EFFECTS OF ORGANIC AMENDMENTS, FERTILISERS AND FENAMIPHOS ON PARASITIC AND FREE-LIVING NEMATODES, TOMATO GROWTH AND YIELD

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Summary. The effects of various organic amendments, fertilisers and fenamiphos on the growth of tomatoes were compared in pots containing soil naturally infested with the plant parasitic nematodes *Meloidogyne javanica*, *Paratrichodorus* sp. and *Criconemella xenoplax* and free living nematodes. Organic amendments (at 3.2-14 t Dry Matter/ha, or 10,270 l molasses/ha) were added to the soil six weeks before transplanting tomato cv. Grosse Lisse. Soils amended with grassy weed residues, barley residues, lucerne pellets, molasses, two commercial organic fertilisers, or with complete fertiliser stimulated stem growth of tomato plants. Root growth was stimulated in plants grown in soil amended with molasses; this was correlated with an increased root gall index, but *M. javanica* densities in soil and roots were not elevated. Root gall index was also increased in plants grown with complete fertiliser. Fruit yield was stimulated in plants grown in soil amended or treated with grassy weed residues, lucerne pellets, complete fertiliser or fenamiphos; yields were 740% higher in plants grown in soil amended with grassy weed residues than in plants grown in unamended soil with an equivalent rate of urea. Shredded paper and potato peel caused N deficiency and poor growth, and sudden collapse was observed in plants growing in soil amended with potato peel, due to infection of stem bases by *Pythium* sp. Pea straw was resistant to breakdown, and inhibited plant growth. Lucerne pellets, a pig manure-based organic fertiliser, and fenamiphos reduced densities of *M. javanica* in soil; lucerne pellets, composted green waste and fenamiphos reduced densities of *M. javanica* on tomato roots. Densities of *Paratrichodorus* sp. were reduced in soil amended with all solid organic materials, or with molasses. *Criconemella xenoplax* densities remained low in all treatments. Of soil amendments and treatments that did not inhibit plant growth, only grassy weed residues, lucerne pellets and poultry manure maintained elevated densities of free-living nematodes in soil up to harvest. Grassy weed residues and lucerne pellets have potential for stimulating tomato growth, and/or reducing *M. javanica* densities, while increasing densities of free-living nematodes.

Key words: Control, *Criconemella xenoplax*, *Lycopersicon esculentum*, *Meloidogyne javanica*, *Paratrichodorus* sp.

Root-knot nematodes (*Meloidogyne* spp.) are the most damaging nematode pests of Australian vegetable crops, both commercial and home garden. Few soil fumigants and nematicides are registered for use in vegetables, and most are too dangerous to be used in home gardens. Resistant cultivars are available for few vegetable crops (Walker and Wachtel, 1994), and resistance in tomatoes tends to break down at temperatures above 28-30°C (Ammati *et al.*, 1986), which are common during the growing season. Crop rotation is often difficult in home gardens, where space is limited.

There is growing interest in use of a wide variety of organic amendments and cover crops as alternatives to chemicals for the control of nematodes (Johnson *et al.*, 1967; Badra *et al.*, 1979; Chindo and Khan, 1990; Stirling and Nikulin, 1998; Walker, 1995a, 2004; Lopez-Perrez *et al.*, 2005). However, some organic amendments may improve survival of *Meloidogyne* spp. in soil, or infectivity, leading to higher densities on subsequent crops (Walker, 1995b, c). Amendments with high N contents are generally recognised as being more effective against nematodes than those with lower N contents (Mian and Rodriguez-Kabana, 1982); the latter can also be effective, but pose particular problems for managing plant nutrition as they cause N drawdown (Stirling and Nikulin, 1998). Molasses also has some suppressive activity against these nematodes (Rodriguez-Kabana *et al.*, 1978).

This paper reports results of a pot experiment to evaluate alternative, non-chemical control strategies in soil naturally infested with *M. javanica* (Treub) Chitw., including a range of organic amendments potentially suitable for use by vegetable growers, particularly in home gardens. Fresh green matter from barley and grassy weeds, pea straw, lucerne pellets, poultry manure, two commercial organic fertilisers and molasses were compared with the locally registered nematicide, fenamiphos, and inorganic fertilisers, in their effects on growth and yield of tomato (*Lycopersicon esculentum* Miller) plants and population densities of nematodes. Shredded paper and fresh potato peelings were also evaluated as soil amendments because they were expected to be more resistant to breakdown and/or to cause N drawdown, particular problems faced by home gardeners attempting to use soil amendments with restricted soil preparation schedules.

MATERIALS AND METHODS

Potting soil and soil treatments. Soil for the shadehouse experiment was collected in August from depth

0.1-0.6 m from under grapevines (cv. Shiraz), infected with *M. javanica*, growing in a McLaren Vale vineyard located 33 km south of Adelaide. Soil type was a McLaren Vale sand, pH 6.2, with 0.67% organic carbon, 0.06% total N and 27 mg/kg nitrate-N. The soil was mixed thoroughly and the initial population densities of nematodes were estimated from five replicate 140 cm^3 sub-samples incubated for five days on extraction trays (Whitehead and Hemming, 1965). The soil also contained low population densities of the plant parasitic nematodes *Paratrichodorus* sp. and *Criconemella xenoplax* (Raski) Luc *et* Raski and of free living nematodes. After mixing, the soil was split into two lots: one to be mixed with organic amendments (apart from unamended control and fenamiphos treatments, which were otherwise similarly processed) before being dispensed into 175 mm diameter pots and transferred to a shade-house bench for six weeks to allow for decomposition; the second lot to be incubated in sealed containers at 10 °C (to assist survival of nematodes) until dispensed into pots in the shade-house 40 days later, allowing application of fenamiphos two days before planting and the same planting date for both lots. Initial population densities of nematodes for the second lot (after incubation at 10 °C) were determined as above.

Coarse organic amendments (fresh barley and weedy grass shoots, pea straw, shredded paper and potato peelings) were chopped into pieces about 60-100 mm in length; these and lucerne pellets, poultry manure and two commercial organic fertilisers (composted green waste or pig manure-based) were mixed with soil at rates equivalent to 10-60 t/ha (Table I) by mixing 24-144 g of amendment/1800 g of soil in each pot. Pots with uncomposted, low N amendments (and unamended control and fenamiphos treatments) were side-dressed with urea (46% N) at 130 kg N/ha, followed by irrigation, to assist decomposition of amendments (Table I). Soil was kept moist during the six-week decomposition period.

Details of soil treatments (Tables I-III) were:

1) Soil held in pots for six weeks at ambient temperature on a shade-house bench: *a)* unamended control; *b)* fenamiphos; *c)* molasses (10 ml/kg of soil, diluted in 240 ml of water/pot); *d)* fresh, green barley (*Hordeum vulgare* L.) shoots (mixed breeders' lines grown in pots in a greenhouse at 22 °C for eight weeks) at 60 t/ha; *e)* shredded, white, office paper at 15 t/ha, plus molasses as above; *f)* fresh potato (*Solanum tuberosum* L.) peelings at 60 t/ha; *g)* composted green waste, commercial organic fertiliser (1.1% N) at 15 t/ha; *h)* grassy weed shoots (*Bromus* sp.) collected from a home garden shortly before seed formation, at 60 t/ha; *i)* lucerne (*Medicago sativa* L.) hay pellets, 4-mm-diameter (Johnson's Pure Lucerne Fertiliser, 2.6% N, Kapunda), at 15 t/ha; *j)* pea (*Pisum sativum* L.) straw at 15 t/ha; *k)* composted poultry manure (Attunga Garden Products, 2.4% N, Dandenong) at 10 t/ha; *l)* pig manure-based organic fertiliser (4% N), at 10 t/ha.

2) Soil incubated at 10 °C in closed containers for 40 days: *a)* complete fertiliser (NPK, 8:3.7:10) at 70 kg N/ha side-dressed at planting; *b)* urea at 70 kg N/ha side-dressed at planting; *c)* Fenamiphos (with urea at 70 kg N/ha side-dressed at planting).

Fenamiphos (9.6 kg/ha; Yates Nemacur Granular Nematicide, 50 g/kg) granules were spread over the soil surface, lightly incorporated and irrigated in, at the end of the decomposition/10 °C incubation period, and two days before planting.

Tomato plants and growth conditions. Tomato plants cv. Grosse Lisse were grown from seed (D.T. Brown, South Windsor) in a greenhouse at 22 °C for 25 days before being transplanted to test soils. There were five replicate 175 mm pots per treatment arranged in a randomised block design on a shade-house bench at ambient temperature. Pots were watered as required, and fertilised with either urea or complete fertiliser within local guidelines, but lower total fertiliser rates were applied to pots amended with animal manures or leguminous materials: viz., lucerne pellets, pea straw, poultry manure and pig manure-based organic fertiliser (Table I). Soil temperature was recorded every 30 minutes at 50 mm-depth using a Tiny Tag® temperature logger (Gemini Data Loggers, Chichester). Pyrethrum and imidacloprid were sprayed to control insects.

Plant growth, tomato yield and nematode assessments. The maximum diameter of the plant stems at ground level was measured after 24, 48, 72 and 107 days of growth using a vernier calliper. After 107 days of growth (two weeks after first reddening of fruit), all fruit, both mature and immature, were harvested and weighed, after drying at 75 °C for seven days. Shoot dry weight (dried at 60 °C for four days) and root fresh weight were measured; root galling was scored using a 0-5 root gall index (Sasser *et al.*, 1984). Nematodes were extracted from a 10 g sub-sample of roots during five days in a mist incubation chamber (Hooper, 1970), and from a 140 cm^3 sub-sample of soil as above.

Statistical analysis. Before statistical analysis, nematode densities were transformed as ln (density + 1) if plots of residuals or tests for non-additivity and normality indicated that this was required. ANOVA, Fisher's protected least significant difference (LSD) or contingency tests ($P = 0.05$) were performed using Statistix (Version 7, Analytical Software, Tallahassee).

RESULTS

Initial nematode population densities. Initial nematode populations per 140 cm^3 of soil (± SE of mean) were 210 ± 28, 8 ± 4, 3 ± 0.6 and 1,172 ± 123 for *M. javanica*, *Paratrichodorus* sp., *Criconemella xenoplax* and free living nematodes, respectively. After incubation at

Table I. Rates of organic amendments and fertilisers applied to potting soil.

Soil treatment	Organic amendment*		kg N/ha (u = urea; c = complete fertiliser)**				
	Fresh weight	Dry matter	pp	ap	1	2	3
Soil at ambient temperature for six weeks before planting							
Untreated	-	-	130 u	-	-	50 u	50 u
Fenamiphos	-	-	130 u	-	-	50 u	50 u
Molasses	(10,270)	-	130 u	-	-	50 u	50 u
Barley shoots	60	4.6	130 u	-	-	50 u	50 u
Shredded paper + molasses	15 (10,270)	14.3	130 u	-	50 u	50 u	50 u
Potato peel	60	3.2	130 u	-	50 u	50 u	50 u
Composted green waste	15	10.5	-	70 u	-	50 u	50 u
Grassy weed shoots	60	6.5	130 u	-	-	50 u	50 u
Lucerne pellets	15	14.0	-	-	-	50 u	50 u
Pea straw	15	13.4	-	70 u	-	50 u	50 u
Poultry manure	10	7.8	-	-	-	50 u	50 u
Organic fertiliser (pig)	10	7.8	-	-	-	50 u	50 u
Soil at 10 °C for 40 days before planting							
Untreated (NPK)	-	-	-	70 c	-	50 c	50 c
Untreated (urea)	-	-	-	70 u	-	50 u	50 u
Fenamiphos	-	-	-	70 u	-	50 u	50 u

* t/ha except for molasses (l/ha in parentheses); dry weights determined after seven days at 70 °C.
**pp = fertiliser applied pre-planting with amendments; ap = fertiliser applied at planting; 1 = fertiliser applied one week after planting to chlorotic plants; 2 = fertiliser applied pre-bloom; 3 = fertiliser applied after start of fruit set.

Table II. Effects of organic amendments, fertilisers and fenamiphos on growth and yield of tomato[1] in pots infested by nematodes.

Soil treatment	Stem diameter (mm)*	Shoot dry weight (g)	Root fresh weight (g)	Fruit	
				Number	Dry weight (g)
Soil at ambient temperature for six weeks before planting					
Untreated	6.4 e	8.8 ef	24.2 bcd	0.8 c	1.0 cd
Fenamiphos	6.2 ef	9 def	13.0 de	1.2 bc	4.3 abc
Molasses	7.3 bcd	14.8 abc	43.6 a	0.6 c	3.4 bcd
Barley shoots	7.6 abc	17.3 a	27.6 bc	1.4 bc	4.2 abc
Shredded paper + molasses	5.5 fg	5.2 f	20.9 cde	1.0 bc	2.2 bcd
Potato peel	3.3 h	10.8 cde	24.5 bcd	0.2 c	0.2 d
Composted green waste	7.3 bcd	13.8 abcd	23.7 bcd	1.4 bc	4.0 abc
Grassy weed shoots	8.2 a	16.3 ab	34.0 ab	1.6 bc	7.36 a
Lucerne pellets	7.8 ab	14.5 abc	35.1 ab	1.6 bc	4.8 ab
Pea straw	5.3 g	5.3 f	11.6 e	1.4 bc	3.1 bcd
Poultry manure	6.8 cde	11 cde	31.9 abc	1.6 bc	3.9 bc
Organic fertiliser (pig)	7.3 bcd	11.4 bcde	30.2 bc	1.6 bc	4.0 abc
Soil at 10 °C for 40 days before planting					
Untreated (NPK)	7.3 bcd	9.4 def	25.5 bc	3.8 a	4.8 ab
Untreated (urea)	6.8 cde	12.4 abcde	28.2 bc	1.4 bc	3.7 bc
Fenamiphos	6.7 de	10.4 cde	20.3 cde	2.4 ab	5.0 ab
LSD ($P<0.05$)	0.81	4.93	11.99	1.40	3.39
CV (%)	20	34	36	76	72

* Factorial ANOVA (soil treatment × number of days' plant growth) significant ($P<0.00001$, both factors); interaction ns; treatment means combine data for 24, 48, 72 and 107-days growth; mean diameters followed by the same letter(s) are not significantly different ($P<0.05$) by LSD test.
[1] Means within a column followed by the same letter(s) are not significantly different ($P<0.05$) by LSD test.

10 °C for six weeks, corresponding populations per 140 cm^3 of soil were 147 ± 15, 9 ± 2, 2 ± 0.7 and 1,399 ± 119, respectively.

Soil temperatures and decomposition of organic amendments. During the six-week decomposition period, mean weekly soil temperatures were 11.4, 12.9, 12.7, 16.3, 13.6 and 16.4 °C, and soil temperatures reached or exceeded 20 °C and 25 °C for a total of 125 and 25.5 hours, respectively, with a maximum recorded soil temperature of 29.9 °C. During the tomato-growing period, mean soil temperature was 16.1 °C (maximum and minimum of 32.6 and 5.4 °C).

At the end of six weeks, the shredded paper, potato peelings and pea straw had broken down the least and, unlike the other amendments, large fragments were still visible in the potting soil.

Tomato plant growth. Leaf chlorosis was observed in plants growing in soils amended with shredded paper and potato peelings one week after transplanting, and a supplementary application of urea was made to these pots (Table I). Two plants growing in soil amended with potato peelings suddenly collapsed and died one week after transplanting, on their first hot day (ambient temperature 37 °C with maximum soil temperature of 32.6 °C). The bases of the stems of these plants were girdled and necrotic, vascular tissue was browned, *Pythium* oogonia were abundant in stem tissue when it was examined under a microscope, and *Pythium* sp. was isolated from this tissue on corn-meal agar. One plant exhibiting root and basal stem rot, and growing in soil amended with pea straw, subsequently also died.

Stem diameter continued to increase up to 72 days after transplanting, but diameter at this date was not significantly different from that at 107 days (data not shown). Plants grown in soils amended with grassy weed residues, barley residues or lucerne pellets had the greatest stem diameters; these and plants grown in soils amended with molasses, the two commercial organic fertilisers, and with complete fertiliser had significantly greater stem diameters than plants grown in unamended soil that had initially been held at ambient temperature for six weeks (Table II). Stem growth of plants grown in soils amended with shredded paper, potato peelings or pea straw was inhibited, and fenamiphos had no significant effect on stem growth when compared with untreated plants (Table II).

Shoot weight was greatest in plants grown in soils amended with barley and grassy weed residues, molasses, lucerne pellets or composted green waste, and was significantly greater than that of plants grown in unamended soil initially held at ambient temperature for six weeks (Table II). Root weight was greatest in plants grown in soils amended with molasses, grassy weed residues, or lucerne pellets, but only in the case of molasses was it significantly greater than that of plants grown in unamended soil initially held at ambient temperature for six weeks (Table II).

The number of fruits per plant was significantly greater in two of the soils initially incubated at 10 °C (viz., those amended with complete fertiliser or treated with fenamiphos) compared with plants grown in unamended soil initially held at ambient temperature for six weeks (Table II). Fruit yield was greatest in plants grown in soil amended or treated with grassy weed residues, lucerne pellets, complete fertiliser, fenamiphos, barley residues or both of the commercial organic fertilisers; it was significantly greater, compared with plants grown in unamended soil initially held at ambient temperature for six weeks, in the case of grassy weed residues, lucerne pellets, complete fertiliser and 10 °C-incubated/fenamiphos-treated soil (Table II).

Root gall index was significantly greater in plants grown in soils amended with molasses or complete fertiliser, compared with plants grown in all other soils (Table III).

Final nematode population densities. Final soil density of *M. javanica* was greatest in soil initially incubated at 10 °C; in soils initially held at ambient temperature for six weeks, densities were significantly less, compared with unamended soil, in soils amended or treated with shredded paper, organic fertiliser (pig manure), lucerne pellets or fenamiphos (Table III). Densities of *Paratrichodorus* sp. were significantly less in all soils compared with unamended soil, except for soils amended with complete fertiliser, or soil initially held at ambient temperature and treated with fenamiphos (Table III). There were no significant differences in soil densities of *C. xenoplax* between treatments, and densities of this nematode remained low (Table III). Densities of free-living nematodes were significantly elevated in soils amended with potato peel, grassy weed residues, pea straw, shredded paper, poultry manure, lucerne pellets or barley residues (Table III).

Meloidogyne javanica was the only plant parasitic nematode detected in roots; densities on roots were significantly reduced in plants grown in soils amended with potato peel, composted green waste, pea straw, lucerne pellets, or soil initially held at ambient temperature and treated with fenamiphos (Table III). Root densities of *M. javanica* were greatest in plants grown in soil amended with complete fertiliser.

DISCUSSION

Amending soil with shredded paper or fresh potato peel resulted in symptoms of nitrogen deficiency and poor plant growth. Amendment with potato peel also led to sudden collapse of tomato plants during hot weather, caused by infection of stem bases by *Pythium* sp. These amendments should be composted before application to soil, or a longer period than six weeks should be allowed for decomposition. Pea straw was also

Table III. Effects of organic amendments, fertilisers and fenamiphos on root gall index of tomato plants, and on densities of plant parasitic and free-living nematodes in soil and/or in roots at the end of the test.

Soil treatment	Root gall index	Nematodes/140 cm³ of soil				*M. javanica* per g DW[1] of roots
		M. javanica	*Paratrichodorus*	*C. xenoplax*	Free-living	
Soil at ambient temperature for six weeks before planting						
Untreated	3.0 b[2]	1,680 bc	17 a	4	1,672 cd	61,678 abc
Fenamiphos	2.2 b	472 d	9 ab	-	2,490 c	21,157 def
Molasses	4.0 a	709 cd	-	3	3,733 c	56,523 abcd
Barley shoots	2.8 b	1,306 cd	-	1	5,134 ab	22,261 cdef
Shredded paper + molasses	2.6 b	263 d	1 c	-	7,600 a	56,184 bcdef
Potato peel	3.0 b	942 cd	5 bc	1	10,074 a	9,183 f
Composted green waste	2.4 b	695 cd	5 bc	4	2,163 cd	11,672 f
Grassy weed shoots	3.0 b	694 cd	-	4	8,939 a	31,382 bcdef
Lucerne pellets	2.6 b	444 d	1 c	2	5,179 a	11,803 ef
Pea straw	2.6 b	863 cd	3 bc	3	8,534 a	19,251 f
Poultry manure	3.0 b	703 cd	-	6	5,508 ab	57,801 abcde
Organic fertiliser (pig)	3.4 b	385 d	3 bc	9	2,110 c	23,047 cdef
Soil at 10 °C for 40 days before planting						
Untreated (NPK)	3.8 a	2,740 ab	27 a	8	1,066 d	107,110 a
Untreated (urea)	3.2 b	3,385 a	3 bc	1	2,154 c	53,284 abc
Fenamiphos	2.2 b	3,502 a	1 c	1	1,486 cd	72,355 ab
CV (%)	21	75	118	108	58	97

[1] DW = dried weight.
[2] Means within a column followed by the same letter(s) are not significantly different ($P<0.05$) by contingency test (root gall index), or by LSD test (other columns; nematode densities transformed as ln [density + 1] for statistical analysis); CV (%) is for untransformed data.

relatively resistant to decomposition, and inhibited plant growth; it is better suited to use as a surface mulch. The other solid organic amendments readily decomposed in the six-week period before transplanting tomato plants.

Soils amended with grassy weed residues, barley residues, lucerne pellets, molasses, the two commercial organic fertilisers, or with complete fertiliser stimulated stem (diameter) growth of tomato plants. Shoot (weight) growth was stimulated in soils amended with barley and grassy weed residues, molasses, lucerne pellets or composted green waste. These organic amendments have potential to increase growth of tomato plants, and did not induce nutrient deficiency symptoms. Growth stimulation from lucerne pellets was previously demonstrated in carrots (Walker, 2004). Root growth was stimulated in plants grown in soil amended with molasses; however, this was correlated with an elevated root gall index indicating that the increased root weight may have resulted, at least partly, from increased root galling caused by *M. javanica*. Molasses applied weekly for fourteen weeks reduced root galling in tomato in soil naturally infested with *M. javanica*, and this effect was thought to be due to stimulation of antagonistic micro-organisms (Vawdrey and Stirling, 1997); the opposite result observed in the current study could be due to differences in the microflora between these soils, or in application frequency.

Fruit yield was stimulated in plants grown in soil amended or treated with grassy weed residues, lucerne pellets, complete fertiliser and in 10 °C-incubated/fenamiphos-treated soil; yields were greatest (740% greater than plants in unamended soil with an equivalent rate of urea) in plants grown in soil amended with grassy weed residues. Grassy weed residues and lucerne pellets have potential for increasing tomato yields, and for reducing the use of or replacing fenamiphos and complete fertilisers.

Of soil amendments and treatments that did not inhibit plant growth, only lucerne pellets, the organic fertiliser based on pig manure, and fenamiphos reduced densities of *M. javanica* in soil; similarly, only lucerne pellets, composted green waste and fenamiphos reduced densities of *M. javanica* in tomato roots. The suppressant activity of lucerne pellets against this nematode has been reported previously (Walker, 2004). Densities of *Paratrichodorus* sp. were reduced in soil amended with all of the solid organic materials, and with molasses. It has been suggested that soil temperatures of 25 °C or higher are required for plant residues to be effective as soil amendments against *Meloidogyne* in tomato (Lopez-Perrez *et al.*, 2005). However, soil temperatures rarely reached this level during the six weeks allowed for decomposition, and it would be difficult to obtain these temperatures in late winter before the most common planting season, spring. The rate of decline in *M. javanica* density was apparently less in soil initially incubated at 10 °C than in soil similarly held at ambient temperature, as final *M. javanica* densities were greatest in the former soil. Of soil amendments and treatments that did not inhibit plant growth, only grassy weed residues, lucerne pellets and poultry manure maintained elevated densities of free-living nematodes in soil up to harvest. Nematode faunal analysis, and abundance of free-living nematodes in particular, has been suggested as a bio-indicator of soil health status (Ferris *et al.*, 2001). The greatest densities of free-living nematodes were detected in soil amended with potato peel, reflecting the slow breakdown of this amendment.

The growth stimulating effects of organic amendments were not entirely due to their effects on parasitic nematodes, and nutritional and other effects, including improved soil structure, stimulation of beneficial soil micro-organisms and increased plant tolerance, were also probably involved. The amendment that gave the greatest fruit yield, grassy weed residues, did not reduce *M. javanica* densities or root galling, indicating that tomato plants were more tolerant of this nematode in soil containing this amendment.

Grassy weed residues appear to have potential for improving tomato growth and yields while increasing densities of free-living nematodes, and could be adapted as green manure crops for this purpose. Lucerne pellets was the only organic amendment that both reduced *M. javanica* density and increased density of free-living nematodes while stimulating tomato growth and yields. Although cost could restrict its usage, this was partly offset by the reduced inputs required of inorganic fertiliser. These two amendments could have particular use for home gardeners, although they need not be restricted to this sector.

ACKNOWLEDGEMENT

Jeffries Garden Soils, Wingfield, and GroMor Australia, Alice Springs donated organic composts.

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Accepted for publication on 3 August 2007.