Project title	Investigating the use of Pre-Tect to prevent run-off (fruitlet abscission) after flowering
Project number:	SF 12 (GSK 219)
Project leader:	James Carew, FAST Ltd
Report:	*Contract report for GlaxoSmithKline and the Agriculture & Horticulture Development Board* Annual report, December 2009
Previous report	None
Location of project:	Wellbrook Farms, Boughton, Faversham, Kent. ME13 9NA.
Project co-ordinator	Mr Rob Saunders
Date project commenced:	7th April 2008
Date project completed (or expected completion date):	31 December 2009
Key words:	Abscission, Ben Gairn, Ben Tirran, Harpin, Pre-Tect, run-off

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The results and conclusions in this report are based on an investigation conducted over a one-year period. The conditions under which the experiments were carried out and the results have been reported in detail and with accuracy. However, because of the biological nature of the work it must be borne in mind that different circumstances and conditions could produce different results. Therefore, care must be taken with interpretation of the results, especially if they are used as the basis for commercial product recommendations.

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.

James carew
Trials Co-ordinator
FAST Ltd

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

CONTENTS

GROWER SUMMARY

Headline

- Pre-Tect shows potential for reducing levels of run-off in blackcurrants.

Background and expected deliverables

The initial component of the natural defence mechanism of higher plants, the hypersensitive response (HR), is associated with plant defence against many bacteria, fungi, viruses and nematodes. The HR is characterized by the rapid, localised death of tissues affected by a pathogen. After the death of localised tissues, the systemic acquired resistance (SAR) pathway is activated. Systemic acquired resistance activation results in the development of a broad spectrum, systemic resistance (Bednarz *et al*., 2002).

There have been a number of studies in the USA which demonstrate the effect of the Harpin protein on disease resistance. Reduction in the impact of *Phytopthera infestans* on tomato with application of Messenger Harpin protein has been observed in pepper (Fontinilla *et al*., 2005). Tomato plants inoculated with *Botrytis cinerea* showed less symptoms of the pathogen following application of Harpin (Fontinilla *et al*., 2005b). In apples, Harpin applied both pre- and post-harvest resulted in a reduction in the effect of infection of *Penicillium expansum* (Capdeville *et al*., 2003).

However, the focus of research has only recently switched to the effect of Harpin on growth and fruiting. There are a number of unpublished research results which demonstrate the effect of Harpin on growth and fruiting, which gives us a basis for this work.

Plant Health Care Pre-Tect is a wettable powder formulation of the Harpin protein. The aim of the project was to determine whether the application of Pre- Tect could help to alleviate the run-off of berries between flowering and fruiting.

Summary of project and main conclusions

During the 2009 season Pre-Tect was applied at the rate of 1.5g/L with an equivalent water volume of 600L/Ha. The product was applied using a motorized knapsack sprayer applying the product from both sides of the plants to ensure optimum coverage.

Treatments were arranged in a completely randomised design with 10 plants per treatment. Timing of application was determined using the FAST flower bud stages chart.

Ben Gairn	**Ben Tirran**
Petal Fall	Open Petal
Early Fruitlet	Petal Fall
	Early Fruitlet

At petal fall, the flower number was counted, and then just prior to harvesting, the fruit number was counted.

At harvest, fruit was collected and supplied to the FAST Lab for Brix and acid levels to be determined.

Results were analysed by ANOVA using t-test to determine the significance of difference between the control and treatment means.

Results - Ben Gairn

The average fruit number from the control plants which had not received any Pre-Tect treatment was 3.42 fruit per cluster. For plants to which Pre-Tect had been applied at Petal Fall, this increased to 4.63 fruit per cluster. However, if Pre-Tect application was delayed to early fruitlet stage there was no effect on fruit number. Fruit number remained at 3.37 fruit per cluster in this case (Figure 1).

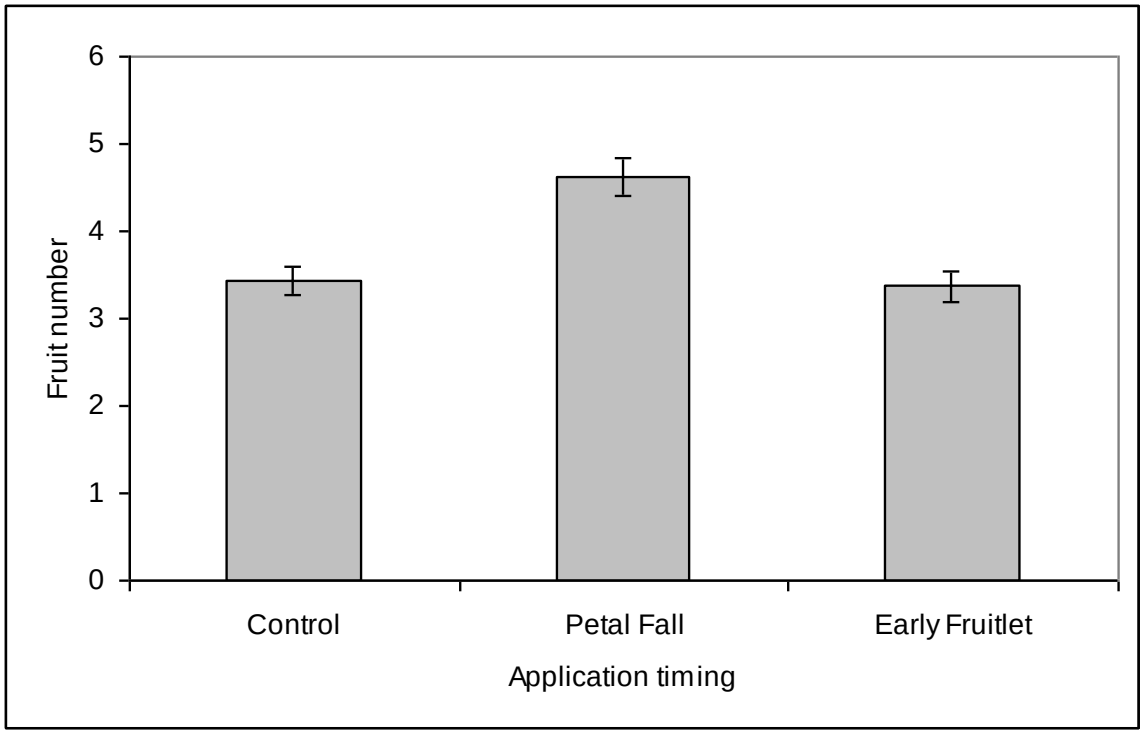

Figure 1. The effect of timing of Pre-Tect application on fruit number per cluster for Ben Gairn. Standard error bars are shown.

ANOVA

Source of Variation	SS	df	MS	F	P-value
Treatment	79.84	2	39.92	15.43	5.4×10^{-7}
Error	558.76	216	2.58		
Total	638.61	218			

The effect of Pre-Tect on fruit number was significant to $P = 5.4 \times 10^{-7}$. The increase in Fruit number between control and Pre-Tect applied at Petal Fall was significant at $P<0.001$.

The effect of Pre-Tect application on percentage run-off was similar. Pre-Tect, when applied at Petal fall reduced the percentage runoff whereas if application was delayed until Early Fruitlet stage, there was no effect on fruit number (Figure 2).

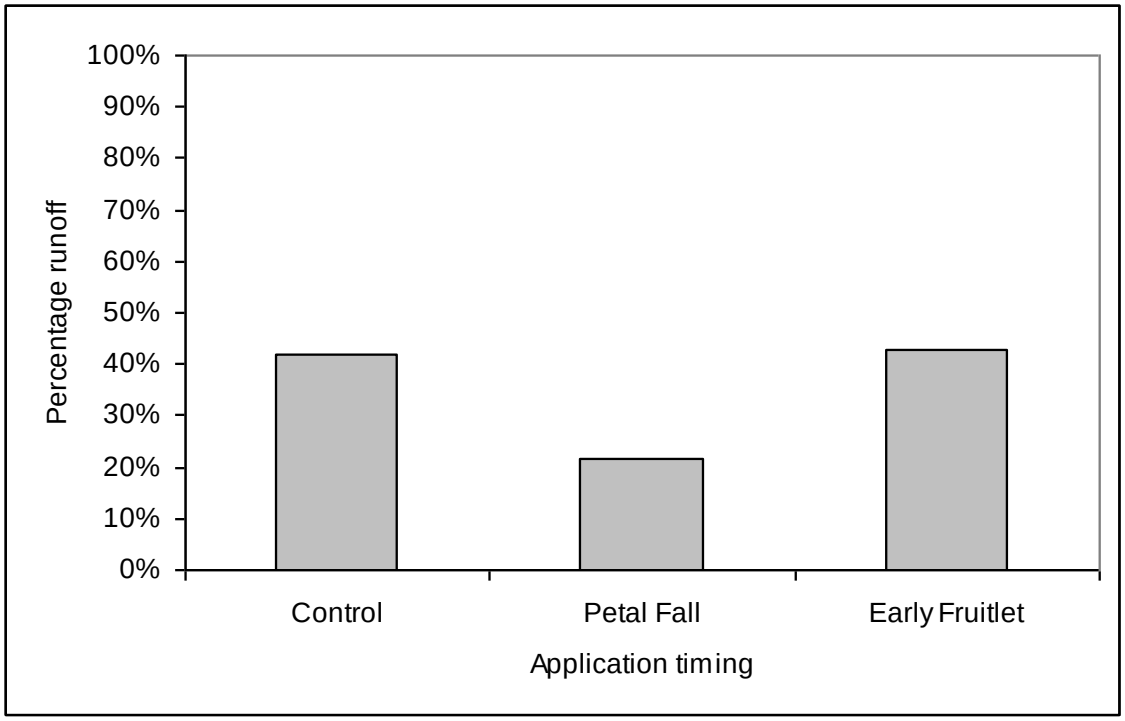

Figure 2. The effect of Pre-Tect on percentage run-off from Ben Gairn.

The °Brix of Pre-Tect treated plants was around 2° higher than the °Brix of fruit from the untreated control plants. This was correlated with a decrease in acidity (Table 1).

Table 1. The effect of Pre-Tect on °Brix of fruit from Ben Gairn.

	°Brix	**Malic Acid**
Control	10.4	31.01
Petal fall	12.2	28.74
Early fruitlet	12.5	29.31

Results – Ben Tirran

There was no significant effect of Pre-Tect on Ben Tirran. There did appear to be an increase in fruit number when Pre-Tect was applied at Open Petal and Petal fall but the effect of treatment was not significant. The variation between fruit number was greater for Ben Tirran than for Ben Gairn and a greater replicate number was needed (Figure 3).

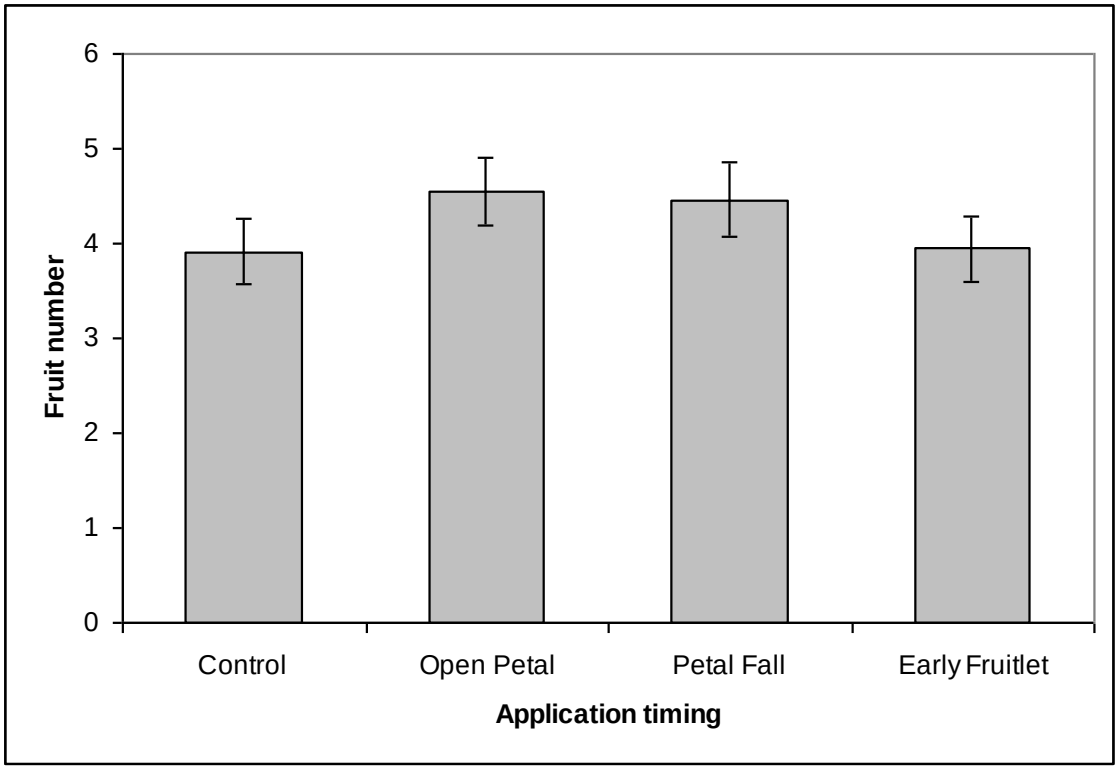

Figure 3. The effect of timing of Pre-Tect application on fruit number per cluster for Ben Tirran. Standard error bars are shown.

ANOVA

Source of Variation	SS	df	MS	F	P-value
Treatment	11.57	3	3.85	0.85	0.47
Error	614	4.51	2.67		
Total	625.57	139			

The °Brix of Pre-Tect treated plants was around 1° higher than the °Brix of fruit from the untreated control plants (Table 2). There didn't seem to be any impact of timing of application of Pre-Tect. Where this was correlated with a decrease in acidity in Ben Gain, this was not the case for Ben Tirran.

Table 2. The effect of Pre-Tect on °Brix of fruit from Ben Tirran.

	°Brix	Malic Acid
Control	16.5	22.32
Open petal	17.4	37.06
Petal fall	17.6	54.56
Early fruitlet	17.4	36.36

Conclusions

There is an indication that Pre-Tect has the potential to reduce the impact of run-off on fruit number. In Ben Gairn, the effects were statistically significant but in the Ben Tirran the effects were not significant. The other significant effect was on Brix. Pre-Tect treated plants produced fruit with Brix which were higher than those which had not been treated.

Unfortunately the trial was started in late April and the treatments should have been applied earlier. The results indicate that the replicate number needs to be increased to take into account the greater variation in the Ben Tirran results than the Ben Gairn results. There does seem to be a potential use for Pre-Tect in blackcurrant but the work needs to be repeated next year to further examine the effects.

Further work

Further work would firstly require the application of treatments from the flower bud stage, continuing until the early fruitlet stage. Secondly the number of plants to which Pre-Tect was applied needs to increase. This would allow details of effects to be determined.

Financial benefits

If Pre-Tect is proven to reduce levels of run-off in blackcurrant, harvested yields will increase leading to improved yields and returns.

Action points for growers

- No action points have arisen from this work.

