The Use of Irish Indigenous Composted Materials in Growing Media©

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INTRODUCTION

Peat substitution in growing media has been continuously and sometimes hotly debated within U.K. horticulture since 1989 (Carlile, 2004; Alexander et al., 2008) with demands from pressure groups, notably the Royal Society for Protection of Birds, that peat use in horticulture be phased out. Peat taxes have been proposed in the U.K., and 2010 is likely to be a pivotal year for peat use in growing media in that market. In 1999, the U.K.'s Biodiversity Action Plan called for growing media and soil improvers to be 40% peat free by 2005, and 90% peat free by 2010. The former target was met (largely through peat substitution in soil improvers), but the latter will not be met. A chorus of disapproval is likely to arise from environmental and other lobby groups, with action demanded from the U.K. government. There is much opportunity to develop peat-reduced media for the U.K. market.

Green compost has been studied extensively in several parts of the world for its potential as a constituent of growing media. The use of green compost and its admixture with other materials has formed the basis of much of the research programme at the Bord na Mona Research Centre since 1995, and is reviewed by Prasad and Carlile (2009). This work has been aimed at both professional and retail markets, and a primary intention was to use materials indigenous to the Republic of Ireland.

STUDIES AT BORD NA MONA 1995 TO 2005

Initially, indigenous materials included prunings and other landscape/garden materials mixed with spent brewery grains from the major brewer in Ireland. This grain had been roasted to colour stout and thus had no value as an animal feed. Materials were co-composted in open windrows to produce green compost that has proved eminently suitable as a diluent in the production of a multipurpose growing medium for the largest commercial retailer of growing media in the U.K. Green compost is now routinely used as a peat diluent at 30%–40% by volume. At these concentrations, the green compost contains sufficient micronutrients to support plant growth, as well as supplying potassium in amounts sufficient to support growth of most common container-grown species.

Although principally directed to retail markets, green compost has been successfully trialled in the Irish nursery stock sector. Five species of nursery stock plants were used in growth studies, and all grew well, with some (e.g., viburnum) performing better in media containing green compost than in pure peat media. Further studies have shown that mixtures of green compost with stable (H4–H5) peats performed significantly better than mixtures with younger peats (H2–H3). These younger peats can be rapidly degraded when mixed with green compost, probably due to microbial degradation as they have a lower lignin content than the more humified H4–H5 peats.

DEVELOPMENTS FROM 2005 TO DATE: HANDLING AND USE OF SLUDGES

Investigations have focused on the use of additional materials considered as wastes originating within the Republic of Ireland. These materials include sludges, which are defined as amorphous materials of high moisture content (around 80% or more moisture). Four non-sewage sludges, sourced from within the Republic of Ireland and co-composted with garden and landscape materials along with spent brewery grains, have been studied:

- A dairy by-product from a cheese/yoghurt manufacturing factory.
- A brewery malt sludge, produced from the washings of sprouted grain within the malting process. The washings (approximately 1.5% dry matter) were compressed to form a sludge.
- A sludge from the pharmaceutical industry: a paper/wood-based material used as a filler/carrier for active ingredients in flowable formulations of drugs and medicines.
- A sludge arising from cider manufacture.

High moisture content and problems of odour make these sludges difficult to handle by waste processors. They have commonly been disposed of at local land spreading sites but their phosphorus and nitrate content poses problems and land spreading now needs to be conducted with reference to local soil and water conditions. The inherent relatively high concentrations of N and P in sludges (Table 1), although initially unavailable to plant growth, may be released (for example from proteins) in composting processes. Subsequent green composts derived from co-composting of mixtures that include sludge may contain enhanced levels of plant nutrients. Indeed, plant growth in media prepared from peat and composted materials was in many cases superior to that in a proprietary peat medium (Fig. 1).

Overall, studies undertaken at Bord na Mona have shown that a range of waste materials indigenous to Ireland can be used in composting processes to produce an end-product suitable for use as a peat diluent in growing media. Some of these materials, notably sludges, pose severe problems of disposal with increasing restrictions on land application and landfill. Their use in composting processes is to some

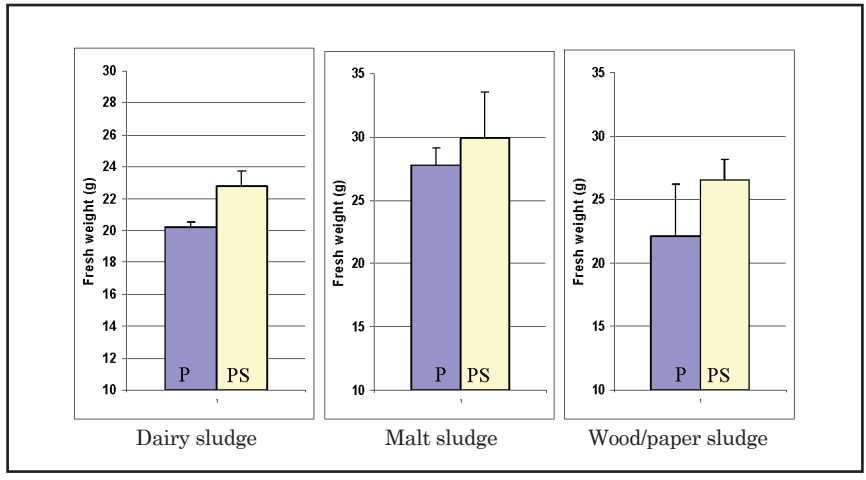

Figure 1. Plant growth in peat media diluted by 40% with compost prepared with three sludges. P = peat-based medium: PS = peat medium amended with compost containing sludge N = 5.

Table 1. Physical and chemical analyses of sludges.

Parameter	Dairy sludge	Malt sludge	Cider sludge	Paper/ wood sludge
Moisture content (%)	78	91.3	81	86.5
pH	7.4	5.96	6.7	5.13
EC as µmhos (ms)·cm^{-2}	1099	904	593	343
DTPA /$CaCl_2$ extracts: mg.L				
NH_4-N	70	3	134	22
NO_3-N	0	3	3	2
P	29	0	27	51
K	131	303	125	86
Acid digests % or mg·kg^{-1}				
N %	7.2	6.8	7.73	9.7
P %	2.53	2.2	1.5	2.84
K %	0.6	1.3	0.48	1.2
Fe	7.6	3280	6260	nd
Mn	0.9	358	79	60
Zn	2.8	147	47	28
Cu	>0.01	25	8.7	9
Mo	1.53	3.1	1.53	nd
Pb	nd	3.4	0.2	2.0
Cd	nd	0.2	<0.01	0.4
Hg	nd	<0.05	<0.05	<0.05
Cr	nd	0.8	11.3	16
Ni	nd	6.1	5.0	5

extent limited by their physical nature. At concentrations above 20% in windrows, air space becomes limiting and the composting activity of microorganisms is restricted (D. NiChualain and W.R. Carlile, unpublished data). However, at incorporation rates of 10%–15% with coarser landscape/garden prunings, co-composting may provide a good solution to the issues surrounding disposal of sludges.

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LITERATURE CITED

Alexander, P.M., N.C. Bragg, R. Meade, G. Padepoulos, and **O. Watts.** 2008. Peat in horticulture and conservation: the UK response to a changing world. Available at: <www.mires-and-peat.net/map03/map_03_08>.

Carlile, W.R. 2004. Growing media and the environment lobby in the UK 1997-2004. Acta Hort. 644:107–113.

Prasad, M., and **W.R. Carlile.** 2009. Practical experiences and background research in the use of composted materials in growing media for the UK market. Acta Hort. 819:111–124.