Compost and Nutrition in Nursery Stock Production

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INTRODUCTION

The last 20 years has seen the steady development of peat dominated mixes for use in container nursery stock. The quantity of peat used by the nursery stock industry has now reached at least 220,000 m^3/annum, (Bragg, 1991).

The most notable developments in the use of peat based mixes have been:

1) The understanding of the physical nature of the materials being used,
2) Development of the use of controlled release fertilizers, (CRFs),
3) Managing the interaction of 1 and 2 above with the water requirements of the plants and the drainage away from the container.

The following sections of this paper will look at the three points above before looking at the future of peat use and at possible alternatives for nursery stock use.

PEAT BASED MIXES

Physical aspects. As the use of peat expanded in the 1970s so the method of harvesting it became more mechanized and there was a move away from the traditional sod-cut peat to surface milling and large scale factory handling of the raw material. This had two effects

1) The quality of peat from a surface milling operation is quite different from stripped down sod-cut peat, and considerable efforts have had to be put into the use of pine bark waste and other physical improvers.

2) Surface milling of bogs lays to waste vast tracts of land very quickly and can in no way be described as sensitive; fuelling the current debate on the use of peat.

The damage caused by the method of harvesting and the poor physical characteristics produced by factory processing was addressed by physically amending the peat. Pine bark waste along with other materials were examined by Scott (1984) and it was shown that waterlogging could be avoided using peat/bark mixes.

Bragg and Chambers (1988) proposed a simple Air-Filled Porosity (AFP) test as a method for growers to assess mixes for themselves Sand was shown to have no advantage in mixes, while barks, perlite and rockwool were shown to give measurable improvement. This then led to the peat suppliers looking with renewed vigour at screening and handling methods for peat and to the vast improvement in the quality of their products. New types of screening, particularly those now referred to as 'star' screens, handle the peat in such a way that the physical nature of the material is not destroyed. This allows a far greater degree of control of the end product and "designer" peats can be offered for specific uses.

The way the peat is handled on the nursery has also changed Growers can easily check the effect of ingredients on the mix, as well as the effects of the mixer and length of time of mixing so the requirements for the type of mixer had changed The fast-acting blade mixer has tended to be replaced by the slower turning drum type mixers.

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Fertilizer Aspects. The most important development in fertilizer practice in container composts was the introduction of controlled release fertilizers (CRF). These differed considerably in philosophy from previous attempts to produce 'control' over the rate of availability of fertilizer to the growing plant.

The two groups of CRF which are currently available in the U.K. are both based on the use of straight compound fertilizers which have been coated with a semi-permeable membrane. The difference in the two major sources is in the type of coating used. In the case of Ficote®the coating is an elastic type polymer which has micropores in it Osmocote®has a resin type coat which relies on its thickness and degree of cracking for the release of the nutrients. In both cases water has to travel into the granules to dissolve the fertilizer and then nutrients move outwards along the concentration gradient.

The longevity of products is currently given on the basis of laboratory determinations made at set temperatures. For Osmocote the temperature for the release period is given at 21°C, although in fairness to the manufacturers, Grace Sierra Europe they do have data for the release at temperatures between 5 and 30° C. Ficote®, which is marketed by Fiscons plc, is an imported product from Japan where the release data is obtained at 25°C.

When the products were first available in the U.K. there was a tendency to only suggest the use of single longevity products for particular uses However growers and the extension service began moving towards blends of longevities to achieve more even feeding patterns. This has led to the production of specific mixes such as the 'Spring' Formulation by Grace Sierra of their 12 to 14 month product and more recently to the introduction of their 'Midlands' mix. The latter is the result of 4 years of independent trials work between Bridgemere Nursery and ADAS (Agricultural Development and Advisory Source of Ministry of Agriculture) to achieve a specific blend for the criteria set down by the nursery and in relation to the nursery's climate. Grace Sierra then looked at the fertilizers used in the blend and gave a single mix of release patterns to achieve a similar end result. Undoubtedly this is the way forward with prescription mixes being produced for specific needs and specific regions.

Water in, Water out! With current overhead irrigation systems on gravel standing beds as little as 20% of the applied water may be used by the crop (Gilbert, 1991)! What does all that runoff take with it from the nursery?

Legislation in Holland prevents summer discharges of run-off containing more than 10 ppm of nitrate. Work in the west midlands by ADAS staff in association with major nurseries has shown that summer levels of nitrate discharge can be more than ten to fifteen times 10 ppm level. HRI Efford (Formerly Ministry of Agriculture Research Station, Efford, Lymington, Hants) is undertaking a major trial with ADAS on nitrate, phosphate, and pesticide losses. Obviously there is a relationship between the type of watering system, the compost used and the standing area and its drainage which needs to be established for the future.

The other area of water management which is more fully understood is the need for acidification Efford has been foremost in promoting the benefits of acidification to reduce lime scale on leaves, prevent pH rise in substrates, and to ensure availability of trace elements.

ALTERNATIVES TO PEAT

The Way Forward The use of peat in all horticultural sectors has been seriously questioned and there are specific areas where its use can be reduced. These include much of the retail use of peat as a garden soil amendment where it is totally wasted, and the final potting mix for much container-grown stock, particularly that which is intended to be planted into amenity/urban landscaping, (Bragg, 1991; Pryce, 1991).

There is a price to be paid for the conservation benefits of such a change in the use of peat. All the currently available alternatives are more expensive than peat as a raw material Therefore the end user must understand and make due allowance when budgeting It could also seriously be argued that peat has been undervalued for many years particularly as it is slow to regenerate but that as a material for growing plants in containers it is exceptional. For any material to be a serious contender for use in container growing of plants then certain criteria do have to be met·

1) Physically the material should be stable.

2) Chemically it should be inert or of low reactivity with low inherent nutrients particularly if it is intended to be stored for any length of time

3) It should be free from weed seeds and plant and animal pathogens

Materials. Of the materials which have emerged in the search for peat replacements the following raw materials look very promising:

Coir Coconut husk waste, which appears to have been first used in UK in the 1860s (Abbey, 1862; Toll, 1863).

Barks. The industry is already familiar with the use of pine bark from the work of Scott (1984). Mixed conifer barks do have a place as direct peat replacements. The mature bark mixes do offer good stand-alone materials, or can be mixed with woodfibre or coir to make very good container composts.

Woodfibre-waste. Processing seems to remove all the soluble carbohydrates and the end product, while looking like white wood, is really just lignin fibre.

Straw-based compost. Various novel treatment systems are emerging and if the stabilization of the residue can be obtained there is the possibility to use some of the waste which is being produced—and which is likely to increase with the ban on burning in the UK after the 1992 harvest.

Furnace / Boiler Slags. Many of the large fossil-fuel-burning power stations produce huge amounts of ash and in some cases near vitreous products Some of these are recoverable and can offer alternatives/dilutents for peat and grits or perlite.

Lignite Currently produced as a waste product of the china clay industry in Cornwall. It has been used in the past in mixes Bragg (1991) but renewed interest is developing in the use as a compost dilutent.

There are also materials which could be used as soil conditioners but are too rich or unstable for container mixes except as fertilizers. This includes many of the animal waste products and compost derived from sewage or refuse (Bragg, 1991).

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