The Peatering Out Project©

Arnie Rainbow
Peatering Out Ltd, Walton House, 218 High Street, Trimley St Mary, Felixtowe, Suffolk IP11 905

INTRODUCTION

In the U.K., horticulture is under pressure from major retailers and conservation groups to phase out its use of peat, which has for 40 years been the main component of growing media. Antagonism between peat producers and conservationists has only impeded progress. Many growers, disillusioned by experiences with alternative ingredients introduced in the late 1980s feel bewildered by current options.

Three years ago the author entered a partnership, called Peatering Out, with horticultural consultant John Adlams to undertake research that would help ease the nursery industry through what we felt was an inevitable change.

Peatering Out focuses on the use of green compost (composted green waste/ composted yard waste) because:

- Availability is expected to become sufficient.
- Quality is growing rapidly.
- Recent research shows its potential is much greater than once supposed.
- It is competitively priced.

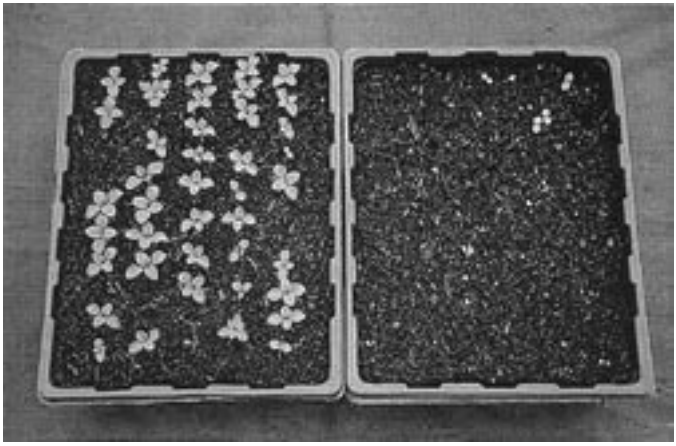

Figure 1. Good quality green compost (seed germination test, right hand tray) can be converted into a cost-effective growing medium (seed germination test, left hand tray) , using a suitable diluent (peat, bark fines, etc).

High nutrient levels in green compost can be turned from a problem into a cost benefit by amelioration (Fig. 1):

- Dilution with peat, bark, and foresting brash.
- pH reduction.
- Addition of a soluble nitrogen supplement.

Fortunately forestry and timber recycling are also expanding strongly in the U.K. In the short-term, at least, peat makes a good diluent because of the following characteristics:

- Low cost.
- Low pH.
- Very low available nutrients.
- Low bulk density.
- Readily available, although increasingly imported.
- Existing industry experience using the product.

Key Features of Green Compost:

- Soil-like (darker and denser than peat).
- High pH (but more manageable than once supposed).
- Low in available N (cheap to add).
- High levels of other nutrients but mainly in slow-release form (especially nitrogen, phosphate, iron).
- High cation exchange capacity (buffering of potassium, ammonium, magnesium, etc).
- Aids nitrification (NH_4 to NO_3).
- Excellent wettability compared with peat.
- Physically stable (because of the high lignin content).
- Air : water ratio can be managed.
- Possible suppression of algae, moss, liverwort and some diseases. (Fig. 2).
- Sustainably sourced.

Its ability to replace conventional nutrients (apart from water-soluble N) and wetting agent, makes green compost good value (Table 1).

The high cation exchange capacity will often enable the omission of loam — a further cost saving.

Figure 2. Suppression of liverwort and *Xanthomonas campestris* pv. *hederae* in *Hedera colchica* 'Dentata Variegata' (peat-based medium, left; medium containing composted material, right). Moss, algae, snails, and diseases such as *Phoma* sp. have also been suppressed.

Table 1. Typical costs and included nutrient value of a green-compost-based growing medium (33% v/v in peat-reduced pot/bedding medium).

	£/m³ green compost			
	Manufacturer	Grower	Manufacturer	Grower
Green compost 10 mm 40 m³ bulk	9.00	-		
24 × 1 m³ bags	-	19.00		
Delivery premium (cf sphagnum peat)	4.50	NA	13.50	19.00
Value of included ingredients:				
Nutrients (N[1])	1.20	3.90		
Magnesium limestone	0.27	0.90		
Wetting agent	1.20	3.36	2.67	8.16
Net cost of green compost			10.83	10.84
Net cost as 33% of growing medium			3.61	3.61

[1]Water-soluble N is added as ammonium nitrate or calcium ammonium nitrate.

RESEARCH METHODS

The project comprises: A literature survey, laboratory studies (on raw materials, formulations, and stability), grower trials, and retail product development.

The laboratory studies include a wide range of chemical and physical tests, plus bioassay based on germination of cress seed. These studies are helping Peatering Out to develop growing media for hobby gardeners. However, product development is mainly focused on professional production of plants in containers, including bedding, pot plants, herbaceous perennials (including ferns), alpines, heathers, shrubs, conifers, roses, deciduous trees, herbs, and vegetable and ornamental transplants.

Some 27 nursery trial sites are spread from Sussex to Northern Ireland, Dorset to Scotland. Twenty-four of the sites are commercial nurseries and three are colleges or research centres. The sites provide 40 trials, featuring 200 cultivars of 172 species. Key subjects such as petunia and winter pansy are replicated over several sites giving more than 300 crops in total. Lime-hating sensitive species are not well represented because we could not secure sufficiently long-term funding and because we believe in "learning to walk before we can run". The wide geographical coverage provides a range of production systems (e.g., irrigation methods), markets, and climates.

Peatering Out has a trials strategy of:

- Including peat-reduced and peat-free treatment mixes compared with the grower's standard peat-based product. After all, peat is a good cheap diluent and the alternatives are currently only available in limited volumes.
- Minimal changes in the nursery's standard mix and management systems.

- Providing a demonstration trial: Plants are nonrandomised to facilitate normal management and detection of treatment effects that are usually only visible in blocks of plants.

Good quality green compost was obtained from composting operations in Co. Armagh, Dorset, Kent, and Cheshire. Diluents include: sphagnum peat, medium grade; composted forestry residues; composted pine bark fines; and coarse conifer bark.

All except peat received a nitrogen supplement at rates ranging from 500 to 750 g ammonium nitrate (total nitrogen; 35%N) per m^3 of the diluent (not of the total mix). Additional nitrogen was added according to use. In Northern Ireland, ammonium nitrate was replaced with equivalent rates of calcium ammonium nitrate (CAN: 27%N) to meet local security requirements.

Green compost was used in peat-reduced and peat-free mixes by volume as follows: Ericas 20%; propagation 25%; bedding, summer 40%; bedding, winter 33%; pot plants 33%; HONS (all types) 33%; herbs 33%.

RESEARCH OBSERVATIONS

Full assessments will follow completion (December 2003) but interim results show:

Bedding Plants. Overall, peat-free and peat-reduced mixes have matched standard peat-based mixes (many of which contain low levels of loam and/or bark). The success of outdoor crops started in December 2001 and December 2002 was especially gratifying. Some vigorous subjects would have benefited from slightly higher rates of nitrogen in peat-reduced and peat-free mixes. All crops have been sold.

Pot Plants. Studies with pot chrysanthemums show that capillary matting needs to be run slightly damper for peat-reduced and peat-free mixes than for the usual peat-based mix. Otherwise, bedding plants comments apply.

Hardy Nursery Stock. On one site, an outdoor capillary bed proved to be too wet for herbaceous perennials newly potted into peat-reduced and peat-free mixes but they recovered to make saleable plants. Rose plants potted into taller pots of the same mixes established well. Overall, subjects ranging from alpines to deciduous trees performed as well in peat-reduced and peat-free mixes as in peat-based. Of special note was:

- Suppression of algae, liverwort, and moss in peat-free mixes.
- Suppression of *Xanthomonas campestris* pv. *hederae* (syn. *Xanthomonas hederae*) in *Hedera* cultivars — especially in the peat-free mix.
- Suppression of *Phoma lavendulae* and *Botrytis cinerea* in *Lavandula angustifolia.*
- Suppression of snails in *Choisya ternata.*
- Absence of slumping, even in outdoor crops receiving overhead irrigation.
- Greater success than expected with calciphobes (pH and EC seems to be less limiting than commonly supposed).

Cuttings (Ornamentals). Rooting out was approximately 10% slower in peat-free and peat-reduced but strike rate and overall quality was comparable with peat-based media (Fig. 3). Peat-free plugs were significantly more resilient than peat-based plugs.

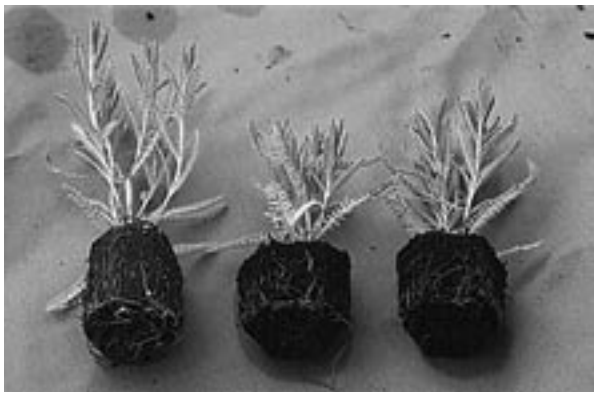

Figure 3. In mixes based on green compost, initial root development has tended to be slightly slower and shoot growth more compact. However, final quality has matched standard (peat-based) treatments overall and rootballs have been especially robust. (left to right: peat-based; peat-reduced; peat-free)

Seeds (Bedding and Vegetables). Germination was sometimes slightly slower in peat-free and peat-reduced mixes but percentage germination was unaffected. Vegetable transplants in peat-free and peat-reduced mixes needed a nitrogenous feed slightly sooner than the peat-based (proprietary) product. However, overall development was satisfactory and plants from all three treatments have subsequently established well in the field. As with cuttings, mixes based on green compost showed enhanced resilience at "pulling".

Herbs. Establishment from seed or plugs in peat-free and peat-reduced mixes matched establishment in the peat-based (proprietary) product.

General. Of the four sources of green compost, none have proved problematic in terms of physical contaminants, odour, weeds, or other quality issues. Indeed, weeds and stones were no more of a problem in green compost than in other substrates.

Initial rooting-out into peat-free and peat-reduced mixes tended to be slower but the plants usually caught up except where overwatered. In nonwoody subjects, peat-free and, to a lesser extent, peat-reduced mixes produced plants that were more compact — the effect being similar to that of a plant growth regulant. The "dwarfing effect" has been significantly increased in some trials where bark fines were used as the diluent instead of composted brush. The effect does not appear to be a result of nitrogen deficiency.

Before use, the bulk density of peat-free and peat-reduced growing media based on green compost is significantly higher than in equivalent all-peat products: typically 70% to 80% and 40% to 45% higher respectively when composted bark/forestry brash or peat are used as diluents. However, when plants are watered ready for dispatch, these differences are reduced: for example, to 7% and 0% in the case of pelargonium.

Each nursery's normal irrigation scheme has proved satisfactory in most crops. However, hand watering has been modified to "less but more often" in some cases, with overall water use being slightly reduced.

CONCLUSIONS

Green compost has greater potential in growing media than commonly supposed. Trials results to date suggest that it is effective, versatile, competitively priced, and may offer some additional benefits:

- 'Plant growth regulator' effect.
- Suppression of liverwort, moss, and algae.
- Suppression of certain diseases.
- Deterrence of snails (and slugs?).
- Physical stability.
- Robust rootballs may enhance handling, especially in all propagation and automatic transplanting systems.

However, the would-be user needs to consider carefully:

- Source of green compost — accredited or seeking accreditation to PAS100 (U.K. agreed standard specification).
- Choice of diluents.
- Bulk density issues — benefit or disadvantage depending on crop/market.
- Irrigation — give a thorough initial watering, and then allow drying back before watering again.
- Denser growth.

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FURTHER INFORMATION

More information on this research is available at <www.peateringout.com>.