Horticultural Fellowship Awards

Interim Report Form

Project title:	Working with the industry to develop the next generation of technical staff for the UK horticulture industry through a Summer Research Programme.
Project number:	CP 87
Project leader:	Dr Jim Monaghan
Report:	Annual report, May 2012
Previous report:	None
Fellowship staff:	Carol-AnneWooley (July - October 2011) Dr Paul Hand (Associate); Prof Dave Pink (Associate); Dr Ivan Grove (Associate)
Location of project:	Harper Adams University College
Industry Representative:	N/A
Date project commenced:	8 July 2011 (back dated 1 April 2011)
Date project completed (or expected completion date):	31 March 2016

DISCLAIMER

AHDB, operating through its HDC division seeks to ensure that the information contained within this document is accurate at the time of printing. No warranty is given in respect thereof and, to the maximum extent permitted by law the Agriculture and Horticulture Development Board accepts no liability for loss, damage or injury howsoever caused (including that caused by negligence) or suffered directly or indirectly in relation to information and opinions contained in or omitted from this document.

AUTHENTICATION

We declare that this work was done under our supervision according to the procedures described herein and that the report represents a true and accurate record of the results obtained.

[Name]
[Position]
[Organisation]

Signature ..... Date .....

[Name]
[Position]
[Organisation]

Signature ..... Date .....

Report authorised by:

[Name]
[Position]
[Organisation]

Signature ..... Date .....

[Name]
[Position]
[Organisation]

Signature ..... Date .....

CONTENTS

Progress Against Objectives and Annual Milestones

Objectives

Objective	Original Completion Date	Actual Completion Date	Revised Completion Date
1. Recruit a minimum of 15 undergraduates from UK Higher Education Institutions to complete applied experiments in horticultural crop production and agronomy.	31/03/2016		
2. Deliver a minimum of 15 small-scale research projects for the industry.	31/03/2016		
3. Publicise the approach and outputs of the programme to the industry, Further Education and Higher Education Institutions.	31/03/2016		
4. Leverage additional funding for follow up projects.	31/03/2016		

Summary of Progress

The first year of the Summer Research Programme (SRP) was successful. Eight students applied for the SRP following limited publicity relying on direct contact with colleagues at other universities and colleges. Three UK undergraduates; one from Cambridge University and two from Newcastle University were appointed. The students undertook three separate research projects at HAUClinked to Elsoms Seeds, G's and Vitacress, and also worked together on a number of on-going crop research experiments at HAUC. Each student prepared and gave a presentation of their research to the BLSA Technical and Research Committee. However, the delayed start to the programme, due to contractual issues, meant that the work undertaken by the students was limited in scope and not of sufficient depth to report meaningful data more widely to growers.

The three students and their projects were:

How best to inoculate lettuce with bacteria that are antagonists to E.coli? (with Elsoms Seeds)

Isabel Webb **(Cambridge University)**

Enteric pathogens such as E. coli O157 and Salmonella enterica, have been identified as key food-borne pathogens of humans in the UK. Recent outbreaks of food poisoning have been associated with consumption of contaminated vegetable or salad produce and there is evidence that such outbreaks are increasing

Both E. coli and Salmonella are able to survive for extensive periods of time on plant surfaces and standard industry decontamination with chlorine solutions can reduce bacterial numbers but cannot eliminate either the natural microbial population or human pathogens completely. However, recent work has identified naturally occurring antagonistic bacteria that may control or suppress the growth of the pathogens.

This project studied the persistence of the pseudomonas antagonist (F12) following three potential methods of plant inoculation with the antagonist were compared: seed inoculation, root / compost drenching and leaf inoculation. The level of the antagonist on plant leaves was determined at two growth stages (for the seed inoculation and drenching treatments) or 1 week post- inoculation (for leaf inoculation). The effect of treatment on the viability of the plant material by use of emergence counts and seed germination tests was assessed.

Key findings

- **Lettuce can be inoculated consistently with antagonistic bacteria**
- **Seed and compost inoculated plants can have viable bacteria persisting at least up to the 3rd leaf stage**
- **Leaf inoculated plants can have viable bacteria persisting at least up to the 3rd leaf stage**

Can we improve the shelf life of babyleaf spinach by stressing the plant with high EC water?

Amy Davies **(Newcastle University)**

There is much research work that has addressed improving yield of baby leafy vegetables, particularly through genetic improvement and breeding. However, the influence of agronomy and physiological treatments applied before and/or after harvest on post-harvest quality has not been well studied in baby leaf crops. It is clear that there are physiological processes in leaves that may be manipulated to lead to better quality. The underlying basis for the treatments was to introduce a moderate level of environmental stress to initiate a physiological quality improvement but not damage the crop.

This project looked at the response of glasshouse grown spinach to a single application of salt (NaCl) at different rates and timings. Three experiments were completed: Experiment 1 studied NaCl applied at 1.5 or 3.0 g/litre after the first true leaf stage. Experiment 2 studied 1.5 g/litre after the first true leaf stage and 3.0 g/litre after the second true leaf stage. Experiment 3 studied 3 g and 6 g/litre applied at the second true leaf stage.

Spinach was harvested after 3 weeks at the commercial harvest stage for a babyleaf crop. Initial measurements were made of membrane leakage as a measure of tissue integrity. The remaining leaves were stored at 4°C in sealed containers and change in gas composition was used as a measure of respiration after 3 and 7 days storage. Leaf colour was also assessed after 7 days.

Key findings

- **Single applications of high EC solutions did not improve spinach shelf life**
- **Later salt applications reduced yield**
- **Membrane leakage increased with salt concentration**
- **Leaf colour and respiration were not affected by salt treatments**

Does irrigation regime change the rooting pattern of leafy veg?

Christina Bosworth **(Newcastle University)**

Improved monitoring of both soil and crop water status and the development of variable water application technology (i.e. Precision Irrigation) has the potential to be used in new irrigation management techniques that manipulate plant growth rather than just prevent the crop from being exposed to a level of water stress that leads to economic loss. In crops that utilise leaf biomass for yield (i.e. leafy vegetables) reduced irrigation is commonly associated with reduced yield. However, drying soil also leads to deeper rooting and if managed through irrigation there may be benefits from deeper rooting, enabling plants to access water lower in the soil profile and conferring greater resilience to mid-summer drought events.

Iceberg lettuce plants (cv Challenger) were grown from transplants in split rhizotrons (7 x 27 x 130 cm for each independent compartment). Soil moisture was measured at ~20cm intervals down the profile 3 times a week and irrigation volumes were calculated from the summed deficits for each compartment: Very wet – returned to 100% field capacity (FC) Moderate – watered to 50% FC, and Dry – no water added. Root depth and distribution was assessed twice a week using transparent grid. The experiment ended when roots reached the bottom of all the rhizotrons, harvest. Top growth and root biomass were then measured.

Key findings

- **Lettuce yield was reduced in the dryer soil.**
- **Lettuce plants produced more, deeper roots in response to a developing soil moisture deficit down the profile.**
- **Lettuce roots grew to >1m in 23 days.**

Six businesses hosted visits by the students: PDM (Lettuce), Lower Reule Farm (Strawberries), Elsoms Seeds (seeds), G's (field vegetables), Produce World (Potatoes), Cornerways Nursery (Tomatoes).

Informal feedback from the students was very positive and two of the three students undertook research in fresh produce crops for their final year research projects. Of the three students one has applied for plant science PhD research, one has applied for MDS and one has been contacting agronomists (including vegetable agronomists) regarding training opportunities.

The fellow aims to keep contact with all the SRP students to track later career choices.

Milestones

Annual Milestone	Original Completion Date	Actual Completion Date	Revised Completion Date
1. Select proposed project titles and outlines of work in agreement with *Advisory Group*.*	31/05/2011	31/05/2011*	
2. Commence experimental work.	31/05/2011	13/06/2011	
3. Complete mail shots and selected visits to other institutions.	31/05/2011	31/05/2011	
4. Recruit SRP students (end June)	30/06/2011	31/05/2011	
5. SRP students start (start July)	01/07/2011	13/06/2011	
6. SRP students finish (mid September)	20/09/2011	20/09/2011	
7. Research reported to HDC (end November)	31/03/2011	08/05/2012	

Milestones not being reached

Milestone 7 - The Annual report was delayed due to administrative oversight.

Milestone 1 - The Advisory Group was not constituted. The businesses linked to each project fulfil the role of guiding the projects and giving the SRP students and the Fellow a direct point of contact.

Do remaining milestones look realistic?

It is proposed that Milestone 1 is reworded

"Select proposed project titles and outlines of work in agreement with Partner businesses and HDC Research Manager."

Training undertaken

No training was undertaken by the Fellow.

Expertise gained by Trainee

N/A

Other achievements in the last year not originally in the objectives

The Gatsby Summer School for high achieving Plant Scientists targeted at first year UK undergraduates (www.gatsbyplants.leeds.ac.uk) will link to this programme as an opportunity for applied research experience.

Changes to Project

Are the current objectives still appropriate for the Fellowship?

No changes proposed

Grower Summary

The first year of the Summer Research Programme (SRP) was successful. Three UK undergraduates; one from Cambridge University and two from Newcastle University were appointed to work at Harper Adams University College during the summer of 2011. The students undertook three separate research projects at the Fresh Produce Research Centre linked to Elsoms Seeds, G's and Vitacress, and also worked together on a number of on-going crop research experiments at the Centre. However, the delayed start to the programme, due to contractual issues, meant that the work undertaken by the students was limited in scope and not of sufficient depth to report meaningful data more widely to growers.

Headline

N/A

Background

The recent Royal Society report and the Field and Vegetable Task Force report have both highlighted the shortage of applied technical expertise available to the UK horticulture industry. Reduction in government funding for applied horticulture research has led to a marked reduction in the pool of applied researchers available for employment in industry, research and advisory/agronomist roles. In addition the loss of many relevant crops focussed courses and modules from Universities have led to a marked shortage of opportunities for undergraduates to be exposed to, and trained in, applied research in horticulture crop production compared to 10-15 years ago. This limits the number of suitable candidates for technical roles in industry, research studentships, technical roles in universities or institutes, or agronomy and extension businesses.

We have launched a Summer Research Programme (SRP) based at Harper Adams University College (HAUC) and led by Jim Monaghan. The SRP will recruit three UK undergraduate students (and potentially seconded industry employees) each year. These students will then carry out applied agronomy/crop production research projects within the Fresh Produce Research Centre and be supported by other research staff associated with the centre.

Summary

N/A

Financial Benefits

N/A

Action Points

N/A

Knowledge and Technology Transfer

The SRP was presented at the

HDC Board – New Covent Garden (18/01/2012)

BLSA Research Committee - HAUC (20/09/2011)

Glossary

N/A

References

N/A

Appendices

N/A

