

# Optimising *Trichoderma* for the Management of White Rot on Bunching Onions

D. Wite<sup>A</sup>, O.N. Villalta<sup>A</sup>, I.J. Porter<sup>A</sup>, K. L. McLean<sup>B</sup>, A. Stewart<sup>B</sup> and J. Hunt<sup>C</sup>

<sup>A</sup> PIRVic, Department of Primary Industries, Knoxfield Victoria, Australia. <sup>B</sup> National Centre for Advanced Bio-Protection Technologies, Lincoln University, Canterbury, New Zealand. <sup>C</sup> Agrimm Technologies Ltd, Christchurch, New Zealand

## Background

- Trichoderma atroviride* isolate C52 has shown good antagonistic activity against *Sclerotium cepivorum* via nutrient competition.
- Before this biocontrol agent is evaluated for control of onion white rot on bunching onions, it is important to determine its ability to survive in soils used for producing short-season onions at levels desirable for effective biocontrol.

## Aim

To determine the ability of *T. atroviride* C52 to colonise different soil types and the effect of soil amendments on biocontrol growth in sandy soil.



Spring onion crop grown in raised beds and ready for harvest.



Onion white rot

## Materials and Methods

- Experiments were conducted in pots (13 cm) in a glasshouse using soils collected from commercial farms.
- Prills with spores of *T. atroviride* C52 (Trichopel Ali 52™) were placed below the seed (1-2 cm) at the base of the planting furrow.
- Soil amendments were placed either under the seed (e.g. pellets 1-2cm) or mixed with soil before sowing using field rates or as per manufacturer's recommendations.
- Trichoderma* levels were monitored in the root zone of seedlings using a standard dilution plating technique and selective medium.
- There were four replicate pots per treatment in each experiment.



Prills with spores of *Trichoderma* (yellow) were placed below the seed at sowing and later *Trichoderma* numbers measured in root zone

## Properties of soils used in the pot experiments

- The sandy soil had less organic matter and lower levels of N, K, Mg, and S than the black (volcanic) and clay loam soils.
- Total bacterial populations were higher in the clay soil compared with black and sandy soils.

SOIL	cfu per g/soil		Total ppm					% w/w	
	Total Fungi	Total Bacteria	K	Mg	S	Ca	P	N	Organic Matter
Clay	18,197	26,302,680a	8900	2600	310	2300	680	4.4	4.4
Black	34,674	4,570,882b	4500	23000	450	4400	2300	8.5	8.5
Sandy	8,318	11,481,536c	390	520	190	4800	1800	0.12	2.3

## *Trichoderma* growth on different soils

- Trichoderma* levels were significantly higher in the black volcanic and clay loam soils than in sandy soil (Fig.1).

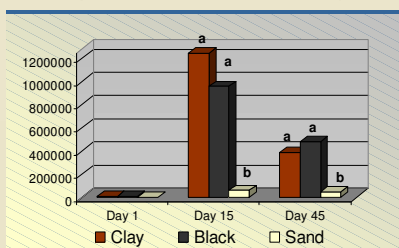


Fig. 1. *Trichoderma* levels (cfu/g soil) after sowing

## Effect of soil amendments on *Trichoderma* growth

- Trichoderma* levels were significantly higher in sandy soil amended with pellets containing humic acids or poultry manure (Table 3).

Substrate	Day 6	Day 15
Trichoderma only	6,950 b	472 c
Chicken manure mixed	4,170 b	1,320 b
Chicken manure pellets	52,369 a	125,991 a
Humic acid solution	3,660 b	2,220 b
Humic acid pellets	974,385 a	120,744 a
Waste compost	6,048 b	2,790 b
Soil only	260 c	390 c

Table 3. *Trichoderma* levels (cfu/g soil) after sowing<sup>0</sup>

## Effect of composted chicken manure on *Trichoderma* growth

- Sandy soil amended with all rates of chicken manure had significantly lower levels of *Trichoderma* than untreated soil (Table 2).

Manure (%w/w)	Day 2	Day 15
nil	4,351 a	2,259 a
1.0%	1,331 a	495 b
2.5%	739 b	470 b
5.0%	296 b	622 b
10.0%	325 b	741 b

Table 2. *Trichoderma* levels (cfu/g soil) after sowing

## Conclusions

- Two weeks after sowing, *Trichoderma* grew at levels considered necessary for effective biocontrol only in the black and clay soils.
- In general, *Trichoderma* growth was less than optimal in untreated sandy soils. This was probably due to the low content of organic matter.
- Incorporation of pellets containing humic acids or pelleted manure with *Trichoderma* prills at sowing enhanced the growth of *Trichoderma* in sandy soil.
- Amending sandy soil with 1-10% (w/w) of fresh composted chicken manure (Table 2) affected the growth of *Trichoderma*.
- Therefore nitrogenous materials (e.g. fertilisers, poultry manure) should not be applied close to *Trichoderma* applications.