Eliminating peat from propagation using growing media blocks

Guidance and information note 3 – Making and using growing media

This short guidance note explains how we are making our growing media, why we use a commercially available control alongside, how we make the blocks, how we sow them and set them out in our trials and how we look after the blocks as the seedlings grow.

The growers:

- Wester Lawrenceton Farm, Forres, Moray (Pam Rodway)
- East Neuk Market Garden, St Monans, Fife (Connie Hunter and Tom Booth)
- Tombreck Farm, Lawers, Aberfeldy, PH15 2PB (Rachel Wake and Ian Machacek).

Growing media recipes

All three trial hosts are using the same recipe for their growing media, along with a commercial growing medium as a control. The recipe was derived from a series of trials conducted in earlier projects and has been shown to be successful in the past. The growing media used in the trials are based on composts which have been made on the trial host sites in insulated Aerobins over a period of 4 to 6 months (see project Guidance Note 2 for details). The Tombreck growers are using an additional compost made from similar ingredients which has been made locally over a 1-year period. The natural heating in a compost heap is very important, because it's the heat which kills plant, animal and human pathogens, weed seeds and weed propagules and which denatures viruses. The heat also helps to break down pesticides and other organic contaminants that might be present.

The growing media recipe is:

- 4 parts by volume of Aerobin compost (sieved through a 10 mm then 6 mm sieve)
- 4 parts by volume of leaf mould (sieved through a 10 mm then 6 mm seive)
- 1 part by volume coarse river sand (sieved through a 6 mm sieve)
- 1 part by volume loamy soil from mole hills (sieved through a 6 mm sieve)

We recognised (and embraced the fact) that none of these ingredients would have been sterile (unlike sphagnum peat from most sources) and we made every effort to try to ensure that

microorganisms present in the materials were likely to be beneficial rather than harmful. See below for details.

The Aerobin™ composts: See project Guidance Note 2 for details of the recipes used to make composts at the three sites. All three sets of host growers felt that their composts (started in November and December 2023) were not mature by the proposed trial start date of late March/Early April 2024. Despite claims that the Aerobins should insulate the feedstocks and allow good self-heating, temperatures at the centre of the composting mass were usually only a few degrees above air ambient at all three sites from November through to the end of March. All the trial participants agreed that 4 months is not likely to be long enough to make good compost in Aerobins in Scotland when the start date for composting is November. It may be possible to make good compost in them in a 4-month period during summer conditions. The growers at Wester Lawrenceton and East Neuk decided to postpone their trials to let the composts have more time to mature. Those at Tombreck decided to have a go as planned. Their compost was sieved and prepared for use in growing media 115 days (approximately 16 weeks) after it had been started. When sieved to remove the coarse fragments, the fraction that passed through the 6 mm mesh smelt sweet and it was not obvious that it was only around 4 months old.

The additional compost used at Tombreck: A more mature compost made locally was also used to make growing media in a fourth treatment at Tombreck. It was based on a mixture of fine (2 – 10 cm in the shortest dimension) wood chip, grass clippings and herbaceous plant/vegetable tops which had been composted, covered with a breathable cover and turned on two occasions within a period of 12 months. It too smelt sweet and looked darker, with finer particles than the Aerobin compost.

Plate 1. Sieving the composts using the rotational sieve (front of picture) and static sieve.

Plate 2. Sieved Tombreck vegan compost ready for mixing with other ingredients in the media.

The leaf mould: Leaf mould is required in large quantities for the recipes used and this is one of the most difficult ingredients to source for most growers. It is not possible to buy leaf mould and great care needs to be taken over a very long period to prepare enough at a high quality for use several years into the future.

The leaf mould used at Tombreck was made from a mixture taken from two sources. Most of it (around 70%) had been made from fallen leaves from mixed hardwood trees over a period of 10

years after storage in a dedicated bin. The remainder was harvested from the forest floor of a native wood where beech was the predominant species. Where leaf mould is to be used for growing media manufacture, care needs to be taken to ensure that plenty of air gets into the rotting leaves over the years that it is forming. It is also important to ensure that sufficient moisture gets in (or the leaves will remain dry and intact) but not too much (when they would turn into a slimy, anaerobic smelly mass). In most areas of the UK, leaf mould will develop naturally and well if leaves are simply dumped in a chicken mesh-sided, open enclosure uncovered.

However, the leaf mould should be checked at least annually and it may be necessary to fork it up a bit, cover it or start a new heap elsewhere in order to ensure that it is ready for use. When ready, the leaf mould should be dark and moist, with fine particles and should have a sweet, earthy smell. If taking leaf mould from your own woodland, you should choose harvest only small quantities at a time from mixed species wood. It is also very important that you never take leaf mould from a wood where there is any evidence of honey fungus or any other tree diseases. If you take leaf mould from a diverse, obviously healthy wood, then there is every chance that it will contain a diverse, healthy microflora, which could help seeds and seedlings to establish well and resist disease.

The coarse river sand: The small amount of sand used in the growing media had a particle size range of approximately 0.5 to 2 mm. It contained small stones which were sieved out prior to use. Whilst it is possible to buy horticultural sharp sand for this purpose, building sand or shell sand from beaches should not be used, because they tend to contain too much salt and also often have a strong liming (or neutralising) value.

The loamy soil: The soil used in the growing media was taken from local molehills. It was not steam-pasteurised, unlike many loams used in commercial and some home-made media. While steam-pasteurisation can kill most of the pathogens present in loam, it will not necessarily kill all of them and will certainly kill some of the beneficial microorganisms too. Rather than sterilise, we used molehill soil selected from a field which has never had any horticultural crops grown in it (in particular no brassica crops which may have suffered from clubroot and no soft or cane fruit, which may have suffered from disease caused by Phytophthora species). We also looked for a species-rich field in which a healthy and diverse range of grasses and broadleaves were growing in pasture and in which no herbicides or synthetic fertilisers have been applied for many years. This type of field (which would probably be easily found on most mixed organic farms) would be most likely to contain a diverse range of microbial species some of which would help seeds and seedlings to establish well and resist disease.

Preparing the growing media and choosing a control

The growing media ingredients were mostly sieved just before forming the blocks. Where it was necessary to collect ingredients days before making the blocks, great care was taken to keep the ingredients moist, cool and open to the air but protected from rainfall ingress.

On the day in which GrowBlocks were to be formed, ingredients were thoroughly mixed according to the recipes in large trugs. Once mixing was complete, the trugs were labelled carefully (because all three compost-based media looked very similar and it would have been easy to mix them up!).

Plate 3. Making small blocks from vegan compost-based media at Tombreck

Plate 4. Making large blocks from non-vegan compost-based media at Wester Lawrenceton.

Moorland Gold® was chosen as the control medium because it was known to be a good quality, easily-available product, which is in common use by small growers. Although it is peat-based, the peat in it is not extracted from bogs but is instead filtered from drinking water supplies during processing. Moorland Gold has a fine particle size because it is based on well-humified peat. It is therefore ideally suited to making blocks. Not all peat-reduced and peat-free media would make good blocks because some are very open in texture and contain a high proportion of wood fibres and coarse bark.

Making the blocks

It is important when making blocks to ensure that the medium has a fine particle size and is slightly sticky. A medium will not form cohesive blocks if it is too coarse or too dry. We found it necessary to add a little water to the Moorland Gold medium in order to make it suitable for making blocks. All our other media naturally had an ideal moisture content and texture for making blocks, although some people may find when repeating our methods that they may have to add water to their media before starting the blocking process.

There is definitely a knack to making blocks that are sufficiently cohesive to be lifted once formed and which will stay cohesive during normal management as the seeds sown in them germinate and grow into young plants. Part of that depends on making the right media with the right moisture content. But it also depends on filling the blocks with sufficient media, firming it in to the right extent and using a good technique to gently but firmly push the blocks onto trays. A bit of practice is needed to get it right, but in short, we:

1. Used Ladbroke Blocking tools (four-block tool for peas, five-block for kale and lettuce)
2. Pushed the empty tool firmly down into a trug full of growing medium
3. Up-ended the tool and pushed the compost firmly into each block
4. Pushed the half-full tool back down again into the trug of growing medium
5. Up-ended the tool and gently firmed the growing medium within each block again
6. Placed the filled tool on to the desired position on capillary matting sat on a plastic or wooden tray and gently pump the handle up and down in order to release the blocks onto the tray. The blocks should be firm enough to be moved by hand into different positions if they need to be.

We have produced a short video showing how the blocks are made – click here to watch.

Treatments, plant species and trial layout

There were four types of GrowBlocks (treatments) at Tombreck as follows:

- A medium (made according to recipe on page 1) based on the vegan Aerobin compost
- A medium (made according to recipe on page 1) based on the non-vegan Aerobin compost
- A medium (made according to recipe on page 1) based on 1 year-old vegan compost
- Proprietary control based on filtered humified peat (Moorland Gold®)

We sowed three types of seeds in each type of growing media. These were:

Pea (Kelvedon Wonder), Kale (Nero de Toscana), Lettuce (Maureen)

Plate 5. Sowing seeds into the blocks at Tombreck

Plate 6. Large and small blocks made from vegan compost-based media at Tombreck, ready for sowing.

There were 12 blocks of peas and 15 blocks of kale or lettuce in each "plot". There were three replicates of each treatment/plant species combination. Each replicate was maintained on separate trays and the blocks within each were set out in a randomised block design.

Blocks were placed on plastic gravel trays (one per replicate) lined with capillary matting and one seed was placed by hand in each block. The capillary matting was watered gently and the trays of blocks were covered in Enviromesh to protect them from the cold and to give some protection from rodents. The trays were kept in an unheated polytunnel.

Maintenance of Growblocks and performance assessments

The GrowBlocks were checked daily, and the capillary matting watered if necessary. The Enviromesh was removed once most of the seedlings had germinated to allow light and air to the developing seedlings.

The number of seeds germinated (and % germination in each plot) were recorded after approximately 10 days, 21 days and 28 days and any abnormalities in seedlings were recorded where they occurred. The appearance of seedlings after 1, 2 and 3 months will be recorded and the fresh weight of all plants in each block will be measured after around 3 months. Any liquid feeds applied will be noted.

Laboratory testing of growing media

All media including the control will be sent to laboratories for testing, the results of which may help us interpret the reasons behind performance of plants in the different media.

Tests being done include:

- A physical test (air-filled porosity)
- Chemical tests including pH, electrical conductivity, total nutrient content (nitrogen [N], phosphorus, potassium, magnesium and sulphur), readily available N [nitrate and ammonium], organic matter content, total carbon [C] content and C:N ratio
- Biological tests (including compost stability [microbial respiration] and the presence of total and viable microbial groups (fungi, bacteria and protozoans)

Future Guidance Note

The final guidance note will cover results of the trials, results from chemical, physical and biological tests on growing media and will include interpretation of the results and a discussion on the potential for producing home-made growing media blocks for propagation using the methods described.

Get involved:

The project team is keen to engage with others. Growers, horticultural scientists and other interested parties are invited to sign up to receive:

- Guidance notes on techniques being used in the project
- Project updates
- Invitations to online and in-person meetings.

Research Institution: SRUC
Co-ordinator: Dr Audrey Litterick, Earthcare Technical

info@innovativefarmers.org 0117 987 4572
www.innovativefarmers.org @IFarmers

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