Potential replacement for peat in horticulture.

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The ultimate goal of peat replacement is to use sustainable components, preferably sourced close to market, and to actually add value to the resultant compost mix. The assumption that peat can be replaced with one material is misinformed. It is commonly considered that new potting compost mixes will be a blend of a variety of raw materials that balance the physical and chemical properties of the individual raw materials as well as interacting with any added nutrition and managing the provision of water (for the plant) in a predictable fashion.

An understanding of the interaction with pesticides and herbicides is important, as is the ability of plants to withstand being transplanted from soil-less potting composts into soil.

Numerous materials have been researched as potential alternatives to peat but the most commonly utilised materials are, coir, green compost, composted bark (pine and spruce/larch mixes) and wood fibres. These meet customer perception that a compost additive should be brown and freely flowing with consistent high quality, supply and cost. These materials also have some beneficial properties but none of them individually either directly replace peat or satisfy all the needs of growers.

It is worth considering that by selecting organic materials from specific waste streams or as by-products from other processes horticulture may also have to compete with energy production for raw materials.

Coir

Coir compost originates from collecting the dust created by rope or matting production that uses the fibres from the outer shell of coconuts (the mesocarp). The mesocarp contains around 75% fibre and 25% fine material and is often soaked in water to facilitate grinding which seperates the fibres from the finer particles.

India and Sri Lanka are the principal sources of coir for potting compost, although other sources do exist (eg Philippines and Mexico). It is often dried and compressed into blocks for transporting, reconstituted by the end-user by simply adding water.

Coir has a number of properties that lend itself to use as an alternative to peat, these include its generally low nutrient status, high air filled porosity and low bulk density. While material from the same source has excellent consistency, chemical and physical variability does exist between sources. Other issues with coir include the fact that it does not readily retain nutrients, it is easily leached and has little buffering capacity.

Coir has been a popular alternative to peat for some time and has shown itself to be of value with many plant species, e.g. tomato, camellia, various ornamentals and has also been widely used in cutting and seed propagation.

There are a number of concerns regarding the utilisation of coir in potting composts, these include the transport mileage involved in importing it but some life cycle assessments regard coir as a waste product which perhaps balances that discussion. Reliability of supply is open to debate, with occasional supply and demand problems occurring. There have also been problems with the use of brackish water to soak the mesocarp (it can lead to potentially plant

toxic chloride and sodium concentrations in the coir). If fresh water is used, questions are asked about the appropriateness of using such water in areas that are often fresh water limited. Finally, there is an argument that suggests the dust material should be used to improve soil organic matter status in the country of origin.

Composted green waste (also known as green compost)
Diverting bulky organic material from landfill to replace the need for peat based potting compost would make a terrific story, however the reality is somewhat different to the aspiration.

Green compost does have some beneficial horticultural properties (high nutrient concentrations and good water holding capacity), it is also widely available and available in quite significant volumes. However, its use in growing media is limited as it tends to have a high pH, high potassium and chloride concentrations and a high bulk density which can all be difficult to manage and present problems for plant performance. Its consistency (batch to batch as well as site to site) remains an issue as many of these properties obviously depend upon the nature of the materials that go into it in the compost heap in the first place. In some examples, the use of local authority collected plant residues can be a useful source of material but the resultant product can contain contaminants such as plastics, pieces of glass and persistent herbicides if not carefully screened.

The value of green compost may lie in its use as a diluent with other materials. Its high nutrient concentrations could supply a range of nutrients, advantageous to plant performance saving money on fertilisers. There have also been reports of its disease suppressive potential when included in pot based growing media although it is very pathogen specific. It has been suggested that it is probably more appropriate to use green compost up to 25% of any mix although for some plant species / planting scenarios that figure can be higher.

Composted (or aged) bark
Composted or aged pine, spruce and larch bark has proven to be a successful component of many peat-based mixes improving the drainage of those mixes due largely to its generally high air filled porosity and low water holding capacity.

A variety of factors influence the actual chemical properties of the resultant finished material (tree species, age, harvest season, growing conditions etc). In general composted or aged bark has good potential as an alternative to peat due to its generally low pH, low nutrient status, low bulk density, some disease suppressive qualities and it is generally widely available.

Care needs to be taken when processing as fresh bark tends to contain volatile and phytotoxic chemicals. These issues can be “managed” by composting or aging the bark. Mixed species barks often contain white wood and are generally more variable than single species “products”. The composted or aged material can be hammer milled and screened to produce different grades which allows for blending of mixes for specific end uses.

Successful use of composted and aged bark based materials across a range of plant types are widely reported.

Availability of bark can vary. Many users are reliant upon a healthy building industry (it drives the need for timber) generating the bark as a waste / by product.

Wood Fibre
Interest in, and use of wood fibre, has increased significantly over recent years. There are a number of methods for producing wood fibre but most involve passing woody material though screw presses to produce what resembles a cotton wool like material.

The wood can be sourced from waste wood streams or virgin wood (spruce or pine usually) but wood fibre is primarily made from the white wood with little or no bark. It is possible to control the fibre size through the production process and colour the finished product if desired.

The physically shredded material will need an addition of nitrogen immediately (if not added during the processing). In some cases the woody material is exposed to heat and pressure which can make it relatively stable and consistent needing little nitrogen to be added (making it good for compost mixes).

The pH of wood fibre varies but tends to be lower than 7 and the conductivity also tends to be low unless the material is fertilised in the treatment process. Macronutrient concentrations can vary according to tree species, production method etc while micronutrients are generally low. In terms of physical properties it is quite similar to peat but it has a high total porosity and usually a very high air filled porosity. No problems with phytotoxicity have been reported.

Product Choice
When purchasing compost, gardeners are faced with many different types of bagged product. Many products target specific plant types (eg ericaceous, orchid or cacti) or specific scenarios (eg John Innes mixes).

Potting compost mixes have been developed with a specific use in mind. The balance of nutrition, water and air will be optimised and the physical stability of the material as well as factors such as the bulk density (weight) should be perfectly balanced. Buying specific composts for specific plants or uses is not a false economy. This is what happens in commercial horticulture where potting composts are designed for specific end uses or crops. In reality the majority of gardeners probably use a multi-purpose compost for most tasks but some may also buy a seed or propagation mix.

While many multi-purpose composts claim to be, and may well be, suitable for seed germination and plant propagation the purchase of a seed / propagation mix would be encouraged. The nutrition and physical structure of many multi-purpose composts can prove to be detrimental to successful germination.

Home produced compost
Some gardeners will be recycling their waste plant material onto their compost heap. Those that try to manage their composting process may try to use the resultant compost as a potting compost. This is not impossible but there are a lot of “ifs” and “buts”.

Well-made garden compost will probably take at least 12 months to produce (to be honest the longer the better). Assuming the heap composts effectively, the time period should ensure everything has decomposed fully. In cases where material hasn’t decomposed fully it will continue to do so and, if used in a potting compost, this can be detrimental to plant growth. [LINK to RHS webpages on composting?]

Even well-made compost will probably need to be screened (passed through a sieve of some sort). The reason for this is it will still probably contain some quite lumpy or coarse material that is simply best avoided in potting compost more for practical reasons rather than technical reasons.

Compost naturally contains some valuable nutrients. For seeds, propagation and tender plants this can make the mix a little strong so care needs to be taken in deciding which plants you want to grow in this compost. Alternatively you can look to dilute down the compost with bagged sterilised loam or garden soil (50:50 is probably a sensible ratio).

It is worth realising that home produced compost will not necessarily by completely free of pests, diseases or weeds. Some of these should be killed off by the composting process but not necessarily all. Similarly using garden soil can also potentially introduced these problems.

Leafmould

If you have the resources, space, time and energy then leafmould can make a useful free potting compost.

Simply collect up the leaves, using a mower to do this can achieve two aims as it collects them up and shreds the leaves. Alternatively rake them up and pass them through a shredder. The problem with leaves is the soft green tissue decomposes quite quickly but the skeleton of veins can persist. Shredding the leaves opens the veins up to microbial decomposition.

Then put the shredded leaves in a plastic bag (eg bin liner). Moisten the leaves if dry to help them rot, pierce the bag with a number of holes, tie the top loosely and then simply hide them around the garden and leave for a year or two. Alternatively wire mesh or plastic could be rolled into a pipe shape and stood on its end to create a container which simply prevents the leaves from being blown away (thus allowing them to rot slowly). Don't forget to cover them with a waterproof cover and then leave them for as long as possible. Be warned, good quality leafmould can take some time to produce.

All leaves will decompose eventually, the rate depending on numerous natural factors including species, size, moisture content, the make-up of your compost heap etc. The reason for the slow progress towards maturity is because unlike the compost heap, which relies upon bacteria, leafmould uses the cool, slow action of fungi to break it down. Well-rotted leafmould is usually produced in two years but can be used before this time for other uses in the garden. If it is over two years old it can also be used as a seed sowing mix (either on its own or mixed with equal parts sharp sand and garden compost) or as a potting compost (mixed equally with sharp sand, garden compost and loam).

Soil Conditioning

The value of managing your garden soil is often underestimated. The organic fraction of the soil, often known as humus, helps retain water and nutrients, improves both the drainage and aeration of the soil, helps maintain soil structure and supports valuable bacterial life. Without the presence of organic matter bacteria will struggle to survive, in such circumstances plants will struggle to grow.

Applying bulky organic material improves soil structure and texture by virtue of their consistency. They are also often rich in trace elements (often lacking in fertilizers) and release their nutrients relatively slowly.

It is advisable to compost bulky organic material before use (stack it covered somewhere for two to three months) as this will stabilize the nutrients, reduce any toxins it may contain and make it easier to handle. Animal manures should never be used fresh. They can scorch young or tender plants due to the freely available nitrogen compounds in the manure. Woody materials should also be stacked prior to use as when fresh they can contain toxins that will be detrimental to plant growth.

Organic Materials

A wide variety of materials can be used to improve the soil although the choice is often governed by availability (some are only locally available) and price. Animal manures are amongst the most popular nutrient rich organic materials. Horse manure is the richest manure, followed by pig, cow and poultry. Pig and chicken manure can be quite caustic to roots so should not be applied fresh. All manures are best dug into the soil in autumn or applied as a mulch in the spring (after the manure has been composted).

Garden compost is another useful (and free) source of bulky organic material that is nutrient rich and can be used as a soil conditioner or a mulch. Spent mushroom compost is a by-product of the mushroom industry and makes an excellent soil conditioner or mulch. Usually made up of manure, loam and chalk (in varying proportions) it can be used in all soils but be aware of the chalk content and avoid using around ericaceous plants.

Peat is often used as a soil conditioner but its properties (low in nutrients etc) would suggest it has a little value in this role. Other valuable materials, beneficial to soil structure but low in nutritional value, include leafmould, cocoa shell, spent hops and bark chip. Like other carbon rich materials, the latter should be used primarily as a mulch as it can lock-up a small amounts of nitrogen from the soil in order to decompose.