Experiences in Development of Green Compost as a Peat Replacement Material©

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In the U.K. it is government policy to replace the use of peat as a constituent of growing media and soil conditioners with other, preferably renewable, materials. There have been three types of barrier to peat replacement: technical, commercial, and psychological. Over the last decade the technical and commercial barriers have become far less significant, but misunderstanding and bad memories, aggravated by vested interests, still frustrate acceptance.

Although green compost, derived from garden waste collected by local authorities, is too nutrient rich to be used as the main component of growing media, improvements in quality, availability, and understanding have recently led to significant use of the material. Indeed, its nutrient content can replace some fertiliser additives and thus reduce manufacturing cost. Being high in woody material, it has high structural stability and is rich in beneficial microorganisms, notably bacteria and fungi, which suppress plant diseases and enhance nutrient availability. Its high humus content binds and buffers nutrients and holds water.

Green compost can be screened to different size grades. The 10–0 mm fraction is most commonly used in growing media but other grades may be used where different air : water balance or a different nutrient content (coarser fractions contain less nutrients) is required.

Green compost is now very plentiful and production standards (UK PAS 100) have been developed. However not all PAS 100 green compost is suitable for growing media. The most common quality issues are contamination (glass, plastic, and wind-blown weed seeds), maturity, and high bulk density (due to high moisture content). Contamination problems can be addressed with in-vessel composting but capital cost is significantly higher than an outdoor windrowing operation.

Vital Earth is believed to be a unique company in the U.K. composting industry as it composts in small (40 m^3) closed vessels, followed by indoor aerated static piles, ensuring thorough sanitisation and maturation. After size-grading, the compost is used as the basis — and main nutrient source — of peat-free growing media for hobby gardeners and professional users.

High pH has long been thought to be a barrier to use of green compost in growing media. However, experience has shown that this is a fallacy. Green compost behaves like an organic soil and "peat chemistry" is unlike soil chemistry in having a uniquely low optimal pH for exchange of cations ($K+$, NH_4+, $Mg+$, etc.). Trials with green-compost-based media have produced excellent ericaceous crops at pH values of 7 and more.

Dilution of green compost with composted conifer bark lowers pH adequately for most crops. It also reduces bulk density and nutrient levels and can be used to adjust air-filled porosity and water-holding capacity. In the case of ericaceous compost, humite (rich in humic acids) is added to lower pH further and to buffer pH. Humates have a high cation exchange capacity and also help to hold water.

Figure 1. Vital Earth is developing extended shelf-life, low density media for bedding. Front-right treatment is leading peat product; others are Vital Earth.

In any composting operation, some nitrogen is lost during processing and, if the N is not replaced efficiently, N lock-up can occur during storage and/or use. Until recently, N lock-up was a major barrier to performance — and thus acceptance — of peat-free growing media. At Vital Earth we believe we have solved the problem using an organic byproduct of U.K. food processing. Storage life of Vital Earth growing media exceeds 2 years and the products "starve out" more slowly than conventional peat products.

Apart from bark, other diluents — coir, woodfibre, composted wood wastes, and soil — can be used with or without green compost, to replace peat, as can processed minerals such as perlite, vermiculite, clay granules, and rockwool. However, to maintain a minimum carbon footprint, Vital Earth avoids the use of such "high energy" imported minerals and prefers to use recycled U.K. substrates that are relatively abundant, cost-effective, and have both appropriate appearance and handling properties.

Ten years of trialling have shown that growing media based on green compost and bark have some surprising performance benefits:

- Starvation is delayed, so feeding is less urgent and overwintered container nursery stock holds its saleable condition better (due to slow-release of organic nutrients).
- Liverwort is virtually non-existent and weeds are greatly reduced (due to surface drying effect).
- Risk of some diseases (especially leaf spots) is reduced.
- Internodes are shortened slightly in many subjects, notably bedding plants, where use of chemical dwarfing agents can often be eliminated.

Figure 2. Growing media based on green compost/bark (right) can reduce some plant diseases [e.g., leaf spots (left)] and shorten internodes slightly as shown on these ivy plants (Trial at Starplants).

- Growers undertaking trials report that overall water consumption is reduced. The irrigation pattern often needs to be modified to apply more frequent but smaller bursts because water-holding capacity is lower than in most peat media.
- The high humate content provides a unique binding action as the rootball dries out which is potentially beneficial in automatic plant handling.

Green compost is gaining significant use in other areas such as a planting medium for green roofing; production of field crops (edible and ornamental) and in landscaping, reclamation, and amelioration of soil erosion.

In field crops, the nutrient contribution of green compost has been appreciated better since the marked escalation of world-wide fertiliser prices, as well as its contribution to disease-suppression, soil structure, and overall fertility. Use of green compost to PAS 100 standard in organic food crop production has shown especially marked growth in recent years.

In landscaping, green compost has already displaced peat in root zone mixes and top dressings, topsoil manufacture, tree and shrub planting composts, and general soil improvement: a trend helped by U.S.A. experience of disease suppression on golf greens and other intensively managed turf.

In green roofing, green compost plays a crucial role in providing slow-release nutrients, water-retention and a healthy root environment in the face of conditions fluctuating from extreme drought to torrential rain or deep snow cover.

Figure 3. Composting in vessels destroys weeds/seeds and diseases (biofilter bed in foreground "scrubs" the vapour as it leaves the vessel). The green compost is then matured indoors with further aeration and temperature monitoring, then screened prior to further maturation and testing before blending.

FUTURE DEVELOPMENT

Having reduced normal bulk density of green compost from 600 $g \cdot L^{-1}$ to 450 $g \cdot L^{-1}$, Vital Earth is developing an "extra light" compost to challenge peat in sectors such as bedding where low crop weight is particularly desirable. Further extension of crop shelf-life is also being researched, as is flavour enhancement for fruit and vegetable crops and further suppression of pests and diseases.

In summary, most of the barriers of 10 years ago have been broken down. Green compost and other peat alternatives are proven and in wide-scale use. Such is the rate of progress that the National Trust, which reported a year ago that they could not source an adequate volume, or range, of peat-free container nursery stock are now delighted with both, grown by Boultons of Moddershall who, after 5 years trialing with Vital Earth, are now producing nursery stock 100% peat-free.

Availability of green compost is not an issue but the quality of some sources will need to be refined. By contrast, availability of bark and other diluents is cited by some sources as a constraint to peat replacement.

The key remaining barrier is psychological: bad memories of poor quality compost, supported by "peat dogmas" and industry inertia.