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MAXIMIZING THE EFFICIENCY OF SOME ORGANIC MANURES

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ABSTRACT

Two incubation and greenhouse experiments were conducted to study the effects of some organic sources, *i.e.* rice straw (RS);wheat straw (WS); broad bean straw (BS); peanuts shells (PS) and orange peel (OP) on organic N mineralization using a sandy soil from the Farm of Faculty of Agriculture, at El-Khattara county, Zagazig University, El-Sharkia Governorate. The obtained results can be summarized as follow: The highest amount of mineralized N was attained after incubation of RS, WS, BS, PS and OP for 11 weeks. For OP the highest amount was attained after 15 Weeks. Mineralized N from the different organic sources can be descendingly arranged as follow: WS > PS > BS > RS > OP. At the 15 Weeks the order was OP > WS > RS > BS > PS. Increasing the rate of organic N (mg N/Kg soil) application increased the amount of mineralized nitrogen (mg N/Kg soil). Increases on percentage of mineralized N (%) negatively correlated with increasing the rate of N application. Organic sources applied individually increased the yield of dry matter of both treated plant (Sorghum and Spinch) when compared with the untreated plant. The organic sources can be descendingly arranged as follow: OP > PS > WS > RS > BS. The highest amount of dry matter was conducted with applied organic sources separately compared with mixing two or three residues. The highest value of dry matter yield was obtained when orange residues was combined with the other residues. Suppressing C/N ratio proportionally increased the yield of dry matter. The highest effect was observed by the C/N ratio 5:1. This trend was true for all the residues.

Key words: Incubation, rice straw, wheat straw, broad been straw, peanut shells, orange peel.

INTRODUCTION

Previous studies for using organic product differed according to the type of source and level: Abo-Hussein (1995); Abd El-Mouty *et al.* (2001); Rizk *et al.* (2002) and Rizk *et al.* (2003) all of them reported that, organic fertilization resulted in comparable yield with those obtained by chemical fertilizers. Moreover, the physical and chemical properties of the organic products improved soil properties. (Abdel-Aty, 1998; Rizk, 2002 and Awad *et al.*, 2002).

Kirchmann and Thorvaldsson (2000) noted that organic inputs, such as plant residues and compost improve soil physical conditions. According to Jeong and Kim (2001) the use of compost, particularly in sandy soils improved soil physical, chemical and biological conditions. Qian and Cai (2007) observed high leaching loss of N in soil of high nitrification potential. Increased soil moisture could slow down nitrification (Brady and Weil, 2002) and increased nitrogen uptake Miller and Bowman (2002). Zhang and Tillman (2007) reported that nitrogen use efficiency is affected by the time of N application. In a sandy soil, field experiments were conducted by El-Eter and Khatab (2004) to study the effect of organic manure (rice straw compost and chicken) alone or mixed with bentonite and vermiculite on peanut and carrot. Showed that, yields of peanut and carrot increased and that the highest yield occurred with the mixture of chicken manure and vermiculate.

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Rice (*Oryza sativa* L.) is an important crop in many areas of the world, and yields a large amount of rice straw residue. A major portion of this agricultural waste is disposed of by burning or used as a mulching material in fields. However, an attractive alternative usage of rice straw is composting. Rice straw is rich in C and poor in N. Its C/N can vary from 50 to 150, which limits the composting process. This high C/N can be decreased by adding N donator to the composted straw using manure. Rashid *et al.* (2001) compared mixtures of rice straw and N materials (cow dung + soybean plants) at ratios ranging from 0.7:1 rice straw, and found that the former ratio produced the most suitable compost in terms of maturity and nutrients. Another plant residue, the faba bean residue can serves as source of N or to composting material since it is rich in N. the present study using to found out the following: a, mineralization rate of different organic N sources as (RS), (WS), (BS), (PS) and (OP) under intermitted leaching, b, the effect of C:N ratio on organic N sources mineralization and the apparent N recovery of the different organic sources by plants (sourghum followed by spinach) from added organic N sources added individually or in combination.

MATERIALS AND METHODS

An Incubation experiment and a green house pot experiment were conducted in the Faculty of Agriculture, Zagazig University to assess the efficiency of some organic sources *i.e.* rice straw (RS);wheat straw (WS); broad bean straw (BS); peanuts shells (PS) and orange peel (OP) as organic manured.

The sandy soil used in this experiment was collected from surface soil of a field in the farm of Faculty of Agriculture, Zagazig Univ., at El-Khattara Country, El-Sharkia Governorate. Soil was air dried, crushed, sieved through 2 mm plastic screen and thoroughly mixed. Table 1 shows properties of the soils.

Some characteristics of organic residues used are shown in Table 2.

The experiments were executed in a randomized complete block design with three replecates.

The Soil Column Incubation Experiment

Two experiments were conducted using the soil in column, each weighing 1200g of air dried soil place in plastic cylinders of 50 cm height. The soil column was 30 cm high.

Soil incubation column experiment 1

These were 21 treatments. Twenty treatments representing 4 organic rates of addition *i.e.* 25, 50, 75 and 100 mgN /Kg soil applied in 5 different sources i.e. RS. WS. BS. PS and OP. An additional treatment of no. N was done.

Soil incubation column experiment 2

These were 15 treatments representing 3 C/N ratio values *i.e.* 5:1, 10:1 and 15:1 applied in the form of the 5 different sources, all having 100 mg N/Kg soil. Mineral N (as ammonium sulphate) was added wherever needed to adjusted the required C/N of the organic sources.

The added material were placed withen the soil surface 5-cm layer covered with the 5-cm subsurface (5-10) layer covered with the surface layer of (5-10) of the soil column. Water was added in amounts enough to reach maximum water holding capacity of soil. Soil column were subjected to ten times of intermittent leaching by tap water. Water amount for each column was 250 ml. Soil column were left in the laboratory. The leachates were collected at the start of the experiment and then following 2, 5, 7, 11, 15, 19, 23, 27, 32 and 36 weeks, and analyzed for these contents of mineral NO_3-N. and NH_4-N.

Pot Experiment

A pot experiment was conducted in the green house, Faculty of Agriculture Zagazig University using a sandy soil from the Farm of the Faculty of Agriculture, at El-Khattara Country, Zagazig University, El-Sharkia Governorate. Plastic pots of internal dimensions of 10 x 20 cm in diameter and 20 cm in height were filled with two kilograms of the soil per pot.

Before planting the organic residues were thoroughly mixed with the soil in pots at the following rates.

1. No- N addition

Table 1. Physical and chemical properties of the investigated soil

Characteristic	El-Khattara soil
Particles size distribution	
Sand (%)	81.83
Silt (%)	12.12
Clay (%)	6.05
Textural class	loamy sand
Field capacity (FC) (%)	10.98
$CaCO_3$ (%)	0.45
Organic matter (%)	0.39
pH	8.01
EC, $dS/_m^{-1}$	0.32
Total N $g/_{Kg}^{-1}$	3.4
Total P $g/_{Kg}^{-1}$	1.2
Total K $g/_{Kg}^{-1}$	0.8

Table 2. Some characteristics of organic residues

Residues elements	RS	WS	BS	Pr	Or
N g /Kg	14	12	19	13	15
OC g /Kg	202.6	161.7	253.2	261.0	220.1
OM g /Kg	349.3	278.8	436.6	450.0	379.5
C/N Ratio	15	13	13	20	15

R.S= Rice Straw W.S = Wheat Straw
B.S = Broad bean Straw P.SH = Peanuts Shell
O.P = Orange Peel

2. 100 mg N/Kg soil added individually as rice straw or wheat straw or broad bean straw or peanuts shells or orange peels.
3. 50 mg N/Kg soil as (AS) + 50 mg as each of rice straw – wheat straw – broad bean straw – peanuts shells or orange peels.
4. 50 mg N/Kg soil as (AS) + 25 mg rice straw + 25 mg wheat straw
5. 50 mg N/Kg soil as (AS) + 25 mg rice straw + 25 mg broad bean straw
6. 50 mg N/Kg soil as (AS) + 25 mg rice straw + 25 mg peanuts shells
7. 50 mg N/Kg soil as (AS) + 25 mg rice straw + 25 mg orange peels
8. 50 mg N/Kg soil as (AS) + 25 mg wheat straw + 25 mg broad bean straw
9. 50 mg N/Kg soil as (AS) + 25 mg wheat straw + 25 mg peanuts shells
10. 50 mg N/Kg soil as (AS) + 25 mg wheat straw + 25 mg orange peels
11. 50 mg N/Kg soil as (AS) + 25 mg broad bean straw + 25 mg peanuts shells
12. 50 mg N/Kg soil as (AS) + 25 mg broad bean straw + 25 mg orange peels
13. 50 mg N/Kg soil as (AS) + 25 mg peanuts shells + 25 mg orange peels
14. 100 mg N as mixture of AS and PS to having 15:1 C/N ratio
15. 100 mg N/Kg soil as rice straw or wheat straw or broad bean straw or peanuts shells or orange peels adjusted to C/N ratio (10:1) by added AS.

16. 100mg N/Kg soil as rice straw or wheat straw or broad bean straw or peanuts shells or orange peels adjusted to C/N ratio (5:1) by added AS.

Material for each experiment was thoroughly mixed with the soil before seeding. Also P and K were applied to all treatments 13 mg P + 42 mg K /Kg soil in former of ordinary superphosphate as (689 P/Kg fertilizer) and potassium sulphate (420 K/Kg fertilizer). Ten seeds of sorghum were sown and then after cutting of sorghum, ten seeds of spinach were seeded per pot. Pots were daily weighed and the soil moisture content was adjusted nearly the field capacity. After germination plants were thinned to five plants.

Plants of each pot were cut above the soil surface after 45 days of sowing. The plant fresh weight was recorded and then dried at 70^0c for 72 hours, weighed, ground and analyzed for total nitrogen. Samples of plants were wet digested with concentrated mixture of H_2SO_4 + $HClO_4$ (3: 1 V/V) for analyses.

Soil Analysis

- The particles size distribution of the soil samples was determined using the international pipette method as described by Piper (1950).
- The electrical conductivity (EC) of soil water extract (1 : 5) was determined by using the bridge, Jackson (1958).
- Calcium carbonate content of the soil was determined volumetrically using Collions calcimeter described by Piper (1950).
- Soil pH was measured using glass electrode pH meter in a 1:2.5 soil water suspension (Cottenie *et al.*, 1982).
- Soluble cations and anions were determined in (1 : 5) soil water extract (Black *et al.*, 1965).
- Organic matter was determined following Walkelly and Black method, as described by Jackson (1958).
- Total nitrogen in soil was wet digested by conc. (4 ml H_2SO_4 + 1 ml $HClO_4$) and determined using the Microkjeldahl method according to Jackson (1958).
- Total potassium in soil was determined by flame photometer according to Jackson, (1958).
- Total phosphorus in soil was digested by conc. (4 ml H_2SO_4 + 1 ml $HClO_4$) and determined colourmetrically using ascorbic acid method (Watanabe and Olsen, 1965)

RESULTS AND DISCUSSION

Incubation Experiment

This experiment was carried out to study mineralization rate of organic N from the five sources of organic sources, *i.e.* rice straw (RS), wheat straw (WS), broad bean straw (BS), peanuts shell (PS) and orange peel (OP). These residues were added to soil and left for 36 weeks. The amount of mineralized N was determined by replacement of soil solution by applying water to the W.H.C. after each period. The data representing N released during incubation for 36 weeks from different organic sources are recorded in Table 3.

Results recorded here representing the averages obtained by treatment. Assessment of results in data with in terms of the patterns of response to treatments.

The data reveal that after 11 weeks period, the amount of mineralized N from the organic sources can be generally descendly arranged as follows: WS > PS > BS > RS > OP while after 15 weeks the order was OP > WS > RS > BS > PS concerning the accumulated amounts of mineralized organic nitrogen at the end of incubation period, the data indicate that increasing the rate of organic N application increased the amount of mineralized nitrogen. The amount increased with the increase in N addition, then decreased at the highest N rate. However, in terms of percentage of applied N, the mineralized portions decreased with the increased in the rate of application.

The overall means of mineralized N relative to applied N percentage of mineralized N amount were 59.0, 33.2, 24.8 and 18.8%of the applied rates of 25, 50, 75 and 100 mg N/Kg respectively.

Table 3. Mineralized-N (NH_4+NO_3) $Nmg/_{kg}^{-1}$ in soil treated with different organic sources at different periods of incubation

Total N added (mgN/Kg soil)	Incubation period (weeks)										
	2	5	7	11	15	19	23	27	32	36	Total
Rice straw (RS)											
25	0.58	0.59	1.22	3.1	3.27	1.50	1.14	1.09	1.09	1.09	14.67
50	1.5	1.51	1.39	3.52	4.15	2.06	0.55	0.61	1.41	0.64	17.34
75	2.07	1.66	1.74	5.22	3.05	1.54	0.70	0.69	0.69	0.51	17.87
100	1.35	1.68	1.37	5.78	3.26	1.41	1.42	0.68	0.56	0.61	18.12
mean	1.37	1.36	1.43	4.40	3.43	1.63	0.95	0.77	0.94	0.72	17.00
Wheat straw(WS)											
25	0.67	0.58	1.48	4.74	3.26	1.91	2.54	0.71	0.69	0.69	17.27
50	1.65	1.43	1.5	4.08	4.37	1.57	1.79	0.64	2.28	0.70	20.01
75	1.84	1.48	1.48	4.29	4.26	1.27	1.77	2.88	1.40	1.14	21.81
100	1.35	0.77	3.42	6.80	4.26	0.57	1.65	2.53	1.59	1.34	24.28
mean	1.38	1.06	1.97	4.98	4.04	1.33	1.94	1.69	1.49	0.97	20.85
Broad bean straw (BS)											
25	0.68	0.74	0.69	3.64	3.01	1.73	0.76	1.50	0.66	0.69	14.10
50	0.96	0.77	1.48	2.84	3.69	1.56	0.50	1.44	1.49	0.60	15.33
75	1.72	0.71	2.93	5.36	3.05	1.54	0.56	0.61	0.50	0.60	17.58
100	2.11	1.49	1.66	4.50	3.89	1.57	1.36	1.66	2.11	1.50	21.85
mean	1.37	0.93	1.69	4.08	3.41	1.60	0.79	1.30	1.19	0.85	17.21
Peanut shells (PS)											
25	0.83	0.79	0.64	4.165	2.61	1.39	1.35	0.65	0.70	0.60	13.72
50	2.29	0.78	0.80	4.44	2.61	1.72	0.64	2.04	0.70	0.55	16.57
75	2.51	0.73	2.38	5.00	3.73	1.17	0.69	0.73	1.39	0.61	18.94
100	1.68	0.74	2.28	6.35	3.70	1.47	0.56	0.55	0.80	0.58	18.71
mean	1.83	0.76	1.52	4.99	3.16	1.44	0.81	0.99	0.90	0.58	16.98
Orange peel (OP)											
25	0.63	0.66	0.79	3.03	3.92	1.55	0.46	0.88	1.37	0.64	13.93
50	0.73	0.67	0.68	3.79	3.48	1.69	0.62	0.61	0.62	0.51	13.40
75	1.59	0.60	3.19	4.46	3.05	1.48	0.68	0.68	1.55	1.34	18.62
100	2.34	0.75	3.18	3.74	5.29	0.74	1.38	0.52	0.57	0.59	19.10
mean	1.32	0.67	1.96	3.75	3.93	1.36	0.78	0.67	1.03	0.77	16.24
General means											
25	0.68	0.67	0.96	3.73	3.21	1.62	1.25	0.97	0.90	0.74	14.74
50	1.74	1.05	1.19	3.86	3.49	1.73	0.82	1.35	1.32	0.61	16.53
75	1.95	1.04	2.34	4.87	3.43	1.40	0.88	1.12	1.11	0.84	18.96
100	1.77	1.09	2.38	5.43	4.08	1.15	1.27	1.19	1.13	0.92	20.41
General mean	1.53	0.96	1.72	4.47	3.55	1.47	1.05	1.16	1.11	0.78	17.66
Non-treated	0.43	0.45	0.48	0.46	0.27	0.09	0.36	0.36	0.43	0.35	3.68

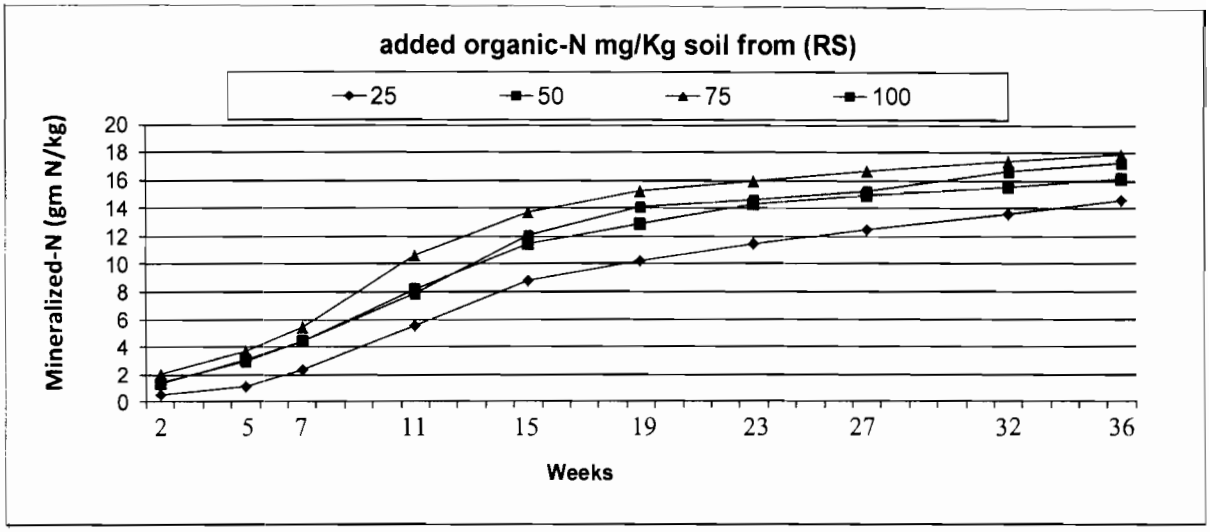

Fig.1. Cumulative contents of added as rice straw during 36 weeks following addition

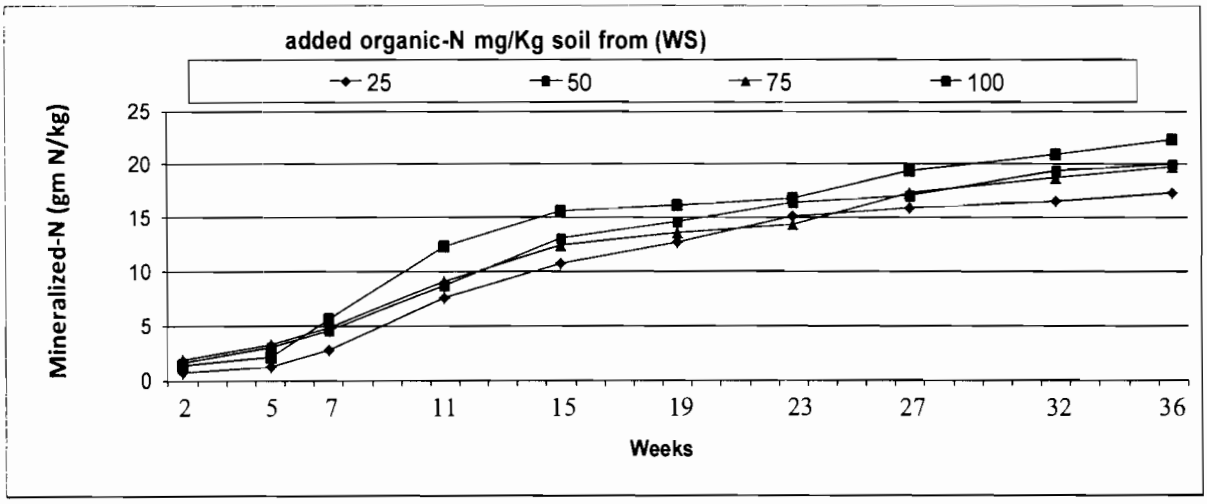

Fig. 2. Cumulative contents of added as wheat straw during 36 weeks following addition

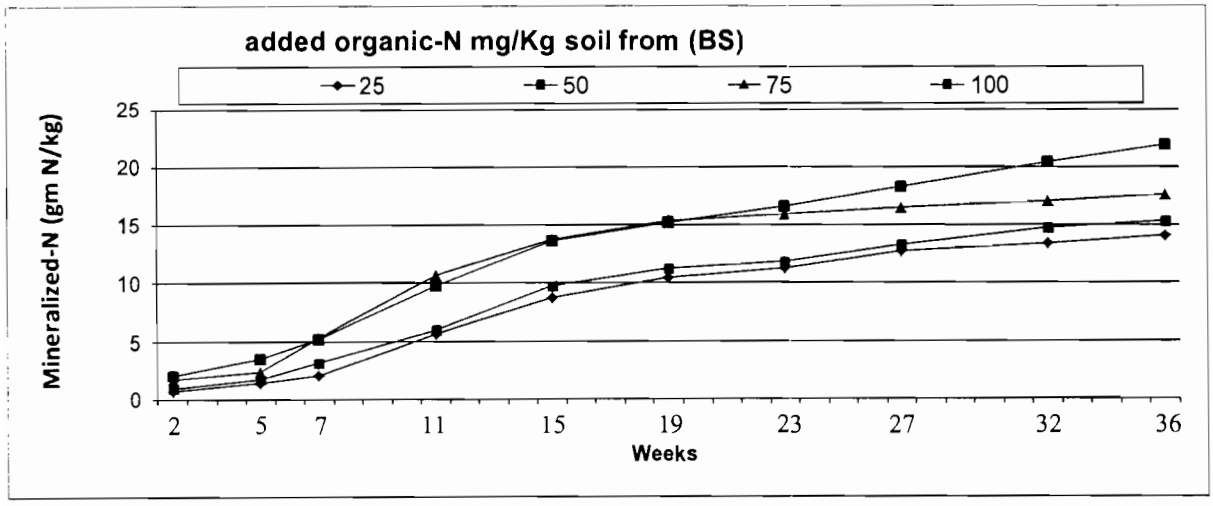

Fig. 3. Cumulative contents of added as broad bean straw during 36 weeks following addition

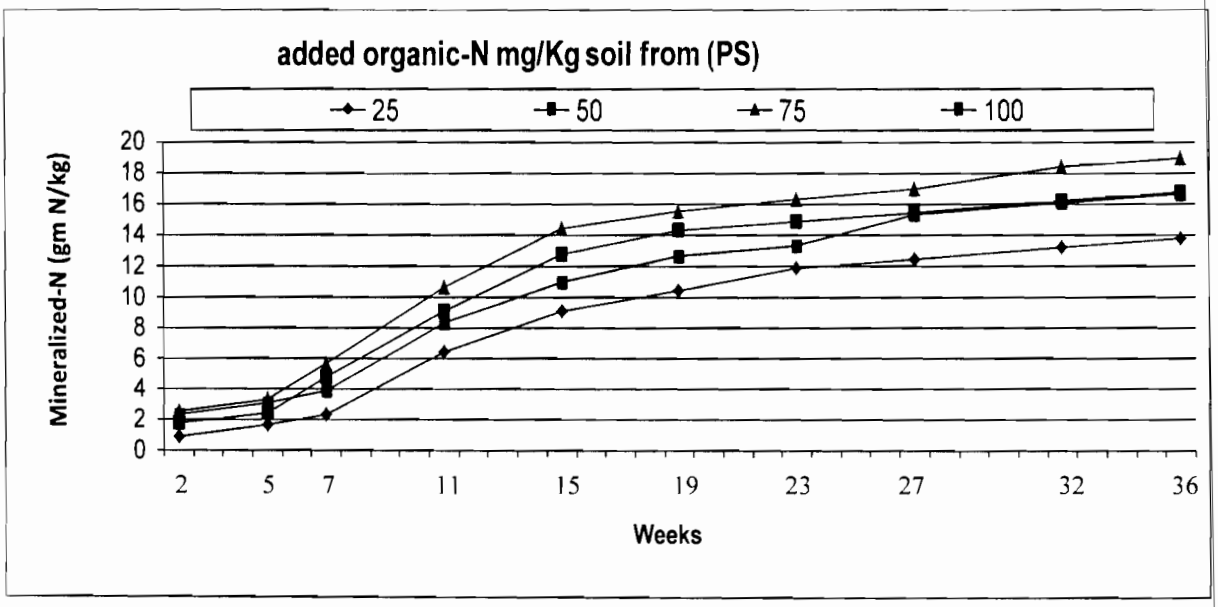

Fig. 4. Cumulative contents of added as peanuts shell during 36 weeks following addition

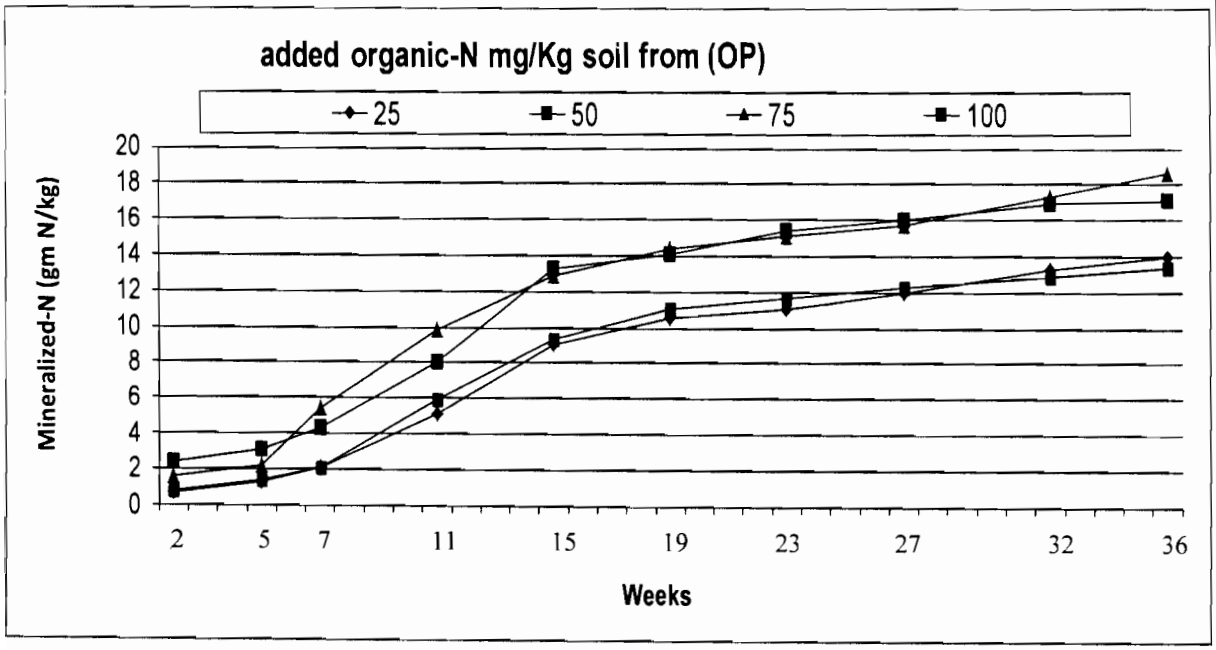

Fig. 5. Cumulative contents of added as orange pell during 36 weeks following addition

Table 4. Effect of (C/N) Ratio on mineralized-N (mg /Kg) during incubation period

C/N Ratio	Incubation period (weeks)										
	2	5	7	11	15	19	23	27	32	36	Total
					Rice straw (RS)						
15:1	1.35	1.68	1.37	3.78	3.26	1.41	1.42	0.68	0.56	0.61	18.12
10:1	2.32	1.91	2.28	3.73	4.04	1.32	0.76	1.30	2.04	1.31	21.01
5:1	5.50	5.44	2.70	1.58	4.72	1.91	1.43	2.32	1.55	0.58	27.73
mean	3.05	3.01	2.11	3.69	4.01	1.54	1.20	1.43	1.38	0.83	22.25
					Wheat straw (WS)						
15:1	1.35	0.77	3.42	6.80	3.26	0.57	0.65	2.53	1.59	1.34	24.28
10:1	2.45	3.16	3.20	3.41	4.64	1.39	1.36	2.43	2.07	0.71	24.82
5:1	7.73	5.17	2.31	3.48	5.17	1.75	0.72	1.65	2.41	1.47	31.86
mean	3.84	3.03	2.98	4.56	4.69	1.24	1.24	2.20	2.02	1.17	26.97
					Broad bean straw (BS)						
15:1	2.11	1.49	1.66	4.50	3.89	1.57	1.36	1.66	2.11	1.50	21.85
10:1	1.61	1.62	2.66	2.31	3.48	1.54	0.63	0.71	1.6	1.34	17.5
5:1	7.23	6.73	3.47	3.60	4.42	2.47	0.7	2.68	1.57	0.54	33.41
mean	3.65	3.28	2.60	3.47	3.93	1.86	0.90	1.68	1.76	1.13	24.26
					Peanut shells (PS)						
15:1	9.76	7.73	6.68	4.38	4.68	2.58	1.38	1.61	1.39	1.4	18.71
10:1	1.26	9.61	1.62	1.42	3.04	0.91	0.64	1.37	1.30	1.45	22.62
5:1	9.73	9.41	1.09	7.39	4.86	2.49	0.66	2.39	1.02	0.49	39.53
mean	4.22	6.59	1.66	5.05	3.87	1.62	0.62	1.44	1.04	0.84	26.95
					Orange peel (OP)						
15:1	2.34	0.75	1.18	3.74	5.29	0.74	1.38	0.52	0.57	0.59	19.1
10:1	5.75	4.54	2.76	1.52	4.64	1.59	1.36	1.35	2.00	1.27	26.78
5:1	5.27	4.50	1.72	2.10	5.58	1.68	1.96	1.59	2.59	1.61	28.6
mean	4.45	3.26	2.55	2.45	5.17	1.34	1.57	1.15	1.72	1.16	24.82

Table 5. Total mineralized-N (mgN/Kg) during incubation period

Organic-N source	N Rate			
	25	50	75	100
RS	14.67	17.34	17.78	18.12
WS	17.27	20.01	21.81	24.28
BS	14.10	15.33	17.58	21.85
PS	13.72	16.57	18.94	18.71
OP	13.93	13.40	18.62	19.10

Table 6. Total mineralized-N (%) during incubation period

Treatments	N Rate			
	25	50	75	100
RS	58.68	34.68	23.71	18.12
WS	69.08	40.02	29.08	24.28
BS	56.40	30.66	23.44	21.85
PS	54.88	33.14	25.25	18.71
OP	55.72	26.80	24.83	19.10

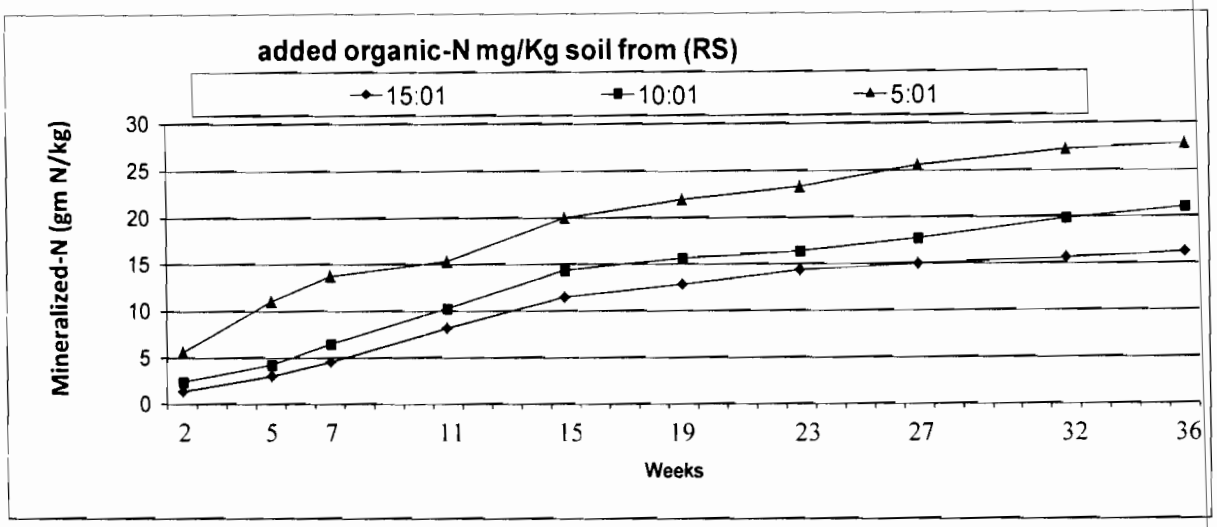

Fig. 6. Effect of (C/N) Ratio on mineralized-N from (RS) (mgN/Kg) during incubation period (accumulated)

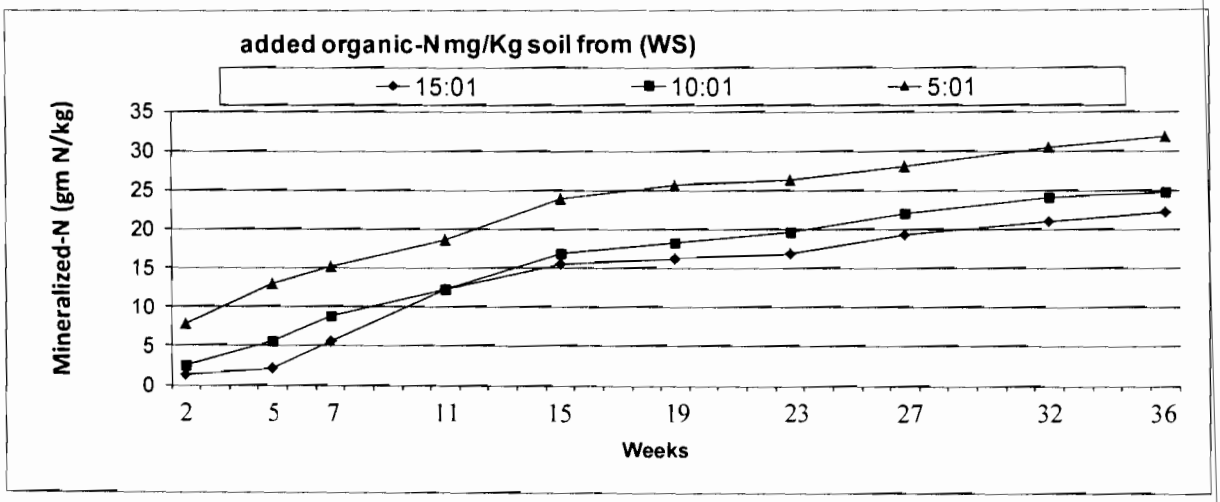

Fig. 7. Effect of (C/N) Ratio on mineralized-N from (WS) (mgN/Kg) during incubation period (accumulated)

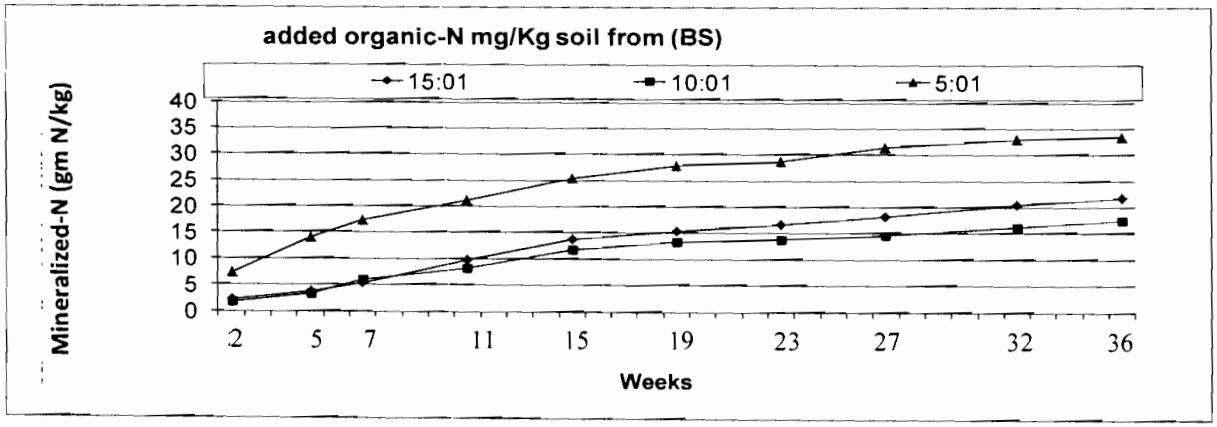

Fig. 8. Effect of (C/N) Ratio on mineralized-N from (BS) (mgN/Kg) during incubation period (accumulated)

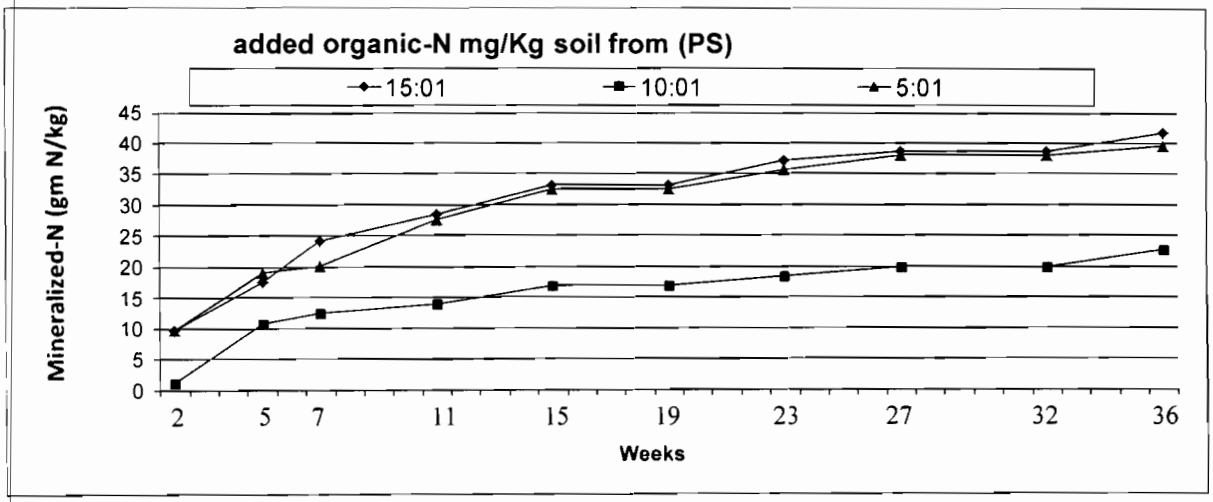

Fig. 9. Effect of (C/N) Ratio on mineralized-N from (PS) (mgN/Kg) during incubation period (accumulated)

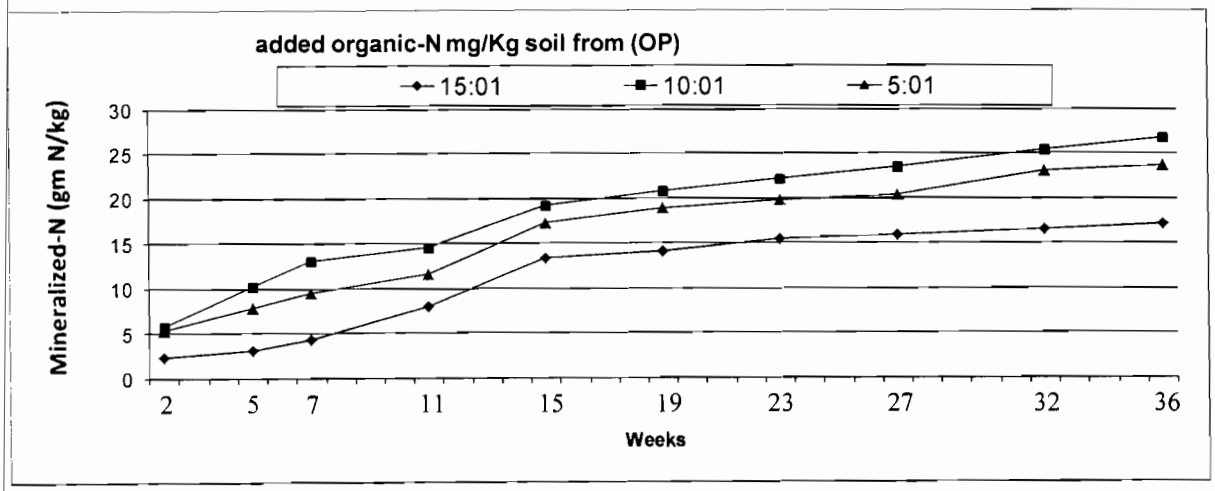

Fig.10. Effect of (C/N) Ratio on mineralized-N from (OP) (mgN/Kg) during incubation period (accumulated)

Table 7. Effect of (C/N Ratio) on total mineralized-N (mgN/Kg) during the 36-weeks incubation period

Organic-N source	C/N Ratio		
	15:1	10:1	5:1
RS	18.12	21.01	27.73
WS	24.28	24.82	31.86
BS	21.85	17.50	33.41
PS	18.71	22.62	39.53
OP	19.10	26.78	28.60

Table 8. Effect of (C/N Ratio) on total mineralized-N as (%) of added organic-N during incubation period

Treatments	C/N ratio		
	15:1	10:1	5:1
RS	18.12	13.79	11.60
WS	24.28	15.90	12.55
BS	21.85	12.96	17.01
PS	18.71	16.31	13.50
OP	19.1	17.99	12.38

On the other hand, the overall means of mineralized N added as different sources were 26.8, 31.7, 26.5, 26.0 and 24.9 for RS, WS, BS, PS and OP sources respectively. This is an indication of the differences in the activity of organisms as well as the differences in the nature of the organic sources.

These percentage were 26.79, 31.69, 26.50, 26.00 and 24.90% for RS.; WS.; BS; PS and OP.

These results pointed out that addition of bacterial inoculants is needed and preferable.

Regarding the effect of C/N ratio on organic N mineralization, the data present that the general mean of different sources increased by narrowing C/N ratio.The highest mineralized N was obtained by 5:1 ratio.

The Pot Experiment

This experiment was carried out to study mineralization of organic N from different organic sources under growing plants. Sorghum and spinach were used as indicator plant for measuring the effect of mineralized of organic N on its yield and N-uptake. The obtained data presenting the effect of individual or in combination with the other on dry matter yield, N Up-take and N-consumptive use are recorded in Tables 9, 10 and 11.

Dry Matter

The data revealed that the organic sources applied individually increased the yield of dry matter of both plants.

Increasing the yield of dry matter of both plants was due to the application of the organic sources can be descendingly arranged as follows:

OP > PS> WS > RS > BS

For the interactive effect of organic residues the data indicated that the individual application show higher yield of dry matter than the combination between 2 or 3 residues as indicated in Tables 9 and 10. The higher value of dry matter yield was obtained when orange residues was combined with the other residues.

Studying the effect of narrowing C/N ratio of added residues, the data in Table 4 showed that narrowing C/N ratio proportionally increased the yield of dry matter. The highest effect was observed by the C/N ratio 5:1. This trend was true for all the residues.

N Uptake

The N uptake as a result of application of five individually or in combination organic-N sources are recorded in Tables 9 and 10. The data shows that the total N uptake by both plants used ranged between 15.50 and 23.86 mg N /Kg soil when organic sources were added individually. When these sources were added in combination of two or three sources, the corresponding values were 15.71 – 29.49 and 19.06 – 33.18 mg N /Kg soil respectively.

From the abovementioned data, it can be noticed that the absorbed organic- N ranged between 15.71 and 33.18% of the added organic-N source.

Table 9. Effect of individual organic sources on dry matter (g/pot), N-uptake (mgN/pot) and consumptive use

Treatment	Dry matter		N uptake			N consumptive use
	Sorghum	Spinach	Sorghum	Spinach	Total	
Non-treated	1.3	0.86	15.38	10.08	25.46	0
100 mg (N) RS	1.47	1.36	20.81	21.08	41.89	8.21
100 mg (N) WS	1.53	1.36	17.91	18.75	36.66	18.33
100 mg (N) BS	0.94	1.53	11.03	19.96	30.99	15.49
100 mg (N) PS	2.07	1.50	25.33	17.06	42.39	21.19
100 mg (N) OP	2.76	1.36	24.77	22.95	47.72	23.86

Table 10. Effect of interaction between organic sources and inorganic N on dry matter (g/pot), N-uptake (mgN/pot) and N-consumptive use

Treatment	Dry matter		N uptake			N consumptive use
	Sorghum	Spinach	Sorghum	Spinach	Total	
			50 mg (N) A.S + 50 mg (N) Residue			
RS	0.94	1.33	15.71	21.41	37.12	18.56
WS	0.83	1.43	11.26	20.16	31.42	15.71
BS	0.96	1.3	17.04	22.06	39.1	19.55
PS	1.56	1.53	27.22	26.09	53.31	26.65
OP	1.79	1.36	33.14	25.84	58.98	29.49
			50 (N) AS + 25 (N) mg Residue 1 + 25 (N) mg Residue 2			
RS + RS	0.64	1.43	11.97	26.14	38.11	19.05
RS +BS	0.82	1.63	16.69	33.16	49.85	24.92
RS + PS	1.31	1.4.0	23.73	26.06	49.79	24.89
RS + OP	1.28	1.33	29.00	25.00	54.00	27.00
WS +BS	0.81	1.5	13.26	31.00	44.26	22.13
WS + PS	1.45	1.43	19.55	19.26	38.81	19.40
WS + OP	1.32	1.43	22.72	24.86	47.58	23.79
BS + PS	1.19	1.6	20.56	27.48	48.04	24.02
BS + OP	1.53	1.43	31.28	28.73	60.01	30.00
PS + OP	1.89	1.23	40.87	25.48	66.35	33.17

L.S.D (0.05)	sorghum	spinach	
	0.37	0.70	Dry matter
	6.73	21.47	N-uptake
	5.94	18.65	N consumptive use

Comparing the method of application, the data indicated that application as a combination of three sources showed higher N absorption than in two combination. In addition, the individual application was the lower.

Concerning the effect of C/N ratio of the added organic sources on the uptake of N, the data in Table 11 indicated that decreasing the C/N ratio resulted in an increases in N uptake. This effect was noticed from all organic sources tested. The highest increase was obtained by the 5:1 ratio.

General Discussion

The data in Table 2 indicated that the organic sources of nutrients such as crop residues may contribute a good supply for N nutrient. These sources differed in this fertilizing value depending on N content and C/N ratio. Also the form of N may influence organic-N mineralization. From the obtained data we may recommend the following:

- The addition of organic sources has to be done before planting by 7-11 weeks this means that these sources act as slow release fertilizer.
- Organic sources added as fertilizer may be added as split dose (2 or 3).
- Narrowing the C/N ratio of organic-N sources, by adding mineral sources (ammonium sulphate) increase mineralization ratio and the efficiency of organic sources used in this study.

Table 11. Effect of (C/N) ratio on dry matter (g/pot), N-uptake (mgN/pot) and N-consumptive use

Treatment	Dry matter		N uptake			N consumptive use
	Sorghum	Spinach	Sorghum	Spinach	Total	
			Rice straw			
15:1	1.47	1.36	20.81	21.08	41.89	8.21
10:1	2.13	1.43	42.28	27.67	69.95	22.96
5:1	2.51	1.53	83.59	39.92	123.51	25.84
			Wheat straw			
15:1	1.53	1.36	17.91	18.75	36.66	18.33
10:1	1.45	1.43	24.27	26.15	50.42	16.154
5:1	4.17	1.40	134.93	41.07	176	34.66
			Broad bean straw			
15:1	0.94	1.53	11.03	19.96	30.99	15.49
10:1	1.93	1.56	39.02	30.79	69.81	25.85
5:1	3.09	1.33	110.92	40.41	151.33	38.53
			Peanuts shell			
15:1	3.37	1.96	67.64	60.71	128.38	64.19
10:1	3.69	1.83	119.07	39.26	158.33	57.08
5:1	1.14	1.60	157.84	50.06	207.9	35.14
			Orange peel			
15:1	2.76	1.36	74.77	22.95	97.72	48.86
10:1	3.16	1.50	106.75	32.71	139.46	46.86
5:1	0.43	1.23	120.60	37.23	157.85	34.18

L.S.D (0.05)	sorghum	spinach	
	0.70	0.36	Dry matter
	21.47	9.06	N-uptake
	19.46	8.56	N consumptive use

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تعظيم كفاءة بعض المخصبات العضوية

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تم إجراء تجربة تحضين وتجربة أصص لدراسة انطلاق النيتروجين الممعدن من بعض المصادر العضوية مثل قش الأرز وقش القمح وقش الفول البلدى وقشر الفول السودانى وقشر البرتقال وتم استخدام تربة رملية من مزرعة كلية الزراعة بالخطارة فى كلتا التجربتين ويمكن تلخيص النتائج المتحصل عليها فيما يلى : تم الحصول على أعلى كمية من النيتروجين الممعدن المنطلق من المصادر العضوية التالية (قش الأرز – قش القمح – قشر الفول البلدى – قشر السودانى) بعد ١١ أسبوع ولكن مع قشر البرتقال تم الحصول على أعلى كميه من النيتروجين الممعدن بعد ١٥ أسبوع، يمكن ترتيب المصادر العضوية تنازليا حسب كمية النيتروجين الممعدن المنطلق منها كما يلى : قش القمح > قشر السودانى > قش الفول البلدى > قش الأرز > قشر البرتقال، زيادة كمية النيتروجين الممعدن المنطلق من المصادر العضوية مع زيادة معدل النيتروجين العضوى المضاف، النسبة المئوية للنيتروجين الممعدن المنطلق من المصادر العضوية تتناسب عكسيا مع كمية النيتروجين العضوى المضاف منها، إضافة المواد العضوية أدى إلى زيادة فى وزن المادة الجافة فى كلا النباتين (السورجم والسبانخ) مقارنة مع الكنترول، يمكن ترتيب المصادر العضوية حسب الزيادة الناتجة منها فى وزن المادة الجافة كما يلى : قشر البرتقال > قشر السودانى > قش القمح > قش الأرز > قش الفول البلدى، أعلى زيادة فى وزن المادة الجافة كانت عند إضافة المادة العضوية منفرده مقارنة مع إضافة مصدرين أو ثلاثة مصادر عضوية مختلطة، أعلى زيادة فى وزن المادة الجافة كان مع إضافة قشر البرتقال مقارنة مع المصادر العضوية الأخرى، تضييق نسبة الكربون إلى النيتروجين فى المصادر العضوية المختلفة أدى إلى زيادة فى وزن المادة الجافة، تحققت أعلى زيادة فى وزن المادة الجافة عند نسبة الكربون إلى النيتروجين ٥ : ١ وتحقق هذا أيضاً مع كل المصادر العضوية، بالنسبة لامتصاص النيتروجين فانه سلك تقريبا نفس سلوك المادة الجافة.

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