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# WHEAT RESPONSE TO SOME AGRO-INDUSTERIAL WASTES AND CONVENTIONAL N-FERTILIZERS

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**ABSTRACT : A pot experiment was conducted to study the response of wheat plant to the application of N – fertilization from different N- sources i.e., Urea (U); Ureaformaldehyde (UF) ; Palma residues (PA); Potatoe residues (PO) and Orange residues (OR) on dry matter yield ,macronutrients (N,P,&K) and micronutrients (Fe , Mn ,& Zn) were investigated. The obtained results could be summarized as follows :**

**1)Dry weight of straw and grains was significantly increased this at the addition of nitrogen sources.The highest value (8.76 g pot$^{-1}$) was observed at the application treatment of Palma residues (75 kg N fed $^{-1}$ as palma +25 kg N fed $^{-1}$ as urea ) at maturity stage. Highest grain yield ( 8.62 g pot $^{-1}$ ) was observed under the application of the same treatment of straw.**

**2)Uptake of N,P&K by wheat plants was significantly affected by the addition of different nitrogen sources . The highest values (196 & 23mg pot $^{-1}$, respectively) of N and P uptake were obtained at booting stage due to the addition of Palma residues (75 kg N fed$^{-1}$ as Palma+25 kg N fed$^{-1}$ as urea) and Potatoe residues (75 kg N fed$^{-1}$ as Potatoes + 25 kg N fed$^{-1}$ as urea).while highest K-uptake value was (109 mg pot$^{-1}$) at maturity stage of palma residues (75 kg N fed $^{-1}$ from N-source + 25 kg N fed $^{-1}$ from urea).**

3) **Uptake of Fe, Mn and Zn were clearly affected due to the addition of nitrogen sources at all growth stages. the highest values of Fe and Zn (1515& 336 µg pot $^{-1}$, respectively) were observed at maturity stage due to the addition of palma residues (75kg N fed$^{-1}$ as palma+25 kg N fed $^{-1}$ as urea) and Potatoe residues (75kg N fed$^{-1}$ as potatoe+25 kg N fed $^{-1}$ as urea). The highest Mn (842 µg pot$^{-1}$) was obtained under the addition of Palma residues (75 kg N fed$^{-1}$ as palma+25 kg N fed $^{-1}$ as urea) at booting stage.**
4) **Highest N & K uptake of grains (245 and 49 mg pot $^{-1}$ ,respectively ) were obtained due to the addition treatment of Palma residues (75 kg N fed$^{-1}$ as palma + 25 kg N fed $^{-1}$ as urea) ,while the highest P-uptake (42 mg pot $^{-1}$) was observed due to the addition of Potatoe residues 75 kg N fed$^{-1}$ as palma + 25 kg N fed $^{-1}$ as urea) .**
5) **Highest Fe & Mn uptake of grains (1100 and 284 µg pot $^{-1}$, respectively) were obtained due to the addition treatment of Palma residues (75 kg N fed$^{-1}$ as palma + 25 kg N fed $^{-1}$ as urea) ,while the highest Zn-uptake (276 µg pot $^{-1}$) was observed due to the addition of Potatoe residues (75 kg N fed$^{-1}$ as palma + 25 kg N fed $^{-1}$ as urea).**

## INTRODUCTION

Fertilizer application is one of the main factors affecting grains and straw yields of field crops. In present time, great efforts are introduced to increase wheat production mainly through increasing the reclamation of sandy soils. Improving fertility of these soils is essential to improve their productivity and efficiency of fertilization (El-Sherbiney *et al.*,1999 b). Attention, therefore, has been directed towards increasing the fertility and productive capacity of sandy soil by using organic matter which has long been recognized as a useful amendment for soils and improves the fertility of sandy soils (Faiyad,1999).

Organic wastes such as crop residues and wastes of agro-industrial products are becoming of an more environmental problem than an asset, because of their accumulation at a large rate with little use. They may have favorable effects on soil fertility.

Sandy soils are droughty. Organic manures are well established to be involved in the fertilization plan in almost all the world. Organic matter improves physical, chemical and biological characteristics of soil as well as being a source for plant nutrients and buffers the soil against rapid changes in pH (Tisdale *et al.* 1985). Intensive efforts were directed in Egypt towards increasing soil productivity. The use of natural amendments like organic manures and composts could be practiced for this purpose (Abgenin and Goladi, 1997; El - Desouky, 1997 and El-Maghraby, 1997).

The present investigation is aimed at assessing the effect of organic industrial wastes and conventional N-fertilizers on growth and chemical composition of wheat plants grown on newly reclaimed sandy soil.

## MATERIALS AND METHODS

A pot experiment was carried out under greenhouse conditions in the Faculty of Agriculture, Zagazig University to study the response of wheat plant to application of fertilizer N from different sources. Closed bottom plastic pots filled with10 kg soil each were used. Physical and chemical properties of the soil used in the current study are recorded in Table (1). Five nitrogen sources were used ; Urea (U) , Ureaformaldehyde (UF) and thre e agro-industrial wastes i.e., Potatoe (PO), Palma (PA) and Orange (OR) residues. N was applied at 100 mg N $kg^{-1}$ in these sources according to total nitrogen in each one. The chemical composition of the industrial wastes are shown in Table (2).

The organic wastes (PO,PA, and OR) were added and mixed throughly with soil one month before seeding. Soil moisture content was adjusted to be around 100% of water holding capacity. Seeds of wheat (*Triticum aestivum c.v Sakha 69*) were sown on 15 November 2000 , and seedlings were thinned to 10 plants $pot^{-1}$. Plant samples were taken at 45, 70 and 140 days after sowing , corresponding to tillering, booting and maturity stages , respectively. Dry matter yield (DW) as well as contents of N,P,K,Fe,Mn and Zn in plant were measured. Potassium sulphate (41% K) and superphosphate (6.5 % P) were applied at rate 30 mg K and 10 mg P $kg^{-1}$ ,to the soil , mixed thoroughly with the soil before

Table (1) some physical and chemical properties of the soil used in the current study

| Particle size distribution | | | Textural grade | $CaCO_3$ (%) | rganic matter( $g\ kg^{-1}$) | pH * | EC** ($dSm^{-1}$) | Soluble ions (meq $L^{-1}$) | | | | | | | | # Available nutrients (mg $kg^{-1}$ soil) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Cations | | | | Anions | | | | Macro-elements | | | Micro-elements | | |
| Sand (%) | Silt (%) | Clay (%) | | | | | | Ca | Mg++ | Na+ | K+ | $CO_3^{-}$ | $HCO_3^{-}$ | $Cl^{-}$ | $SO_4^{-}$ | N | P | K | Fe | Mn | Zn |
| 86.2 | 8.6 | 5.2 | Sand | 0.6 | 7.9 | 8.0 | 0.5 | 1.4 | 0.8 | 1.3 | 1.4 | nil | 1.9 | 1.6 | 1.4 | 19.7 | 5.5 | 12.5 | 8.1 | 2.1 | 4.4 |

* Suspension of 1 : 2.5 w / w soil : water ** Water extract of 1 : 2.5 w / w soil : water
# Extractants for nutrients as follow:N (KCl extract; mineral N);P: NaHCO3 extract 0.5M;K: NH4 OAc pH7 1M and Fe,Mn and Zn :DTPA

**Table (2) Some chemical characteristics of the organic N-sources of the current study**

| *Characteristics* | *Potatoes* | *Palma* | *Orange* |
|---|---|---|---|
| Organic carbon (%) | 49.6 | 52.5 | 57.9 |
| C / N ratio | 14.4 | 12.2 | 30.5 |
| ***Total macro nutrients ($g\ 100g^{-1}$)*** | | | |
| N | 3.44 | 4.30 | 1.90 |
| P | 0.66 | 0.37 | 0.19 |
| K | 3.89 | 1.91 | 1.65 |
| ***Total micro nutrients ($mg\ kg^{-1}$)*** | | | |
| Fe | 304 | 773 | 125 |
| Mn | 73 | 119 | 74 |
| Zn | 139 | 72 | 18 |

seeding, respectively. Each treatment was replicated three times. Nitrogen was added at 100 mg kg $^{-1}$ according to the following treatments:

1) Urea

2)Ureaformaldehyde (100mg N kg $^{-1}$.; 75 mg N kg $^{-1}$.as UF + 25 mg N kg $^{-1}$ as U and 50 mg N kg $^{-1}$ as UF + 50 mg N kg $^{-1}$ as U).

3)Potatoe residues (100mg N kg $^{-1}$; 75 mg N kg $^{-1}$ as PO + 25 mg N kg $^{-1}$as U and 50 kg N fed.$^{-1}$ as PO + 50 mg N kg $^{-1}$as U).

4)Palma residues (100mg N kg.$^{-1}$.;75 mg N kg $^{-1}$.as PA + 25 mg N kg $^{-1}$as U and 50mg N kg $^{-1}$as PA + 50 mg N kg $^{-1}$as U).

5)Orange residues (100mg N kg $^{-1}$; 75 mg N kg $^{-1}$.as OR + 25 mg N kg $^{-1}$as U; 50mg N kg $^{-1}$as OR+50 mg N $^{-1}$as U).

### Methods of analysis

The following soil and plant analyses were performed : Particle size distribution was determined by the pipette method ,(Piper, 1950) and $CaCO_3$ content was determined by the calcimeter (Black 1965).Total N in organic wastes was determined by the Kjeldahl method; and total K and P in organic wastes were determined in a conc. $H_2SO_4$ digest (Chapman and Pratt ,1961). Measurement of P in digest was done colormetrically by the ascorbic acid method (Watanabe and Olsen ,1965). Soil organic matter as well as organic matter of organic wastes were assayed by the methods described by Black (1965). Total iron, manganese and zinc of industrial organic wastes were measured in conc. $H_2SO_4$ acid using atomic absorption spectrophotometer as described by Black (1965).Statistical analysis of the obtained data was done according to Snedecor and Cochran (1972).

## RESULTS AND DISCUSSION

### Effect of nitrogen sources application on plant growth and nutrients content.

#### *Dry matter yield*

Data shown in Table (3) reveal that dry matter yields at all stages were greater by applying N as a mixture of source N + urea N.This show the positive effect of the sources (slow release and organic). Ureaformaldehyde as slow release N fertilizers characterized by low dissolution rate which would enhance the N-efficiency through minimizing N-loss (El-Aila and Abou Seeda,1996). Organic matter PO,PA and OR may have acted as chelating agents for nutrients. Such organic residues contain nutrients other than N ( see table 2 ) which

Table( 3 ) Dry matter yield (g / pot ) of wheat as affected by nitrogen sources and nitrogen addition treatments.

| **Nitrogen sources (S)** | **( R ) Rates of N (sources N / added N)** | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | **1 / 0** | **3 / 1** | **1 / 1** | **Mean** | **1 / 0** | **3 / 1** | **1 / 1** | **Mean** |
| | **Tillering stage** | | | | **Booting stage** | | | |
| **Uf** | 1.92 | 1.56 | 1.46 | **1.65** | 4.82 | 5.08 | 3.51 | **4.47** |
| **PO** | 2.37 | 1.89 | 1.78 | **2.01** | 5.06 | 5.56 | 4.84 | **5.15** |
| **PA** | 3.20 | 2.96 | 1.96 | **2.71** | 6.20 | 8.08 | 5.74 | **6.67** |
| **OR** | 2.14 | 1.62 | 1.42 | **1.73** | 4.53 | 5.48 | 3.86 | **4.62** |
| **Mean** | **2.41** | **2.01** | **1.66** | | **5.15** | **6.05** | **4.49** | |
| **LSD at 0.05** | R:** 0.065 | S: ** 0.084 | R S:** 0.145 | | R:** 0.208 | S:** 0.269 | R S:** 0.467 | |
| | **Maturity stage** | | | | | | | |
| | Straw | | | | Grains yield | | | |
| **Uf** | 5.74 | 6.06 | 4.48 | **5.43** | 4.18 | 4.28 | 3.14 | **3.87** |
| **PO** | 6.52 | 7.20 | 5.86 | **6.53** | 5.26 | 6.30 | 5.02 | **5.53** |
| **PA** | 7.46 | 8.76 | 7.01 | **7.74** | 7.16 | 8.62 | 6.14 | **7.31** |
| **OR** | 6.10 | 6.36 | 5.40 | **5.95** | 4.76 | 5.56 | 4.50 | **4.94** |
| **Mean** | **6.46** | **7.10** | **5.69** | | **5.34** | **6.19** | **4.70** | |
| **LSD at 0.05** | R:** 0.177 | S:** 0.288 | R S: ** 0.395 | | R:** 0.240 | S: ** 0.309 | R S:** 0.536 | |

***1 / 0** (100 kg N fed.$^{-1}$ from N-sources) ; **3 / 1** ( 75 kg N fed.$^{-1}$ from N-sources + 25 kg N fed.$^{-1}$ from urea) and **1 / 1** (50 kg N fed.$^{-1}$ from N-sources +50 kg N fed.$^{-1}$ from urea, respectively).

Yield for all N as soluble urea were, 1.34, 2.96 , 4.21 and 2.72 (g / pot) at tillering, booting , straw and grains yield, respectively.

must have contributed to their superiority over the treatment which received all of the N rate as soluble urea. Improvement of soil physical properties due to organic residues addition must have contributed to the higher yield obtained by PO , Pa OR treatments. The positive effect of the Uf, PO, PA and OR was most pronounced with the 3/1 and 1/0 rates. Therefore increase root respiration and root development causing the plant to require more nutrients from soil and fertilizers (Faiyad,1999). Abdul Salam (1997) found that nitrogen application increased both yield of wheat. El Naggar (1999) pointed out that Ureaformaldehyde coated urea significantly increased dry weight of wheat at tillering and booting stages. These results are in agreement with those obtained by Awad *et al.*(2000) and Mostafa (2001). Highest straw yield was observed from the addition of PA (3/1 ratio) at booting and maturity stages. At tillering stage it was due to PA (1/0 ratio). Highest values were (8.1 , 8.8 and 3.2 g pot $^{-1}$, respectively). Mohammed, (2002a) reported that amending the soil either with natural town refuse or sewage sludge compost manure increased the dry matter as well as straw and grains yields. The positive effect of such organic applications on the aforementioned traits of wheat could be attributed to improving the hydro-physical properties as well as nutritional statues of the treated soil, (Thind *et al.*,1993). These results are in agreement with those obtained by Soliman, 2000; Metwally,2000 and mahmoud, 2000 who found that the addition of organic wastes (FYM and chicken manure) increased the grains and straw yield of wheat grown in sandy soil.

Highest grain yield (8.6 g pot $^{-1}$) was obtained due to PA (3/1 ratio).

**Uptake of macronutrients**

***a) Nitrogen uptake***

Data in Table (4) show that nitrogen uptake increased significantly due to addition of nitrogen as organic sources. This trend was observed true at all growth stages. Kotb (1998) found that increasing the rate of nitrogen increased nutrients uptake particularly N by both straw and grains. Metwally (2000) pointed out that increasing nitrogen rates up to 75 mg N kg $^{-1}$ significantly increased the concentration and uptake of nitrogen, phosphorus and potassium in wheat plant as well as grains and straw at tillering and flowering stages. Similar results were obtained by Atia and Aly (1998);

Table( 4 ) N - uptake (mg / pot ) of wheat as affected by nitrogen sources and nitrogen addition treatments.

| Nitrogen sources (S) | (R) Rates of N (sources N / added N) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | **1 / 0** | **3 / 1** | **1 / 1** | **Mean** | **1 / 0** | **3 / 1** | **1 / 1** | **Mean** |
| | **Tillering stage** | | | | **Booting stage** | | | |
| **Uf** | 64.0 | 58.2 | 43.9 | **55.4** | 85.3 | 130 | 80.4 | **98.6** |
| **PO** | 76.1 | 71.3 | 58.5 | **68.6** | 130 | 163 | 115 | **136** |
| **PA** | 101 | 88.1 | 63.6 | **84.2** | 165 | 171 | 149 | **162** |
| **OR** | 69.9 | 62.8 | 49.7 | **60.8** | 108 | 149 | 104 | **120** |
| **Mean** | **77.8** | **70.1** | **53.9** | | **122** | **153** | **112** | |
| **LSD at 0.05** | R: ** 1.634 | S: ** 2.109 | R S: ** 3.661 | | R: ** 1.923 | S: ** 2.485 | R S: ** 4.304 | |
| | **Maturity stage** | | | | | | | |
| | Straw | | | | Grains yield | | | |
| **Uf** | 52.4 | 59.1 | 49.6 | **53.7** | 117 | 128 | 105 | **117** |
| **PO** | 66.1 | 81.1 | 66.7 | **71.3** | 150 | 187 | 142 | **160** |
| **PA** | 73.9 | 91.6 | 84.1 | **83.2** | 181 | 198 | 173 | **184** |
| **OR** | 56.4 | 75.0 | 51.9 | **61.1** | 127 | 155 | 122 | **135** |
| **Mean** | **62.2** | **76.7** | **63.1** | | **144** | **167** | **136** | |
| **LSD at 0.05** | R: ** 2.469 | S: ** 3.186 | R S: ** 5.503 | | R: ** 2.303 | S: ** 2.972 | R S: ** 5.149 | |

***1 / 0** (100 kg N fed.$^{-1}$ from N-sources) ; **3 / 1** ( 75 kg N fed.$^{-1}$ from N-sources + 25 kg N fed.$^{-1}$ from urea) and **1 / 1**,(50 kg N fed.$^{-1}$ from N-sources +50 kg N fed.$^{-1}$ from urea, respectively).

Yield for all N as soluble urea were; 40.5, 76.8 , 42.0 and 98.4 (mg /pot) at tillering, booting , straw and grains yield, respectively.

El-Naggar, (1999) and Omran *et al.*,(1999).

Highest N-uptake of straw at booting and maturity stages (196 and 92 mg pot $^{-1}$, respectively) were obtained at the addition treatment of palma residues (75 mg N kg $^{-1}$ as palma residues + 25 mg N kg $^{-1}$ as urea), While, at tillering stage (101 mg pot $^{-1}$) it was observed due to the addition of palma residues (100 mg N kg $^{-1}$ as palma). N-uptake of grains was highest (245 mg pot $^{-1}$) due to the addition of palma residues (75 mg N kg$^{-1}$ as palma residues +25 mg N kg $^{-1}$ as urea).

***b) Phosphorus uptake***

Table 5 reveals that, P-uptake followed the same pattern as observed with N-uptake of wheat plant. Hence the application of nitrogen as organic sources was increased significantly P-uptake of all growth stages. This may be due to the benefits of organic matter supply to the soil on the basis of anion replacement for or competition between humate and phosphate ions on the active sites of adsorbing surfaces.

Solving action of humic substances on insoluble phosphates leading to the formation of fulvic acids metal phosphates was also a suggested mechanism in this respect. Products of organic decay such as organic acids and humus are thought to be effective in forming complexes with iron and aluminum compounds which are mainly responsible for P fixation in soils. Mikhaeel *et al.* (1997) noticed that the application of organic manure such as town refuse or sewage sludge increased P uptake by wheat plants in sandy soil. These results are in harmony with those obtained by Ibrahim (1998) ; Metwally ,(2000) and Nasr-Alla, ,(2000).

The highest P-uptake of straw at booting and maturity stages (23 and 11 mg pot $^{-1}$, respectively) was observed due to the addition of palma residues (75 mg N kg $^{-1}$ as palma + 25 mg N kg -1 as urea). At tillering stage , P-uptake was highest (8 mg pot $^{-1}$) due to the addition of palma residues (100 mg N kg $^{-1}$ as palma). Also P-uptake of grains was highest (42 mg pot $^{-1}$) under the application treatment of 75 mg N kg $^{-1}$ as palma residues + 25 mg N kg $^{-1}$ as urea.

**Potassium uptake**

Data presented in Table 6 indicate that K-uptake was significantly increased at the addition of nitrogen as organic sources.

This was true at all growth stages. El-Sherbieny *et al.*,(1999b) stated that increasing the rate of added nitrogen significantly increased

Table( 5 ) P - uptake (mg / pot ) of wheat as affected by nitrogen sources and nitrogen addition treatments.

| Nitrogen sources (S) | (R) Rates of N (sources N / added N) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 1 / 0 | 3 / 1 | 1 / 1 | Mean | 1 / 0 | 3 / 1 | 1 / 1 | Mean |
| | **Tillering stage** | | | | **Booting stage** | | | |
| Uf | 4.29 | 4.07 | 3.20 | **3.85** | 10.5 | 12.8 | 9.25 | **10.9** |
| PO | 7.87 | 7.38 | 6.33 | **7.19** | 15.4 | 23.4 | 14.5 | **17.8** |
| PA | 6.47 | 6.11 | 5.26 | **5.95** | 13.2 | 18.7 | 12.1 | **14.7** |
| OR | 5.92 | 5.51 | 4.17 | **5.20** | 11.7 | 15.0 | 11.1 | **12.6** |
| **Mean** | **6.14** | **5.77** | **4.74** | | **12.7** | **17.5** | **11.7** | |
| **LSD at 0.05** | R: ** 0.083 | S: ** 0.108 | R S: ** 0.187 | | R: ** 0.072 | S: ** 0.093 | R S: ** 0.161 | |
| | **Maturity stage** | | | | | | | |
| | Straw | | | | Grains yield | | | |
| Uf | 3.81 | 4.94 | 3.56 | **4.10** | 17.8 | 23.4 | 16.4 | **19.2** |
| PO | 7.86 | 11.3 | 7.21 | **8.79** | 31.7 | 41.5 | 25.6 | **32.9** |
| PA | 6.26 | 7.70 | 5.28 | **6.41** | 24.2 | 29.9 | 23.1 | **25.7** |
| OR | 5.19 | 6.61 | 4.14 | **5.31** | 21.8 | 24.7 | 20.6 | **22.4** |
| **Mean** | **5.78** | **7.64** | **5.05** | | **23.9** | **29.9** | **21.4** | |
| **LSD at 0.05** | R: ** 0.068 | S: ** 0.087 | R S: ** 0.152 | | R: ** 1.089 | S: ** 1.405 | R S: ** 2.433 | |

*1 / 0 (100 kg N $fed.^{-1}$ from N-sources) ; 3 / 1 ( 75 kg N $fed.^{-1}$ from N-sources + 25 kg N $fed.^{-1}$ from urea) and 1 / 1,(50 kg N $fed.^{-1}$ from N-sources +50 kg N $fed.^{-1}$ from urea, respectively).
Yield for all N as soluble urea were; 2.86, 7.89 , 3.15 and 15.4 (mg /pot) at tillering, booting , straw and grains yield, respectively.

Table( 6 ) K - uptake (mg / pot ) of wheat as affected by nitrogen sources and nitrogen addition treatments.

| Nitrogen sources (S) | (R) Rates of N (sources N / added N) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 1 / 0 | 3 / 1 | 1 / 1 | Mean | 1 / 0 | 3 / 1 | 1 / 1 | Mean |
| | **Tillering stage** | | | | **Booting stage** | | | |
| **Uf** | 47.1 | 41.7 | 37.8 | **42.2** | 54.9 | 62.2 | 41.0 | **52.7** |
| **PO** | 65.2 | 61.2 | 54.5 | **60.3** | 69.8 | 73.1 | 61.3 | **68.1** |
| **PA** | 76.4 | 65.3 | 59.5 | **67.1** | 75.9 | 82.2 | 65.3 | **74.5** |
| **OR** | 61.2 | 56.5 | 47.3 | **55.0** | 64.4 | 68.8 | 55.2 | **62.8** |
| **Mean** | **62.5** | **56.1** | **49.8** | | **66.3** | **71.6** | **55.7** | |
| **LSD at 0.05** | R: ** 0.143 | S: ** 0.184 | R S: ** 0.319 | | R: ** 0.101 | S: ** 0.130 | R S: ** 0.206 | |
| | **Maturity stage** | | | | | | | |
| | Straw | | | | Grains yield | | | |
| **Uf** | 60.6 | 66.8 | 44.3 | **57.2** | 21.4 | 25.0 | 18.7 | **21.7** |
| **PO** | 86.0 | 104 | 72.2 | **87.4** | 30.1 | 37.8 | 27.3 | **31.7** |
| **PA** | 93.4 | 109 | 82.0 | **94.8** | 38.4 | 49.1 | 36.2 | **41.2** |
| **OR** | 76.0 | 83.1 | 64.1 | **74.4** | 25.2 | 32.7 | 23.5 | **27.1** |
| **Mean** | **79.0** | **90.7** | **65.7** | | **28.8** | **36.2** | **26.4** | |
| **LSD at 0.05** | R: ** 0.081 | S: ** 0.105 | R S: ** 0.182 | | R: ** 0.114 | S: ** 0.148 | R S: ** 0.252 | |

*1 / 0 (100 kg N fed.$^{-1}$ from N-sources) ; 3 / 1 ( 75 kg N fed.$^{-1}$ from N-sources + 25 kg N fed.$^{-1}$ from urea) and 1 / 1 (50 kg N fed.$^{-1}$ from N-sources +50 kg N fed.$^{-1}$ from urea, respectively).

Yield for all N as soluble urea were; 28.1, 31.2 , 41.8 and 17.3 (mg /pot) at tillering, booting , straw and grains yield, respectively.

total content of nitrogen, phosphorus and potassium of wheat grains. The average values ranged from 19.6 to 44.4 kg fed.$^{-1}$ for nitrogen ; 6.8 to 14.8 kg fed.$^{-1}$ for phosphorus and 8.4 to 14.8 kg fed.$^{-1}$ for potassium. Such positive response might reflect the different characteristics of the added organic manures (their chemical composition and nutritional status), hence the rate of decomposition and the differences in the subsequent release of included nutrients. Also the production of organic and inorganic acids during the degradation of such organic materials (as well as humates) as a result of the microbe activities must have contributed in decreasing soil pH and produing more chelating ions, leading to increase in available forms of elements in the rhizosphere zone consequently a uniform supply of nutrients to plants could be expected throughout the growth season. However, the organic manuring addition to soil resulted in creating favorable soil physical conditions (such as structure),which must have affected the solubility and availability of nutrients and thus uptake of nutrients (Rabie *et al.*,1997). Similar results were obtained by El-Sherbieny *et al.*, (1999a) ; and Mohamed (2002b).

Values of highest K-uptake of straw at booting and maturity stages (82 and 109 mg pot$^{-1}$,respectively) were observed due to the addition of palma (75 mg N kg$^{-1}$ as palma + 25 mg N kg$^{-1}$ as urea). On the other hand at tillering stage the highest K-uptake (76 mg pot$^{-1}$) was observed due to the addition of palma residues (100 mg N kg$^{-1}$ as palma ).

K-uptake of grains was greatest (49 mg pot$^{-1}$) due to the addition of palma residues (75 mg N kg$^{-1}$ as palma residues + 25 mg N kg$^{-1}$ as urea).

***Uptake of micronutrients***

As shown in Tables 7 addition of nitrogen as organic sources significantly increased Fe -uptake of wheat. This trend was observed at all growth stages. The greatest Fe uptake (1515 and 1100 µg pot$^{-1}$ ,respectively) were observed at maturity stage and grains ,respectively due to the addition of palma residues (75 mg N kg$^{-1}$ as palma + 25 mg N kg$^{-1}$ as urea). The positive effect of organic nitrogen sources on increasing Fe, Mn and Zn uptake could be attributed to one or all of the following factors: 1) reducing soil pH values as a result of organic manure decomposition ; 2) the high initial content of such nutrients in the applied organic manure ; 3)the possible increases in plant growth as a result of applied such materials which also contribute to increasing

Table( 7 ) Fe - uptake (µg / pot ) of wheat as affected by nitrogen sources and nitrogen addition treatments.

| Nitrogen sources (S) | (R) Rates of N (sources N / added N) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 1 / 0 | 3 / 1 | 1 / 1 | Mean | 1 / 0 | 3 / 1 | 1 / 1 | Mean |
| | **Tillering stage** | | | | **Booting stage** | | | |
| **Uf** | 570 | 594 | 553 | **572** | 879 | 948 | 837 | **888** |
| **PO** | 659 | 703 | 618 | **660** | 1062 | 1137 | 1005 | **1068** |
| **PA** | 728 | 789 | 697 | **738** | 1156 | 1228 | 1087 | **1157** |
| **OR** | 602 | 637 | 569 | **603** | 964 | 1075 | 923 | **987** |
| **Mean** | **640** | **681** | **609** | | **1015** | **1097** | **963** | |
| **LSD at 0.05** | R: ** 6.545 | S: ** 8.448 | R S: ** 14.635 | | R: ** 8.170 | S: ** 10.540 | R S:** 18.270 | |
| | **Maturity stage** | | | | | | | |
| | Straw | | | | Grains yield | | | |
| **Uf** | 961 | 1105 | 910 | **992** | 590 | 714 | 543 | **616** |
| **PO** | 1230 | 1379 | 1105 | **1238** | 676 | 824 | 632 | **711** |
| **PA** | 1359 | 1515 | 1210 | **1361** | 926 | 1100 | 838 | **955** |
| **OR** | 1129 | 1305 | 1027 | **1154** | 796 | 933 | 715 | **815** |
| **Mean** | **1170** | **1326** | **1063** | | **747** | **893** | **682** | |
| **LSD at 0.05** | R: ** 8.436 | S: ** 10.890 | R S: **18.855 | | R: ** 7.472 | S: ** 9.616 | R S:** 16.717 | |

***1 / 0** (100 kg N fed.$^{-1}$ from N-sources) ; **3 / 1** ( 75 kg N fed.$^{-1}$ from N-sources + 25 kg N fed.$^{-1}$ from urea) and **1 / 1**,(50 kg N fed.$^{-1}$ from N-sources +50 kg N fed.$^{-1}$ from urea, respectively).

Yield for all N as soluble urea were; 534, 781 , 874 and 504 (µg /pot) at tillering, booting , straw and grains yield, respectively.

these nutrients uptake by wheat plants.

Table (8) reveals that, highest Mn uptake (842 μg pot $^{-1}$) was obtained due to the addition treatment of Palma residues (75 mg N kg $^{-1}$ as palma residues + 25 mg N kg $^{-1}$ as urea). at booting stage. Mn-uptake of grains was highest (284 μg pot $^{-1}$) due to the addition of palma residues (75 mg N kg $^{-1}$ as palma residues + 25 mg N kg $^{-1}$ as urea). Awad *et al.*,(2000) pointed out that application of organic wastes ,i.e., potatoes, Palma and Jojoba residues increased significantly Fe , Mn and Zn uptake and concentration compared to the control value.

Table (9) postulates that highest Zn uptake ( 336 μg pot $^{-1}$) was observed due to the addition of Potatoe residues (75 mg N kg $^{-1}$ as potatoe residues + 25 mg N kg $^{-1}$ as urea), while highest Zn uptake of grains (276 μg pot $^{-1}$) was obtained due to the same treatment of that for straw. Mostafa,(2001) found that, the addition of organic materials i.e. poultry manure and olive cake residues increased the uptake and concentration of Fe , Mn , Zn and Cu. Similar results were observed by El-Koumy (1998) and Faiyad (1999). These increases may be attributed to the role of organic nitrogen sources on improving these micronutrients availability which was likely attributed to several reasons: 1) Releasing of these nutrients through microbial decomposition of organic matter ; 2) Enhancing the chelation of metal ions by fulvic acid , organic legends and / or other organic function groups which may promote the mobility of metal from solid to liquid phase in the soil environment; 3) Reducing the pH of the soil making the nutrients more available and 4)Lowering the redox statues of iron and manganese, leading to reduction of higher $Fe^{3+}$ & $Mn^{4+}$ to $Fe^{2+}$ and $Mn^{2+}$ and / or transformation of insoluble chelated forms into more soluble ions.

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Table( 8 ) Mn - uptake (µg / pot ) of wheat as affected by nitrogen sources and nitrogen addition treatments.

| Nitrogen sources (S) | (R) Rates of N (sources N / added N) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 1 / 0 | 3 / 1 | 1 / 1 | Mean | 1 / 0 | 3 / 1 | 1 / 1 | Mean |
| | **Tillering stage** | | | | **Booting stage** | | | |
| **Uf** | 133 | 125 | 112 | **123** | 530 | 622 | 502 | **551** |
| **PO** | 202 | 175 | 143 | **173** | 645 | 751 | 548 | **648** |
| **PA** | 280 | 223 | 178 | **227** | 789 | 842 | 680 | **770** |
| **OR** | 231 | 190 | 151 | **191** | 700 | 802 | 593 | **698** |
| **Mean** | **212** | **178** | **146** | | **666** | **754** | **581** | |
| **LSD at 0.05** | R: ** 4.840 | S: ** 6.569 | R S: ** 10.859 | | R: ** 7.415 | S: ** 9.558 | R S:** 16.581 | |
| | **Maturity stage** | | | | | | | |
| | Straw | | | | Grains yield | | | |
| **Uf** | 482 | 565 | 456 | **501** | 194 | 217 | 173 | **195** |
| **PO** | 526 | 680 | 498 | **568** | 221 | 236 | 181 | **213** |
| **PA** | 717 | 782 | 678 | **726** | 251 | 284 | 239 | **258** |
| **OR** | 636 | 729 | 539 | **635** | 237 | 257 | 196 | **230** |
| **Mean** | **590** | **689** | **543** | | **226** | **249** | **197** | |
| **LSD at 0.05** | R: ** 7.878 | S: ** 10.189 | R S: **17.650 | | R: ** 8.486 | S: ** 10.962 | R S:** 18.988 | |

***1 / 0** (100 kg N fed.$^{-1}$ from N-sources) ; **3 / 1** ( 75 kg N fed.$^{-1}$ from N-sources + 25 kg N fed.$^{-1}$ from urea) and **1 / 1**,(50 kg N fed.$^{-1}$ from N-sources +50 kg N fed.$^{-1}$ from urea, respectively).

Yield for all N as soluble urea were; 102, 370 , 336 and 132 (µg /pot) at tillering, booting , straw and grains yield, respectively.

Table( 9 ) Zn - uptake (µg / pot ) of wheat as affected by nitrogen sources and nitrogen addition treatments.

| **Nitrogen sources (S)** | **( R ) Rates of N (sources N / added N)** | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | **1 / 0** | **3 / 1** | **1 / 1** | **Mean** | **1 / 0** | **3 / 1** | **1 / 1** | **Mean** |
| | **Tillering stage** | | | | **Booting stage** | | | |
| **Uf** | 82 | 90 | 72 | **81** | 188 | 208 | 154 | **183** |
| **PO** | 133 | 167 | 118 | **139** | 253 | 294 | 233 | **260** |
| **PA** | 115 | 140 | 106 | **120** | 226 | 257 | 195 | **226** |
| **OR** | 102 | 115 | 93 | **103** | 207 | 225 | 174 | **202** |
| **Mean** | **108** | **128** | **97** | | **219** | **246** | **189** | |
| **LSD at 0.05** | R: ** 6.152 | S: ** 7.936 | R S: ** 13.760 | | R: ** 7.096 | S: ** 9.160 | R S:** 15.870 | |
| | **Maturity stage** | | | | | | | |
| | Straw | | | | Grains yield | | | |
| **Uf** | 208 | 225 | 183 | **205** | 137 | 153 | 124 | **138** |
| **PO** | 296 | 336 | 265 | **299** | 236 | 276 | 217 | **243** |
| **PA** | 260 | 281 | 214 | **252** | 213 | 247 | 190 | **217** |
| **OR** | 221 | 248 | 189 | **219** | 186 | 211 | 152 | **183** |
| **Mean** | **246** | **273** | **213** | | **193** | **222** | **171** | |
| **LSD at 0.05** | R: ** 6.882 | S: ** 8.886 | R S: **15.379 | | R: ** 6.597 | S: ** 8.515 | R S:** 14.742 | |

***1 / 0** (100 kg N fed.$^{-1}$ from N-sources) ; **3 / 1** ( 75 kg N fed.$^{-1}$ from N-sources + 25 kg N fed.$^{-1}$ from urea) and **1 / 1**,(50 kg N fed.$^{-1}$ from N-sources +50 kg N fed.$^{-1}$ from urea, respectively).

Yield for all N as soluble urea were; 64, 146 , 164 and 102 (µg /pot) at tillering, booting , straw and grains yield, respectively.

# استجابة القمح لبعض مخلفات التصنيع الغذائي والأسمدة النيتروجينية التقليدية

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أقيمت تجربة أصص لدراسة استجابة نبات القمح للتسميد النيتروجيني من مصادر مختلفة (اليوريا ، اليوريافورمالدهيد ، مخلفات تصنيع البطاطس ، مخلفات تصنيع الخروع ، مخلفات تصنيع البرتقال) على محصول المادة الجافة لنبات القمح و امتصاصه لبعض العناصر الكبرى(نيتروجين - فوسفور - بوتاسيوم) و الصغرى (حديد - منجنيز - زنك).

ويمكن تلخيص أهم النتائج المتحصل عليها كما يأتي :

(١) أزداد محصول المادة الجافة للقش و الحبوب لنبات القمح معنويا بإضافة المصادر النيتروجينية المختلفة و كانت أعلى قيمة من القش ( ٨،٧٦ جم / أصيص) تم التحصل عليها نتيجة معاملة الإضافة " مخلفات الخروع (٧٥ كجم ن / فدان على صورة خروع + ٢٥ كجم ن / فدان على صورة يوريا ) خلال مرحلة النضج . أعلى قيمة للحبوب (٨,٦٢ جم / أصيص) تم التحصل عليها نتيجة لنفس المعاملة مع القش.

(٢) أزداد امتصاص النيتروجين و الفسفور و البوتاسيوم معنويا بواسطة نباتات القمح فى التربة بإضافة المصادر النيتروجينية المختلفة و كانت أعلى قيم للنيتروجين و الفوسفور هي (١٩٦ ، ٢٣ ملليجرام / أصيص ) تم التحصل عليها نتيجة معاملة الإضافة مخلفات الخروع (٧٥ كجم ن / فدان على صورة خروع + ٢٥ كجم ن / فدان على صورة يوريا ) و مخلفات البطاطس (٧٥ كجم ن / فدان على صورة بطاطس + ٢٥ كجم ن / فدان على صورة يوريا ) على التوالي خلال مرحلة طرد السنابل بينما كانت أعلى قيمة للبوتاسيوم خلال مرحلة النضج ( ١٠٩ ملليجرام / أصيص ) تم

التحصل عليها باستخدام معاملة الإضافة مخلفات الخروع (٧٥ كجم ن / فدان على صورة خروع + ٢٥ كجم ن / فدان على صورة يوريا ).

(٣) أزداد امتصاص الحديد و المنجنيز و الزنك معنوياً نتيجة إضافة مخلفات التصنيع الغذائي و المصادر النيتروجينية الأخرى.أعلى قيم للحديد و الزنك (١٥١٥ ، ٣٣٦ ميكروجرام / أصيص ) كانت عند استخدام مخلفات تصنيع الخروع (٧٥ كجم ن / فدان على صورة خروع + ٢٥ كجم ن / فدان على صورة يوريا ) و مخلفات تصنيع البطاطس (٧٥ كجم ن / فدان على صورة بطاطس + ٢٥ كجم ن / فدان على صورة يوريا ) على التوالي خلال مرحلة النضج بينما كانت أعلى قيمة للمنجنيز الممتص ( ٨٤٢ ميكروجرام / أصيص ) تم التحصل عليها عند معاملة الإضافة مخلفات الخروع (٧٥ كجم ن / فدان على صورة خروع + ٢٥ كجم ن / فدان على صورة يوريا ) خلال مرحلة النضج.

(٤) أعلى قيم للنيتروجين و البوتاسيوم الممتصين للحبوب (٢٤٥ ، ٤٩ ملليجرام / أصيص على التوالي) تم التحصل عليها نتيجة لإضافة مخلفات الخروع (٧٥ كجم ن / فدان على صورة خروع + ٢٥ كجم ن / فدان على صورة يوريا ) .أعلى قيمة للفوسفور الممتص للحبوب ( ٤٢ ملليجرام / أصيص ) تم التحصل عليها نتيجة لإضافة مخلفات تصنيع البطاطس (٧٥ كجم ن / فدان على صورة بطاطس + ٢٥ كجم ن / فدان على صورة يوريا ).

(٥) أعلى قيم للحديد و المنجنيز الممتصين للحبوب (١١٠٠ ، ٢٨٤ ميكروجرام / أصيص على التوالي) تحصل عليها نتيجة لإضافة مخلفات تصنيع الخروع (٧٥ كجم ن / فدان على صورة خروع + ٢٥ كجم ن / فدان على صورة يوريا ) بينما أعلى قيمة للزنك الممتص للحبوب ( ٢٧٦ ميكروجرام / أصيص ) تم التحصل عليها نتيجة لإضافة مخلفات تصنيع البطاطس (٧٥ كجم ن / فدان على صورة بطاطس + ٢٥ كجم ن / فدان على صورة يوريا ).