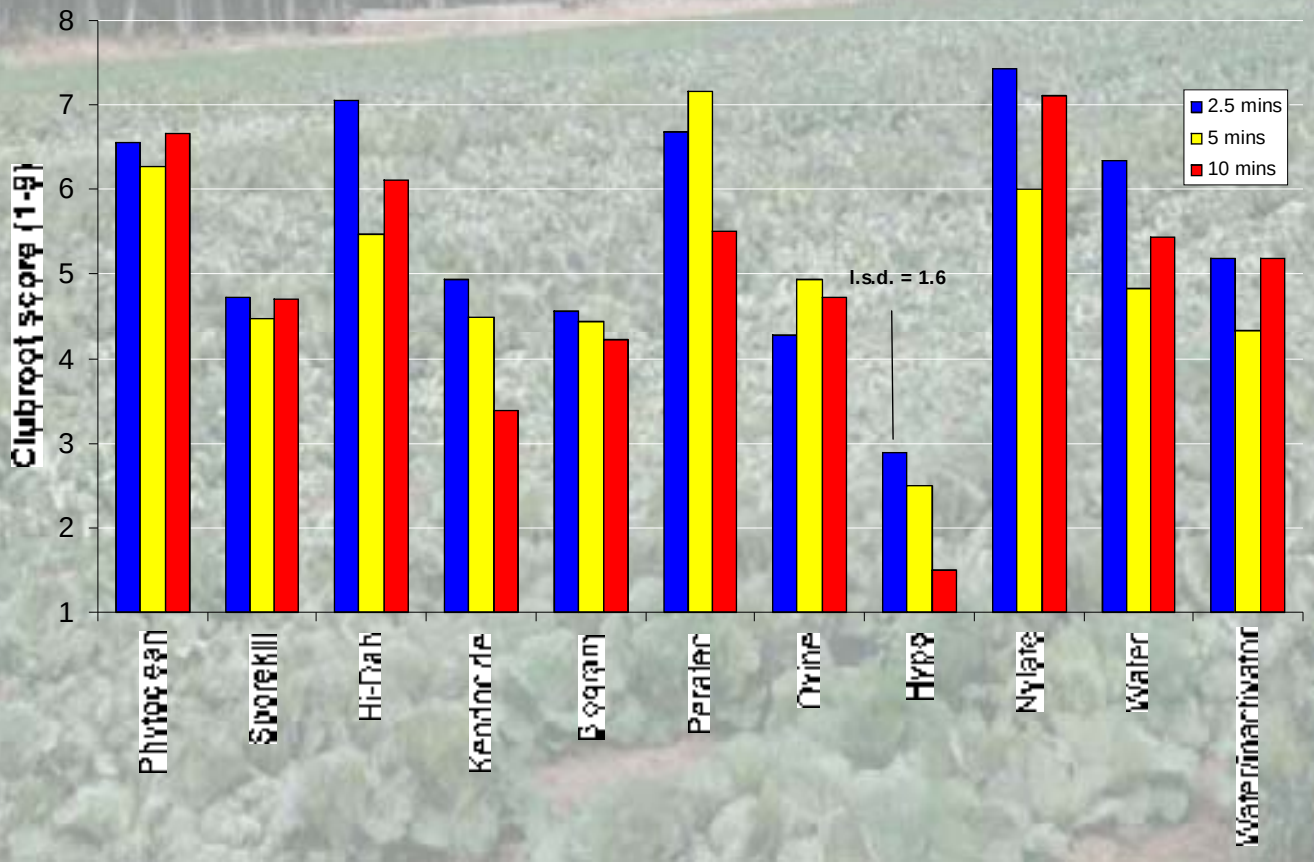
Top 10 hygiene tips

1. Restrict unnecessary movement into production areas
2. Clearly sign post to limit access
3. Purchase high pressure washing equipment and use it.
4. Practice a ‘come clean, go clean’ policy.
5. Purchase high quality seedlings from a reputable source.
6. Keep seedling trays off the ground.
7. Identify and eliminate sources of contamination
8. Provide a foot bath for visitors.
9. Work from the cleanest to dirtiest parts of the farm.
10. Ensure all workers and visitors are aware of hygiene protocols.



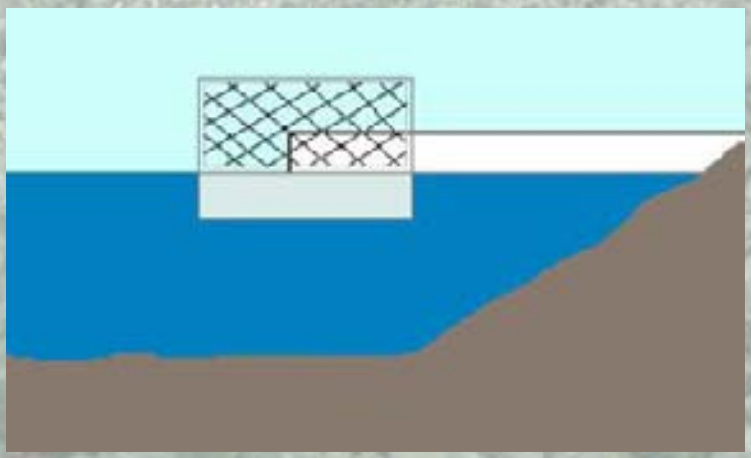
Disinfection

Use a high-pressure wash first to eliminate dirt before disinfection.



Irrigation

Minimise the likelihood of irrigating with water from dams which are likely to be contaminated by locating the intake pipe in the stillest part of the dam, mounted on a float to collect water from near the surface of the dam.



Cultural control methods

- Avoid overwatering
- Improve drainage by increasing bed heights and/or laser grading low lying areas

- Rotate with non-brassicas
- Avoid double cropping and summer cropping infested soils
- Control brassica weeds
- Source disease free seedlings
- Use tolerant or resistant varieties

Managing new and isolated outbreaks

- Identify the disease
- Quarantine the area (3 m)
- Remove and dispose of plants within this area
- Clean all machinery and gear used on this site
- Prevent soil movement from the site
- Disinfest the site (fumigate)
- Prepare a management action plan for future control if required
- Use cultural practices (manipulation of soil pH, rotation, use of nutrients to create unfavourable conditions for disease on the farm.

Limes and liming

Lime is an effective preventative measure. It is cheap and easy to apply.

Aim to achieve a pH 7.0-7.5 in responsive soils

Not all limes are equally able to increase soil pH.

Consider:

pH of the liming material
Neutralising value
Particle size
Timing of application

LIME COMPARISON	Agricultural lime	Hydrated lime	Burnt Lime
Major chemical components	calcium carbonate	calcium hydroxide	calcium oxide
Also known as	Aglime	Slaked lime	GBA, Quicklime, Burnt lime
Form of lime	crushed limestone	slaked lime	calcined
Relative particle size	coarse-fine	intermediate	fine
Neutralising Value	80 - 100%	140%	160%
pH of liming material	7.5	12.0	12.0 - 12.5
Reaction rate	slow	fast	very fast
Time between application and planting	at least 3 months, preferably longer	7-10 days	7-10 days

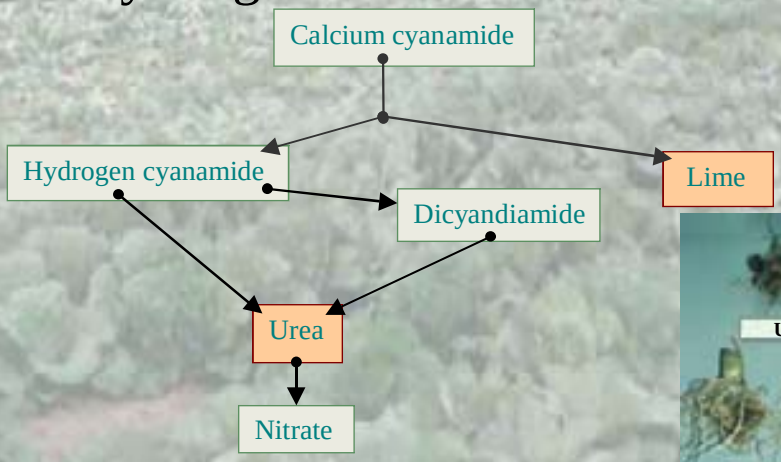
A Comparison of Readily Available Limes

Nutrient amendment

Clubroot is inhibited with the addition of calcium and boron

The effect of calcium on clubroot development depends on pH and is more effective at neutral pH.

Calcium and/or boron must be present within the first 3 weeks of planting to protect young roots from infection.



Chemical control of clubroot

Chemical application may be necessary on high risk (heavily infested) soils to achieve adequate control of clubroot.

Fungicides

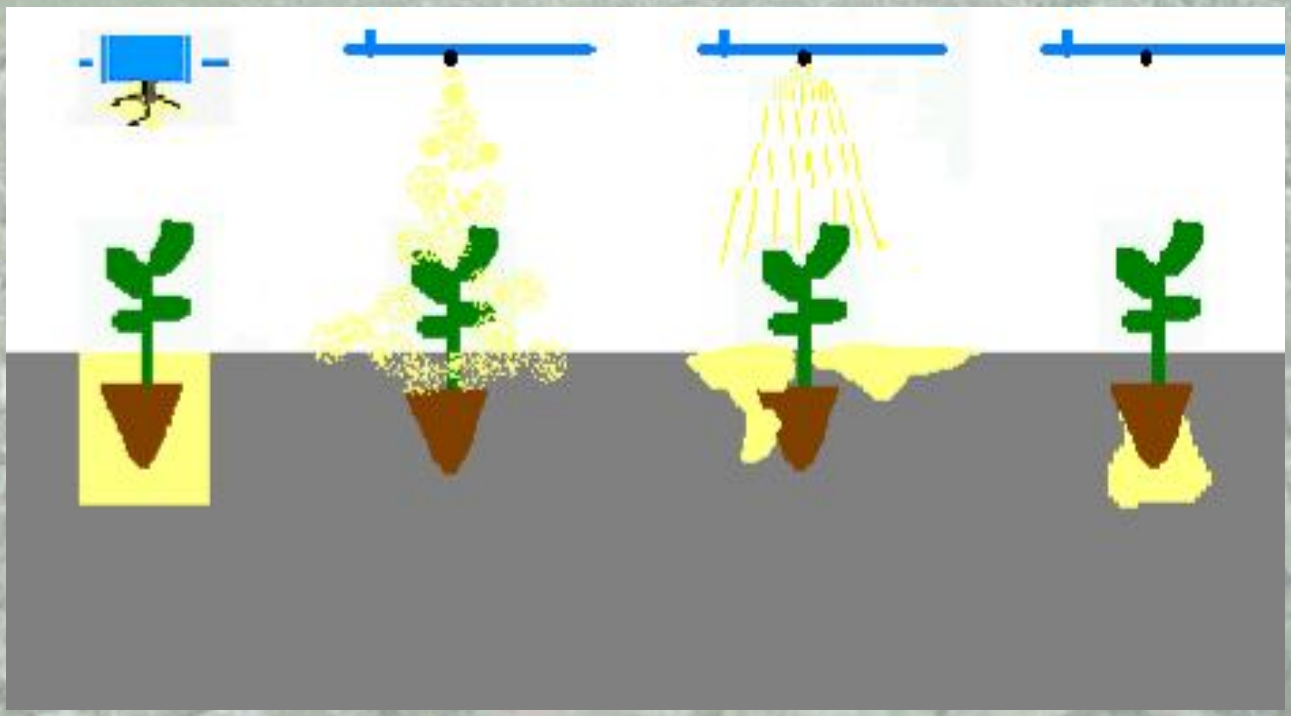
Registered fungicides include PCNB formulations and fluazinam (Shirlan®). Apply at transplanting to the plant root zone.

Fumigants

Registered fumigants include Metham sodium and Dazomet (Basamid®). Useful for new or spot outbreaks, seedbeds or on severely infested sites. Apply to moist soil and seal the surface.

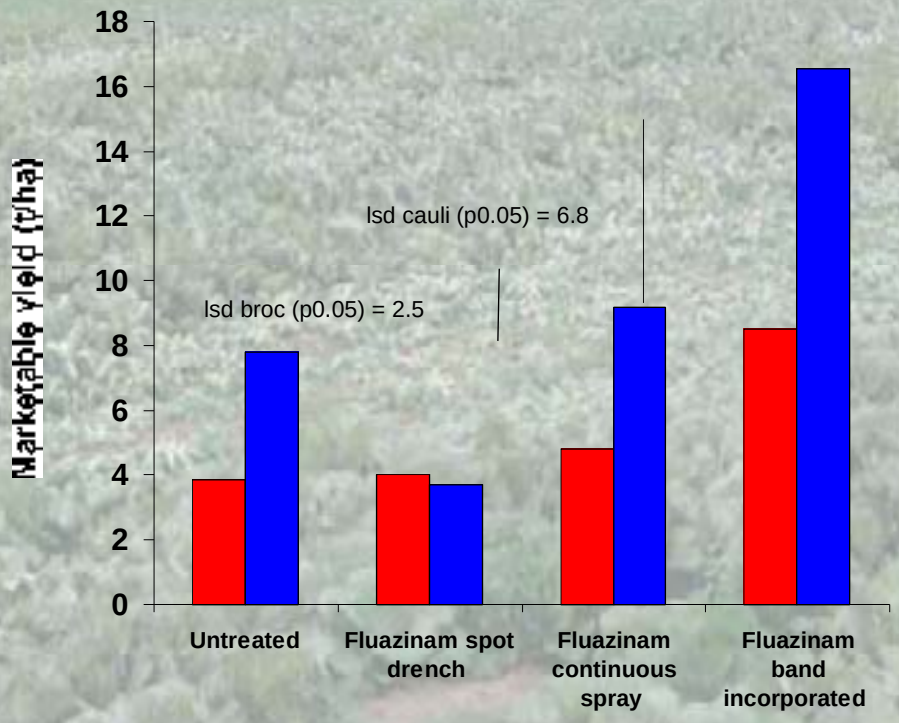
Strategic application

Strategic application targets products to the plant root zone



Benefits of strategic application

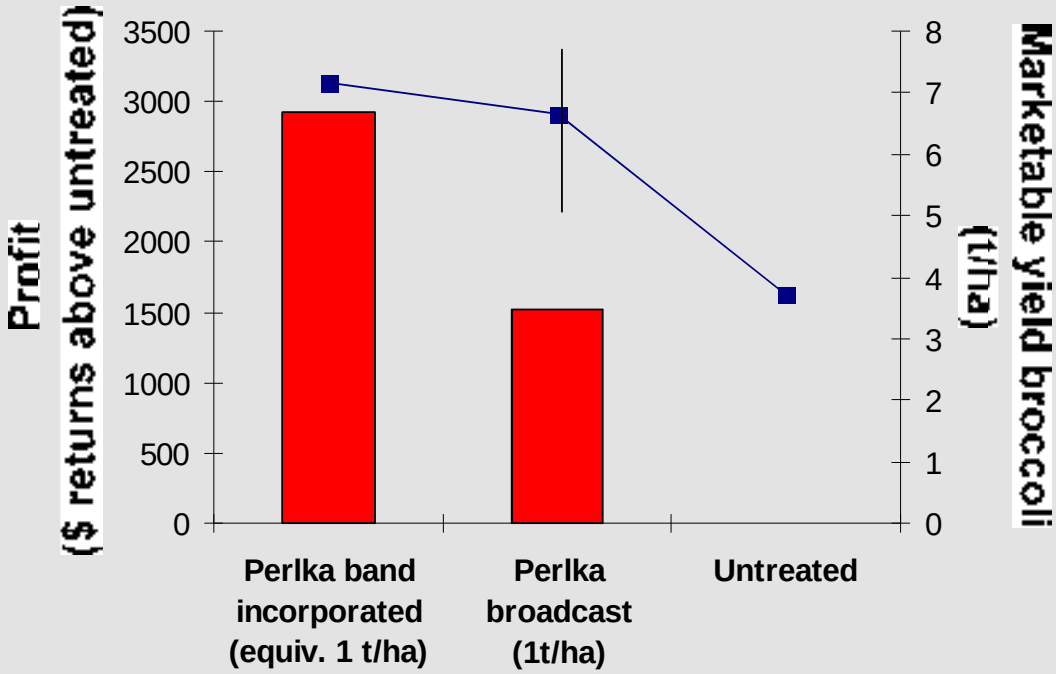
1. Efficacy of some products is increased



Manjimup, WA.

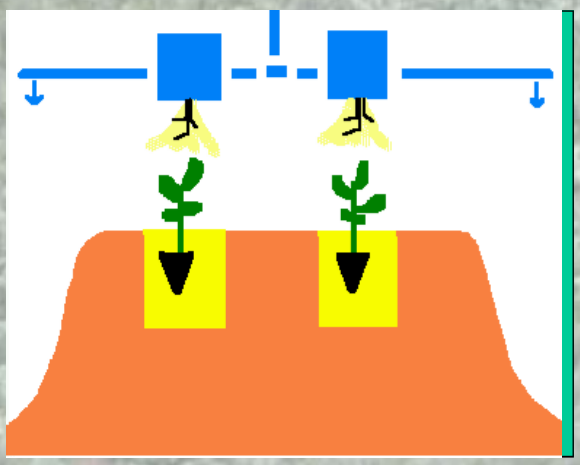
Benefits of strategic application

2. Cost is reduced as less than a third of the broadcast area is treated



Benefits of strategic application

3. Targets the root zone where protection is needed, evenly distributing the product in the root zone.



Benefits of strategic application

4. Saves time as treatment and transplanting can be simultaneous provided the selected treatment does not pose a health risk to the operator.

Benefits of strategic application

5. Suits a range of soil types, liquid and granule application

Machinery design

Existing machinery can be modified for strategic application

Jets and/or granular chutes mounted on tool bar

Rotary hoes mounted in metal box (23 cm wide)

Till soil in bands to depth 15-20 cm

Implementing an integrated control strategy

Prevention

HYGIENE
Good farm sanitation and hygiene protocols are your responsibility and your right.
Develop a hygiene strategy and ensure all staff and visitors implement it.

SOURCE
Use uncontaminated;
Water.
Seedlings.
Trays.
Equipment.

CULTURAL PRACTICES
Improve drainage.
Rotate with non-brassica crops.
Control brassica weeds.
Use beneficial nutrients.

CLUBROOT THRIVES
in warm, moist, acid soils.
Increase pH to 6.5-7.5 with lime.

Implementing an integrated control strategy

Management

IDENTIFY
Determine disease risk.
Identify and eliminate the source.

QUARANTINE
Remove affected plants.
Dispose of diseased material.
Isolate the area.

DECIDE
upon a management strategy based on the disease risk category.

IMPLEMENT
the elements of the strategy.
Consider appropriate rates, timing and method of application.

Low Risk

Be rigorous about farm hygiene. See factsheet 3.

Adjust soil pH to 7.0-7.5 with lime. See factsheet 5.

Improve drainage and irrigation practices. See factsheet 3.

Monitor for symptom development such as stunted or wilting plants.

Remove plants and check for galls. See factsheet 1.

Treat any spot infection immediately. See factsheet 4.

Medium risk

Practise a minimum 3 yr crop rotation.

Keep crops free of brassica weeds.

Adjust soil pH to 7.0-7.5 with lime. See factsheet 5.

Maintain high soil calcium in first 3 weeks after planting.

See factsheet 6.

Improve drainage and irrigation practices. See factsheet 3.

Use tolerant / resistant plant varieties.

High risk

Avoid summer plantings.

Do not crop Chinese cabbage.

Practise a minimum 3 yr crop rotation.

Keep crops free of brassica weeds.

Adjust soil pH to 7.0-7.5 with lime. See factsheet 5.

Incorporate fungicides into the transplant row immediately before planting. See factsheet 8.

If severely affected fumigate the disease site. See factsheet 7.

Maintain high soil calcium in the first 3 weeks after planting. See factsheet 6.