Evaluation of new seed dressings for improved disease and insect control in vegetable crops

HAL Project VG04021

Final Report

6 July 2007

By

Dr Hoong Pung

Peracto Pty Ltd
ABN: 97 109 472 559
Head Office: 16 Hillcrest Road
Devonport, Tas 7310 Australia
Telephone: +61 3 6423 2044
Facsimile: +61 3 6423 4876
Email: admin@peracto.com.au
Web: www.peracto.com.au

syngenta

Peracto
Knowledge through Experience

HAL
Know-how for Horticulture™

Project Number: *VG04021*

Report written by: Hoong Pung

Principal Investigator: *Hoong Pung*
Peracto Pty Ltd
16 Hillcrest Road
Devonport Tasmania 7310

Phone (03) 6423 2044
Fax (03) 6423 4876
Email: hpung@peracto.com.au

Report Date: *6 July 2007*

Key Research Personnel

Hoong Pung, Susan Cross & Sarah Babcock Peracto Pty Ltd 16 Hillcrest Road Devonport, Tasmania 7310	Dr. Chris Monsour Peracto North Queensland 11 Grantham Street Bowen, Queensland 4805

Acknowledgements
This project has been facilitated by Horticulture Australia Limited, and has been funded by voluntary contributions from Syngenta Crop Protection Pty Ltd and the Australian Government. The assistance of Tasmanian bean growers, Garry McNab and Chris Russell of Simplot Australia Pty Ltd, Darren Briggs of McCain Food (Aust) Pty Ltd, and Lyndon Butler of Forthside Research Station, in field trial studies, is gratefully acknowledged. We are grateful to Henderson Seed Group Pty Ltd, McCain Food (Aust) Pty Ltd and Simplot Australia Pty Ltd for providing vegetable seeds for trial studies in this project. Peracto Pty Ltd staff, who also contributed to this project included Phillip Frost, Sarah Flynn, Kate Williams, David Kohler and Warrick Barnes.

Table of Contents

Media Summary

Seed treatment is the most cost-effective disease and pest control method on seed and seedlings, applied at a stage when they are most vulnerable to attack by pathogens and insect pests. Seed dressings use only a small amount of chemical, so even though the new chemicals are more expensive, their use in new seed dressings is still affordable to growers. Currently, most vegetable seed treatments rely on old broad-spectrum chemicals, such as thiram, which are indiscriminate in their target organism and could be removed from use eventually. In recent years, new chemicals that are safer and can better target pests and diseases are being developed for use in broad-acre crops like wheat and canola. This project is a two-year feasibility study conducted in 2005 and 2006 to evaluate new seed dressings in vegetable crops from the major vegetable groups of legumes (green peas and green beans), brassicas (cauliflower) and curcubits (pumpkin).

Six new fungicide dressing formulations containing the active ingredients azoxystrobin (A), fludioxonil (F), metalaxyl-M (M) and difenconazole (D), and two new insecticide seed dressings with abamectin (Ab) or thiamethoxam (Thx), were examined at different rates to identify the appropriate concentrations for use on the different vegetable groups. These new seed dressings were compared against untreated control seeds and thiram treated seeds.

This project identified two new fungicide seed dressings, containing the active ingredients, azoxystrobin + fludioxonil + metalaxyl (AFM) and fludioxonil + metalaxyl (FM), as suitable replacements for thiram seed dressings on the major vegetable crops of green peas, green beans, pumpkin (curcubits) and cauliflowers (brassicas).

In comparison to the standard thiram seed treatments, AFM seed treatments generally give better root rot control on the major vegetable crops. AFM was also more effective than the thiram seed treatment against *Ascochyta* infections on peas, where it prevented seed rot, and reduced collar rot. FM or seed treatment with single active seed dressings of metalaxyl-M or fludioxonil were also shown to be effective in reducing root rot severity.

Seed safety tests showed that the new fungicide and insecticide seed dressings mostly have no phytotoxic effects on garden pea, green bean, cauliflower and pumpkin seeds. Generally, the new fungicide seed dressing treatments containing azoxystrobin, fludioxonil, metalaxyl and difenconazole tend to increase seedling growth, with increased average fresh shoot weights in comparison to the untreated control and the thiram seed treatment.

There was also no obvious decline in seed viability as a result of the new fungicide seed treatments in pea, bean, pumpkin and cauliflower treated seeds after a 10-month storage period. This is important, because in practice, treated seeds are often not used immediately after treatment, and can be stored for up to one year before use.

Technical Summary

Seed treatment is the most cost-effective disease and pest control method on seed and seedlings, applied at a stage when they are most vulnerable to attack by pathogens and insect pests. Seed dressings use only a small amount of chemical, so even though the new chemicals are more expensive, their use in new seed dressings is still affordable to growers. Currently, most vegetable seed treatments rely on old broad-spectrum chemicals, such as thiram, which are indiscriminate in their target organism and could be removed from use eventually. In recent years, new chemicals that are safer and can better target pests and diseases are being developed for use in broad-acre crops like wheat and canola. This project was a two-year feasibility study conducted in 2005 and 2006 to evaluate new seed dressings in vegetable crops from the major vegetable groups of legumes (green peas and green beans), brassicas (cauliflower) and curcubits (pumpkin).

Six new fungicide dressing formulations containing the active ingredients azoxystrobin (A), fludioxonil (F), metalaxyl-M (M) and difenconazole (D), and two new insecticide seed dressings with abamectin (Ab) or thiamethoxam (Thx), were examined on green pea, green bean, cauliflower and pumpkin seeds. Various seed dressings coded according to a single or multiple actives as A, F, FM, MF, DM, AFM, Ab and Thx, were examined at three to four different rates each to identify the appropriate concentrations for use on the different vegetable groups. These new seed dressings were compared against untreated control seeds and thiram treated seeds.

A. Safety tests

Seed safety tests showed that the six new fungicide seed dressings (A, F, FM, MF, DM and AFM) and their different rates of applications had no adverse effects on seedling emergence of garden pea, green bean, cauliflower and pumpkin seeds. Generally, the new seed dressing treatments containing azoxystrobin, fludioxonil, metalaxyl and difenconazole tend to increase seedling growth, with increased average fresh shoot weights in comparison to the untreated control and the thiram seed treatment.

With new insecticide seed dressings, except for the highest rate of abamectin on pumpkin, seeds treated with different rates of abamectin or thiamethoxam showed no adverse effects on seedling germination and emergence in comparison to the untreated control. Abamectin applied at the highest rate of active at 600 g ai/100 kg pumpkin seeds appeared to delay and reduce seedling emergence.

B. Storage effects of treated seeds

Seed samples of the new fungicide and insecticide treatments from the initial safety test in Section A were stored for up to 10 months, and were shown to have no effects on seed viability after storage.

C. Efficacies of fungicide seed dressings

The effectiveness of new fungicide seed dressings against the common damping-off pathogens, *Pythium irregulare, Rhizoctonia solani and Fusarium culmorum*, were examined on pea, bean, pumpkin and cauliflower seeds in 2005. In general, the active ingredients used in the new seed dressing combinations are highly selective against their target pathogen. Metalaxyl-M is only effective against *Pythium*, azoxystrobin and fludioxonil are effective against *Fusarium* and *Rhizoctonia*. In contrast, thiram is not selective and is effective against all of the pathogens. The high selectivity of metalaxyl-M, fludioxonil and azoxystrobin means that they are best used in seed dressing combinations in order to extend their range of pathogen control.

D. Evaluations of new seed dressings in field trials

Two new seed dressing combinations, FM and AFM, were selected for further evaluation in four field trials. In a fifth trial, the effects of seed dressings that contain only one active ingredient (metalaxyl, fludioxonil or thiamethoxam only) and their combinations were also compared against the standard thiram seed treatment in a bean trial. Generally, the field trials demonstrated that the new seed dressing combinations were suitable alternatives to thiram in improving seedling establishment and reducing root rot incidence or severity. AFM seed treatments tended to give the greatest root rot control on the vegetable crops. AFM was more effective than FM or thiram seed treatment against *Ascochyta* infections on peas, where it prevented seed rot, and reduced collar rot. FM or seed treatment with single active seed dressings of metalaxyl-M or fludioxonil were also shown to be effective in reducing root rot severity.

Recommendations

Research conducted in this project was meant to be a feasibility study to assist in screening potential new seed dressings. While results have been very useful in identifying effective and non-toxic rates of new active ingredients and their combinations for use on vegetables, the developments of new seed dressings for specific use in vegetable seed are still evolving to suit different industry requirements. Therefore, no recommendations for commercial use could be made at this point.