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BRAN AS A PEAT REPLACER - A FEASIBILITY STUDY

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BRAN AS A PEAT REPLACER – A FEASIBILITY STUDY

by

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C O N T E N T S

ABBREVIATIONS

cm	centimetre
DM	Dry matter
g	gram
ha	hectare
kg	kilogram
LA	Levington Agriculture Limited
l	litre
m	metre
ml	millilitre
microS/cm	micro Siemens per centimetre

OBJECTIVE

To investigate the products of composting bran and other feedstocks for use in horticulture as a soil improver or as a peat substitute in growing media.

SUMMARY

Composting

Bran is a good material for composting in that it contains both protein, rich in nitrogen, and carbohydrates. The carbon to nitrogen (C:N) ratio is low, approximately 15:1, and therefore other carbon rich, but nitrogen poor, materials could be co-composted with bran. This would raise the initial C:N ratio to, ideally, between 30:1 and 35:1 and lead to a more balanced and stable end product, plus revenues for accepting such wastes (eg paper or wood wastes), but result in a greater volume of end product to sell.

Composting the bran alone leads to a more concentrated nutrient end product which could be used as an organic fertilizer base.

Water is required wet up the bran for composting (approximately an equal weight to the bran to bring it to 60% moisture content). The water could be replaced with wash water from other processing activities, such as starch production, thereby aiding a disposal problem.

End products

The end product of composting bran on its own, as was tested at Levington Agriculture, is a dark-coloured, nutrient-rich material with good water retention and fibre content. Dry matter is lost during composting and may lead to a 50% reduction in mass, although this has not been accurately determined.

One sample was leached of much of its mineral nutrients which had become concentrated during the composting process. Excessive nutrients are adverse when the material is to be used directly as a growing medium. However, the leached material, after further stabilisation, could be tested as a material for tomato growing bags. At 3 kg of dry matter per bag, 50% efficiency of use of raw bran and £0.50 per bag for the peat, the value of the bran is £83 per tonne with a maximum use of 60,000 tonnes of raw bran in UK. The value may be higher if the nutrient content is taken into account.

More extensive washing would enable the material to be tested as a potting compost of higher value. The washings could be re-used to wet the bran in batches that were to be used as organic fertilizer.

The composted bran was mixed with commercially available peat, coir and woodfibre in order to lower the pH and dilute the nutrient content. The rate of mixing was 20% composted bran to 80% of the other material in each case. The bran/peat mixture resulted in a medium suitable for growing tomatoes as was verified by pricking out seedlings which grew well. The coir and woodfibre mixtures resulted in the pH and conductivities still being too high and a lower inclusion rate eg 10% may be needed.

The maximum market size for use as a peat replacer at 10% in mixes providing fibre, nutrients and liming effect is 30,000 tonnes of composted bran in UK, or 60,000 tonnes of raw bran at 50% efficiency. The price of good quality peat is £19/m^3 containing 111 kg dry matter. At 50% efficiency the raw bran is therefore potentially worth about £85 per tonne. By co-composting bran with other wastes low in N and K but high in carbon, the end product would be more stable biologically. This is to be recommended where the end product is to be used in growing media. A greater inclusion rate could be used in the peat mixture, and less washing would be required where the composted materials were used predominantly on their own.

The composted bran is an organic fertilizer material having an analysis of 4:7:7 ($N:P_2O_5:K_2O$). Growmore is a standard fertilizer with analysis of 7:7:7 and a retail value of £200 per tonne when sold in small packs. The raw bran may therefore have a value of eg £60 per tonne (at 60% of retail price and 50% efficiency) as base fertilizer material requiring some topping up with nitrogen.

Alternatively, pelleted manures are retailing at £5 per 7 kg to the gardening market. The raw bran, at 50% efficiency and at 60% of retail price, may be worth closer to £200 per tonne. This market is relatively undeveloped at present but should be a good prospect with aggressive selling. Prices should be higher than for the product as a fertilizer due to the added properties of organic matter and liming value as a soil improver.

There is a small market for biodegradable plant pots. These are made from eg wood fibre with some peat. The manufacturers of such pots could be approached to test the composted bran, with and without leaching, as a replacement for the peat content.

MATERIALS & METHODS

Two by-products from milling were obtained from RHM, Felixstowe: bran and 'wheat feed'. Two composting operations were carried out, firstly on the bran alone and secondly with the wheat feed. Both were wetted up with water to approximately 60% moisture content and composted in a drum that could be rotated to mix and aerate the materials.

The materials were analysed prior to composting, during the process and then at a final stage, in the case of the bran, at 4 months. The 4 month old bran compost was mixed with various substrates, re-analysed and plants grown in the mixtures.

RESULTS

1. Initial materials analysed

	K%	N%	Organic carbon %	C:N ratio	Organic matter %
Bran	1.74	2.55	39.3	15.4	93.5
Wheat feed	1.53	2.44	39.7	16.3	94.6

Both materials have high K and N contents. The C:N ratio is rather lower than necessary as 30 to 35 would normally be recommended to achieve a stable end product. These lower values can lead to a loss of N from the system as ammonia. Either other waste products, low in N, could be added or the bran prepared in a way that reduced its N content. The high K is a problem in that it becomes concentrated in the end product as composting proceeds. The final high K content has an adverse osmotic effect on plant growth. Either other waste materials, low in K, could be added, or the bran prepared in a way that reduced its K content.

One benefit of bringing in another waste feedstock is that taking in eg. wood or paper waste can generate revenue. However, waste management licences may be required and if care is not taken contaminants, eg. potentially toxic elements (PTEs), may be introduced such as lead, zinc, copper, etc, which may lower the value of the end product. A greater volume of end product would have to be sold, however, and it is likely that it would be biologically more stable. This is needed in a growing medium component but not in a soil fertilizer.

Fresh water was used to wet up the bran materials but wash water from related industries could be used as a useful method of their disposal. An equal weight of water was found to be required to wet up the bran material to 60% moisture content.

As will be discussed later, the liquid from washing the composted bran could also be used as an initial wetting source.

Greater volumes of water could be utilised if the heat generated during composting was used to drive off moisture.

2. Composting

2.1 Bran

The bran was wetted to 60-70% moisture content (dry weight/wet weight), composted and sampled as follows:

composting started	7.5.96
sampled + 1 month	
sampled + 2 months	
removed from drum	12.7.96
sampled + 3 months	
dried and sampled at + 4 months	

The composting processes commenced rapidly on wetting of the materials without the addition of any other feedstocks as the bran contained adequate nitrogen and carbohydrates. The breakdown of carbohydrates, etc to CO_2 resulted in a loss in dry matter, estimated at 50%, and a concentration of salts.

The dried material was mixed with each of peat, coir or wood fibre as 20% by volume. Each blend was analysed and tested for plant growth with a range of species (Section 4). A sample of the dried material was also washed to reduce its conductivity.

2.2 Wheat feed

The wheat feed was wetted to 60-70% moisture content and composted and sampled as follows:

composting started	12.7.96
sampled + 2 months	

3. Analysis results

See the attached results sheets (pages 9-21) for detailed analysis results.

3.1 i. Bran + 1 month in process

The pH was high as would be expected at this stage. The proteins were being mineralised into NH_4-N. The conductivity was rising as, especially potassium, salts were released into solution from within the plant material.

ii. Bran + 2 months in process

The pH had dropped slightly to 8.6 as some NH_4-N had been converted to nitrate. The conductivity had risen as the dry bulk density increased and some organic matter had been lost as CO_2, concentrating the salts. The air filled porosity (AFP) at 11% was good and the total water retained was similar to peat.

iii. Bran + 3 months in process

The pH continued to fall to 7.8 with fungi possibly utilising some of the available nitrogen which was at a lower concentration at this stage. The conductivity continued to rise.

iv. Bran + 4 months in process

The pH in the dried, composted bran was 7.4 and all nutrients had generally become concentrated, partly due to the drying process. The product resembled an organic fertilizer with the structure of fine peat. This end product could be blended with peat, or other substrates, to replace part of the peat and also add nutrients.

v. Leached, composted bran

On 20.9.96, the 4 month dried composted bran was re-saturated with demineralised water.

1 litre 314 g contained 20% moisture ie. 63 g of water. 500 g water was added bringing the compost to 70% moisture by weight. One litre aliquots of demineralised water were added at a time, pressed out and the conductivity of the liquid measured. Four aliquots were added:

	Leachate conductivity
1st litre	13×10^3
2nd litre	6.6×10^3
3rd litre	3.8×10^3
4th litre	2.1×10^3

The resulting leached material remaining was analysed and the conductivity had been reduced to 790 microS/cm, not much above a multipurpose compost which would typically be 500-600 microS/cm. However, the pH had risen between leaching and analysis possibly due to some microbial activity in the days between. The other difference between a multipurpose compost and this product was the available nitrogen being in NH_4-N form which would require conversion to nitrate form for most, and especially the sensitive, plant species. A fifth leaching followed by a period of maturation may result in a growing medium, although the AFP stability would need to be investigated.

3.2 i. Wheat feed + 2 months in process

The analysis of this material composted gave results similar to those for bran.

3.3 Bran mixes

The dried composted bran was mixed with peat, coir and wood fibre (Sylvafibre). The analysis of these three base materials is shown and can be used in comparison with those for the blended products. The analysis of a peat-based multipurpose compost is also shown.

Peat is a low pH (4.0), low conductivity (110 μS/cm) stable product. Sylvafibre also has a low conductivity (85 μS/cm) but a higher pH of 6.1. Coir contains more soluble salts, mainly potassium, giving a higher conductivity (180 μS/cm) with a pH of 6.3. The Sylvafibre is a more open, but denser product, compared with peat and coir.

The composted bran was added at 20% of the mix by volume in each case.

The peat/bran mix resulted in a pH of 6.1 and a conductivity of 720 μS/cm. This would be an optimum mixture rate for a vigorous plant, eg tomatoes, but excessive for more sensitive species, which may not tolerate the available nitrogen as NH_4-N. The coir/bran at this rate of mix resulted in excessive pH and conductivity, with Sylvafibre/bran intermediate.

4. Plant growth

A number of plant species seedlings were transplanted into the mixtures. The best growth, equal to a commercially available peat-based multipurpose product, was of tomatoes in the peat/bran mix. This is not surprising, as tomatoes are very vigorous and can tolerate higher salt concentrations (conductivity) than many other species. Pelargonium seedling growth was also reasonable but less vigorous than that of seedlings in the multipurpose product. Lower inclusion rates are required for the other species or use made of a co-composted or washed material.

5. Prices and markets

Bulk peat medium grade for preparation of growing media = £5.70 per 300 l = £19/m^3.

Woodfibre (Sylvafibre) = £15/m^3.

Coir briquettes = £400 per 20 m^3 = £20/m^3.

Leached composted bran had a very similar dry bulk density to peat being 112 g/l, ie 112 kg/m^3. It needs to be ascertained how much bran raw material is required to end up with one m^3 of leached composted bran. At a ratio of 2:1, the value of the bran raw material could be calculated as

$$£19 \times \frac{1000}{112 \times 2} = £85 \text{ per tonne}$$

Even with the cost of composting and processing, this price may compare favourably with the price of cattle feed, especially when the value of the nutrients is taken into account.

The leachate could be used to re-wet some batches of bran. This would result in an even greater nutrient content of the final product.

The composted bran wetted with water had a nutrient content of 4.2% N, 3.3% P and 5.6% K in the dry matter. This equates to 4.2% N, 7.5% P_2O_5 and 6.7% K_2O ie approximately 4:7:7 not dissimilar to standard Growmore fertilizer (7:7:7) which retails for £200/tonne, although some extra nitrogen would have to be added. At 60% of retail price and 50% efficiency the raw bran may therefore realise a price of £60 per tonne.

Use as an organic fertilizer may lead to even higher prices, for instance pelleted chicken manure retails at £5 for a 7 kg pack. The raw bran, at 50% efficiency and at 60% of retail price, may be worth closer to £200 per tonne. This market is relatively undeveloped at present but could be a good prospect with aggressive selling. Prices should be higher than for the product as a fertilizer due to the added properties of organic matter and liming value.

TABLE 1 COMPOST ANALYSIS Bran 1 month in process

Test	Units	
Bulk density	g/l fresh compost	329
AFP	% volume	
Saturated moisture content	% w/w fresh compost	
Moisture as received	% w/w fresh compost	70
pH		9.1
Conductivity	microS/cm	2100
Organic matter by LOI	% of dry matter	86
Dry matter content	g/l fresh compost	99
Organic matter content	g/l fresh compost	85

	Totals		Water extractables	
	mg/l fresh material	% DM	mg/l fresh material	% DM
NH4-N	N/A		840	0.85
NO3-N	N/A		0.6	0.00
P	nd		1740	1.76
K	nd		2376	2.41
Mg	nd		12	0.01

nd = not determined

TABLE 2 COMPOST ANALYSIS Bran 2 months in process

Test	Units	
Bulk density	g/l fresh compost	340
AFP	% volume	11
Saturated moisture content	% w/w fresh compost	83.8
Moisture as received	% w/w fresh compost	66
pH		8.6
Conductivity	microS/cm	2650
Dry matter content	g/l fresh compost	116

	Totals		**Water extractables**	
	mg/l fresh material	% DM	mg/l fresh material	% DM
NH4-N	N/A		840	0.73
NO3-N	N/A		240	0.21
P	nd		1524	1.32
K	nd		3420	2.96
Mg	nd		15	0.01

nd = not determined

TABLE 3 COMPOST ANALYSIS Bran 3 months in process

Test	Units	
Bulk density	g/l fresh compost	460
AFP	% volume	
Saturated moisture content	% w/w fresh compost	
Moisture as received	% w/w fresh compost	71.5
pH		7.8
Conductivity	microS/cm	3100
Organic matter by LOI	% of dry matter	82
Dry matter content	g/l fresh compost	131
Organic matter content	g/l fresh compost	108

	Totals		Water extractables	
	mg/l fresh material	% DM	mg/l fresh material	% DM
NH4-N	N/A		540	0.41
NO3-N	N/A		20	0.02
P	nd		228	0.17
K	nd		4398	3.35
Mg	nd		109	0.08

nd = not determined

TABLE 4 COMPOST ANALYSIS Composted bran over 4 months old

Test	Units	
Bulk density	g/l fresh compost	312
AFP	% volume	
Saturated moisture content	% w/w fresh compost	
Moisture as received	% w/w fresh compost	19.5
pH		7.4
Conductivity	microS/cm	5000
Organic matter by LOI	% of dry matter	82
Organic carbon	% of dry matter	31.2
Dry matter content	g/l fresh compost	251
Organic matter content	g/l fresh compost	206
Organic carbon	g/l fresh compost	78

	mg/l fresh material	% DM
Total nitrogen	10650	4.24

C:N ratio 7

	Totals		Water extractables	
	mg/l fresh material	% DM	mg/l fresh material	% DM
NH4-N	N/A		990	0.39
NO3-N	N/A		3	0.00
P	8400	3.34	458	0.18
K	14064	5.60	9924	3.95
Mg	3228	1.29	144	0.06
Ca	738	0.29	37	0.01
Na	86	0.03	74	0.03
S	734	0.29	236	0.09
	mg/l fresh material	ppm DM	mg/l fresh material	ppm DM
B	2.2	8.8	0.7	2.8
Mo	1.4	5.6	0.1	0.4
Cu	6	23.9	0.9	3.6
Zn	46	183.2	3.2	12.7
Mn	58	230.9	0.9	3.6
Fe	105	418.1	4	15.9

TABLE 5 COMPOST ANALYSIS Leached composted bran over 4 months old

Test	Units	
Bulk density	g/l fresh compost	519
AFP	% volume	
Saturated moisture content	% w/w fresh compost	
Moisture as received	% w/w fresh compost	78.5
pH		8.9
Conductivity	microS/cm	790
Organic matter by LOI	% of dry matter	90
Organic carbon	% of dry matter	35
Dry matter content	g/l fresh compost	112
Organic matter content	g/l fresh compost	100
Organic carbon	g/l fresh compost	39

	mg/l fresh material	% DM
Total nitrogen	3160	2.83

C:N ratio 12

	Totals		Water extractables	
	mg/l fresh material	% DM	mg/l fresh material	% DM
NH4-N	N/A		258	0.23
NO3-N	N/A		3	0.00
P	1954	1.75	434	0.39
K	1881	1.69	822	0.74
Mg	1632	1.46	28	0.03
Ca	273	0.24	13	0.01
Na	20	0.02	17	0.02
S	278	0.25	27	0.02
	mg/l fresh material	ppm DM	mg/l fresh material	ppm DM
B	1.2	10.8	0.2	1.8
Mo	1.9	17.0	0.3	2.7
Cu	3.6	32.3	0.3	2.7
Zn	18	161.3	1.1	9.9
Mn	25	224.0	0.3	2.7
Fe	58	519.8	1.3	11.7

TABLE 6 COMPOST ANALYSIS Wheatfeed two months in process

Test	Units	
Bulk density	g/l fresh compost	521
AFP	% volume	
Saturated moisture content	% w/w fresh compost	
Moisture as received	% w/w fresh compost	73.5
pH		8.6
Conductivity	microS/cm	3700
Dry matter content	g/l fresh compost	138

	Totals		**Water extractables**	
	mg/l fresh material	% DM	mg/l fresh material	% DM
NH4-N	N/A		1920	1.39
NO3-N	N/A		3	0.00
P	nd		1200	0.87
K	nd		3132	2.27
Mg	nd		5	0.00

nd = not determined

TABLE 7 COMPOST ANALYSIS Peat

Test	Units	
Bulk density	g/l fresh compost	252
AFP	% volume	
Saturated moisture content	% w/w fresh compost	
Moisture as received	% w/w fresh compost	56
pH		4
Conductivity	microS/cm	110
Organic matter by LOI	% of dry matter	96
Organic carbon	% of dry matter	35.4
Dry matter content	g/l fresh compost	111
Organic matter content	g/l fresh compost	106
Organic carbon	g/l fresh compost	39

	mg/l fresh material	% DM
Total nitrogen	1571	1.42

C:N ratio 25

	Totals		Water extractables	
	mg/l fresh material	% DM	mg/l fresh material	% DM
NH4-N	N/A		30	0.03
NO3-N	N/A		17.4	0.02
P	23	0.02	5	0.00
K	11	0.01	5	0.00
Mg	231	0.21	6	0.01
Ca	483	0.44	12	0.01
Na	37	0.03	30	0.03
S	218	0.20	40	0.04
	mg/l fresh material	ppm DM	mg/l fresh material	ppm DM
B	0.5	4.5	0.1	0.9
Mo	0.7	6.3	0.1	0.9
Cu	0	0.0	0	0.0
Zn	0	0.0	0.06	0.5
Mn	1.7	15.3	0.2	1.8
Fe	96	865.8	0.2	1.8

TABLE 8 COMPOSTI ANALYSIS Peat/bran 80/20

Test	Units	
Bulk density	g/l fresh compost	302
AFP	% volume	
Saturated moisture content	% w/w fresh compost	
Moisture as received	% w/w fresh compost	54.5
pH		6.1
Conductivity	microS/cm	720
Organic matter by LOI	% of dry matter	92
Organic carbon	% of dry matter	35.4
Dry matter content	g/l fresh compost	137
Organic matter content	g/l fresh compost	126
Organic carbon	g/l fresh compost	49

	mg/l fresh material	% DM
Total nitrogen	3139	2.28

C:N ratio 15

	Totals		Water extractables	
	mg/l fresh material	% DM	mg/l fresh material	% DM
NH4-N	N/A		240	0.17
NO3-N	N/A		12	0.01
P	1318	0.96	805	0.59
K	1929	1.40	702	0.51
Mg	691	0.50	15	0.01
Ca	538	0.39	20	0.01
Na	44	0.03	34	0.02
S	291	0.21	64	0.05
	mg/l fresh material	ppm DM	mg/l fresh material	ppm DM
B	0.7	5.1	0.1	0.7
Mo	1	7.3	0	0.0
Cu	0.7	5.1	0.1	0.7
Zn	7	50.9	0.3	2.2
Mn	10	72.8	0.2	1.5
Fe	118	858.7	0.8	5.8

TABLE 9 COMPOST ANALYSIS Coir

Test	Units	
Bulk density	g/l fresh compost	186
AFP	% volume	
Saturated moisture content	% w/w fresh compost	
Moisture as received	% w/w fresh compost	64.5
pH		6.3
Conductivity	microS/cm	180
Organic matter by LOI	% of dry matter	82
Organic carbon	% of dry matter	35
Dry matter content	g/l fresh compost	66
Organic matter content	g/l fresh compost	54
Organic carbon	g/l fresh compost	23

	mg/l fresh material	% DM
Total nitrogen	319	0.48

C:N ratio 72

	Totals		Water extractables	
	mg/l fresh material	% DM	mg/l fresh material	% DM
NH4-N	N/A		0	0.00
NO3-N	N/A		2.4	0.00
P	19	0.03	5.5	0.01
K	495	0.75	134	0.20
Mg	98	0.15	0.5	0.00
Ca	202	0.31	5	0.01
Na	181	0.27	83	0.13
S	66	0.10	20	0.03
	mg/l fresh material	ppm DM	mg/l fresh material	ppm DM
B	1.2	18.2	0.2	3.0
Mo	0.5	7.6	0.06	0.9
Cu	0.24	3.6	0	0.0
Zn	0.05	0.8	0	0.0
Mn	4.3	65.1	0.06	0.9
Fe	122	1847.6	1	15.1

TABLE 10 COMPOSTAL ANALYSIS Coir/bran 80/20

Test	Units	
Bulk density	g/l fresh compost	241
AFP	% volume	
Saturated moisture content	% w/w fresh compost	
Moisture as received	% w/w fresh compost	62.5
pH		7.7
Conductivity	microS/cm	1180
Organic matter by LOI	% of dry matter	80
Organic carbon	% of dry matter	32.5
Dry matter content	g/l fresh compost	90
Organic matter content	g/l fresh compost	72
Organic carbon	g/l fresh compost	29

	mg/l fresh material	% DM
Total nitrogen	864	0.96

C:N ratio 34

	Totals		**Water extractables**	
	mg/l fresh material	% DM	mg/l fresh material	% DM
NH4-N	N/A		246	0.27
NO3-N	N/A		1.8	0.00
P	1306	1.45	759	0.84
K	2380	2.63	1439	1.59
Mg	562	0.62	23	0.03
Ca	276	0.31	20	0.02
Na	156	0.17	127	0.14
S	168	0.19	60	0.07
	mg/l fresh material	ppm DM	mg/l fresh material	ppm DM
B	1.2	13.3	0.2	2.2
Mo	0.7	7.7	0.1	1.1
Cu	1.7	18.8	0.2	2.2
Zn	7	77.5	0.8	8.9
Mn	12	132.8	0.5	5.5
Fe	103	1139.7	0.5	5.5

TABLE 11 COMPOST ANALYSIS Sylvafibre

Test	Units	
Bulk density	g/l fresh compost	348
AFP	% volume	
Saturated moisture content	% w/w fresh compost	
Moisture as received	% w/w fresh compost	54
pH		6.1
Conductivity	microS/cm	85
Organic matter by LOI	% of dry matter	94
Organic carbon	% of dry matter	37.1
Dry matter content	g/l fresh compost	160
Organic matter content	g/l fresh compost	150
Organic carbon	g/l fresh compost	59

	mg/l fresh material	% DM
Total nitrogen	1110	0.69

C:N ratio 54

	Totals		Water extractables	
	mg/l fresh material	% DM	mg/l fresh material	% DM
NH4-N	N/A		0	0.00
NO3-N	N/A		2.4	0.00
P	78	0.05	30	0.02
K	326	0.20	103	0.06
Mg	95	0.06	1	0.00
Ca	736	0.46	9	0.01
Na	17	0.01	16	0.01
S	68	0.04	2	0.00
	mg/l fresh material	ppm DM	mg/l fresh material	ppm DM
B	1.4	8.7	0.3	1.9
Mo	0.7	4.4	0	0.0
Cu	0.5	3.1	0	0.0
Zn	3.4	21.2	0.06	0.4
Mn	34	212.4	0.06	0.4
Fe	188	1174.4	0.4	2.5

TABLE 12 COMPOST ANALYSIS Sylvafibre/bran 80/20

Test	Units	
Bulk density	g/l fresh compost	352
AFP	% volume	
Saturated moisture content	% w/w fresh compost	
Moisture as received	% w/w fresh compost	55.5
pH		7.6
Conductivity	microS/cm	950
Organic matter by LOI	% of dry matter	92
Organic carbon	% of dry matter	36.7
Dry matter content	g/l fresh compost	157
Organic matter content	g/l fresh compost	144
Organic carbon	g/l fresh compost	57

	mg/l fresh material	% DM
Total nitrogen	2082	1.33

C:N ratio 28

	Totals		Water extractables	
	mg/l fresh material	% DM	mg/l fresh material	% DM
NH4-N	N/A		240	0.15
NO3-N	N/A		2.4	0.00
P	1039	0.66	725	0.46
K	1792	1.14	1086	0.69
Mg	456	0.29	39	0.02
Ca	726	0.46	47	0.03
Na	25	0.02	28	0.02
S	149	0.10	0.5	0.00
	mg/l fresh material	ppm DM	mg/l fresh material	ppm DM
B	1.4	8.9	0.2	1.3
Mo	0.25	1.6	0.1	0.6
Cu	1.2	7.7	0.2	1.3
Zn	8	51.1	8	51.1
Mn	38	242.6	1.1	7.0
Fe	205	1308.7	1	6.4

TABLE 13 COMPOST ANALYSIS Peat-based multipupose compost

Test	Units	
Bulk density	g/l fresh compost	365
AFP	% volume	
Saturated moisture content	% w/w fresh compost	
Moisture as received	% w/w fresh compost	65
pH		5.4
Conductivity	microS/cm	560
Organic matter by LOI	% of dry matter	91
Dry matter content	g/l fresh compost	128
Organic matter content	g/l fresh compost	116
Organic carbon by calc. DM*0.44	g/l fresh compost	51

	mg/l fresh material	% DM
Total nitrogen	1400	1.10

C:N ratio 37

	Totals		Water extractables	
	mg/l fresh material	% DM	mg/l fresh material	% DM
NH4-N	N/A		6	0.00
NO3-N	N/A		270	0.21
P	190	0.15	90	0.07
K	460	0.36	222	0.17
Mg	nd		174	0.14
Ca	nd		156	0.12

	mg/l fresh material	ppm DM
Cu	9	70.5
Zn	3	23.5

nd = not determined