# Grower Summary

## SF 012 (GSK228)

Blackcurrants: Hot water treatment (HWT) of cuttings

Final 2012

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Before using all pesticides check the approval status and conditions of use.

Read the label before use: use pesticides safely.

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| **Project Number:** | SF 012 (GSK228) |
| **Project Title:** | Blackcurrants: Hot water treatment (HWT) of cuttings |
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| **Industry Representative:** | Rob Saunders, GSK |
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## Further information

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## *GROWER SUMMARY*

### Headline

- Hot water treatment of four cultivars of blackcurrant cuttings (up to 50$^{o}$C for up to 20 minutes) did not improve establishment of cuttings.

### Background and expected deliverables

The objective of this project was to evaluate different water temperatures and durations of hot water treatment (HWT) to cuttings, for crop safety and potential beneficial effects of establishment and vigour on four varieties of blackcurrant, Ben Gairn, Ben Starav, Ben Dorain and Ben Tirran.

Heat treatment is an established method used to eradicate diseases and pests from plant material and has been utilised in many crops. In blackcurrant, hot water treatment has been used in Denmark and Finland for eradication of gall mite, by immersing cuttings in water baths at 45ºC for 20 minutes. HWT is also used in grape vines for the eradication of various pests and diseases including nematodes and *Phytophthora*. However there can be a narrow temperature/duration margin between achieving pest eradication and damaging the cutting. Different vine varieties have been shown to have different tolerances to temperature and duration of HWT. To investigate whether blackcurrant varieties also vary in their tolerance to HWT, four commonly grown newer cultivars were selected for this trial. Researchers have also reported incidental improvements in crop vigour following HWT regimes when used for pest eradication. As cutting establishment and vigour is important to ensuring plantations are brought into crop on target, this was a further aspect investigated in this project.

### Summary of the project and main conclusions

Cuttings of four varieties Ben Gairn, Ben Starav, Ben Dorain and Ben Tirran were kept in a cold store until treatment on 16 April 2012. Cuttings were removed from cold store and allowed to reach room temperature before immersing in a hot water bath, according to the treatment schedule (Table 1). After the allotted times, blackcurrants were removed and rapidly brought back to room temperature, before planting into 3 L pots filled with a sterilised loam. Irrigation was supplied overhead and pesticides were applied as required.

**Table 1.** Treatment schedule for HWT applied to four cultivars of blackcurrant cuttings, 16 April 2012, ADAS Boxworth

| Treatment number | Temperature ($^{o}$ C) | Duration (minutes) |
|---|---|---|
| 1 | Untreated (not soaked) | - |
| 2 | Ambient | 5 |
| 3 | Ambient | 10 |
| 4 | Ambient | 15 |
| 5 | Ambient | 20 |
| 6 | 40 | 5 |
| 7 | 40 | 10 |
| 8 | 40 | 15 |
| 9 | 40 | 20 |
| 10 | 45 | 5 |
| 11 | 45 | 10 |
| 12 | 45 | 15 |
| 13 | 45 | 20 |
| 14 | 50 | 5 |
| 15 | 50 | 10 |
| 16 | 50 | 15 |
| 17 | 50 | 20 |

Establishment and growth stage was assessed on 5 May 2012, three weeks after planting and was scored according to blackcurrant growth stages. At this first assessment, establishment was similar across treatments 1 to 12. However for treatments 13-15 (45$^{o}$C for 20 minutes and all 50$^{o}$C treatments) there was a significant delay in establishment or an increase in the proportion of dead plants. Shoot growth was assessed on four occasions through the growing season. Figures 1 and 2 show the average growth across all the varieties at both the June assessment and at the final growth assessment carried out in October. Table 2 shows the same data but split by variety. The same result was clear across all assessments and varieties. None of the water treatments (with or without heat) enhanced establishment or growth when compared to an untreated cutting. There were, however, significant effects of hot water treatment, with growth suppression occurring at higher temperatures and longer durations. At 45$^{o}$C for 20 minutes there was some initial growth reduction for varieties apart from Ben Tirran. At 50 $^{o}$C, there was significant growth suppression at all soak durations, with cutting death occurring at durations of 15 and 20 minutes. Ben Tirran appeared to be the most resilient to the hottest treatment showing more consistent growth at 50 $^{o}$C for up to 15 minutes than the other three varieties; Ben Gairn showed marginally less heat tolerance.

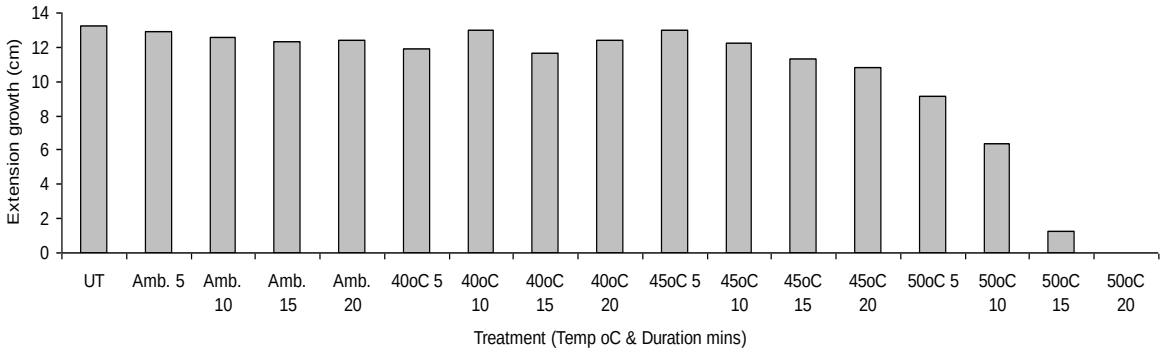


**Figure 1.** Effect of hot water treatment on average growth (cm) of blackcurrant cuttings (averaged across four varieties) – June 2012

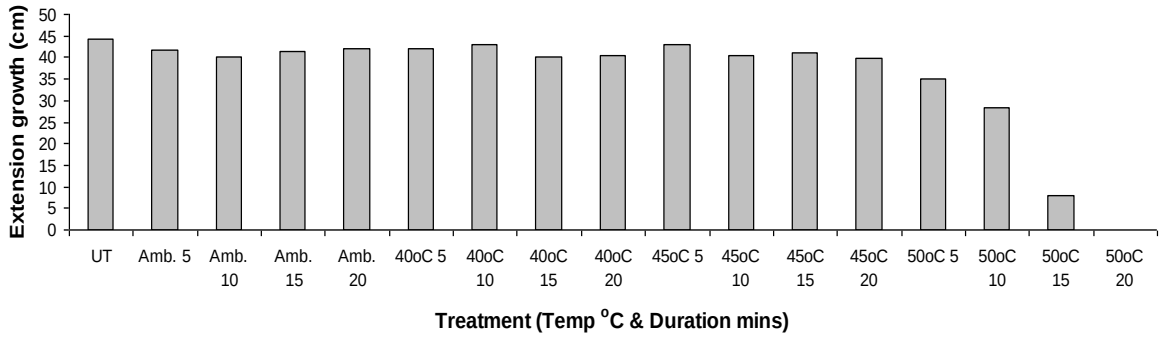


**Figure 2.** Effect of hot water treatment on average growth (cm) of blackcurrant cuttings (averaged across four cultivars) - October 2012

**Table 2.** Effect of hot water treatment on average growth of four cultivars of blackcurrant cuttings - assessment 4, October 2012

| | Average shoot growth in cm | | | |
|---|---|---|---|---|
| **Treatment** | **Ben Gairn** | **Ben Starav** | **Ben Dorain** | **Ben Tirran** |
| Untreated | 52.35 | 41.15 | 45.40 | 38.10 |
| Ambient 5 min | 48.95 | 34.95 | 43.75 | 38.75 |
| Ambient 10 min | 45.30 | 37.05 | 43.80 | 34.90 |
| Ambient 15 min | 49.50 | 39.65 | 43.35 | 33.05 |
| Ambient 20 min | 51.35 | 39.20 | 41.80 | 35.45 |
| 40°C 5 min | 50.45 | 40.95 | 43.25 | 33.45 |
| 40 °C 10 min | 52.20 | 43.50 | 43.55 | 33.00 |
| 40 °C 15 min | 50.65 | 36.75 | 40.25 | 32.45 |
| 40 °C 20 min | 48.90 | 37.00 | 42.30 | 33.05 |
| 45 °C 5 min | 52.35 | 42.90 | 40.80 | 35.60 |
| 45 °C 10 min | 47.90 | 35.50 | 42.45 | 35.50 |
| 45 °C 15 min | 48.50 | 37.85 | 40.65 | 37.30 |
| 45 °C 20 min | 44.00 | 36.70 | 42.70 | 35.40 |
| 50 °C 5 min | 30.40 | 33.15 | 40.25 | 36.40 |
| 50 °C 10 min | 19.70 | 21.50 | 32.15 | 40.50 |
| 50 °C 15 min | 2.30 | 1.70 | 5.05 | 23.25 |
| 50 °C 20 min | 0.00 | 0.00 | 0.00 | 0.00 |

## Financial benefits

This project did not demonstrate improved establishment and vigour resulting from soaking cuttings. Therefore any financial benefit would have to be associated with pest or disease eradication. Establishing a safe and practical method for heat treating cuttings may enable cutting material to be produced with reduced pest and disease pressure from pathogens such as gall mite and *Phomopsis ribicola.* The Plant Health Propagation Scheme (PHPS) in the UK already minimises the level of gall mite contamination in propagation material. Reduction in inoculum of *Phomopsis ribicola,* however, would have a large financial benefit for growers. Further research is required to establish the significance of cutting infection versus other infection routes and also to establish the temperatures needed to eradicate this specific pathogen and to make the process practical on a larger scale.

## Action points for growers

At present there are no action points. Adoption of HWT would first require further research to confirm the role of cutting infection in spread of *Phomopsis ribicola*, then to establish the temperature required for eradication.