Digging into Composts

Workshop session on peat and its alternatives for container composts: the assessment, sourcing, use, and management of materials.

MODERATORS

Margaret Scott
Deputy Director, Horticultural Research International, Efford Experimental Station, Lymington, Hampshire

Neil Bragg
Technical Manager, Bulrush Peat, Northern Ireland

SESSION REPORTER

Spence Gunn
GB&I Regional Editor

AIM OF WORKSHOP

In the UK, and much of Europe, the use of peat as an ingredient in container composts has become an important environmental issue. Environmental groups have given publicity to peat as a non-renewable resource, and to the need to preserve peat bogs as a habitat for wild plants and animals. They have highlighted horticulture as a consumer of peat and hence as a threat to the conservation of peat bogs.

Rightly or wrongly, this has resulted in customer pressure on the horticulture industry to develop alternative ingredients for soil amendments and container composts.

This workshop aimed to highlight the characteristics of peat that have made it so valuable as a container compost ingredient, and which would therefore need to be present in any alternatives. It was also intended to demonstrate the improbability of finding a single material that can replace peat for every growing situation in which peat is currently used. Finally it was hoped to illustrate the kinds of questions growers will have to ask their customers, their suppliers and their advisers before selecting new compost ingredients.

After an initial briefing, the workshop delegates were split into six groups. Each was given a specific crop to produce for a customer who had specified a peat-free growing medium. Each group had to assess a range of materials, samples of which were available, and choose those they felt most suitable for their crop. Neil Bragg acted as the supplier of each material. Margaret Scott acted as the customer for each crop. John Adlam (I.P.P.S. committee member and horticultural adviser) was available to give impartial technical advice to each group.

BRIEFING

The Properties of Peat. The following properties of peat were cited as making it particularly suitable as a container compost ingredient, although it was emphasised that peat is not a homogeneous material but differs according to its place of origin and vegetative composition:

- Clean product to use
- Reliable batch to batch and relatively uniform within the various types
- Reasonable structure for plant growth
- Low nutrient status makes regulation of feeding easy
- Low in weeds and pathogens
- Economical
- Brown “earthy” colour highly acceptable to consumers

Properties of peat alternatives currently available.

- These tend to be generally more expensive than peat
- Many have a tendency to lock-up nitrogen making control of nutrition more difficult
- Animal wastes are high in phosphate, straw-based media are high in potash
- Peat alternatives based on waste products also tend to vary in quality, from batch to batch, more than peat
- Crop management and compost handling procedures invariably need to be changed when compost ingredients change

Peat alternatives available at workshop. Each group was allowed to use up to three ingredients from the following, in a container compost for its crop.

Pine Bark. Waste product from forestry. Needs to be matured, or composted with nitrogen. Wide availability, 1.5 to 2 times price of peat. Slightly less dense than peat. 0N-5P-3K-0Mg. Manganese levels can vary depending on source. AFP 35%. Currently used widely in container mixes at between 20% and 50% by volume.

Spruce/Larch Mixes. Generally as above. Widespread availability, 1.5 times price of peat. Similar density to peat. 0N-5P-3K-0Mg. Manganese levels can vary depending on source. AFP 20% to 30%. Used with varying success in propagation and container mixes.

Composted Bracken. Relatively new material, by-product of forestry industry where bracken is a major weed. Can be composted or matured without N, then shredded or chopped. Further work needed to determine consistency of nutrient status etc. but initial trials in container composts at Efford EHS look promising, especially for ericaceous species.

Polystyrene Granules. Waste material from packaging industry. Non-biodegradable therefore questionable environmental-friendliness. Widespread availability, very cheap, various colours. Chemically and nutritionally inert. Useful for amending other materials, for example increasing AFP. Very low density. Major problem is handling—tends to blow around and become electrostatically charged. Possible residues of plasticiser or boron may lead to phytotoxic damage.

Perlite. Heat expanded volcanic rock. Mined as mineral. Chemically and nutritionally inert granules, little buffering capacity, very high porosity, low density. Widespread availability, 2 times price of peat. Already used in some propagation mixes in nursery stock. Dust may present health hazard.

Vermiculite. Naturally occurring mineral, heat treated (1000C) for horticultural use. Asbestos content may be health hazard. Nutritionally inert. pH very variable depending on source. High cation exchange capacity—can "hold back" nutrients such as potassium and ammonium N. Currently used in mixes for bedding, pot plants, young herbs. Possible role as fertiliser and pesticide "carrier".

Hop Waste. Waste product of brewing industry. Limited availability but relatively low price. Must be composted to avoid fungal growth (spores may present health hazard). Fibrous texture. 0N-9P-0K-5Mg but large residues of organic N which break down releasing N to plant. Density on drying similar to peat. May become difficult to wet with time. Has been used as ingredient (nitrogen source) in mix with pine litter for raising azaleas in Belgium and bulking ingredient in growing bags. May prove useful in mix with straw waste.

Grain Waste. Industrial waste product currently used as animal feed. Limited availability. Price depends on transport costs. Granular texture. 0N-6P-3K-3Mg but contains some organic N released when composted or used in growing media. Low density when dry. Some sources may be high in copper (phytotoxic). Possible health risk from fungal spores. Possible development as ingredient with straw to produce container growing medium.

Municipal Solid Waste/Refuse Derived Humus. Domestic waste consisting largely of paper/card and degradable organic matter. Inconsistent availability, price similar to peat. Soil-like to granular texture. Typical 3N-6P-4K-4Mg but very variable. Problems include possible presence of pathogens (plant and human), heavy metals, phytotoxins, glass. Has been used with varying success as container medium and soil amender.

Despite problems it is a renewable resource and further research may be worthwhile.

Coir. Residue from coconut fibre production. Erratic availability, 2 to 3 times price of peat, fine granular texture with some fibre, some coarser grades. 0N-0P-4K-0Mg (at pH 5.9). Salt contamination may be present. AFP around 10%, similar density to peat. Pathogen and fungal spores may be present. So far shows promising results as container medium. Not necessarily environmentally friendly to use coir in developed countries in long term as big problem in developing countries is loss of organic matter through soil erosion.

Animal Wastes. Pig, cow, poultry, and sheep manure. Widely available, slightly dearer than peat, variable texture and nutrient analysis. Problems of high levels of available nutrients releasing unpredictable amounts of N. Best regarded as potential ingredients in mixes with peat, coco fibre, or straw—fertilisers rather than peat substitutes.

Expanded Aggregates and Slate Waste. Clay waste or slate waste from quarrying etc. Treated at high temperature to expand material. Limited availability. 2 to 3 times price of grit. Hard, granular texture, low density if heat expanded. Typical 2N-1P-1K-0Mg but varies with source. High buffering capacity. Currently included in some potting mixes to improve buffering capacity. Could be developed for use with alpines and salt sensitive plants and for use in semihydroponic systems.

Loam. Traditional material used for John Innes composts. Now very limited in availability. Check for possible contamination with heavy metals or residual herbicides.

Rockwool. Produced by heating rock to 1500C and spinning off "flocks", Fibres can be woven into matting or pads. Widely available, 1.5 to 2 times price of peat. Fibrous texture, very high AFP, very low density, nutritionally inert, pH 8. Used widely in horticulture, sometimes added to peat in container mixes. Well established as partial or complete peat alternative.

Pumice and Zeolite. Produced by fast cooling, in water, of volcanic lava flow. Low availability, expensive, relatively inert. High AFP, low density. Zeolite has high cation exchange capacity. Has been used as an additive to peat and a stand-alone growing medium. Zeolite could be mixed with spent mushroom compost to adsorb high levels of available nutrients.

Sewage Sludge. Waste product. Wide availability, variable price. Crumby texture when dried. Would be co-composted with straw, wood chips or bark for use in horticulture giving a typical 3N-5P-8K-7Mg. Batches vary and may also contain heavy metals, organic residues, phenols, or herbicides. Trials have given inconsistent results as container mix ingredient. Further work needed, especially on human pathogen survival.

Spent Mushroom Compost. Waste product of mushroom growing industry. Mushrooms grown in compost containing chopped straw, manure, calcium sulphate, and sugar source. Consistent availability, fibrous texture when dry. Typical 5N-2P-8K-7Mg, pH 7.3. Density similar to peat. May contain organic contaminants, e.g., herbicides, pesticides. Could be used co-composted with wood chips. Currently used in tree planting composts.

Worm-Worked Composts. Useful method of treating materials that are otherwise difficult/unpleasant to handle. Limited and localised availability, similar price to retail brands of peat-based potting mixes. Friable crumb structure. Typical 0N-8P-8K-2Mg, pH 9.3. Possible heavy metal contamination and possible survival of human or plant pathogens. Has been used as peat amendment but with variable results.

Wood Wastes. Wood shavings, sawdust, chips, and fibre. Variable price, competition from purchasers in chipboard industry. Nutrient analysis depends on how material obtained and processed, can be short of N, can be composted. Similar density to peat when in fibrous state. Widely used in U.S.A. and Australia as basic ingredient for potting mix. Could be useful co-composted with refuse and manures.

Straw. Farm waste, widely available, variable price, needs composting with N after which the C : N ratio stabilises at between 30 and 40 : 1. Herbicide residue may be present. Best considered as co-composting material with other waste products, e.g., sewage.

RESULTS

The crops produced by each group and the media used are the following:

Group 1

Crop. Two thousand *Ficus benjamina* in 5-litre plastic terracotta pots to be used in the landscaping of a shopping mall.

Customer's Criteria. The plants could only be watered in the evening; the compost had to be of a natural looking colour and present no fire hazard—shoppers often drop cigarette ends into plant pots. It had to be pest and disease free, be safe for humans, and contain no pesticide residues. The pants had to have a six month pot life and the pots had to be heavy enough to be stable, light enough for ease of handling. Maximum price set by customer was £3.05/plant.

Compost Choice. Prime considerations identified by the growers were customer requirements plus pH, water retention, and ease of availability of materials. Coir was eliminated because the team felt the risk of human health problems, however remote, would be unacceptable for the given use of the plants. They decided to mix a range of grades of composted bark to give the required water retention, bulk density, and potting machine flowability. Cost of compost was estimated to be 20p/plant, on a total production cost of £1.13/plant.

Group 2

Crop. 60,000 *Erica carnea* in 9-cm pots to be ready for a municipal roundabout planting in March.

Compost Choice. Decided to grow from single stem cuttings taken in September and struck in medium grade (18-mm screen) coir. They would be potted into 9-cm pots the following May—into an 8 Norbark : 1 grit : 1 rockwool (by volume) mixture, with nutrition supplied by controlled release fertiliser and ammonium nitrate—and grown on in a vented tunnel on sandbeds. Total costs were reckoned at £13,900 for the batch.

Group 3

Crop. Spot crop of 50,000 poinsettias for a wholesaler, to be ready on December 10 for Christmas market.

Customer Criteria. Early flowering *Euphorbia pulcherrima* 'Lilo'. Crop to consist of 80% red, 10% pink, and 10% white bracted plants. Twenty-five percent of crop was to be in 8-cm pots, 15 to 20 cm at 75p each, and remainder in 13-cm pots, 25 to 30 cm, at £1.30 each.

Compost Choice. The group decided to grow plants from rooted cuttings, starting on two dates to obtain finished batch of large and small plants together. Rooted cuttings to be grown in Grodan rockwool with liquid feed for ease of control. These would then be potted into a mix of 7 bark : 1 grit : 2 vermiculite (by volume) to give an acceptable light brown colour and a good, open free-draining structure.

Cost Projection. Production cost £38,500, income £58,000.

Group 4

Crop. 50,000 dwarf rhododendrons in 3-litre pots for French market.

Growers Compost Criteria. The following criteria were established:

- pH of 4.5; ease of handling in potting machinery
- Air-filled porosity was critical, had to be 20% at the start of the crop cycle, and not less than 15% after 2.5 years.

A large number of media were eliminated on pH grounds and buffering capacity. The group was left with composted bracken which had a good open structure, low pH, and was resistant to shrinkage; and Corsican pine litter (Corsican pines are widely grown in UK forestry). Corsican pine litter may contain spores of mycorrhizal fungi which was considered a plus point, but the pH was not as favourable as composted bracken for rhododendrons.

Compost Choice. The compost of choice was a mix of 1 composted bracken : 1 Corsican pine litter : 1 composted pine bark (by volume), with a long-term controlled release fertiliser and nitric acid injection in the irrigation water to help keep pH down. Liquid feed was applied as necessary.

Cost. Compost cost reckoned at 3p or 4p/plant, plus the cost of extra management.

Group 5

Crop. 3000 specimen blue conifers for a garden centre chain, available over a 2-year period—100 each March, April, May, June, and July.

Customer Criteria. Peat-free compost tolerant of sporadic irrigation. Maximum price per plant of £3 for 5 litre plants; £4.25 for 7.5-litre plants and £5.60 for 10-litre plants.

Compost Choice. Price was critical and many technically acceptable ingredients were discarded on price. A 13 composted bracken : 7 composted pine bark : 2 clay aggregate (to give weight and stability to the pots) (by volume) mix was selected. Grower had to accept that plants would have to be potted in winter due to bracken availability.

Cost Projection. Estimated cost of compost was £16.40/m^3. This group did not believe they could produce the plants profitably at the customer's specified price.

Group 6

Crop. A crop of 100,000 groundcover roses in 9-cm pots for the amenity market, ready for delivery in late May, was required.

Customer Requirements. A peat-free, non-irritant compost at maximum price of 50p for royalty cultivars and 30p for non-royalty cultivars.

Compost Choice. Plants were to be grown from purchased micropropropagated plantlets. Price of compost was key consideration, with coir, matured bark, and perlite rejected because of cost. Rockwool was rejected because it was an irritant, and bracken was rejected because there was too little information available about performance. Compost selected was a composted bark with 15% to 20% polystyrene granules to reduce the cost and controlled-release fertiliser.

Cost Projection. Compost cost £28.50/m^3.

CONCLUSIONS

Many of the groups came back to choosing a home-supplied product because of worries about the consistency of supply and of quality. The groups were good at quickly eliminating inappropriate ingredients.

However very few members of the workshop actually took samples out of their bags to handle or to physically mix together the materials they had selected. No one asked for samples and no one asked for a complete, recent, compost analysis of their chosen material. No one tried to see what it looked like wet.

These are all things that must be considered, Bragg told the workshop. Salesmen will always try to show their material in the most attractive way, the grower's job is to ask difficult questions.

He also emphasised the need for growers to carry out small-scale trials whenever a new combination of growing medium/crop is contemplated. There was a need to discuss this with the buyer and perhaps to negotiate if they will accept a percentage of the crop in the peat-free and a percentage in your existing mix until both sides were happy with results.

The need to consider peat-free composts as a positive selling point to environment-conscious customers, and the possibility of increasing prices to cover the increased costs involved was also discussed.