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ORGANIC SOIL AMEDMENTS FOR TREE ESTABLISHMENT

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Summary

The addition of organic materials to amenity tree planting pits has become a standard practice. However, experiments to evaluate a number of commonly used organic soil amendments have shown no consistent benefit from their use. Money spent on these materials, particularly peat, could be better spent on comprehensive site preparation and a higher level of after care.

Introduction

1. In ‘Sylva’ John Evelyn (1678) recommended that tree planting pits dug in summer be filled with straw which was then burned. The resultant potash rich ash washed into the soil before the tree was planted in the dormant season. Victorian landscape gardeners used available organic material (eg. leaf mould and well-rotted manure) as soil improvers even in relatively undisturbed soils on country estates. In the twentieth century the use of peat predominates for pit planting due to its availability, ease of handling and sterility.

2. This Note discusses research to evaluate the use of peat, bark and farmyard manure; materials which continue to be commonly specified for use in amenity tree planting schemes.

Background

3. Previous experiments gave no consistency in tree and shrub response for organic amendments. Skride (1985) noted a reduction in the growth of *Forsythia x intermedia* and *Deutzia scabra* when grown in bark compost amended soil. Whitcomb (1986) reports the same from an experiment using Silver maple (*Acer saccharinum*). Wager (1982) found the growth of *Zelkova* spp. was reduced by soil amendment with peat in one experiment, but increased in another, whilst growth of mulberry (*Morus* spp.) was increased in two similar experiments. A trial with *Pittosporum tobira* showed a positive root growth response to the use of peat in the backfill after 6 months, but after 12 months root and shoot dry weights were unaffected by soil amendment. In a similar trial with *Juniperus chinensis* no response to amendment after 6 months was detected, but there was an increased shoot dry weight after 12 months where no fertilizer was added. (anon,1981).

4. There is growing concern that peat is a limited resource, and as such, should be conserved in order to maintain supplies for use where there is no alternative and to protect peatland habits.

Experimental Results

5. Five experiments (Fig1) examine the use of organic ameliorants in varying proportions with soil as a planting pit backfill. Despite covering a range of species, site and soil types, four of these experiments showed no significant benefit from the use of peat. Only one experiment, on a

roadside cutting with a heavy clay soil using hawthorn (*Crategus monogyna*) showed a significant benefit from the use of peat, both in terms of tree survival and growth (Fig. 2). In this experiment however, 50% and 80% peat in the planting pit gave no better survival that 20% and only slightly better growth. In contrast, ash (*Fraxinus excelsior*) and Norway maple (*Acer platanoides*) (Milton Keynes) showed reduced diameter growth with 50% peat compared with 20% peat in planting pit backfill of the control (Fig 3.).

6. Neither pulverised bark nor farmyard manure at 20% of backfill yielded any significant benefit to tree survival or growth on either a heavy clay or a light sandy soil.

Discussion.

7. The precise explanation for the results of each experiment described are not known. However the characteristics of the most commonly used soil amendments (course texture, high carbon/nitrogen ratio, large water holding capacity at low moisture tensions but small water holding capacity at high moisture tensions) and general observation indicate possible explanations.

8. In clay, silt and loam soils, soil disturbance and the addition of peat leads to an increase in porosity in backfill material compared to the surrounding undisturbed soil. As a consequence, at times of high rainfall the planting pit tends to become waterlogged, and, in drier conditions planting pit material can be actually less moisture retentive than the surrounding soil. When this is the case, plant water stress may occur whilst the surrounding unamended soil is still quite moist.

9. Both of these problems are accentuated by the poor planting practices of using a very high percentage of peat in the backfill to make up the material lost during planting pit excavation, and of inadequate mixing of peat with the excavated material.

10. Organic soil amendments may adversely affect nutrient supply to the newly planted tree for several years after application due to their high carbon/nitrogen ratio. Soil nutrients, particularly nitrogen, are utilized by soil micro-organisms as populations grow during the process of organic matter break down. On freely draining sites even use of farmyard manure can cause similar problems as the nutrients in the manure are rapidly leached, leaving the straw to be broken down and creating a short-term nitrogen demand. Application of a high nitrogen slow release fertilizer at the beginning of the second growing season after planting (Patch *et al*, 1984) may alleviate this problem on all but the most free draining soil.

Conclusions

11. Recent experiment results generally show that, as planting pit backfill amendments, peat and the other organic materials tested are unlikely to yield benefits to tree establishment. Bulky organic matter in backfill material around newly planted trees should not be used prescriptively on every site. The conditions on each site should be assessed and appropriate treatments adopted.

12. Soil ameliorants such as those discussed above should not be used in an attempt to alleviate the effects of poor site preparation, plants and planting practices. Resources for tree establishment are better used on comprehensive site preparation before planting, the purchase of the best quality stock available and thorough weed control (Davies,1987), that on soil amendments for use in the planting pit.

13. Before prescriptions for planting pit amendment can be prepared for all site and soil types more research is needed. This should also improve understanding of the interaction between bulk organic materials, soil conditions and root growth.

Acknowledgement

14. The work reported in this Note has been funded by the Department of the Environment

Fig 1: Details of Experiments on Organic Soil Amendments

Experiment	Tree Size	Species	Soil Type	Site Type	Product	Proportion in backfill (v/v)
Michael Wood Services M5	Transplant	Betula pendula Crataegus monogyna	Heavy clay	Steep motorway cutting	Sphagnum peat	0% 20% 50% 80%
Arborfield	Transplant	Fraxinus excelsior Tilia cordata	Clay loam	Flat ground amenity area	Sedge peat Pulv. bark FYM	20% 20% 20%
Thetford	Transplant JPP	Acer pseudoplatanus Pinus nigra var maritima	Light sand	Raked forest restock site	Sedge peat Pulv. bark FYM	20% 20% 20%
Islington	Standard	Sorbus aucuparia	Clay	Pavement	Sphagnum peat	10% 20% 40%
Milton Keynes	Transplant	Fraxinus excelsior Acer platanoides Thuja plicata	Disturbed clay loam	Flat area used as a topsoil dump	Sphagnum peat	0% 20% 50%

fig 2. MICHAEL WOOD SERVICES. DIAMETER INCREMENT AND (99.9% slg) AND SURVIVAL (99% slg) OF HAWTHORN THREE YEARS AFTER PLANTING ON A MOTORWAY SITE

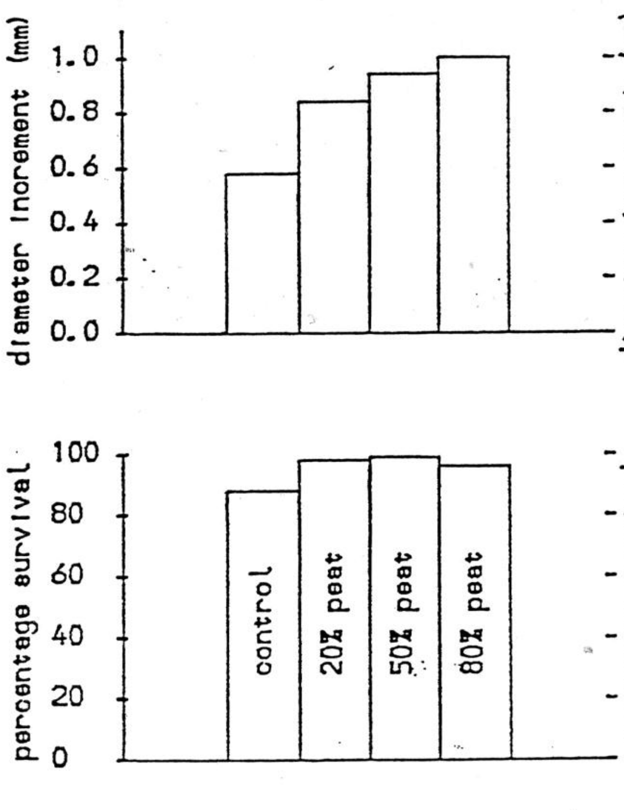
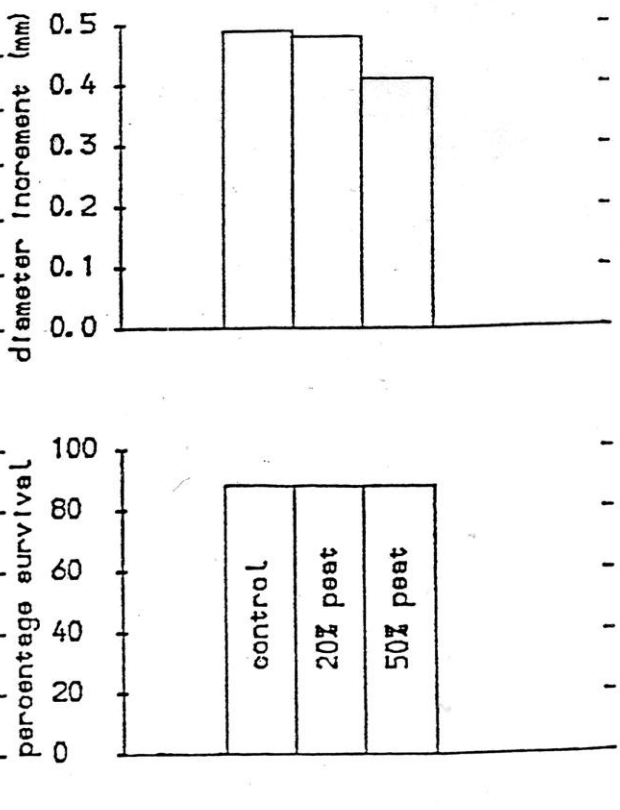


fig 3. MILTON KEYNES. DIAMETER INCREMENT (95% slg) AND SURVIVAL (NS) OF ASH ONE YEAR AFTER PLANTING ON A DISTURBED CLAY SITE



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