

Project title: Producing a horticultural growing media peat replacement through the retention of plant structure in composted food-processing waste "COMPEAT"

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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.

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GROWER SUMMARY

Headline

- Growing media produced by composting food chain waste from a number of sources has been successfully used at up to 75% incorporation rate as a peat replacement for a number of plant species.

Background and expected deliverables

Peat is used by the majority of commercial growers and amateur gardeners due to its aeration and water-holding properties. Growers are faced with increasing environmental, consumer and legislative pressures to avoid the use of peat. The UK has used over 94% of its available peat supplies and Government previously asked for a 90% reduction in peat usage by 2010. Following of a recent Defra consultation¹, recommendations have been made to completely phase out peat use in England within the professional sector by 2030.

Food processing companies must also reduce the quantities of food-processing waste that goes to landfill. It may be possible to address both challenges together if the food-processing waste can be used to create a high-quality alternative to peat.

It was previously demonstrated (CP 23 / HL0172) that composting food chain waste could provide a potentially suitable and sustainable main constituent of growing media as a replacement for peat.

The aim of this project has been, with the aid of a state-of-the-art controlled composting bioreactor facility at the Institute of Food Research (IFR), to control the bioconversion of food-processing waste materials. This computer-controlled facility

¹ Consultation on reducing the horticultural use of peat in England, December 2010, Defra, available at <http://www.defra.gov.uk/corporate/consult/peat/index.htm>, accessed 8 February 2011.

has helped us to better understand the composting process and the characteristics of peat that have to be emulated.

The project partners involved were: Bulrush Horticulture Ltd, the Association for Organics Recycling, Del Monte Fresh Produce (UK) Ltd, Farplant Sales Ltd, the HDC, the Institute of Food Research, Organic Recycling Ltd, Carlsberg, Diverse Technologies Ltd, Madestein (UK) Ltd and Lincolnshire Herbs Ltd.

Summary of the project and main conclusions

The aim of this project has been to provide the scientific and processing knowledge necessary to control the production of high-quality horticultural growing media through the retention of plant structure in composted food-processing and food chain wastes from a wide variety of traceable sources.

High quality growing media have been produced from composted food chain co-products and wastes. These have been evaluated in full plant trials with partners in the project consortium. This represents one of the most extensive programmes of reduced-peat plant trials in the UK. The trials have demonstrated that the new substrates can be used to effectively replace a large proportion of peat in horticultural growing media. Numerous examples have shown that the new composted material may be successfully used as a potentially sustainable peat replacement (so far at up to 75% replacement) in horticultural growing media (pot-grown herbs and several short-term and long-term ornamental pot plants) without loss of growing quality. At 75% peat replacement, the new composted material was generally as effective as the industry standard growing medium.

The main outputs and conclusions are as follows:

- 1) The project has successfully produced high quality growing media through the controlled composting of a range of readily available, traceable waste streams using COBRA1 (bespoke bioreactor) and windrow facilities in conjunction with Organic Recycling Ltd. followed by processing of cubic metre quantities in order

to retain functional plant structure. Waste streams have included leafy vegetables, fruits and cereal by-products – the exact choice of wastes used will depend on availability and cost, as well as competing uses.

Key industry-standard physical properties that relate to growing media structure have been evaluated with Bulrush Horticulture Ltd.

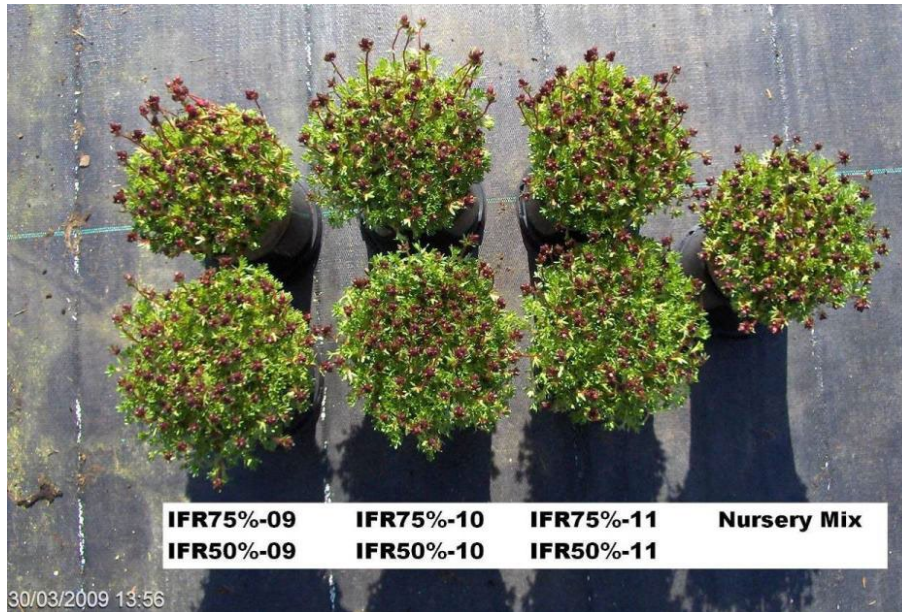
- 2) Through the implementation of over 30 plant trials by commercial growers, the general similarities between the results across a number of plant species indicate that the windrow-derived prototype growing media can be potentially used for a peat substitute without loss of growing quality.

This involved considerable developmental work by Bulrush Horticulture Ltd in controlling nutrient status, and also the commercial growers in carrying out the extensive trials. Furthermore, it was recognised that as for peat-based growing media, a degree of tailoring of the new compost-derived media is required for many plant species.

The plant species chosen were considered to give a rigorous test of the growing medium in a range of conditions. These conditions included subjects that needed to be grown on capillary matting, were seed germinated / bulb crops, specific in their water / feed requirements, short-term / long-term crops. The trials lasted between 2-3 months and one year.

The growing media produced were tested in growing trials with over 25 species of nursery plants of various sizes. In many cases the plants compared favourably to those produced in the nursery commercial mix.

Some of the growing media produced within project were successfully used in plant trials at an incorporation rate of 75% with no adverse or only a marginal effect on plant growth (e.g. Mossy saxifrage, *Osteospermum*, *Phlox paniculata*, *Argyranthemum*).



The Moss saxifrage trials: at 75% peat replacement, the IFR-derived composted material was as effective as the industry standard growing medium (Nursery Mix).

All of the COBRA1 and windrow-derived substrates provided reasonable quality trial results. Some were slightly better than the nursery standard, some are a little worse. The introduction of these growing media could add value and reduce a potential oversupply of lower grade compost.

- 3) An improved understanding of the composting process has provided the information necessary for producing the larger volumes of growing media that would be required to provide a significant alternative to peat.
- 4) Blocking material produced from composted waste streams is promising as a peat replacement. The material had the correct cohesive properties to form well-structured blocks.
- 5) Life cycle assessment indicates that windrow composting creates a slightly larger carbon footprint than peat exploitation, due to unavoidable release of some methane during windrow management. However, the sister TSB-funded ZEE project has indicated that the use of a fully optimised aerobic composting bioreactor is likely to result in a carbon footprint that is about half that of peat.

- 6) Commercial evaluation of the process indicates a positive net present value (NPV) assuming the retail price of the new growing media is similar to that of peat. It is quite possible that the NPV will be increased further by targeted R&D for developing materials handling and processing within an industrial-scale processing facility. The availability of suitable waste streams and associated transport costs will influence both the scale and location of such industrial facilities.
- 7) The IFR was a finalist in the Technical Product category of the Grower of the Year 2011 competition.
- 8) In respect of this work, and that of the sister TSB-funded ZEE project, Professor Keith Waldron received the BBSRC award “Most Promising Innovator of 2011”.

Financial benefits

The financial benefits for growers are not clear at this point. However, it is hoped that the newly developed growing media can be produced at a similar price to peat.

The IFR has continued to protect the Intellectual property (IP) through filing of patents. This is being extended internationally (USA). The IFR and the project partners will continue to identify ways to exploit the IP arising from the project with the ultimate aim of producing the newly developed growing media at a similar price to peat.

At the time of writing, there are two areas of exploitation which are currently being explored:

- 1) The consortia are currently investigating the use of a modified in-vessel system on a nursery to examine a) on-site waste reduction, b) the exploitation and use

of the heat and carbon dioxide generated back into the nursery and c) added value product from this otherwise constant waste production stream.

- 2) The analysis of the physical properties of the various growing media outputs has been undertaken using a mathematical technique termed 'Principle Component Analysis' (PCA). This will be reported in a scientific paper at an ISHS symposia on 'Composting and use of materials in substrates' in October 2011. The use of this technique should be further developed and then used to assess new and novel materials and mixes to give clear guidelines of how the materials will behave in use. This will mean that a laboratory technique can be developed to short cut much of the early testing of mixes to achieve suitable 'on-nursery' mixes hence reducing the time taken to bring new materials into commercial use.

Action points for growers

- There are no action points for growers arising from this project.
- However, the project is an important stepping stone on the path to reducing the horticultural use of peat and has developed substrates with the potential to effectively replace a large proportion of peat across a wide variety of plant species.
- The project fed into the Government consultation on reducing the horticultural use of peat reflecting both the opportunities and the significant challenges which remain.