Objectives

1. To validate and improve the Ascochyta disease forecaster by comparing with field disease incidence and yield responses. To further confirm fungicide responses in peas.
2. Determine the distribution and severity of Fusarium rot in peas.

Site Details

Replicated trials were undertaken at Rob McIlraiths property in St Andrews (irrigated), and in irrigated plots at the FAR arable site at Chertsey

Farmers' properties- side by side assessment of the model and the farmer practice on property near weather stations were planned but due to low disease incidence this year and lack of interest from growers these were not undertaken.
Company evaluations- a number of companies (two or three) will run the model at four properties each in conjunction with PIDG. We have received no feedback on this.

The trial design, treatments and assessments will vary between replicated sites and farmers sites.

Trial Design- St Andrews and Chertsey (dryland and irrigated). Completely randomized design with 4 replicates.
Target Sowing Rate: 90plants/m^2
Plot size –single width plot size - 10m* 1.35m. Buffer plots either side which were unsprayed.
Use Proline 800ml + Amistar at 250ml rate (both full rate) – Fungicide to be applied by Rodger Welsh.

St Andrews

The trial was sown on the 22nd September 2008. The field was conventionally tilled with the trial designed as a randomized complete block. For treatments 7 and 8, a weather station on site provided data for the forecaster.

Results

Assessments were made to assess for the incidence of Ascochyta, Botrytis and Downy Mildew. Yields were also obtained. ANOVAs were then completed to analyze the data.

Yield

Results concluded that the means for treatments 4 and 6 were different to treatments 1, 2, 3, 5, 7 and 8 with a P-value of 0.0029** (figure 1.). But it is to be noted that it could be due to some management complications. Thus there is no significant yield increase to any fungicide treatments.

The first fungicide application was made on the 3rd November T 4 & 6 within a day or so the grower applied herbicides, this application proved phytotoxic to the whole crop. It was noted at time of treatment for T4 and T5 on the 19th November that there were distorted plants with seemingly 45% loss in vigor. This application reaction has affected the crop yield. Comparisons with a trial alongside seem to indicate antagonism between the herbicide and Proline.

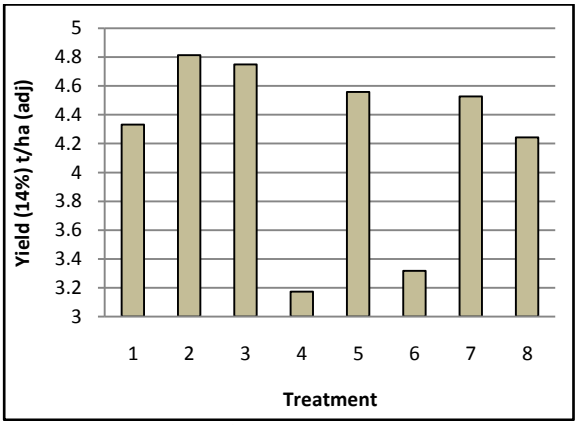

Figure 1. Yield (14%) t/ha for the treatments. P= 0.0029**. Treatment details outlined below. *Statistical Results*= 2a, 3a, 5a, 7a, 1a, 8a, 6b, 4b. There are two groups (a & b) in which the means are not significantly different from one another.

Treatments

1. *Nil,*
2. *> 5% disease infection,*
3. *< 5% disease infection + early flower*
4. *7th node*
5. *Early flower*
6. *7th node + early flower*
7. *Apply when model predicts, no follow up spray*
8. *Apply when model predicts, reset model to a low incidence of disease and follow up spray if model recommends again after a set period, i.e. 3 weeks. The fungicide needs time to work, if we assume the fungicide will be active for 21 days then it is reassessed at that time and if it says spray then it gets a second hit.*

Disease assessment

Five plants and fifteen leaves per plot were assessed on the 5th of January for Ascochyta for each of the eight treatments (table 1). Botrytis and Downy mildew were also assessed for but there proved a very low disease incidence (no significant difference for either disease across the treatments).

Following assessment of Ascochyta on pods, there was a low incidence of Ascochyta present but there was no significant difference between the means across all fungicide treatments with an insignificant P-value score of 0.0522 (table 1), TL[8]=LOG([8]+1. But three treatments differed significantly from the untreated control.

Also, there was high incidence of Ascochyta on stems (table 1). The ANOVA results presented differences between the means.

Most importantly, a significant difference was found for the incidence of Ascochyta on leaves with a P-value of 0.001 (table 1). Treatment 1and 2 were each significantly different to treatments 3-8. Treatment 1 had no fungicide application and treatment 2 had fungicide applied at >5% disease infection.

A comparison of the yields for the treatments showed no significant difference between mean (table 1) apart from treatments 4 & 6 which showed the phytotoxic response.

Table 1. Incidence of Ascochyta in the leaves, pods and stems; Yield for each of the corresponding treatments. Treatment details outlined above.

	Ascochyta Incidence			*Yield*
Date	*5-Jan*	*19-Jan*	*19-Jan*	*1-Mar*
Treatment	*Leaves*	*Pods*	*Stems*	
1	3.89a	0.47a	10.6a	4.33a
2	1.55b	0.24b	8.2a	4.82a
3	0.21c	0.07bc	2.5ab	4.75a
4	0.59c	0.06bc	1.7ab	3.17b
5	0.19c	0.09bc	2.5ab	4.56a
6	0.08c	0.03c	2.7ab	3.32b
7	0.26c	0.00c	1.0b	4.53a
8	0.11c	0.01c	2.2ab	4.24a
LSD (5%)	0.8427	0.0522	0.402	0.8746
P-value	0.001*	0.052	0.053	0.0029

A correlation graph was created to see if there was any relationship between yield and the Ascochyta incidence on leaves (figure 2). Conclusively, there was no significant relationship between Ascochyta incidence on leaves and yield R^2= 0.054 (figure 2). This was expected as the herbicide phytotoxicity appears to be responsible for the low yields.

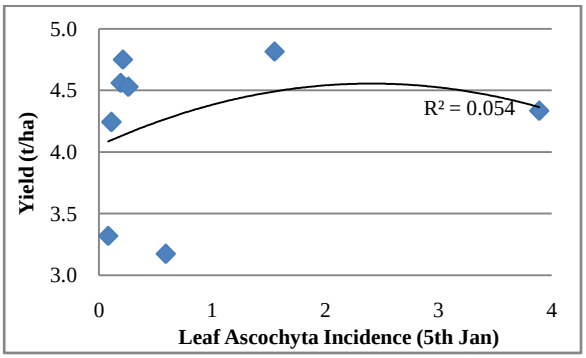

Figure 2. Correlation between yield (t/ha) and the incidence of Ascochyta in the leaves (R^2= 0.054).

Chertsey Results

The trial was drilled on the 3rd of November 2008. The trial was conventionally tilled and designed as a randomized complete block. For treatments 7 and 8, a weather station on site supplied figures for the forecaster.

Yield

Analysis of the yields for the Chertsey trial site showed a significant yield response to all fungicide treatments (figure 3).

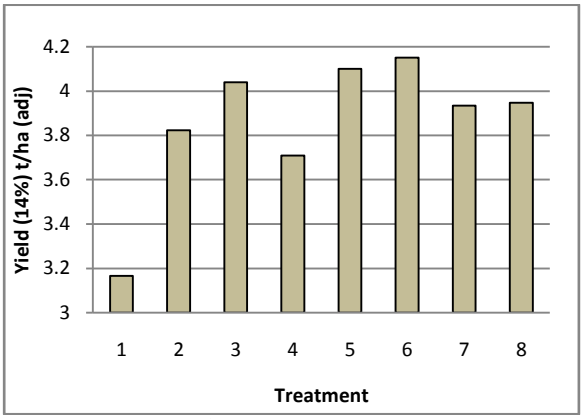

Figure 3. Yield (14%) t/ha for the treatments. P= 0.00***. Treatment details outlined below. *Statistical Results*= 6a, 5ab, 3ab, 8abc, 7abc, 2bc, 4c, 1d. There are four groups in which the means are not significantly different from each another.

Treatments

1. *Nil,*
2. *> 5% disease infection,*
3. *< 5% disease infection + early flower*
4. *7th node*
5. *Early flower*
6. *7th node + early flower*
7. *Apply when model predicts, no follow up spray*
8. *Apply when model predicts, reset model to a low incidence of disease and follow up spray if model recommends again after a set period, i.e. 3 weeks. The fungicide needs time to work, if we assume the fungicide will be active for 21 days then it is reassessed at that time and if it says spray then it gets a second hit.*

Disease Assessment

Following statistical analysis, significant differences in means were found for the disease incidence of Ascochyta in leaves for

both observation dates (table 2). There were no significant differences in means for disease incidence in pods. The fungicide significantly reduced disease incidence on the stems relative to the untreated control and the early application (7th node) had a lower disease incidence on stems than some other fungicide treatments.

Table 2. Incidence of Ascochyta in the leaves, pods and stems; Yield for each of the corresponding treatments. Treatment details outlined above

	Ascochyta Incidence				*Yield*
Date	*30-Dec*	*19-Jan*	*1-Feb*	*1-Feb*	*13-Mar*
Treatment	*Leaves*	*Leaves*	*Pods*	*Stems*	
1	0.3ab	2.83a	0.44a	1.88a	3.2d
2	0.2ab	1.10abc	0.39a	1.05b	3.8bc
3	0.0b	0.79abc	0.19a	0.40bc	4.0ab
4	0.3ab	0.70bc	0.15a	0.15c	3.7c
5	0.0b	0.18c	0.29a	0.63bc	4.1ab
6	0.0b	0.17c	0.30a	0.13c	4.2a
7	0.4ab	1.85ab	0.23a	0.88bc	3.9abc
8	0.6a	2.04ab	0.48a	0.35bc	3.9abc
LSD(5%)	0.3	3.23	0.58	0.39	0.29
P-value	0.025*	0.032*	0.077	0.356	0.000***

A correlation graph was created to see if there was any relationship between yield and the Ascochyta incidence on leaves on the 30th of December (figure 4). Conclusively, there was no significant relationship between Ascochyta incidence on leaves and yield R^2= 0.534 (figure 4).

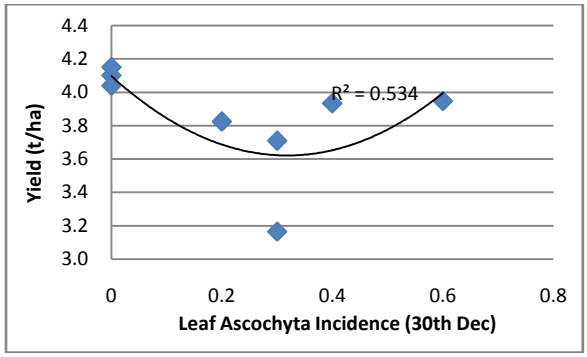

Figure 4. Correlation between yield (t/ha) and the incidence of Ascochyta in the leaves (R^2= 0.534).

Conclusion

Ascochyta disease incidence was low at both sites in the 08/09 season. All fungicide treatments reduced Ascochyta disease incidence.

At St Andrews there was no increase in yield due to application of fungicide (the low yields for treatments 4 and 6 reflect phytotoxic response to the herbicide- probably an interaction with proline). Disease incidence on leaves, pods and stems at the St Andrews site was significantly reduced by all fungicide treatments, but not to as great an extent when fungicide was applied after disease had established (treatment 2).

At Chertsey, all fungicide treatments significantly increased yields over the control but the earliest treatment had the smallest yield response.

At the Chertsey site, all fungicide applications significantly reduced disease incidence stems (not pods). There was greater reduction in disease incidence in treatments which only received early fungicides (7th node).

At neither Chertsey nor St Andrews was there a significant correlation between disease incidence and crop yield. Thus the increase yield at Chertsey is a response to controlling other fungi rather than Ascochyta.

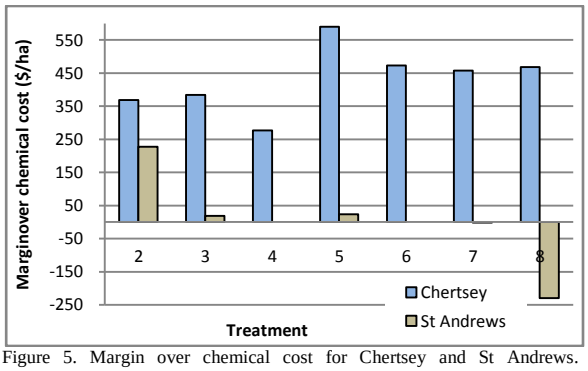

Figure 5. Margin over chemical cost for Chertsey and St Andrews. (Treatments outlined page 2). Note: St Andrews treatments 4 & 6 were not included due to excessive losses from chemical interactions. Nil is representative of the control treatment. Results are based on $800/t for peas, $20 application cost, Amistar (250ml) $35.25, Proline (800ml) $102.40.

The margin over chemical cost (MOCC) shows that at St Andrews there was an increased return for treatment 2, but minimal positive results for treatments 3 & 5. A loss was made for treatments 4, 6-8.

At Chertsey, all fungicide treatments gave a positive MOCC with peas at $800/t.

Future Research

- Test the disease forecaster in farmers' fields in high disease incidence area.
- Undertake farmer scale trials to define infield yield responses to growth stage based fungicides (7th node & early flower) across a range of sites.

Acknowledgements

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