4.RESULTS AND DISCUSSION

4.1. General overview:

Analyses of variance had calculated for all measured and calculated (78) parameters of soil, as well as plant (shoots & roots) and yield. Which were. F-test and least significant differences (LSD) of the 78 characters representing soil nutrients at 60 and 120 days, concentration and nutrients uptake of maize shoot and root at 60 and 120 days, plant dry weight and yield components under treated factors are tabulated in appendix (1-3). A few numbers of measured characters were affected significantly by irrigation, di-interaction of irrigation-manureing, irrigation-fertilization and tri-interaction of irrigation- manuring-fertilization representing 19, 54, 38 and 38% of the total measured characters, respectively. More measured characters were significanly affected by manuring, fertilization, and di-interaction effect of manureing-fertilization which represented 90, 100 and 72% of total measured characters, respectively.

4.2. Effect of irrigation, manuring, mineral fertilization and their interactions:

4.2.1. Effect of irrigation, irrigation manuring , and irrigation –manuring – fertilization :

Irrigation discharges had affected insignificantly on all the measured and estimated parameters may be due to the soil drainable pores which represent about 75% of the total pores , which they could not retain more water with the higher discharge rate (4l/h) as compared to the lower one (2l/h).

Also di- interactions of irrigation –manuring, irrigation fertilization and tri – interaction of irrigation- manuring – fertilization could not significantly affect so much parameters .

4.2.2.Effect of mineral fertilization:

Data of measured parameters (Tables 4-24) show that mineral fertilization affected significantly all the measured parameters and the highest mineral fertilizer rate (100% MF of the recommended rate) wase of the highest effect as common sense.

Table (4): The number of measured and estimated parameters which were affected significantly and non- significantly by application factors, and the percentage of any related to total parameters (78 parameters)

Sources	No. SMEP	No. NSMEP	Percent of SMEP
I	15	63	19
O	70	8	90
I × O	42	36	54
F	78	_	100
I× F	30	49	38
O× F	57	21	73
I × O × F	30	48	38

I= Irrigation, O= organic manuring F= mineral fertilization

SMEP = significant measured and estimated parameters

NSMEP = non- significant measured and estimated parameters

4.2.3. Effect of manuring and manureing-mineral fertilization interaction:

4.2.3.1. Soil available nutrients:

4.2.3.1.1. Total nitrogen:

Total soil nitrogen depends mainly upon the N content of applied N source of either the mineral N fertilizer or the organic manure. Therefore, the total nitrogen values in the soil when applying organic manure and/or mineral fertilizer ranged between 18.62 and 65.52 mg/kg at 60 days and between 8.56 and 28.05 mg/kg at 120 days after planting these finding are harmonized with those reported by **Antoun et al (1991).** Thus the values were significanting affeted by application of organic manure and mineral fertilizer. Also the effect of organic manure preceded the mineral fertilizer, unless they encourge each other absorbed nitrogen by plant, though the effect of high rate of any of organic manure with the high rate mineral fertilizer become perior on total nitrogen content of soil due to higher soil N absorption by plants either at 60 or 120 days after planting. The total soil nitrogen values at 60 days were higher than those at 120 days, where the mean values were 30.5 and 14.06 mg/kg respectively, (Table 5 and Fig.1).

4.2.3.1.2. Available potassium:

Soil available potassium values at 60 and 120 days were little affected by organic manure refering to more K-absorption by plant with manure applicationed, (Table 5 and Fig.1).

The values of soil available potassium upon applying organic manure with mineral fertilizer ranged between 48.04 and 180.77 mg/kg at 60 days, where as they ranged between 27.17 and

66.49 ppm at 120 days after planting. Data of available potassium were significantly more when soil received 3 ton/fed ChM or 10 ton/fed CM with 100% MF at 60 days, while those at 120 days affected in significantly. Under zero MF, the treatment of 3 ton/fed ChM was superior for avilable potassium as compared to the others this is in agreement with that of **Montasser (1987).** Available potassium values at 60 days growth were higher than that at 120, where the mean values were 86.76 and 41.38 mg/kg respectively, due to K absorption by maize plant.

4.2.3.1.3. Available phosphorus:

The values of available phosphorus in the soil at the two times of soil sampling are shown in Table (6) and depicted in Fig.(2). The values of soil available phosphorus when applying of organic manure with mineral fertilizer ranged between 7.39 and 20.76 mg/kg at 60 days, where as they ranged between 6.66 and 13.48 mg/kg at 120 days after planting. **EL-Ghozoli (1994)** reported findings similar to the above ones. Data revealed that the lower rate phosphorus in the soil. Such a trend may be attributed to more vigorous plant growth with using organic manure and hence more absorption of soil phosphorus by growing plant. However, this was true for individual effect of manuring or di-interaction effect of manuring with mineral fertilization.

Table(5): Total nitrogen (mg/kg) and available potassium (mg/kg) in the soil cultivated with maize plants at 60 and 120 days after sowing.

Organic ton/fed	Fertilizer %*	Nitrogen (mg/kg)		Potassium (mg/kg)	
		60	120	60	120
0	0	18.62 e	10.40 efg	53.25 f	29.71
	70	37.61 b	15.60 c	71.86 def	38.34
	100	60.53 a	22.48 b	102.97 cd	61.22
1.5t ChM	0	18.64 e	10.80 efg	57.71 f	29.19
	70	33.29 bcd	15.49 c	74.75 def	49.99
	100	65.52 a	28.05 a	118.88 bc	66.49
3t ChM	0	15.98 e	10.46 efg	67.27 ef	31.20
	70	24.77 cde	12.06 def	94.85 cde	39.09
	100	35.15 bcd	14.61 cd	180.77 a	55.82
5t CM	0	13.04 e	8.56 g	53.94 f	29.14
	70	20.00 e	12.85 cdef	70.85 ef	37.04
	100	35.54 bc	15.93 c	91.27 cde	49.88
10t CM	0	16.51 e	9.73 fg	48.04 f	27.17
	70	23.15 de	10.39 efg	64.74 ef	32.44
	100	39.16 b	13.55 cde	150.26 ab	43.90
Means of organic manure					
0		38.92 a	16.16 b	76.02 b	43.09 ab
1.5t ChM		39.15 a	18.11 a	83.78 b	48.56 a
3t ChM		25.30 b	12.38 c	114.30 a	42.04 b
5t CM		22.86 b	12.45 c	72.02 b	38.69 bc
10t CM		26.27 b	11.22 c	87.68 b	34.50 c
Means of mineral fertilizer					
0		16.56 c	9.99 c	56.04 c	29.28 c
70		27.77 b	13.28 b	75.41 b	39.38 b
100		47.18 a	18.92 a	128.83 a	55.46 a

ChM= chiken manure CM= Compost

*Fertilizer %= percent of recommended dose of N,P,K fertilizers

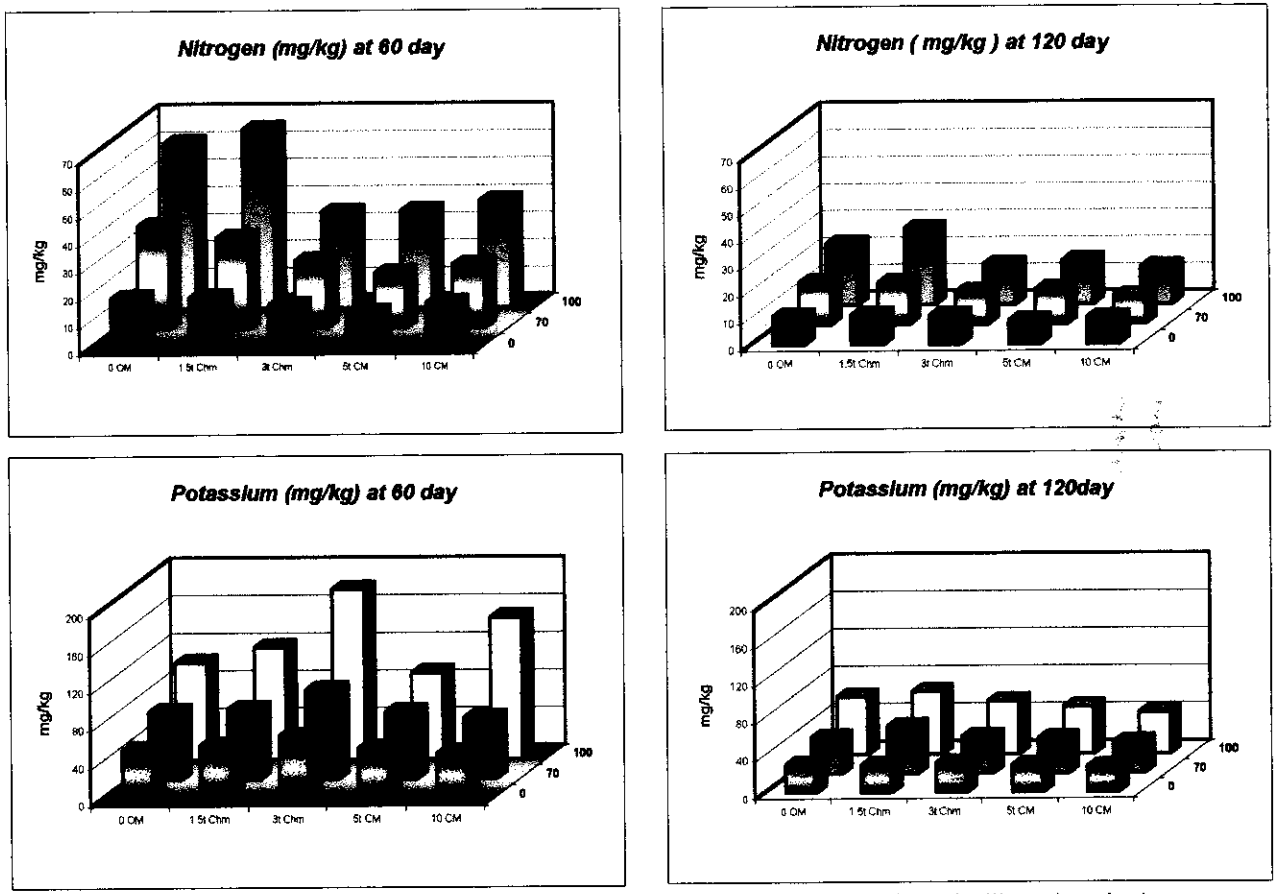

Fig (1) : Total nitrogen (mg/kg) and available potassium (mg/kg) in the soil cultivated with maize plants at 60 day and 120 days after sowing

either of ChM or CM was more effective on available Available phosphours values ranged betwen 7.39 and 20.76 mg/kg at 60 days and between 6.66 and 13.48 mg/kg at 120 days after planting. The values at 120 days were lower than those at 60 days, with the mean values of 13.23 and 9.23 mg/kg respectively.

4.2.3.1.4. Available iron:

The values of soil available iron at the two sampling times are shown in Table (6) and depicted in Fig. (2). Applying the organic manure with mineral fertilizer, the values ranged between 3.97 and 14.35 mg/kg at 60 days,averaging 7.73 mg/kg where as they ranged between 4.55 and 20.80 mg/kg at 120 days averaging 10.89 mg/kg after planting. **Dahane and shukla (1995)** mentioned similar results. The organic manure affected significantly the available iron at 60 and 120 days, where, 10 ton/fed of CM represented the superior effect followed by 3 ton/fed ChM treatments, this was true either for individual, effect or di-interaction with using 100% mineral fertilizer rate.

Table (6) : Available phosphorus and iron (mg/kg) in the soil cultivated with maize plants at 60 and 120 days.

Organic ton/fed	Fertilizer %*	Phosphorus (mg/kg)		Iron (mg/kg)	
		60	120	60	120
0	0	11.26	7.86 fgh	3.97 h	4.55 h
	70	15.08	9.34 de	6.88 de	9.98 ef
	100	20.76	11.41 b	8.63 c	11.65 cd
1.5t ChM	0	10.39	7.99 fgh	5.13 fg	7.53 g
	70	14.99	10.73 bc	6.77 de	8.83 fg
	100	19.04	13.48 a	8.75 c	12.05 cd
3t ChM	0	9.53	7.35 hi	5.95 ef	9.63 f
	70	12.92	9.11 de	8.52 c	11.33 de
	100	15.73	10.16 cd	10.47 b	14.88 b
5t CM	0	9.33	6.66 I	4.90 gh	7.62 g
	70	12.17	8.61 ef	7.35 d	8.75 fg
	100	14.81	9.64 cde	9.77 b	11.78 cd
10t CM	0	7.39	7.46 ghi	5.95 ef	11.05 de
	70	10.38	8.55 efg	8.95 c	12.92 c
	100	14.70	10.02 cd	14.35 a	20.80 a
Means of organic manure					
0		15.69 a	9.54 b	6.49 d	8.73 c
1.5t ChM		14.81 a	10.73 a	6.88 cd	9.47 c
3t ChM		12.73 b	8.88 c	8.31 b	11.95 b
5t CM		12.10 bc	8.30 c	7.34 c	9.38 c
10t CM		10.83 c	8.68 c	9.64 a	14.92 a
Means of mineral fertilizer					
0		9.56 c	7.46 c	5.18 c	8.08 c
70		13.11 b	9.27 b	7.63 b	10.36 b
100		17.01 a	10.94 a	10.39 a	14.23 a

ChM= chiken manure CM= Compost

*Fertilizer %= percent of recommended dose of N,P,K fertilizers

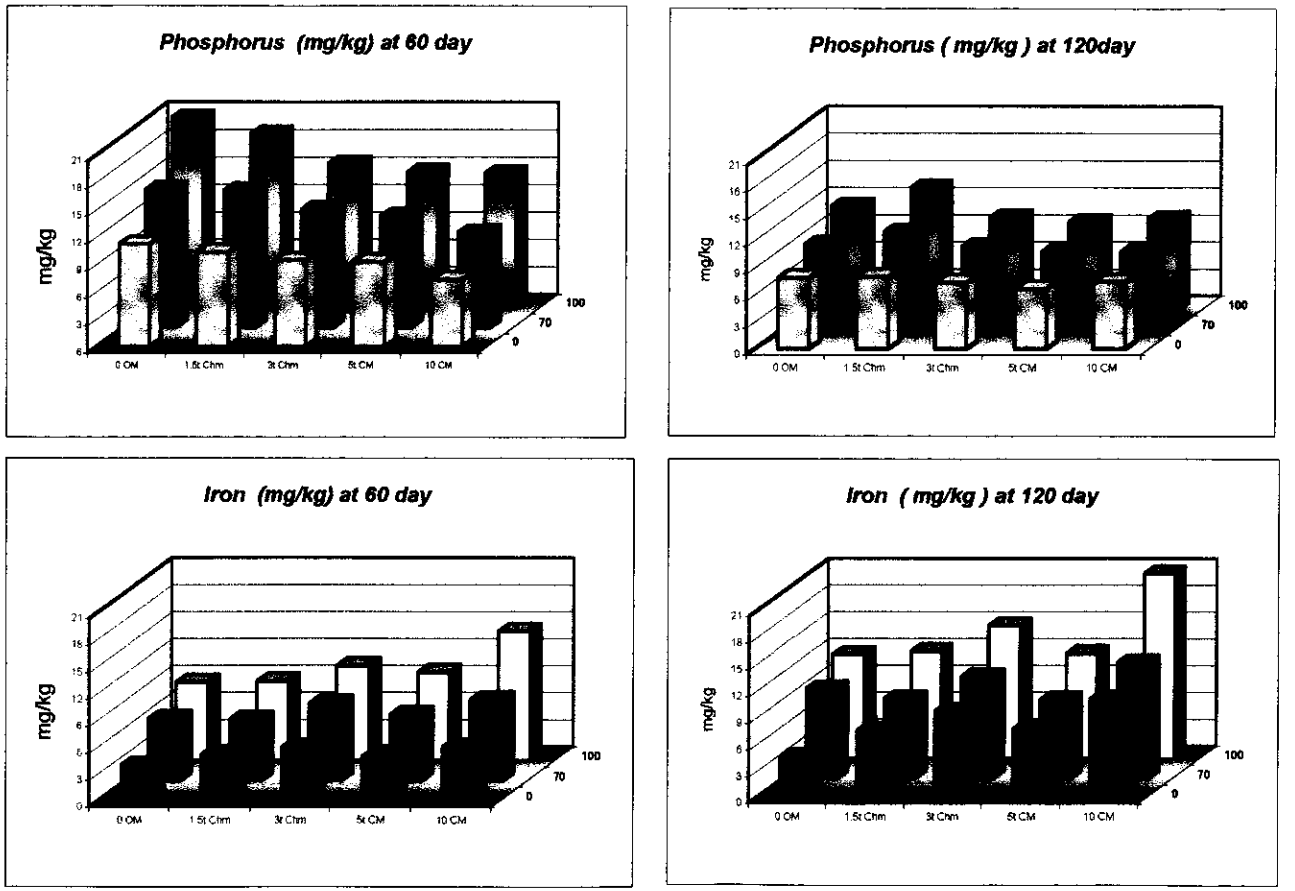

Fig (2) :Available phosphorus and iron (mg/kg)in the soil cultivated with maize plants at 60 and 120 days .

4.2.3.1.5. Available manganese:

The values of soil available manganese at both sampling times are shown in Table (7) and depicted in Fig. (3). As for the interaction effect of organic manure with mineral fertilizer, the values of soil available manganes ranged between 2.05 and 5.40 mg/kg at 60 days where they ranged between 2.32 and 8.80 mg/kg at 120 days after planting. Thereby, the significant effect on available manganese occurred after treating the soil with organic manure and decomposition of such organic manure either individual or interact with mineral fertilizer. **Dahane and shukla (1995)** mentioned similar results. The highest values of available-Mn at both periods were obtained with the rate of 3 ton/fed ChM followed by 10 ton/fed CM, while the priority of these two previous organic treatments was contradictory when the effect was interacted with mineral fertilization. The mean values at 60 and 120 days were 3.70 and 5.85 mg/kg respectively.

4.2.3.1.6. Available zinc:

The values of available zinc in the soil at the two times of soil sampling are shown in Table (7) and depicted in Fig. (3). The values when applying organic manure with mineral fertilizer ranged between 0.25 and 1.05 mg/kg at 60 days, where as they ranged between 0.25 and 1.78 mg/kg at 120 days after planting. **Dahane and shukla (1995)** mentioned similar results. The treatments either individually added as organic manure or interacted as manuring with mineral fertilization affected significantly the soil available zinc at growth periods of 60 and 120 days with mean values of 0.53 and 0.92 mg/kg for the two

growth periods, respeetivly. Organic treatment of 3 ton/fed ChM had superior effect on available zinc either individually added or interacted with 100% mineral fertilizer.

Table (7) : Available manganese and zinc (mg/kg) in the soil cultivated with maize plants grown for 60 and 120 days.

Organic ton/fed	Fertilizer %*	Manganese (mg/kg)		Zinc (mg/kg)	
		60	120	60	120
0	0	2.05 j	2.32 k	0.25 f	0.25 h
	70	2.77 h	4.40 I	0.42 de	0.72 def
	100	3.77 e	6.15 fg	0.68 c	1.18 c
1.5t ChM	0	2.57 hi	3.88 j	0.28 f	0.56 efg
	70	3.28 fg	5.33 h	0.47 d	0.77 d
	100	4.47 c	7.23 d	0.75 bc	1.32 bc
3t ChM	0	3.20 g	5.35 h	0.30 ef	0.53 fg
	70	4.08 d	6.83 c	0.73 bc	1.27 bc
	100	5.05 b	8.42 b	1.05 a	1.78 a
5t CM	0	2.53 I	4.15 ij	0.27 f	0.50 g
	70	3.48 f	5.93 g	0.50 d	0.83 d
	100	4.47 c	7.55 c	0.78 bc	1.37 bc
10t CM	0	3.08 g	5.10 h	0.27 f	0.50 g
	70	3.80 c	6.26 g	0.42 de	0.73 de
	100	5.40 a	8.80 a	0.85 b	1.43 b
Means of organic manure					
0		2.86 c	4.29 d	0.45 b	0.72 c
1.5t ChM		3.94 b	5.48 c	0.50 b	0.88 b
3t ChM		4.11 a	6.87 a	0.69 a	1.19 a
5t CM		3.49 b	5.88 b	0.52 b	0.90 b
10t CM		4.09 a	6.72 a	0.51 b	0.89 b
Means of mineral fertilizer					
0		2.69 c	4.16 c	0.27 c	0.47 c
70		3.48 b	5.75 b	0.51 b	0.86 b
100		4.63 a	7.63 a	0.82 a	1.42 a

ChM= chiken manure CM= Compost

*Fertilizer %= percent of recommended dose of N,P,K fertilizers

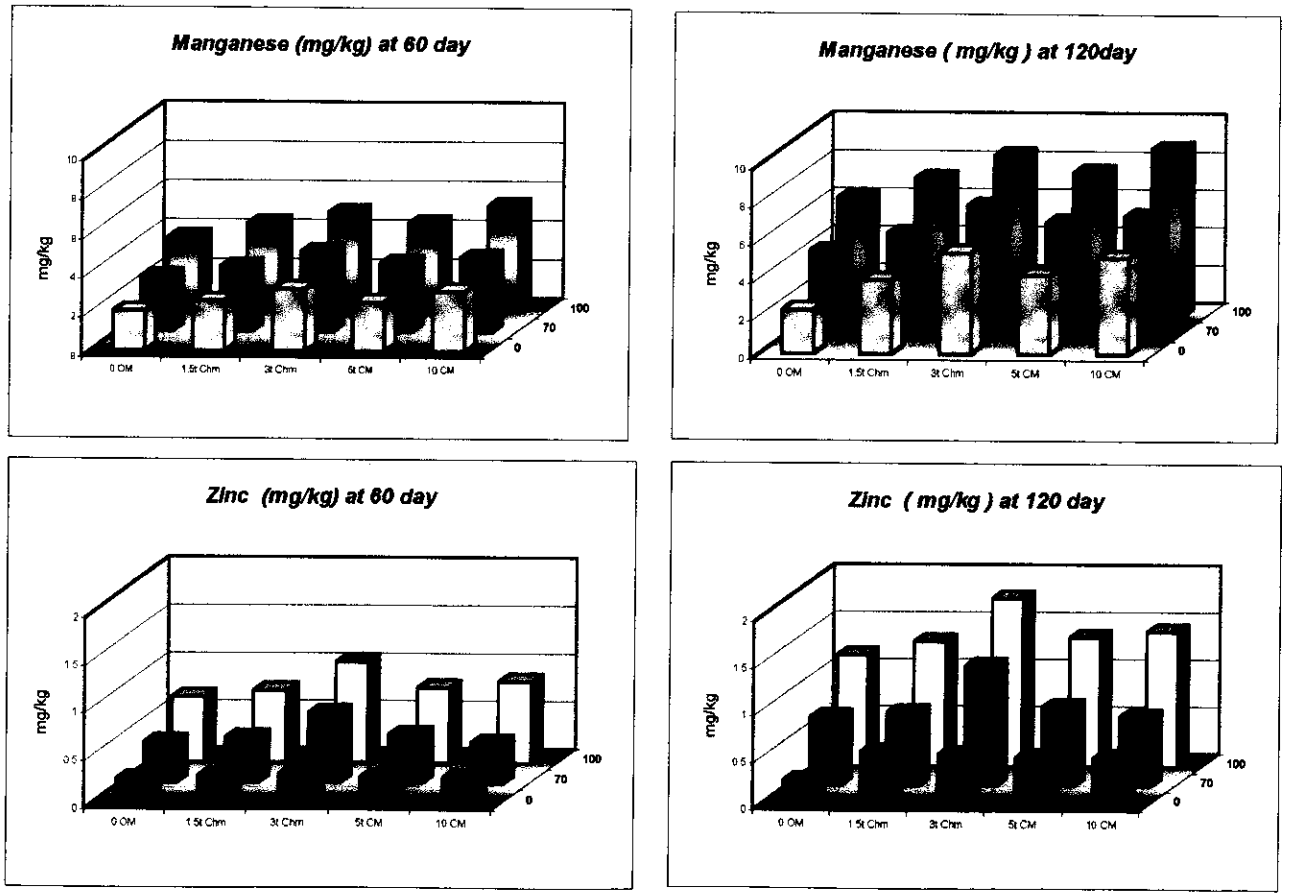

Fig (3) :Available manganese and zinc (mg/kg)in the soil cultivated with maize plants at 60 and 120 days .

4.2.3.2. Plant dry weight and nutrients:

Fifty two plant characters representing plant dry weight, concentration and uptake of N, K, P, Fe, Mn and Zn in the plant shoots and roots after 60 and 120 days of plant growthwere measured. The percentages of 88, 100 and 71 of the abovementioned characters were found to be affected significantly by manuring, mineral fertilization, and di-interaction of organic manuring-fertilization respectively.

4.2.3.2.1. Plant dry weight:

The mean values of dry weight (kg/fed) of plant shoot and root at 60 and 120 days after planting are presented in Table (8) and illustrated in Fig.(4). All organic treatments had almost similar effect on root dry weight at 60 days and significantly superior to zero application, except for 5 ton/fed CM which was of the least effect and almost similar to zero application. Where as, 3 ton/fed ChM was the best organic treatments which affected significantly root dry weight at 120 days. Shoot dry weights at 60 and 120 were significantly affected by 10ton CM as well as dry weight at 120 days by 3ton ChM.

The values of shoot and root dry weight were affected by organic manure interacted with mineral fertilizer (Table (8) and Fig. (4)). They ranged between 353 and 936 kg/fed at 60 days and between 274 and 889 kg/fed at 120 days after planting respechiely. Chicken manure at 3 ton/fed with 100% MF was significntly superior to the other treatments. **Khalil et al (2000)** repoeted the effect of different oranic manures on growth of corn. Under zero fertilizer application, the best organic treatments on shoot dry weight were 10ton/fed of CM, at 60 days

and both 3ton/fed ChM and 10ton/fed CMat 120 days. The two chicken manure rates as well as 10ton/fed CM were significntly better than the other organic applications implying zero organic one. No significant different was found for shoot dry weigh at 120 days when organic manure with mineral fertilizer was applied.

Generally, the mean values of root dry weights at 60 and 120 days were 605 and 495 kg/fed, while those of shoot dry weights at the two sampling times were 3650 and 5281 kg/fed, respectively. Data of mean values showed that shoot dry weight was increased with developed growing, however root dry weight decreased mostiy significant at 120 days as compared to 60 days from planting.

Shoot/root ratio at 60 and 120 days were 6.02 and 7.37 respectively. The highest ratios occurred under the organic treatment of 10ton/fed CM with 100% MF, i.e., 6.89 and 11.97 at 60 and 120 days respectively. This means that the higher rate of compost applied affected plant shoot more than root as compared to either at 60 days, or with those of the other organic treatments.

Table (8) : Dry weights (kg/fed) for root and shoot of maize plants at 60 and 120 days growth periods.

Organic ton/fed	Fertilizer %*	Root (kg/fed)		Shoot (kg/fed)	
		60	120	60	120
0	0	353 hi	304 g	1735 h	3532
	70	554 ef	456 de	2391 fg	4483
	100	755 be	563 c	4101 cde	5174
1.5t ChM	0	441 gh	330 g	2671 f	3874
	70	568 e	397 f	3714 e	4743
	100	916 a	659 b	4650 c	5701
3t ChM	0	407 ghi	404 ef	2749 f	5325
	70	637 de	555 e	4028 de	6502
	100	936 a	889 a	5400 b	7392
5t CM	0	338 i	274 g	1985 gh	3627
	70	554 ef	464 d	3548 e	4360
	100	676 cd	541 c	4508 cd	5503
10t CM	0	461 fg	406 def	2901 f	5270
	70	666 cd	544 c	3778 e	6386
	100	799 b	638 b	6595 a	7337
Means of organic manure					
0		554 b	441 cd	2742 d	4396 c
1.5t ChM		642 a	462 c	3678 c	4773 b
3t ChM		660 a	616 a	4059 b	6406 a
5t CM		523 b	426 d	3347 e	4497 bc
10t CM		642 a	529 b	4425 a	6331 a
Means of mineral fertilizer					
0		340 c	344 c	2408 c	4326 c
70		596 b	483 b	3492 b	5295 b
100		816 a	658 a	5051 a	6221 a

ChM = chiken manure ; CM = compost

*Fertilizer % = percent of recommended dose of N ,P & K fertilizers

Similar letters are in significant , while the different letters are at different significancies .

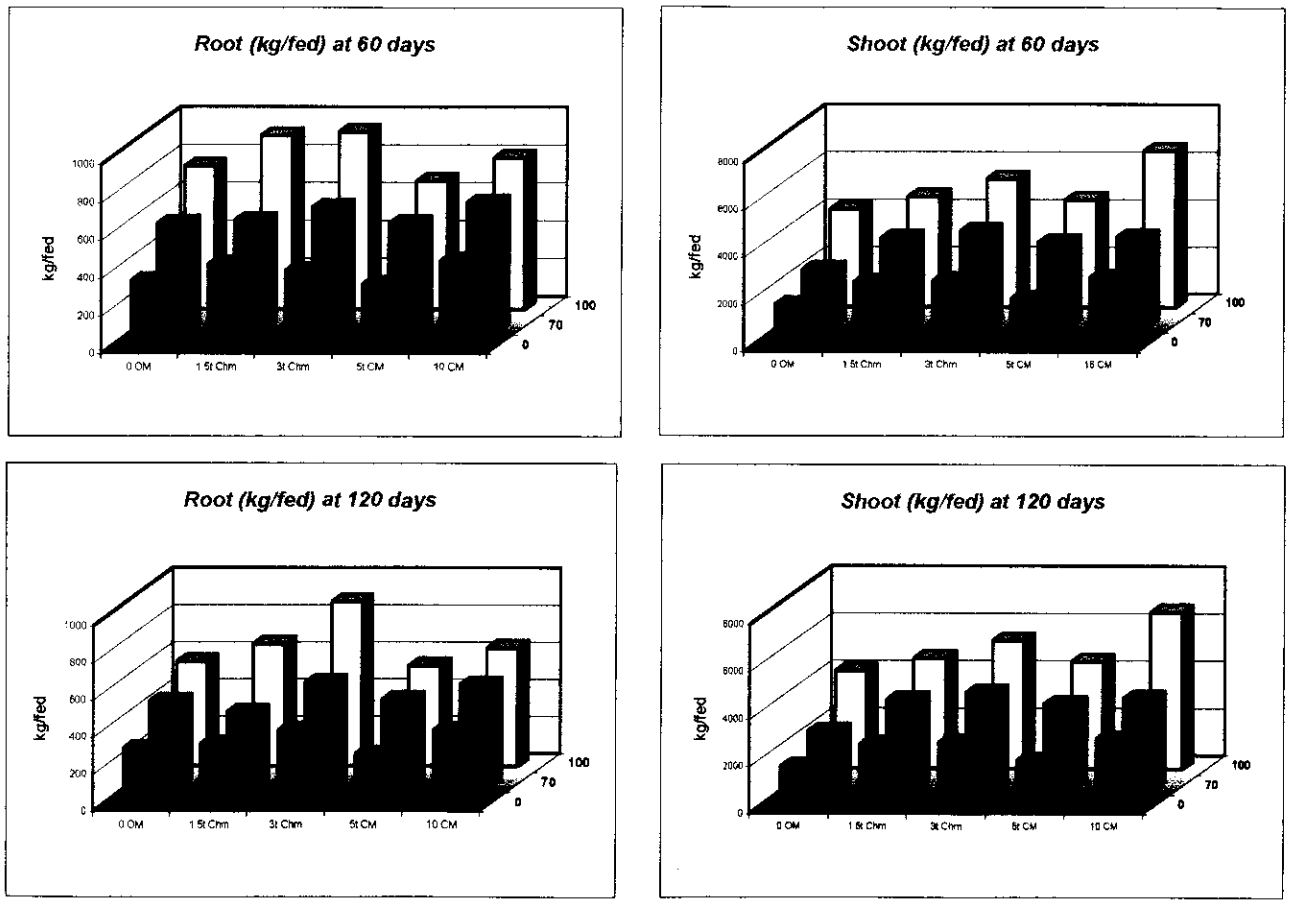

Fig (4) : Maize root and shoot dry weights (kg/fed)at 60 and 120 days after sowing

4.2.3.2.2. Nitrogen concentration and uptake:

Mean values of nitrogen concentration and uptake in the shoot and root were shown in Tables (9&10). The highest values of nitrogen either concentration or uptake by shoot and root at the two sampling times were a chieved from the used 3 ton/fed ChM followed by 10 ton/fed CM.

Data presented in Tables (9 & 10) and depicted in Figs (5 & 6) explained that chicken manure of 3 ton/fed with 100% MF was the best significnt treatment on N-concentration at 60 days and uptake at 60 and 120 days of root, while interaction of organic manure with mineral fertilizer was insignificnt effect on N-concentration and uptake of shoot at both sampling times. The values of N-concentration at 60 days ranged between 0.18 and 0.99% for the root and between 2.08 and 2.98% for the shoot, while those at 120 days ranged between 0.28 and 0.93% for the root and between 1.21 and 1.64% for shoot. As for the values of N-uptake at 60 days ranged between 0.67 and 9.42 kg/fed for the root and between 37.94 and 197.14 kg/fed for the shoot, while at 120 days ranged between 0.73 and 6.53 kg/fed for the root and between 43.27 and 120.89 kg/fed for the shoot. The treatments of 3 ton/fed ChM and 10 ton/fed CM were the better ones as compared to the other organic treatments for N-concentration and uptake for the root at the two sampling times. **Schroder et al** (1992) and **Magid et al** (1998) reported similar vesults. No distincted trend was observed for N-concentration and uptake by the shoot at the two samping times when the treatment of organic manure-fertilizer was applied. This may be due to the organic manure attained a pronounced content of nitrogen.

The mean values of N-concentration in the root at 120 days were more than at 60 days, where they were 0.57 and 0.48%, respectively, while those concern the shoot at 120 days were less than at 60 days where they were 1.4 and 2.47%, respectively. As for N-uptake values for the root and shoot were at 60 days more than at 120 days, where they were 3.19 and 2.98 kg/fed for the root and 108.58 and 74.97 kg/fed for the shoot, respectively. Nitrogen uptake by the shoot and root tended to decrease from 60 to 120 days.

Shoot/root ratio of N-uptake at 60 and 120 days were 50.08 and 30.51, respectively. These values showed that shoot absorbed nitrogen at 60 days more than that at 120 days. The ratio was relativly high under all the applied organic treatments with zero mineral fertilizer as compared to those with mineral fertilize. The ratio under chicken manure of 5 ton/fed at 60 and 120 days recorded the highest values followed by chicken manure of 1.5 ton/fed. This means that all the applied organic manure with zero fertilizer increased transfer of nitrogen from the root to shoot especially chicken manure. On the other hand, applying the mineral fertilizer plus organic manure encourage the root growth, which minimizing the ratio of nitrogen shoot/root.

Table (9) : Nitrogen concentration (%) and uptake (kg/fed) for the root of maize plants at 60 and 120 days growth periods.

Organic ton/fed	Fertilizer %*	Concentration (%)		Uptake (kg/fed)	
		60	120	60	120
0	0	0.22 g	0.37	0.80 fg	1.13 gh
	70	0.28 fe	0.55	1.53 efg	2.52 ef
	100	0.61 bc	0.80	4.60 cd	4.49 cd
1.5t ChM	0	0.18 g	0.43	0.80 fe	1.43 g
	70	0.41 ef	0.57	2.18 e	2.27 f
	100	0.74 b	0.81	5.76 b	5.35 b
3t ChM	0	0.45 de	0.37	1.84 ef	1.50 g
	70	0.63 bc	0.51	4.03 d	2.86 ef
	100	0.99 a	0.74	9.42 a	6.53 a
5t CM	0	0.20 g	0.28	0.67 g	0.73 h
	70	0.25 g	0.49	1.37 efg	2.30 f
	100	0.56 cd	0.74	3.70 d	4.05 d
10t CM	0	0.46 de	0.38	2.09 e	1.57 g
	70	0.53 cde	0.58	3.61 d	3.13 e
	100	0.66 bc	0.93	5.44 bc	4.84 bc
Means of organic manure					
0		0.37 cd	0.57	2.31 cd	2.71 cd
1.5t ChM		0.44 c	0.60	2.91 c	3.02 bc
3t ChM		0.69 a	0.54	5.10 a	3.63 a
5t CM		0.33 d	0.50	1.92 d	2.36 d
10t CM		0.55 b	0.63	3.72 b	3.18 b
Means of mineral fertilizer					
0		0.31 c	0.37 c	1.24 c	1.27 c
70		0.42 b	0.54 b	2.55 b	2.62 b
100		0.71 a	0.80 a	5.77 a	5.05 a

ChM = chiken manure; CM = compost

*Fertilizer % = percent of recommended dose of N ,P & K fertilizers

Similar letters are in significant, while the different letters are at different significancies .

Table (10) : Nitrogen concentration (%) and uptake (kg/fed) for the shoot of maize plants at 60 and 120 days growth periods.

Organic ton/fed	Fertilizer %*	Concentration (%)		Uptake (kg/fed)	
		60	120	60	120
0	0	2.20	1.22	37.94	43.27
	70	2.33	1.35	55.62	60.58
	100	2.83	1.57	115.50	80.97
1.5t ChM	0	2.27	1.28	60.01	47.52
	70	2.43	1.35	90.22	64.11
	100	2.72	1.49	132.93	84.75
3t ChM	0	2.31	1.33	197.14	70.96
	70	2.55	1.51	104.14	98.15
	100	2.87	1.63	174.57	120.89
5t CM	0	2.13	1.21	111.81	44.03
	70	2.39	1.33	84.70	57.79
	100	2.98	1.64	134.01	90.56
10t CM	0	2.08	1.27	60.26	66.85
	70	2.26	1.30	85.50	83.41
	100	2.67	1.51	184.35	110.69
Means of organic manure					
0		2.45 b	1.38 b	69.69	61.61 c
1.5t ChM		2.47 ab	1.37 b	94.38	65.46 c
3t ChM		2.58 a	1.49 a	158.62	96.66 a
5t CM		2.50 ab	1.39 b	110.17	64.13 c
10t CM		2.33 c	1.36 b	110.04	86.99 b
Means of mineral fertilizer					
0		2.20 c	1.26 c	93.43 b	54.53 c
70		2.39 b	1.37 b	84.03 b	72.81 b
100		2.81 a	1.57 a	148.27 a	97.57 a

ChM = chiken manure ; CM = compost

*Fertilizer %=percent of recommended dose of N ,P& K fertilizers

Similar letters are in significant , while the different letters are at different significancies .

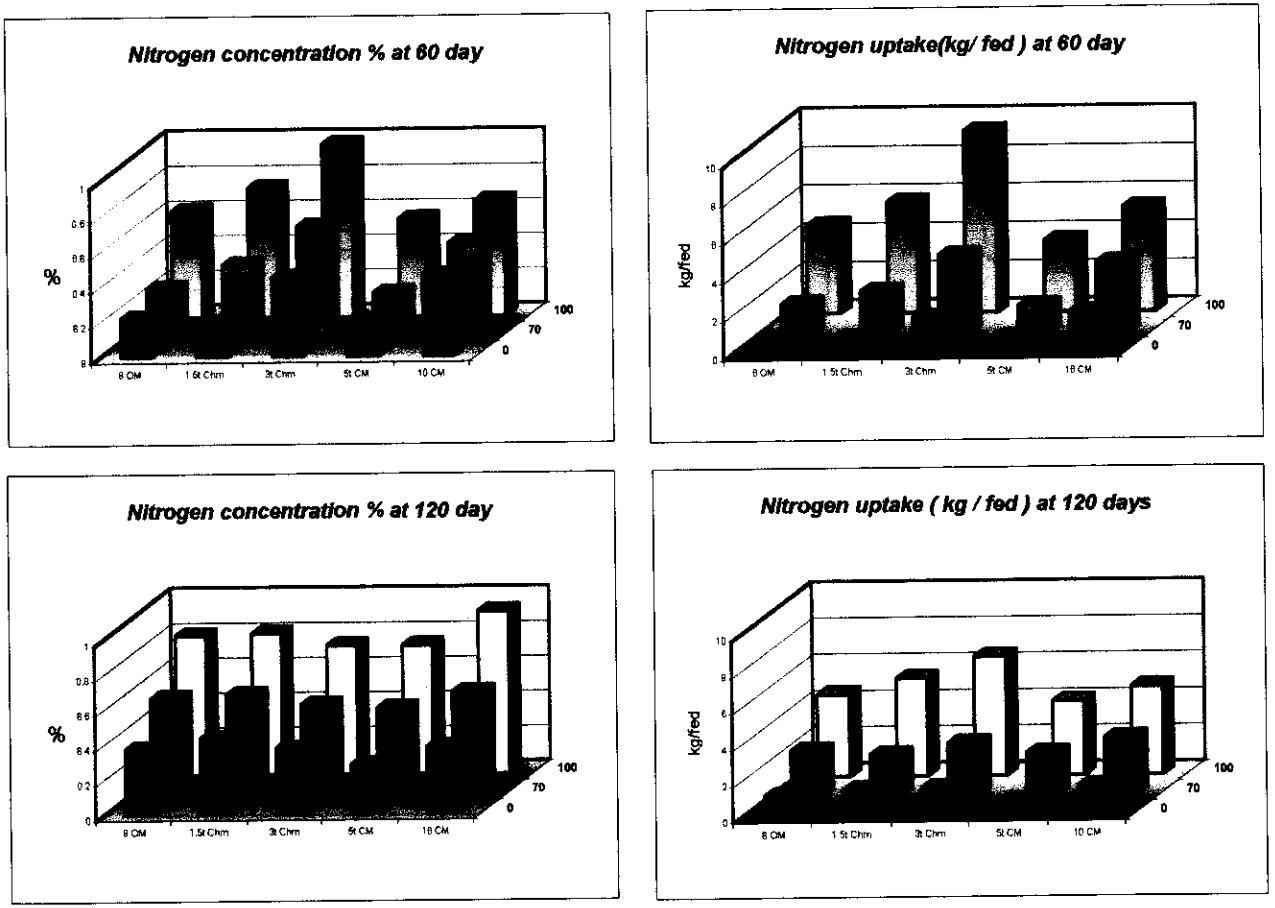

Fig (5) : Nitrogen concentration (%) and uptake (Kg/ fed) for the root of maize plants at 60 and 120 days

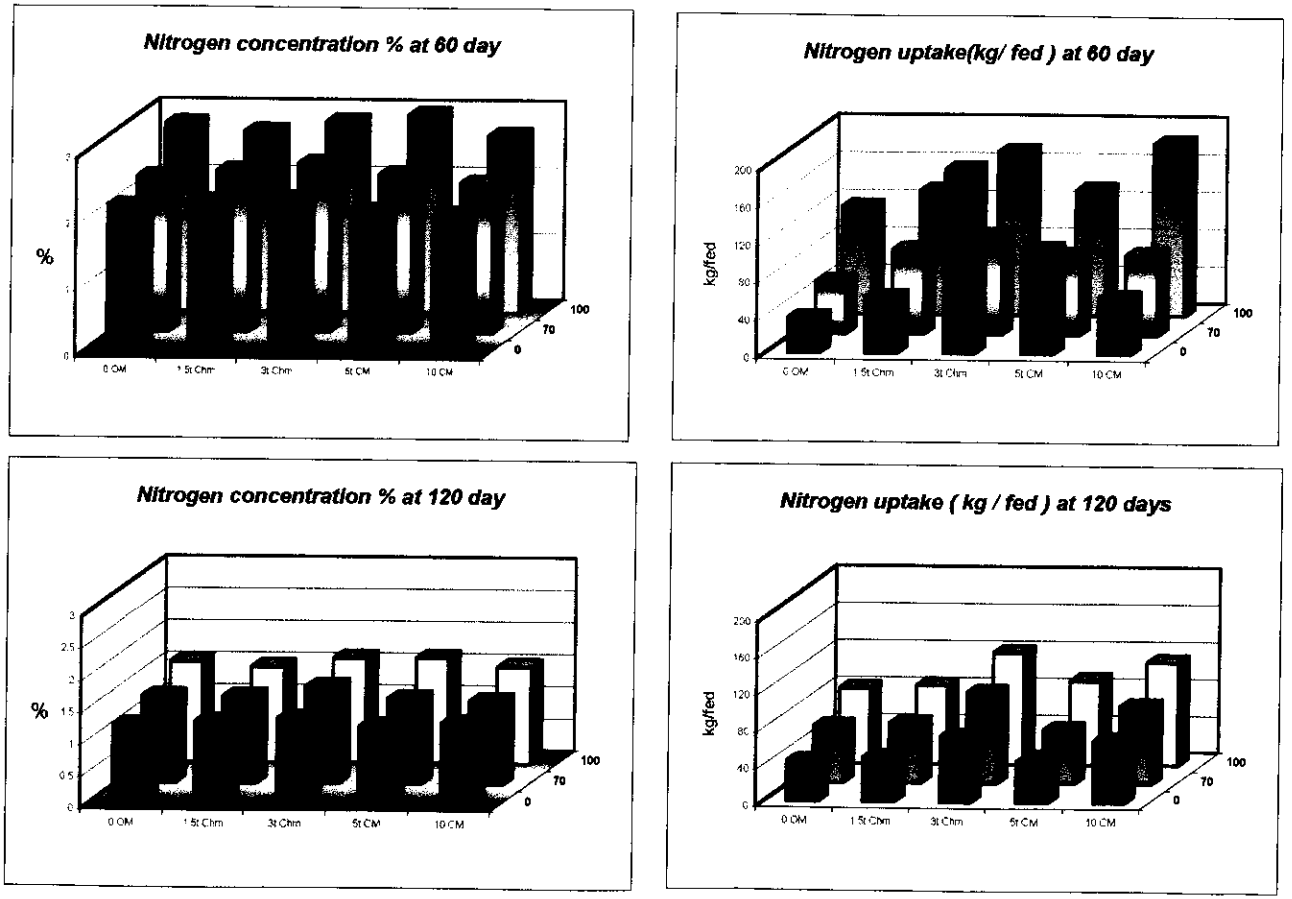

Fig (6) : Nitrogen concentration (%)and uptake (kg/fed) for the shoot of maize plantsat 60 and 120 days

4.2.3.2.3. Potassium concentration and uptake:

Data in Tables (11 & 12) show the concentration and uptake of potassium in the roots and shoots at the two sampling times. Potassium concentrations at 60 days in the roots and shoots were not affected by organic manure treatmetns. While the low rate of chicken manuare (1.5 ton/fed) and high one of compost (10 ton/fed) had significantly superior effects on K-concentration in the root, Whereas, the low rates of chicken manure C1.5 ton/fed and low rate of compost (5ton/fed) were of higher effect than the others on the shoot at 120 days. The highest rate of chicken manure (3 ton/fed) was at the highest significant effect on K-uptake for the root at 120 days, while at 60 days, all organic treatments showed no significant effect. Concerning K-uptake of shoot at 60 and 120 days, the significant superior effects were at the highest rates of both chicken manur and the compost similar results were reported by **Khalil et al (2000).**

The results of K concentration and uptake under di-interaction of organic manure with fertilizer are shown in Tables (11&12) and depicted in Figs (7&8). The values of K-concentration at 60 days ranged between 0.56 and 1.37% for the root and between 1.18 and 3.80% for the shoot, while those at 120 days ranged between 0.35 and 1.05% for the root and between 1.02 and 1.32% for the shoot. As for the values of K-uptake at 60 days ranged between 2.15 and 10.68 kg/fed for the root and between 22.70 and 242.15 kg/fed for the shoot, while at 120 days the ranged between 0.94 and 8.07 kg/fed for the root and between 36.06 and 89.59 kg/fed for the shoot. Di-interaction

effect of organic manure with mineral fertilizer was significantly affected the K-concentration at 60 days, and-uptake of roots at 60 and 120 days, in addition to K-concentration at 60 and 120 days and K-uptake of shoots at 60 days. As for the roots, the highest values of K-concentration and uptake were obtained under 100% MF with zero organic manure at 60 days, while the treatment of 3 ton/fed chicken manure with 100% MF had the highest significant effect on K-uptake. As regard to the shoots, K-concentrations at 60 and 120 days were affected by 100% fertilizer. Whereas, for K-uptake in shoot was significantly superior under 10 ton/fed compost with 100% MF.

The mean value of K-concentration for the root at 60 days was more than that at 120 days, where they were 0.77 and 0.68% for 60 and 120 days respectively. While those concern the shoot at 60 were less than at 120 days where they were 0.24 and 1.14%, respectively. As for K-uptake by the roots and shoots, the values were at 60 were more than at 120 days, where they were 4.87 and 3.74 kg/fed for the roots and 99.07 and 60.43 kg/fed for the shoots, respectively.

Shoot/root ratio of K-concentration and uptake at 60 days were lower with organic manure at zero fertilizer than the combined effect of organic treatments with mineral fertilizer. But the ratio of K-concentration and uptake at 120 days were higher with organic manure at zero fertilizer than the organic manure with fertilizer. Generally. shoot/root ratio of K-concentration at 60 and 120 days were 3.1 and 1.79, while those of K-uptake were 18.83 and 19.48 for the two sampling times, respectively.

Table (11) :Potassium concentration (%) and uptake (kg/fed) for the root of maize plants at 60 and 120 days growth periods.

Organic ton/fed	Fertilizer %*	Concentration (%)		Uptake (kg/fed)	
		60	120	60	120
0	0	0.69 e	0.51	2.41 g	1.55 gh
	70	0.82 bc	0.79	4.56 de	3.64 cd
	100	1.37 a	1.05	10.68 a	5.92 b
1.5t ChM	0	0.58 fg	0.55	2.54 fg	1.81 fg
	70	0.71 de	0.78	4.04 ef	3.13 de
	100	0.81 bc	1.04	7.37 bc	6.54 b
3t ChM	0	0.56 g	0.52	2.26 g	2.12 fg
	70	0.72 de	0.65	4.57 de	3.62 cd
	100	0.85 bc	0.89	7.91 b	8.07 a
5t CM	0	0.64 ef	0.35	2.15 g	0.94 h
	70	0.79 cd	0.53	4.40 e	2.48 ef
	100	0.88 b	0.72	5.99 cd	3.95 c
10t CM	0	0.56 g	0.54	2.60 fg	2.22 fg
	70	0.67 e	0.70	4.84 de	3.75 cd
	100	0.85 bc	0.60	6.73 bc	6.31 b
Mean of organic manure					
0		0.96 a	0.78 a	5.88 a	3.70 b
1.5t ChM		0.70 c	0.79 a	4.65 b	3.83 b
3t ChM		0.71 c	0.69 b	4.91 b	4.60 a
5t CM		0.77 b	0.53 c	4.18 b	2.46 c
10t CM		0.69 c	0.74 ab	4.72 b	4.09 b
Means of mineral fertilizer					
0		0.60 c	0.49 c	2.39 c	1.73 c
70		0.74 b	0.69 b	4.48 b	3.33 b
100		0.95 a	0.94 a	7.74 a	6.16 a

ChM = chiken manure ; CM = compost

*Fertilizer%=percent of recommended dose of N,P&K fertilizers

Similar letters are in significant , while the different letters are at different significancies .

Table (12) : Potassium concentration (%) and uptake (kg/fed) for the shoot of maize plants at 60 and 120 days growth priods.

Organic ton/fed	Fertilizer %*	Concentration (%)		Uptake (kg/fed)	
		60	120	60	120
0	0	1.30 e	1.02 g	22.70 f	36.06
	70	2.50 d	1.10 de	59.60 e	49.40
	100	3.54 ab	1.32 a	142.52 c	68.39
1.5t ChM	0	1.26 e	1.08 e	33.94 f	40.15
	70	2.54 d	1.15 cd	94.30 d	54.44
	100	3.45 bc	1.29 a	160.26 c	72.99
3t ChM	0	1.21 e	1.03 fg	33.30 f	54.65
	70	2.55 d	1.10 de	102.10 d	72.00
	100	3.80 a	1.22 b	212.48 b	89.59
5t CM	0	1.35 e	1.08 ef	26.99 f	39.18
	70	2.51 d	1.20 bc	89.10 d	52.18
	100	3.20 c	1.29 a	144.46 c	70.77
10t CM	0	1.18 e	1.02 g	34.23 f	53.58
	70	2.33 d	1.06 efg	87.92 d	67.93
	100	3.67 ab	1.18 bc	242.15 a	85.09
Means of organic manure					
0		2.45	1.15 b	74.94 c	51.28 c
1.5t ChM		2.42	1.17 ab	96.17 b	55.86 b
3t ChM		2.52	1.12 c	115.96 a	72.08 a
5t CM		2.35	1.19 a	86.85 b	54.04 bc
10t CM		2.39	1.09 c	121.44 a	68.87 a
Means of mineral fertilizer					
0		1.26 c	1.04 c	30.23 c	44.73 c
70		2.49 b	1.12 b	86.60 b	59.19 b
100		3.53 a	1.26 a	180.37 a	77.37 a

ChM = chiken manure ; CM = compost

*Fertilizer%=percent of recommended dose of N,P&K fertilizers

Similar letters are in significant , while the different letters are at different significancies .

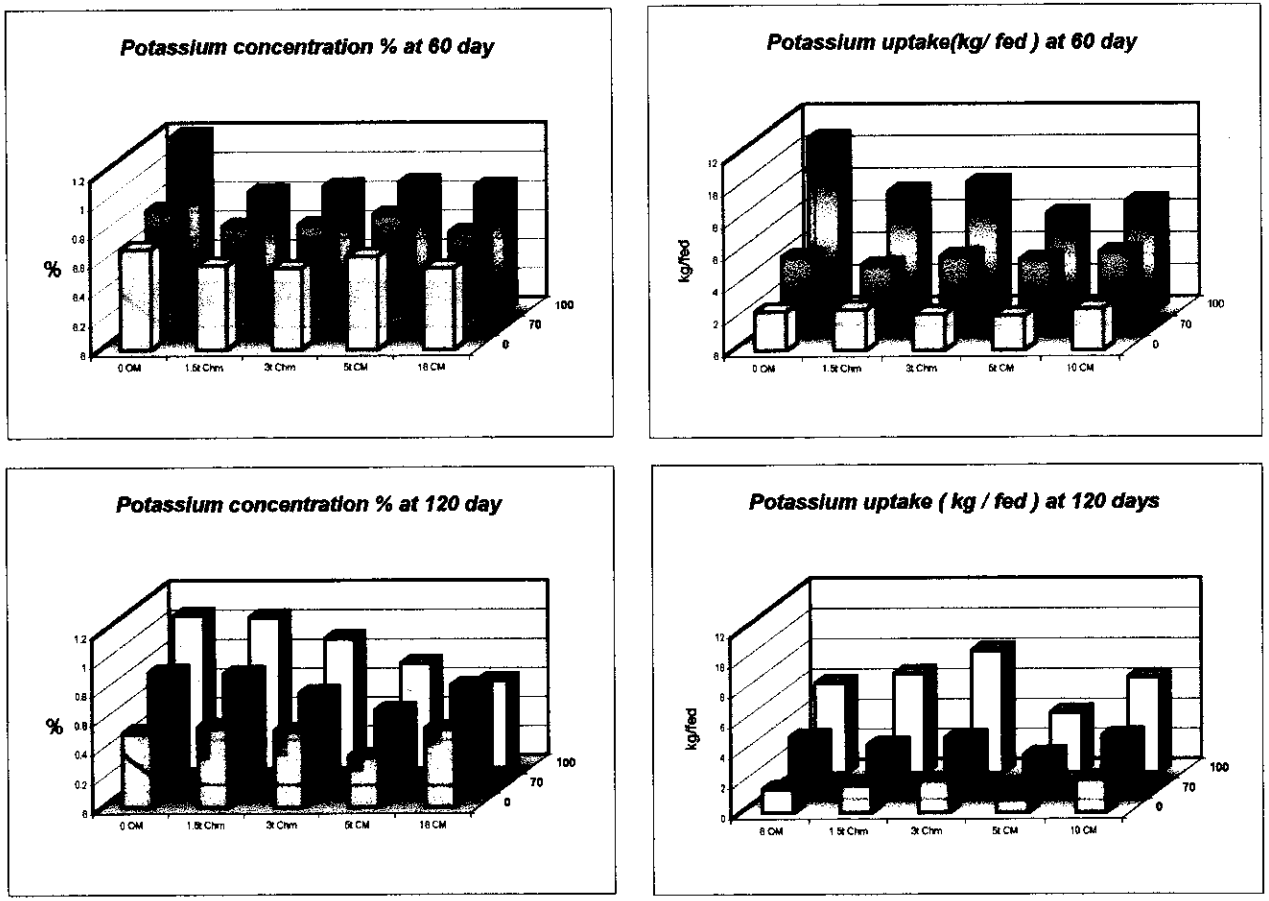

Fig (7) : Potassium concentration (%) and uptake (Kg/ fed) for the root of maize plants at 60 and 120 days

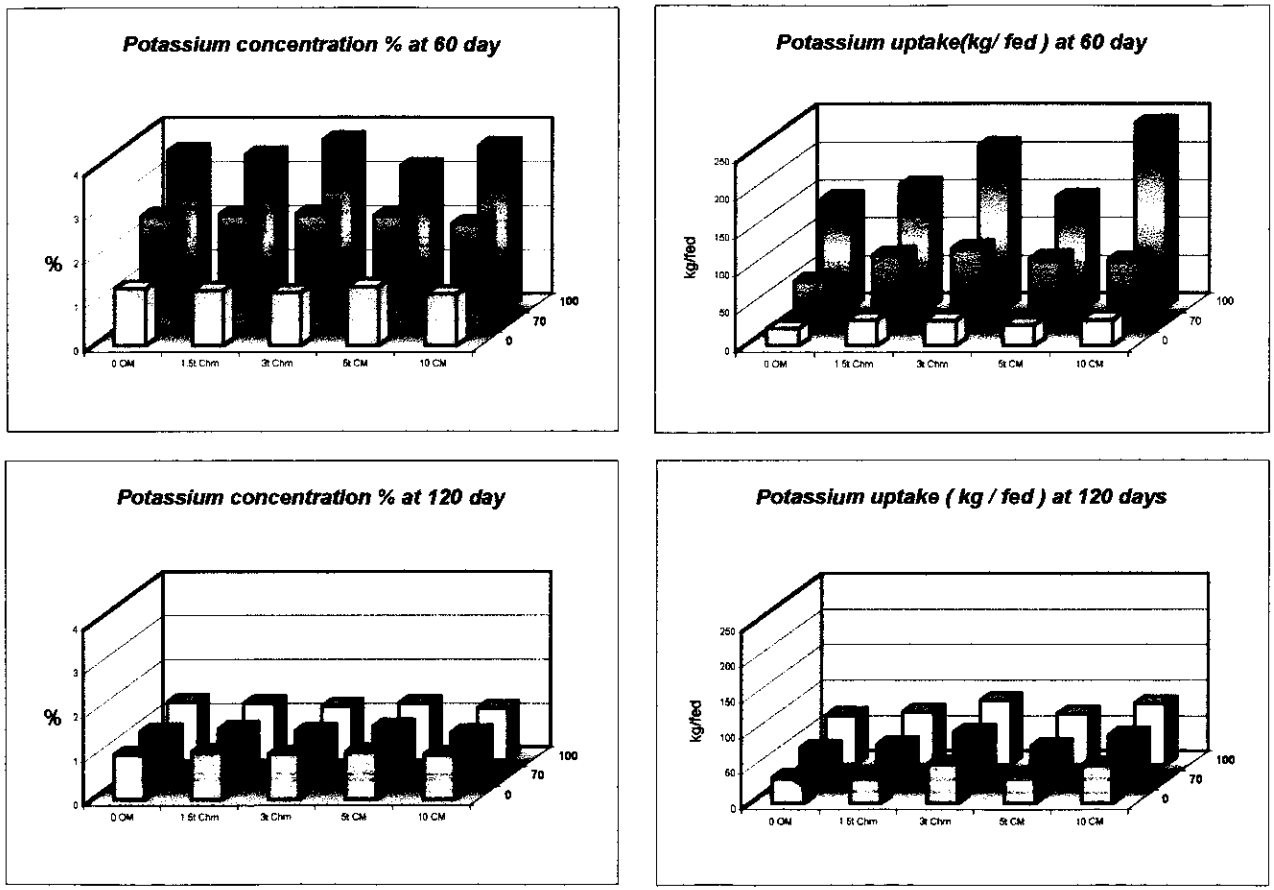

Fig (8) : Potassium concentration (%) and uptake (Kg/ fed) for the shoot of maize plantsat 60 and 120 days

4.2.3.2.4. Phosphorus concentration and uptake:

Data in Tables (13&14) and depicted in Figs (9&10) indicated that mean values of P- concentration in the root and shoot increased with the low rate of compost (5 ton/fed), while the two rates of chicken manuare, especially the highest one increased significantly P-uptake either for the root or shoot.

Results of P-concentration and uptake in the root and shoot at the two sampling times –significant effect under organic manure with mineral fertilizer, except for the root uptake at 120 days and shoot concentration at 60 days where chicken manure was of the highest effect. The values of P-concentration at 60 days ranged between 0.37 and 0.70% for the root and between 0.13 and 0.48% for the shoot, while those at 120 days ranged between 0.23 and 0.82% for the root and between 0.11 and 0.17% for the shoot. As for the values of P-uptake at 60 days, they ranged between 1.35 and 5.37 kg/fed for the root and between 3.46 and 21.90 kg/fed for the shoot, while , they ranged between 0.85 and 6.44 kg/fed at 120 days for the root and between 3.93 and 9.90 kg/fed for the shoot. The treatments of organic manure with zero fertilizer showed more or less similar effect with preference of chicken manure rates. Simillar results were reportect by **Khalil et al (2000).**

The mean values of P-concentration of the root were al most similar at 60 and 120, where they were about 0.49% for both, while the values of the shoots at 120 day were less than those at 60, where they were 0.27 and 0.13%, respectively. As for phosphorus uptake by the root and shoot, the values at 60 were more than at 120 days where they were 3.11 and 2.65

kg/fed for the root and 10.23 and 6.75 kg/fed for the shoot, respectively.

Shoot/root ratio of P-concentration and uptake at 60 days were lower with organic manure at zero fertilizer compared to combined effect of organic treatments with fertilizer. But the ratio of P-concentration and uptake at 120 days was higher with organic manure at zero mineral fertilizer than the organic manure with fertilizer. The relative small fraction of shoot/root ratio with P- concentration and the high ration with P- uptake can be explained by the great amount of shoot biomass as compared to that of root one. Generally. shoot/root ratios of P-concentration at 60 and 120 days were 0.53 and 0.29, while those concern P-uptake were more or less similar, where they were 3.13 and 3.28 for the two successive sampling times.

Table (13) : Phosphorus concentration (%) and uptake (kg/fed) for the root of maize plants at 60 and 120 days growth periods.

Organic ton/fed	Fertilizer %*	Concentration (%)		Uptake (kg/fed)	
		60	120	60	120
0	0	0.38	0.29	1.35	0.85 g
	70	0.48	0.44	2.64	1.85 ef
	100	0.56	0.62	4.29	3.45 c
1.5t ChM	0	0.39	0 23	1.73	0.87 g
	70	0.49	0.54	2.82	0.01 e
	100	0.58	0.74	5.37	4.63 b
3t ChM	0	0.38	0.28	1.54	1.14 fe
	70	0.48	0.53	3.05	2.94 cd
	100	0.56	0.73	5.17	6.44 a
5t CM	0	0.42	0.31	1.43	0.86 g
	70	0.54	0.51	3.02	2.39 de
	100	0.70	0.65	4.75	3.48 c
10t CM	0	0.37	0.25	1.69	1.02 g
	70	0.48	0.47	3.16	2.58 de
	100	0.58	0.82	4.61	5.21 b
Means of organic manure					
0		0.47 b	0.45	2.76	2.05 d
1.5t ChM		0.49 b	0.50	3.31	2.51 c
3t ChM		0.47 b	0.51	3.25	3.51 a
5t CM		0.55 a	0.49	3.07	2.24 cd
10t CM		0.47 b	0.52	3.15	2.94 b
Means of mineal fertilizer					
0		0.39 c	0.27 c	1.55 c	0.95 c
70		0.49 b	0.50 b	2.94 b	2.35 b
100		0.59 a	0.71 a	4.84 a	4.64 a

ChM = chiken manure ; CM = compost

*Fertilizer%=percent of recommended dose of N ,P&K fertilizers

Similar letters are in significant , while the different letters are at different significancies .

Table (14) : Phosphorus concentration (%) and uptake (kg/fed) for the shoot of maize plants at 60 and 120 days growth periods.

Organic ton/fed	Fertilizer %*	Concentration (%)		Uptake (kg/fed)	
		60	120	60	120
0	0	0.20 fg	0.13	3.46	4.66
	70	0.30 de	0.14	7.18	6.41
	100	0.42 ab	0.16	17.19	7.99
1.5t ChM	0	0.19 fgh	0.12	4.89	4.43
	70	0.35 cd	0.15	12.80	6.84
	100	0.48 a	0.17	21.90	9.56
3t ChM	0	0.14 h	0.10	3.87	5.37
	70	0.18 gh	0.12	7.60	7.46
	100	0.25 ef	0.14	14.49	9.90
5t CM	0	0.22 fg	0.11	4.41	3.93
	70	0.31 d	0.13	10.96	5.71
	100	0.38 bc	0.15	17.34	8.22
10t CM	0	0.13 h	0.09	3.88	4.82
	70	0.19 fgh	0.11	7.13	7.21
	100	0.25 ef	0.12	16.38	8.79
Means of organic manure					
0		0.31 a	0.14 a	9.28 bc	6.35 bc
1.5t ChK		0.34 a	0.14 a	13.20 a	6.94 b
3t ChK		0.19 b	0.12 c	8.65 c	7.58 a
5t CM		0.31 a	0.13 b	10.90 b	5.96 c
10t Cm		0.19 b	0.11 d	9.13 c	6.94 b
Means of mineral fertilizer					
0		0.18 c	0.11 c	4.10 c	4.64 c
70		0.27 b	0.13 b	9.13 b	6.73 b
100		0.36 a	0.15 a	17.46 a	8.89 a

ChM = chiken manure ; CM = compost

*Fertilizer%=percent of recommended dose of N ,P&K fertilizers

Similar letters are in significant , while the different letters are at different significancies .

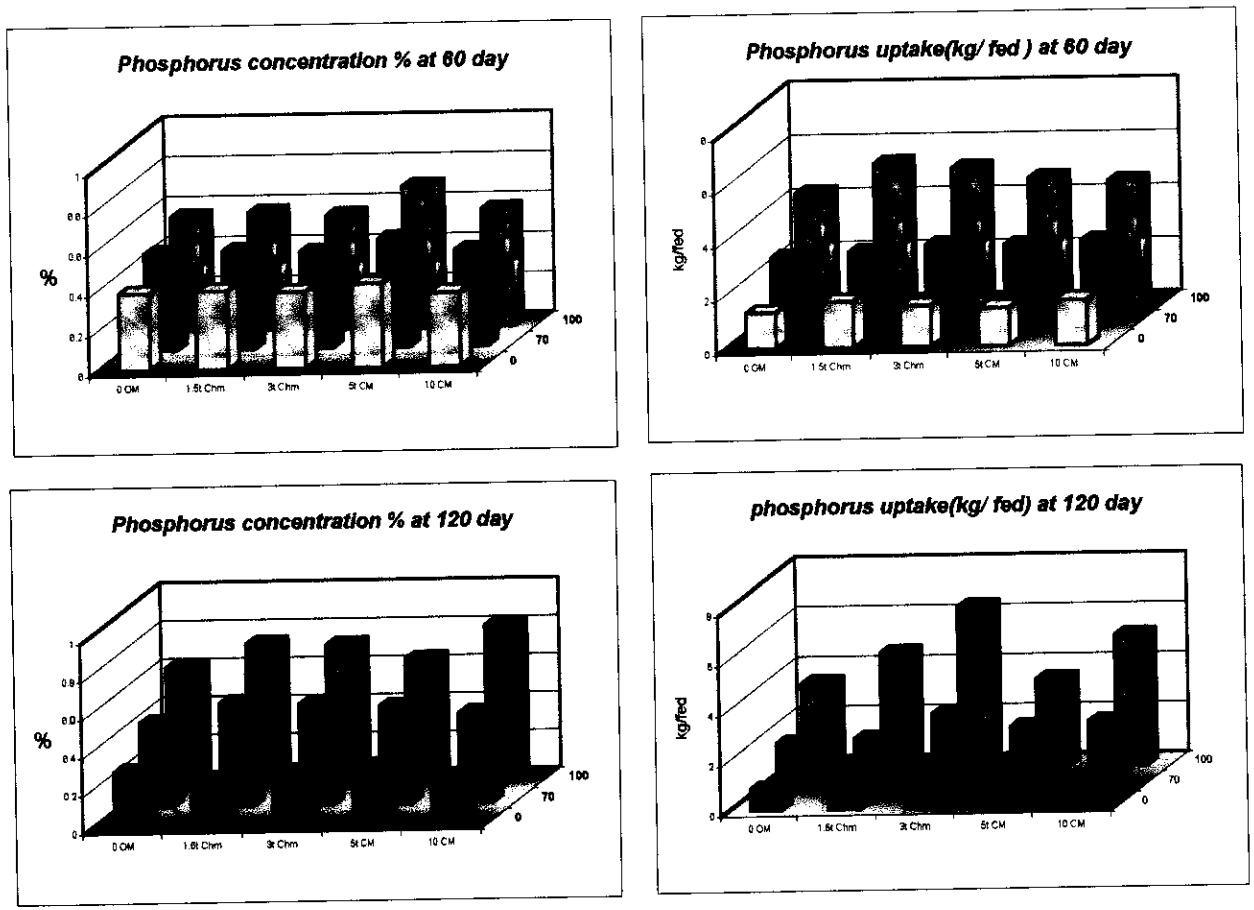

Fig (9) : Phosphorus concentration (%) and uptake (kg / fed) for the root of maize plantsat 60 and 120 days

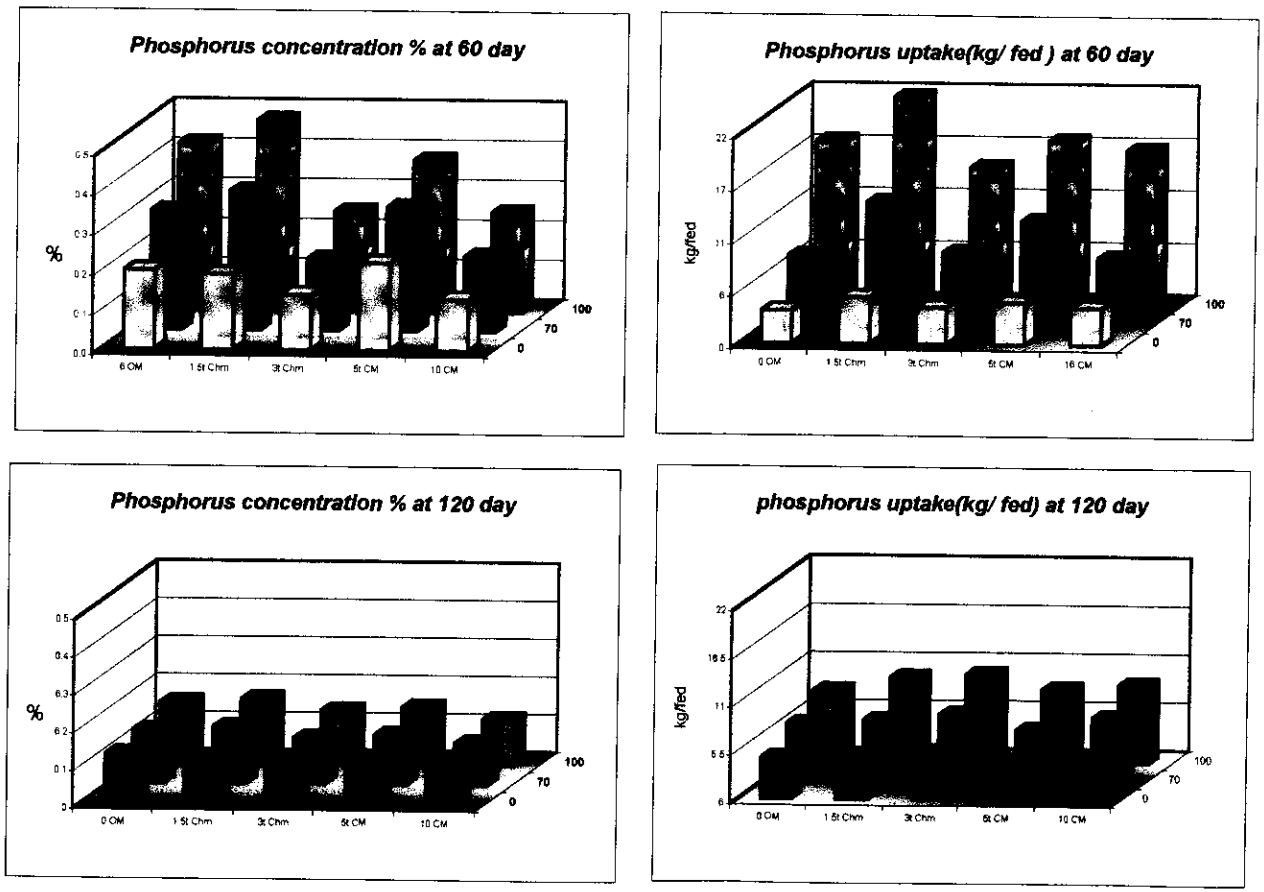

Fig (10) : Phosphorus concentration (%) and uptake (kg / fed) for the shoot of maize plants at 60 and 120 days

4.2.3.2.5. Iron concentration and uptake:

Data of iron as shown in Tables (15 & 16) and depicted in Figs (11&12) indicated that Fe- concentration and uptake by the root and shoot at 60 and 120 days were significant affected by organic manure treatments. Thereby, chicken manure of 3 ton/fed was the best significant organic treatments for the root Fe-concentration at 120 days, Fe-uptake at both times 60 and 120 days, shoot Fe-concentration at 60 and Fe-uptake at 60 days. While compost of 10 ton/fed was the best significant treatments. **Mehana (1998)** and **Laila (2001)** mentioned similar results.

The values of Fe-concentration caused by the di-interaction effects of organic manure with mineral fertilizer at 60 days ranged between 545 and 1380 mg/kg for the root and between 767 and 2867 mg/kg for the shoot, while those at 120 days ranged between 387 and 1132 mg/kg for the root and between 617 and 1900 mg/kg for the shoot. As for the values of Fe-uptake at 60 days ranged between 184 and 1260 g/fed for the root and between 1344 and 18853 g/fed for the shoot, while they ranged between 1064 and 9868 g/fed at 120 days for the root and between 2226 and 13964 g/fed for the shoot.

The values of root Fe-concentration at 120 days, Fe-uptake at 60 and 120 days were superior under chicken manure of 3 ton/fed with 100% MF. While, those concern Fe-concentration and uptake of the shoot at the two sampling times were superior under compost of 10 ton/fed. The highest rates of chicken manure and compost with zero mineral fertilizer had higher effect on increaseing Fe-concentration and uptake at the two sampling times as compared to the other organic rates.

The mean values were 935, 679 mg/kg for Fe-concentration and 624, 3609 g/fed for Fe-uptake in the root as well as 1610, 1047 mg/kg for Fe-concentration and 6920, 5900 g/fed for Fe-uptake in the shoot in the two sampling times, respectively. The grand mean of Fe-concentration in the root and shoot at 120 days decreased as compared to those at 60 days. This is attributed to the dilution effects due to the increase in plant biomass. While, those concern uptake increased in the root and decreased in the shoot, mainly due to iron concentrated more in the root. Kamh and Hashem (1991)said that the application of organic matter to soil showed significant decreases for Fe content in the maize plant.

Shoot/root ratio of Fe-concentration at 60 and 120 days were lower with organic manure at zero fertilizer than the combined effect of organic treatments with mineral fertilizer, except chicken manure at 3 ton/fed at 120 days which it was higher. Also, a similar ratio of Fe-uptake at 60 days was obtained, except chicken manure at 3 ton/fed, which it was higher. The ratio at 120 days was higher, except compost at 10 ton/fed, which it was lower. Generally. shoot/root ratios of Fe-concentration at 60 and 120 were 1.7 and 1.57, while those concern Fe-uptake were 11.03 and 1.72 for the two successive sampling times. This means more iron transfered from root to shoot, especially at 60 days after planting. The ratio indicated that treatment of 3 ton/fed ChM or 5 ton/fed CM each with zero MF was better treatment on Fe vaules either concentration or uptake at the two sampling times as compared to those organic treatments with zero mineral fertilizer.

Table (15) : Iron concentration (mg/kg) and uptake (g/fed) for the root of maize plants at 60 and 120 days growth periods.

Organic ton/fed	Fertilizer %*	Concentration (mg/kg)		Uptake (g /fed)	
		60	120	60	120
0	0	638	387 i	225 hi	1182 g
	70	745	680 e	570 ef	3105 cd
	100	1297	883 cd	978 c	4987 b
1.5t ChM	0	622	437 h	274 ghi	1439 fg
	70	853	585 f	485 f	2325 def
	100	1223	870 d	1121 b	5755 b
3t ChM	0	728	497 g	297 gh	2002 efg
	70	957	648 e	610 e	3602 c
	100	1345	1132 a	1260 a	9868 a
5t CM	0	545	390 i	184 i	1064 g
	70	857	565 f	475 f	2617 cde
	100	1182	912 c	799 d	4906 b
10t CM	0	733	475 gh	338 g	1934 efg
	70	920	640 e	613 e	3481 c
	100	1380	1090 b	1102 b	5871 b
Means of organic manure					
0		893	650 c	591 c	3091 c
1.5t ChM		899	631 cd	627 bc	3173 bc
3t ChM		1010	759 a	722 a	5157 a
5t CM		861	622 d	486 d	2862 c
10t CM		1011	735 b	684 ab	3762 b
Means of mineral fertilizer					
0		653 c	437 c	264 c	1524 c
70		866 b	624 b	551 b	3026 b
100		1285 a	977 a	1052 a	6278 a

ChM = chiken manure ; CM = compost

*Fertilizer%=percent of recommended dose of N ,P&K fertilizers

Similar letters are in significant , while the different letters are at different significancies .

Table (16) : Iron concentration (mg/kg) and uptake (g/fed) for the shoot of maize plants at 60 and 120 days growth periods.

Organic Ton/fed	Fertilizer %*	Concentration (mg/kg)		Uptake (g/fed)	
		60	120	60	120
0	0	775 k	625 iji	1344 e	2226 g
	70	1400 h	808 gh	3324 de	3623 e
	100	1642 ef	1267 d	6642 c	6502 d
1.5t ChM	0	767 k	617 j	2069 e	2267 g
	70	1517 g	867 fg	5633 cd	4144 e
	100	1708 de	1208 d	7945 bc	6922 d
3t ChM	0	1200 I	750 h	7047 bc	4008 e
	70	1742 d	917 f	7086 bc	5982 d
	100	2792 a	1625 c	16065 a	12043 b
5t CM	0	1000 j	683 i	1995 e	2472 eg
	70	1550 fg	900 f	5500 cd	3951 e
	100	2208 b	1825 b	9976 b	10091 c
10t CM	0	1117 i	650 ij	3237 de	3429 ef
	70	1867 c	1067 e	7085 bc	6879 d
	100	2867 a	1900 a	18853 a	13964 a
Means of organic manure					
0		1272 d	900 d	3770 c	4117 d
1.5t ChM		1331 c	897 d	5215 bc	4444 d
3t ChM		1911 a	1097 c	10066 a	7344 b
5t CM		1586 b	1136 b	5824 b	5504 c
10t CM		1950 a	1206 a	9725 a	8090 a
Means of mineral fertilizer					
0		972 c	665 c	3138 c	2880 c
70		1615 b	912 b	5726 b	4916 b
100		2243 a	1565 a	11896 a	9904 a

ChM = chiken manure ; CM = compost

*Fertilizer% = percent of recommended dose of N ,P & K fertilizers

Similar letters are in significant , while the different letters are at different significancies .

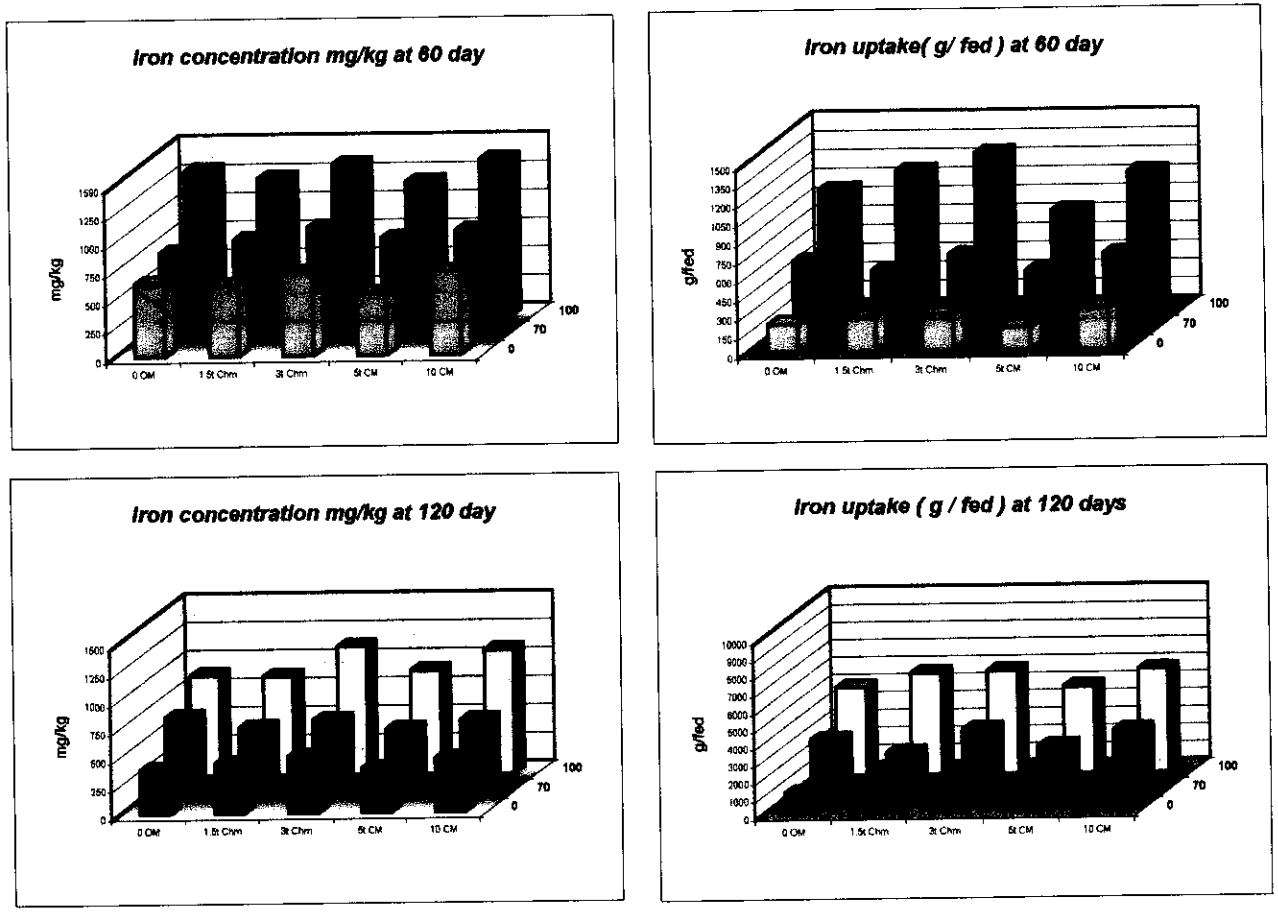

Fig (11) : Iron concentration (mg/kg) and uptake (g/ fed) for the root of maize plants at 60 and 120 days

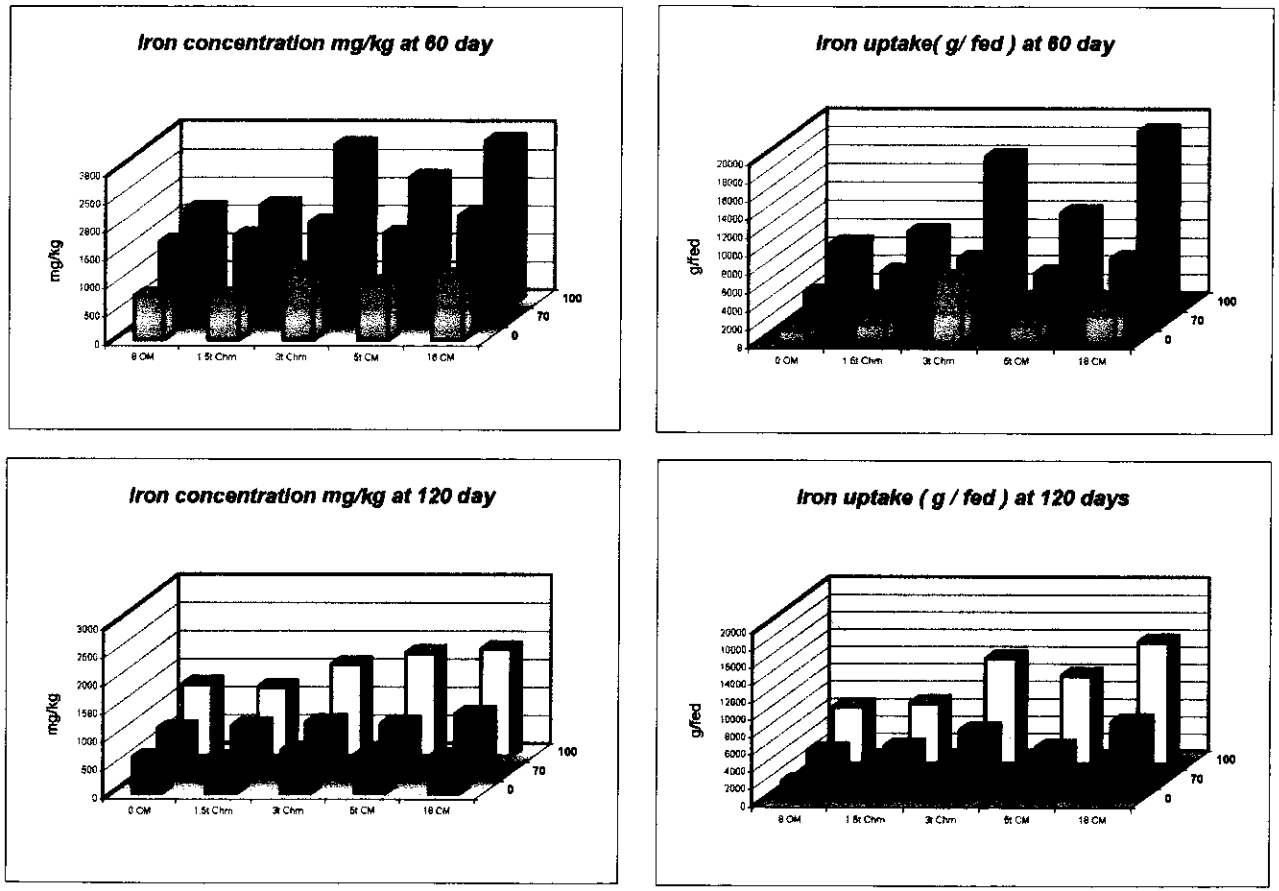

Fig (12) : Iron concentration (mg/kg) and uptake (g/ fed) for the shoot of maize plants at 60 and 120 days

4.2.3.2.6. Manganese concentration and uptake:

Manganese concentration and uptake at 60 and120 days of the root and shoot were affected when using organic manure treatments (Tables 17&18 and Figs 13&14), and the highest values occurred with receiving 10 t/fed CM, as well as only Mn-uptake at 120 days with receving 3 t/fed ch M.

The values of manganese of root and shoot at the two sampling times occurred with receiving organic manure with mineral fertilizer. The values of Mn-concentration at 60 days ranged between 14 and 33 mg/kg for the root and between 30 and 113 mg/kg for the shoot, while those at 120 days ranged between 10 and 25 mg/kg for the root and between 20 and 90 mg/kg for the shoot. Whereas, the values of Mn-uptake at 60 days ranged between 5 and 26 g/fed for the root and between 52 and 741 g/fed for the shoot, while at 120 days ranged between 30 and 186 g/fed for the root and between 66 and 660 g/fed for the shoot. Manganese concentrations in the root and shoot receiving 10 ton/fed CM with 100% MF at 60 and 120 days as well as receiving 3 ton/fed ChM with 100% MF at 60 days were recorded the highest values. Simillar results were reported by **Kamh and Hashem (1991).** Results of Mn-uptake at 60 days showed the highest values when receiving 10 ton/fed CM with 100% MF for the root and shoot, and 3 ton/fed ChM for the root. As for Mn-uptake at 120 days, the highest values occurred with 3 ton/fed ChM with 100% MF for the root and the shoot, and with 10 ton/fed CM with 100% MF for the shoot.

The results of average values were 19.13 & 16.0 mg/kg Mn-concentration and 12.53 & 83.33 g/fed Mn-uptake for the root as well as 69.0& 49.87 mg/kg Mn-concentration and 280.27& 278.13 g/fed Mn-uptake for the shoot in the two sampling times, respectively. The grand mean of Mn-concentration for the root and shoot at 120 days decreased as compared to those at 60 days. This is attributed to the dilution effects due to increased the plant biomass. While those concern uptake caused on the root and shoot at 120 as compared to those at 60 days.

Shoot/root ratio of Mn-concentration and uptake at 60 and 120 days were lower with receiving organic manure at zero fertilizer than those receiving organic treatments with fertilizer, except those receiving 3 ton/fed ChM and 5 ton/fed CM which showed higher values than the others. The shoot/root ratios of Mn-concentration at 60 and 120 were 3.66 and 3.01, while those concern Mn-uptake were 21.19 and 3.22 for the two successive sampling times. This means that the concentration ratio was almost similar at both times of 60 and 120 days, while the uptake ratio at 60 was more than that at 120 days. In general, manganese was transfered from the root to shoot. The ratio values indicated that treatment of 3 ton/fed ChM with zero MF was the better treatment on either Mn-concentration or uptake at the two sampling times as compared to those treatedwith organic without mineral fertilizer.

Table (17) : Manganese concentration (mg/kg) and uptake (g/fed) for the root of maize plants at 60 and 120 days growth periods.

Organic ton/fed	Fertilizer %*	Concentration (mg/kg)		Uptake (g/fed)	
		60	120	60	120
0	0	14 i	10 i	5 g	30 g
	70	16 fg	14 f	9 e	63 ef
	100	10 d	16 e	15 c	88 d
1.5t ChM	0	15 hi	11 h	6 fg	36 g
	70	16 fg	13 fg	9 e	53 f
	100	21 cd	17 d	19 b	113 c
3t ChM	0	16 gh	14 f	6 fg	55 f
	70	19 de	17 d	12 d	92 d
	100	27 b	21 b	26 a	186 a
5t CM	0	15 hi	13 g	5 g	34 g
	70	18 e	15 e	10 e	70 e
	100	27 b	20 c	18 b	106 c
10t CM	0	18 ef	15 e	8 ef	61 ef
	70	22 c	19 c	14 c	103 c
	100	33 a	25 a	26 a	160 b
Means of organic manure					
0		17 d	13 e	10 d	60 c
1.5t ChM		17 d	14 d	11 c	68 b
3t ChM		21 b	17 b	15 b	111 a
5t CM		10 c	16 c	11 c	70 b
10t CM		24 a	20 a	16 a	108 a
Means of mineral fertilizer					
0		15 c	12 c	6 c	43 c
70		18 b	16 b	11 b	76 b
100		25 a	20 a	21 a	131 a

ChM = chiken manure ; CM = compost

*Fertilizer%=percent of recommended dose of N ,P & K fertilizers

Similar letters are in significant , while the different letters are at different significancies .

Table (18) : Manganese concentration (mg/kg) and uptake (g/fed) in the shoot of maize plants at 60 and 120 days growth periods.

Organic ton/fed	Fertilizer %*	Concentration (mg/kg)		Uptake (g/fed)	
		60	120	60	120
0	0	30 h	8 L	52 j	26 i
	70	47 f	34 i	110 hi	151 g
	100	68 d	52 e	275 e	266 d
1.5t ChM	0	45 fg	21 k	118 h	76 h
	70	58 e	43 h	217 f	206 ef
	100	90 b	61 c	418 c	350 bc
3t ChM	0	60 e	46 g	165 g	243 de
	70	81 c	57 d	330 d	369 b
	100	109 a	86 b	614 b	635 a
5t CM	0	42 g	28 j	77 ij	102 h
	70	60 e	42 h	213 f	182 fg
	100	78 c	58 d	349 d	319 c
10t CM	0	66 d	49 f	193 fg	258 d
	70	88 b	61 c	332 d	389 b
	100	113 a	90 a	741 a	660 a
Means of organic manure					
0		48 e	31 d	145 e	147 c
1.5t ChM		64 c	42 c	251 c	211 b
3t ChM		83 b	63 b	370 b	416 a
5t CM		60 d	43 c	213 d	201 b
10t CM		89 a	67 a	422 a	463 a
Means of mineral fertilizer					
0		49 c	30 c	121 c	141 c
70		67 b	47 b	240 b	259 b
100		91 a	69 a	479 a	446 a

ChM = chiken manure ; CM = compost

*Fertilizer % = percent of recommended dose of N ,P & K fertilizers

Similar letters are in significant , while the different letters are at different significancies .

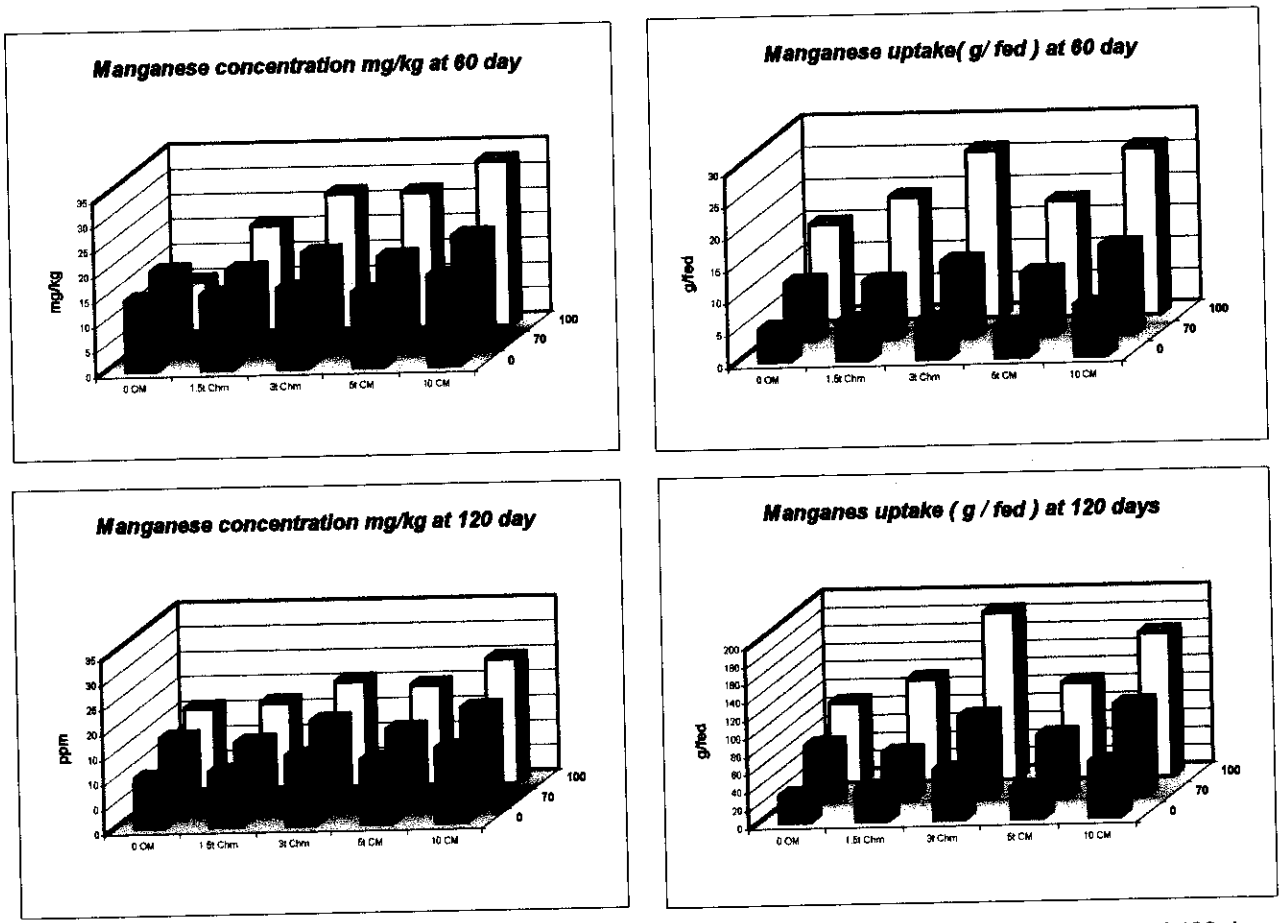

Fig (13) : Manganese concentration (mg/kg) and uptake (g/ fed) for the root of maize plants at 60 and 120 days

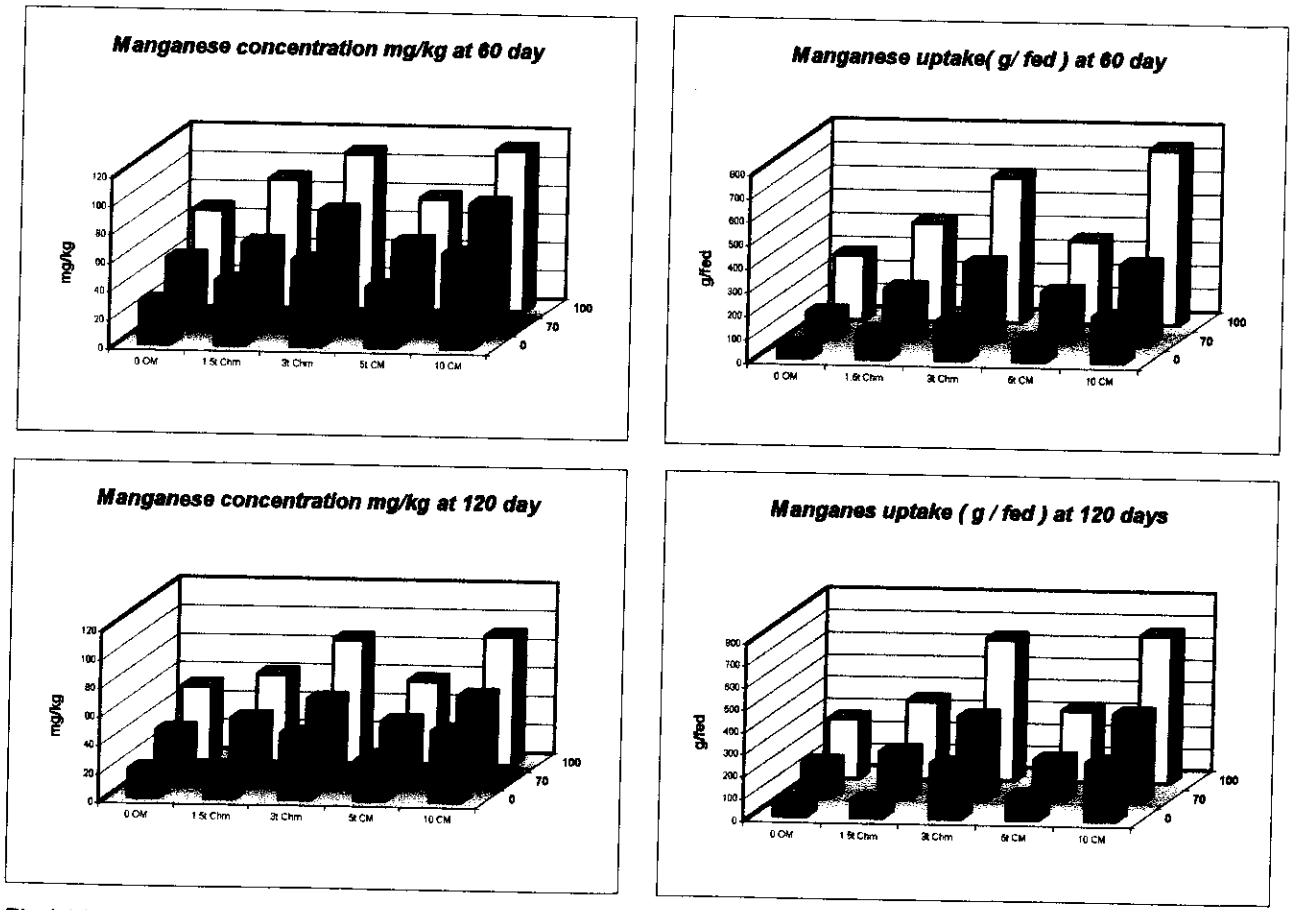

Fig (14) : Manganese concentration (mg/kg) and uptake (g/ fed) for the shoot of maize plants at 60 and 120 days.

4.2.3.2.7. Zinc concentration and uptake:

The results of Zn-concentration and uptake were presented in Tables (19 & 20) and depicted in Figs (15&16). The average values revealed that the highest significant of Zn-concentration at 60 and 120 for the root and at 120 days for the shoot occurred when received 10 ton/fed compost, as well as at 60 and 120 days for the shoot received 3 ton/fed chicken manure. Generally, the highest significant values of Zn-uptake at the two sampling times in the root and shoot were at 3 ton/fed chicken manure and 10 ton/fed compost. Simillar results were reported by **Kamh and Hashem (1991).**

Di-interaction of organic manure with mineral fertilizer caused significant affected on Zn-concentration and uptake at 60 and 120 days of the root and shoot. The values of Zn-concentration at 60 days ranged between 32 and 747 mg/kg for the root and between 37 and 197 mg/kg for the shoot, while those at 120 days ranged between 21 and 659 mg/kg for the root and between 25 and 177 mg/kg for the shoot. Also, the values of Zn-uptake at 60 days ranged between 11 and 685 g/fed for root and between 64 and 1207 g/fed for the shoot, while at 120 days ranged between 66 and 5907 for the root and between 90 and 1299 g/fed for the shoot. Generally, the highest Zn-concentration values accurred at 60 and 120 days for the root and shoot when receiving 3 ton/fed ChK and 10 ton/fed CM with 100% MF, as well as, Zn-uptake when received 3 ton/fed ChK with 100% MF for the root or 3 ton/fed ChM and 10 ton/fed CM with 100% MF for the shoot.

The average values were 287.6 & 226.93 mg/kg Zn-concentration and 212.87& 1413.6 g/fed for Zn-uptake in the root as well as 105.4 & 78.20 mg/kg Zn-concentration and 438.13 & 461.93 g/fed Zn-uptake for the shoot in the two sampling times, respectively. The grand mean of Zn-concentration for the root and shoot at 120 days decreased as compared to those at 60 days. This is attributed to the dilution effects due to the increase of plant biomass. While, those concern uptake increased in the root and shoot at 120 as compared to those at 60 days, and the increase was particularly marked for the root..

Shoot/root ratios of Zn-concentration and uptake at 60 and 120 days were higher with receiving organic manure at zero fertilizer than those receiving organic treatments with fertilizer. Generally, shoot/root ratios of Zn-concentration at 60 and 120 were 0.77 and 0.64, while those concern Zn-uptake were 4.57 and 0.72 for the two successive sampling times. This means that the concentration ratio was more or less the same for 60 and 120 days, while the uptake ratio at 60 was more than that at 120 days. In general, zinc accumulated in the root especially at 120 days. The ratio indicated that treatment of 3 ton/fed ChM with zero MF was the better treatment for Zn vaules as a concentration or uptake at the two sampling times as compared to those treated with organic treatments with zero mineral fertilizer.

Table (19) : Zinc concentration (mg/kg) and uptake (g/fed) for the root of maize plants at 60 and 120 days growth periods.

Organic ton/fed	Fertilizer %*	Concentration (mg/kg)		Uptake (g/fed)	
		60	120	60	120
0	0	32 i	21 g	11 h	66 h
	70	51 h	35 fg	28 h	160 h
	100	158 f	118 e	120 g	666 f
1.5t ChM	0	46 hi	36 fg	20 h	119 h
	70	204 e	135 de	116 g	536 fg
	100	537 b	338 c	487 c	2226 cd
3t ChM	0	47 hi	41 fg	19 h	165 h
	70	518 c	345 c	331 e	1914 de
	100	732 a	659 a	685 a	5907 a
5t CM	0	44 hi	40 fg	15 h	110 h
	70	197 e	157 d	108 g	725 f
	100	383 d	324 c	259 f	1749 e
10t CM	0	68 g	58 f	31 h	236 gh
	70	550 b	452 b	366 d	2510 c
	100	747 a	645 a	597 b	4115 b
Means of organic manure					
0		80 e	58 d	53 d	297 d
1.5t ChM		262 c	170 c	208 b	960 c
3t ChM		432 b	348 b	345 a	2662 a
5t CM		208 d	174 c	127 c	861 c
10t CM		455 a	385 a	331 a	2287 b
Means of mineral fertilizer					
0		47 c	39 c	19 c	139 c
70		304 b	225 b	190 b	1169 b
100		511 a	417 a	430 a	2933 a

ChM = chiken manure ; CM = compost

*Fertilizer%=percent of recommended dose of N ,P&K fertilizers

Similar letters are in significant , while the different letters are at different significancies .

Table (20) : Zinc concentration (mg/kg) and uptake (g/fed) for the shoot of maize plants at 60 and 120 days.

Organic ton/fed	Fertilizer %*	Concentration (mg/kg)		Uptake (g/fed)	
		60	120	60	120
0	0	37 k	25 g	64 h	90 h
	70	72 hi	45 f	172 fg	202 feh
	100	95 f	82 c	392 de	421 de
1.5t ChM	0	60 j	30 g	160 fg	110 gh
	70	98 f	45 f	365 e	214 fg
	100	133 c	118 b	620 c	677 b
3t ChM	0	87 g	58 e	236 f	310 ef
	70	115 de	78 c	458 d	510 cd
	100	197 a	173 a	1110 b	1288 a
5t CM	0	68 i	30 g	135 gh	109 gh
	70	108 e	65 de	384 de	284 f
	100	132 c	110 b	594 c	609 bc
10t CM	0	78 h	60 e	227 f	316 ef
	70	118 d	77 cd	448 de	490 d
	100	183 b	177 a	1207 a	1299 a
Means of organic manure					
0		68 e	51 c	209 c	238 c
1.5t ChM		97 d	64 b	382 b	334 b
3t ChM		133 a	103 a	601 a	703 a
5t CM		103 c	68 b	371 b	334 b
10t CM		127 b	104 a	628 a	701 a
Means of nineral fertilizer					
0		66 c	41 c	165 c	187 c
70		102 b	62 b	365 b	340 b
100		148 a	132 a	785 a	859 a

ChM = chiken manure ; CM = compost

*Fertilizer%=percent of recommended dose of N ,P&K fertilizers

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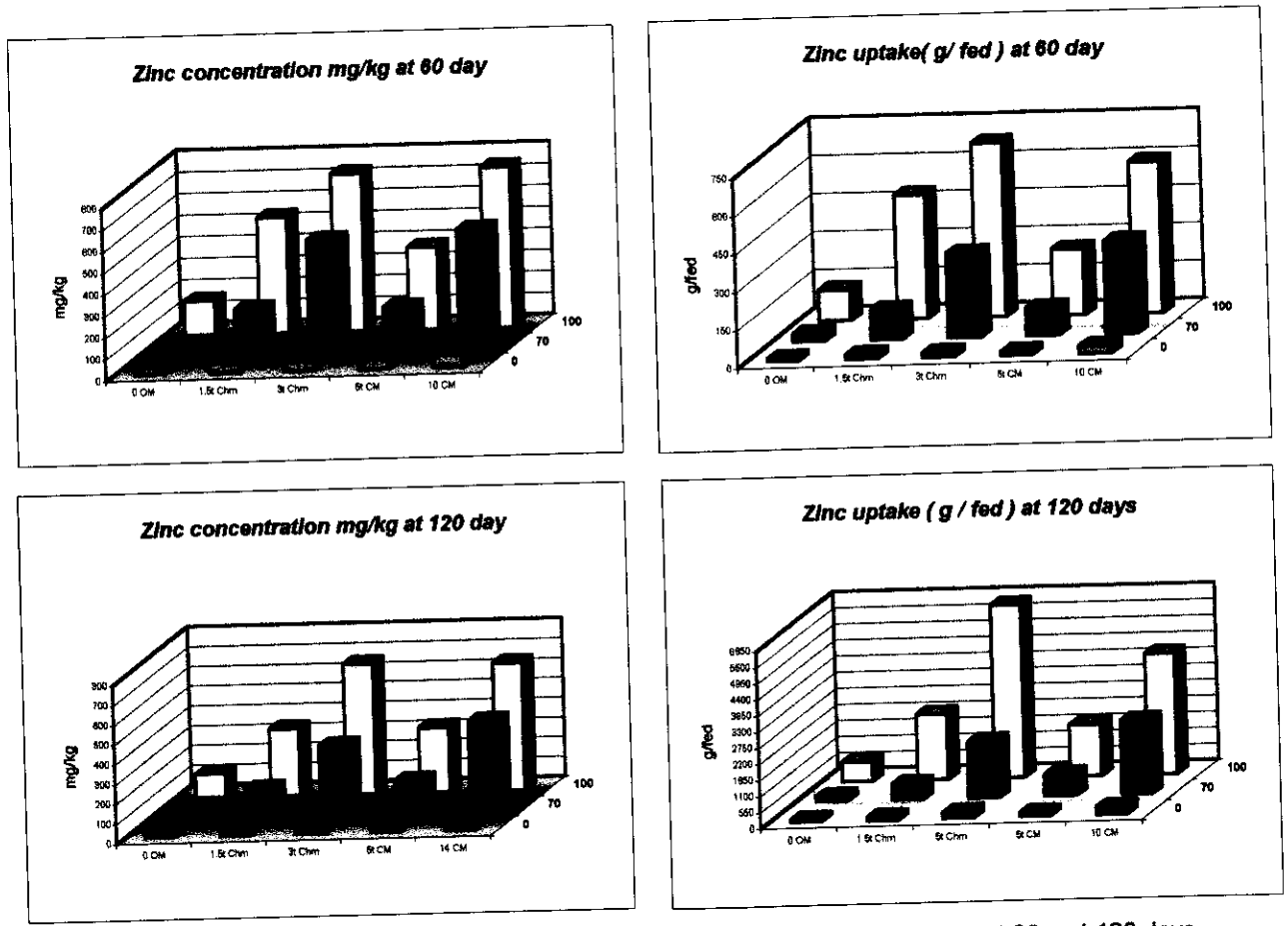

Fig (15) : Zinc concentration (mg/kg) and uptake (g/ fed) for the root of maize plants at 60 and 120 days.

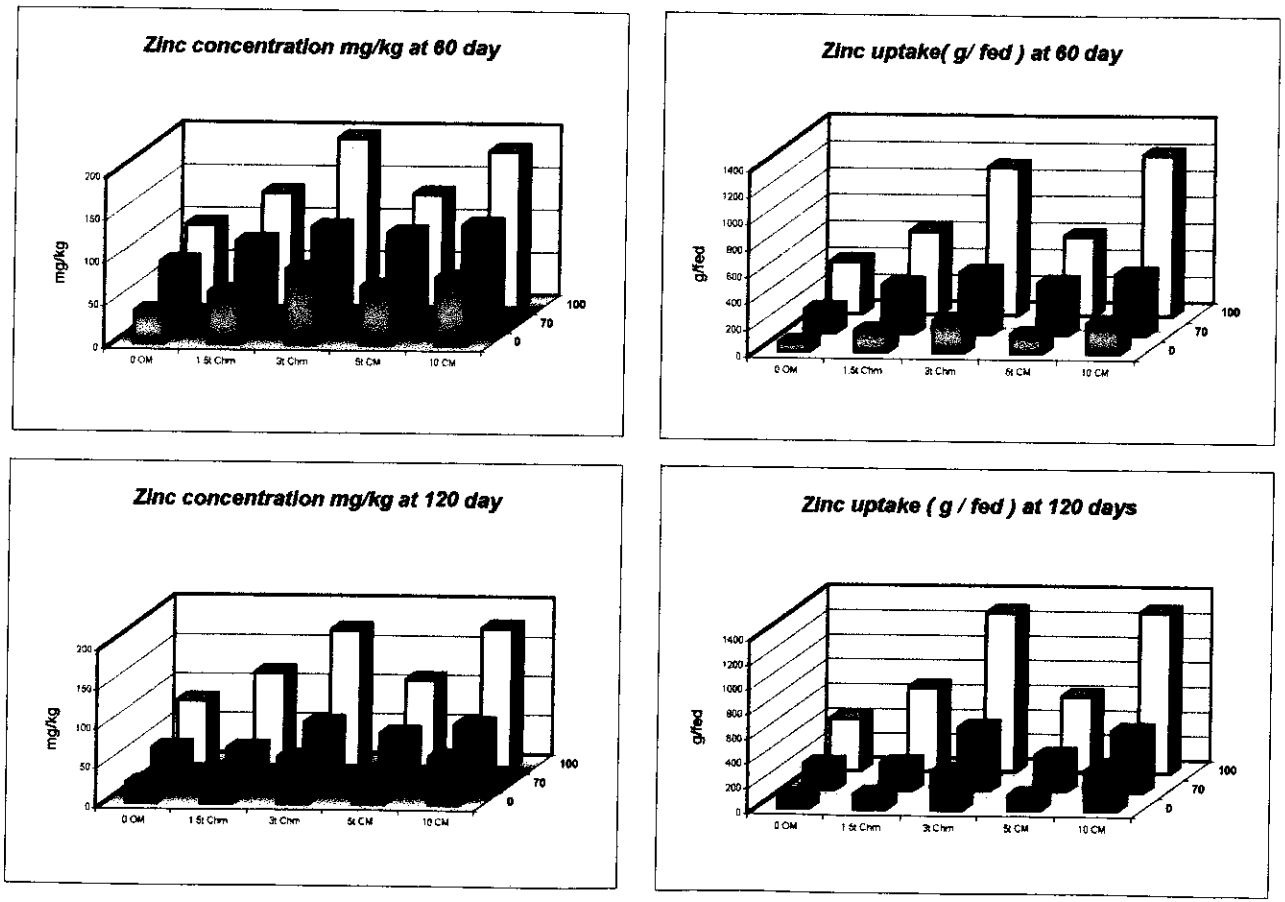

Fig (16) : Zinc concentration (mg/kg) and uptake (g/ fed) for the shoot of maize plants at 60 and 120 days.

4.2.3.3. Nutrients in the grain:

4.2.3.3.1.Nitrogen, potassium and phosphours:

The values of nitrogen in the grains ranged between 0.67 and 4.81% for the concentration and 4.08 and 213.54 kg/fed for uptake, (Table, 21 and Fig.,17). The mean values of N-concentration and uptake were significant superior when receiving 10 ton/fed CM and 3 ton/fed ChM. Otherwise, under di-interaction effect, nitrogen concentration values of maize grain were significantly higher at 10 ton/fed compost with 100% MF, then 3 ton/fed chicken manure than the other treatments. The uptake values were in significant, when applying organic manure with zero mineral fertilizer. Whereas, N-concentration and uptake reached the highest values when applied 3 ton/fed ChK and 10 ton/fed CM.

The values of potassium in the grains ranged between 0.23 and 0.37 mg/kg for k concentration and 1.63 and 17.92 kg/fed k- uptake for k uptake, (Table, 21 and Fig.,17). K-uptake values were significant superior when receiving 10 ton/fed CM and 3 ton/fed ChM. While K-concentration values of maize grain were significantly higher at 10 ton/fed CM and 3 ton/fed ChM with 100% MF. But those uptake were in significant, when applying organic manure with zero mineral fertilizer. K-uptake values reached the highest values when applied 3 ton/fed ChK and10ton/fedCM

Table (21) : Nitrogen and potassium concentration and uptake by maize grain at harvesting (120 days).

Organic Ton/fed	Fertilizer %*	Nitrogen		Potassium	
		(%)	(Kg/fed)	(%)	(kg/fed)
0	0	0.670 f	4.08	0.27 efgh	1.63
	70	0.90 ef	27.09	0.29 cdef	8.65
	100	2.15 cd	90.95	0.32 bc	13.39
1.5t ChM	0	0.73 ef	12.37	0.23 i	3.84
	70	1.12 ef	40.46	0.26 fghi	9.48
	100	2.58 bc	122.51	0.31 bcd	14.78
3t ChM	0	0.99 ef	24.23	0.24 hi	5.73
	70	1.53 de	61.97	0.28 cdefg	11.45
	100	3.00 b	157.7	0.34 ab	17.92
5t CM	0	0.71 ef	7.48	0.25 ghi	2.70
	70	0.99 ef	34.14	0.27 defg	9.60
	100	2.17 bcd	97.33	0.33 b	14.80
10t CM	0	1.16 ef	24.52	0.23 i	4.81
	70	2.15 cd	81.29	0.30 bcde	11.38
	100	4.81 a	213.54	0.37 a	15.04
Means of organic manure					
0		1.24 c	40.70 c	0.29	7.89 d
1.5t ChM		1.4 bc	58.45 bc	0.27	9.37 bc
3t ChM		1.84 b	81.31 ab	0.28	11.70 a
5t CM		1.29 c	46.32 c	0.28	9.03 cd
10t CM		2.71 a	106.45 a	0.30	10.41 ab
Means of mineral fertilizer					
0		0.85 c	14.54 c	0.24 c	3.74 c
70		1.34 b	48.99 a	0.28 b	10.11 b
100		2.94 a	136.41 b	0.33 a	15.18 a

ChM = chiken manure ; CM = compost

*Fertilizer % = percent of recommended dose of N ,P & K fertilizers

Similar letters are in significant , while the different letters are at different significancies .

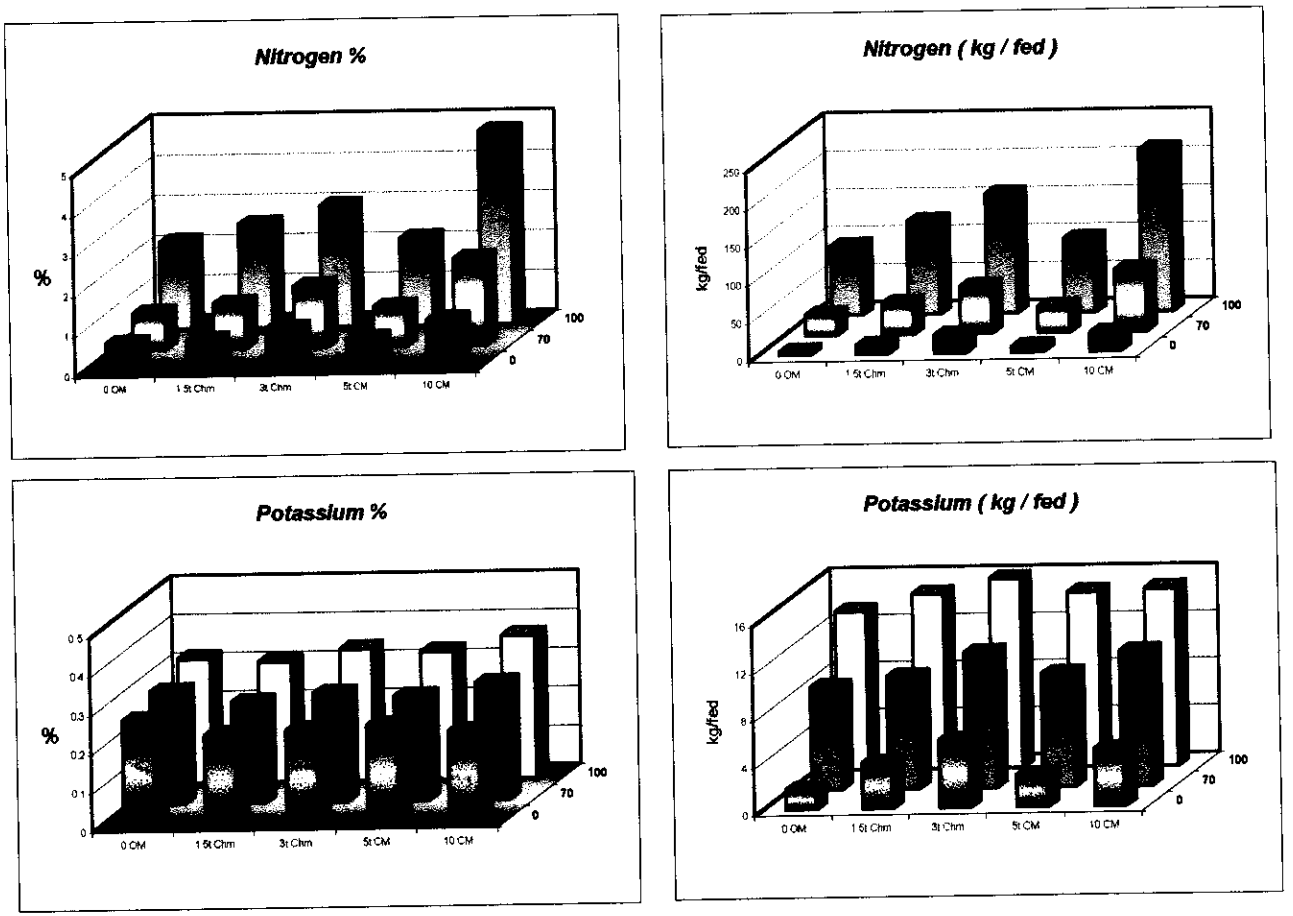

Fig (17) : Nitrogen and potassium concentration and uptake by maize grain at harvesting (120 day) .

The values of phosphorus in the grains ranged between 0.22 and 0.41 mg/kg for P- concentration and 1.61 and 21.64 kg/fed for P- uptake, (Table, 22 and Fig.,18). P-uptake as mean values were superior when receiving 10 ton/fed CM and 3 ton/fed ChM, although the organic manure either as individualy applied or di-interaction effects with mineral fertilizer were in significance on P-concentration and upteke of maize grain. There were preceding of 3 ton/fed ChM and 10 ton/fed CM with zero MF on P-uptake those comparing with the others, without mineral fertilizer.

4.2.3.3.2. Iron, manganese and zinc:

The values of iron in the grains ranged between 99 and 401 mg/kg for concentration and 60 and 1975 g/fed for uptake, (Table, 22 and Fig.,18). Iron concentration and uptake values were significant either individually applied for organic manure or di-interaction effects with mineral fertilizer. The mean values of Fe-concentration and uptake reached the highest values when received 3 ton/fed ChM and 10 ton/fed CM. As for di-interaction, the values of Fe-concentration as result of applied 10 ton/fed CM with 100% MF and Fe-uptake received 3 ton/fed ChM with 100% MF reached the highest ones. The treatment of 10 ton/fed CM with zero MF had higher effect on Fe-uptake as compared to the others.

The values of manganese in the grains ranged between 10 and 58 mg/kg for concentration and 6 and 238 g/fed for uptake, (Table, 23 and Fig.,19). Mn-concentration and uptake of grain were affected significantly by either individually applied of

Table (22) : Phosphorus and iron concentration and uptake by maize grain at harvesting (120 days).

Organic ton/fed	Fertilizer %*	Phosphorus		Iron	
		(%)	(Kg/fed)	(mg/kg)	(g/fed)
0	0	0.27	1.61	99 o	60 g
	70	0.32	9.48	184 j	552 e
	100	0.39	16.37	278 f	1177 d
1.5t ChM	0	0.24	4.07	112 n	192 fg
	70	0.29	10.37	204 i	743 e
	100	0.36	16.93	304 d	1444 bc
3t ChM	0	0.24	5.90	126 l	308 f
	70	0.32	12.97	253 g	1027 d
	100	0.41	21.64	374 b	1975 a
5t CM	0	0.26	2.79	117 m	127 fg
	70	0.33	11.37	212 h	733 e
	100	0.37	16.87	313 c	1416 c
10t CM	0	0.22	4.68	154 k	325 f
	70	0.33	12.38	296 e	1110 d
	100	0.39	15.80	401 a	1656 b
Means of organic manure					
0		0.32	9.15 c	187 e	596 c
1.5t ChM		0.30	10.46 bc	207 d	793 b
3t ChM		0.32	13.50 a	251 b	1103 a
5t CM		0.32	10.34 bc	214 c	758 b
10t CM		0.31	10.95 b	283 a	1030 a
Means of mineral fertilizer					
0		0.25 c	3.81 c	122 c	202 c
70		0.32 b	11.31 a	230 a	833 a
100		0.38 a	17.52 b	334 b	1534 b

ChM = chiken manure ; CM = compost

*Fertilizer % = percent of recommended dose of N ,P & K fertilizers

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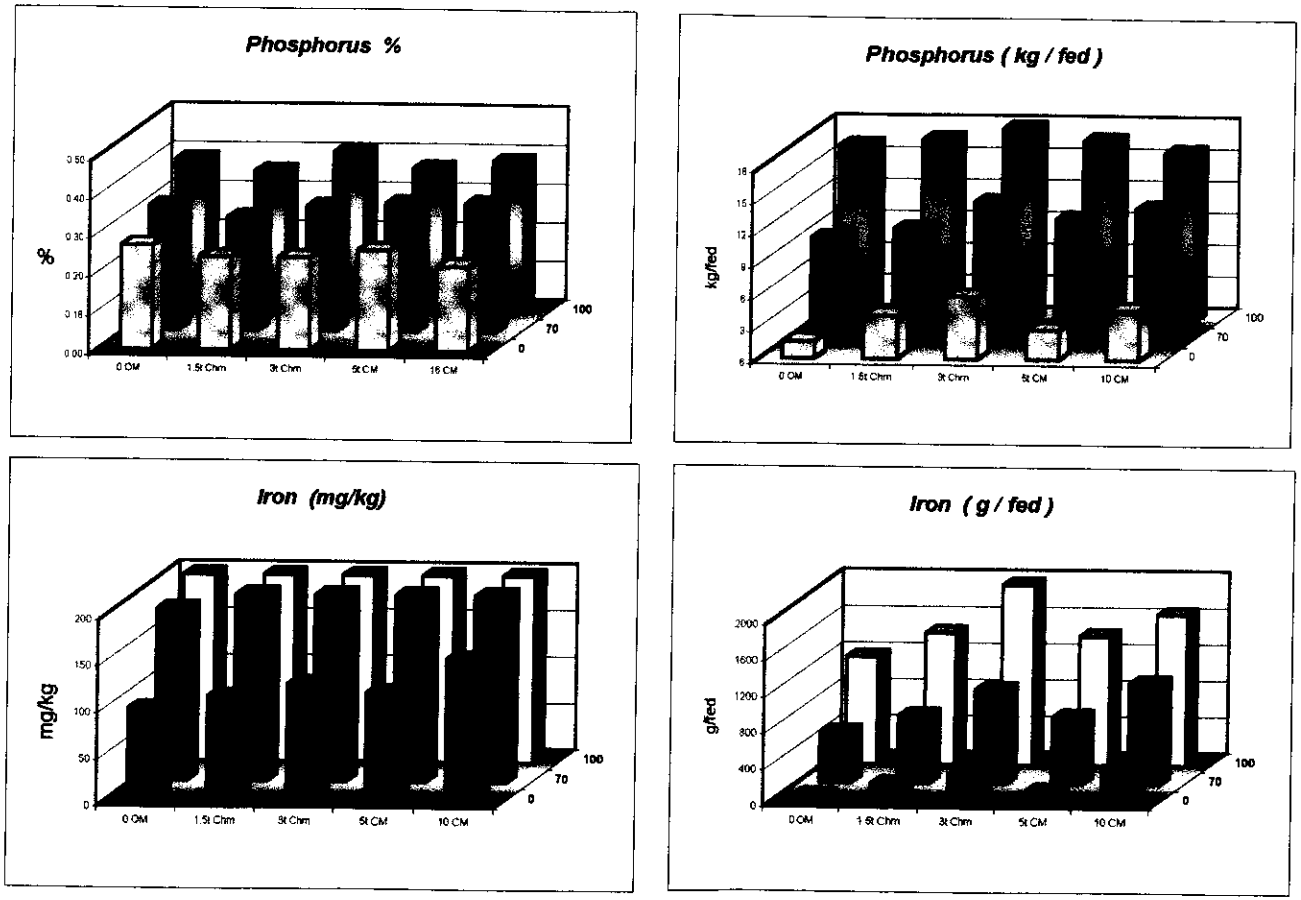

Fig (18) : Phosphorus and iron concentration and uptake by maize grain at harvesting (120 day) .

Table (23) :Manganese and zinc concentration and uptake by maize grain at harvesting (120 days).

Organic ton/fed	Fertilizer %*	Manganese		Zinc	
		(mg/kg)	(g/fed)	(mg/kg)	(g/fed)
0	0	10 g	6 h	13 i	8 h
	70	21 e	63 ef	24 g	71 fg
	100	31 d	131 cd	34 f	144 d
1.5t ChM	0	12 g	21 gh	23 gh	39 gh
	70	23 e	82 e	34 f	123 de
	100	32 d	154 c	42 d	201 c
3t ChM	0	16 f	39 fg	36 ef	87 ef
	70	32 d	130 cd	49 c	199 c
	100	43 b	227 a	65 b	346 a
5t CM	0	15 f	16 gh	21 h	23 h
	70	35 c	120 d	35 ef	120 de
	100	42 b	191 b	50 c	225 c
10t CM	0	22 e	46 fg	37 e	77 fg
	70	43 b	161 bc	51 c	193 c
	100	58 a	238 a	72 a	299 b
Means of organic manure					
0		21 d	67 e	23 e	74 e
1.5t ChM		22 e	86 e	33 d	121 b
3t ChM		30 b	132 a	50 b	210 a
5t CM		30 b	109 b	35 c	122 b
10t CM		41 a	148 a	53 a	190 a
Means of mineral fertilizer					
0		15 c	25 c	26 c	74 c
70		31 b	111 b	38 b	141 b
100		41 a	188 a	53 a	243 a

ChM = chiken manure ; CM = compost

*Fertilizer %= percent of recommended dose of N ,P & K fertilizers

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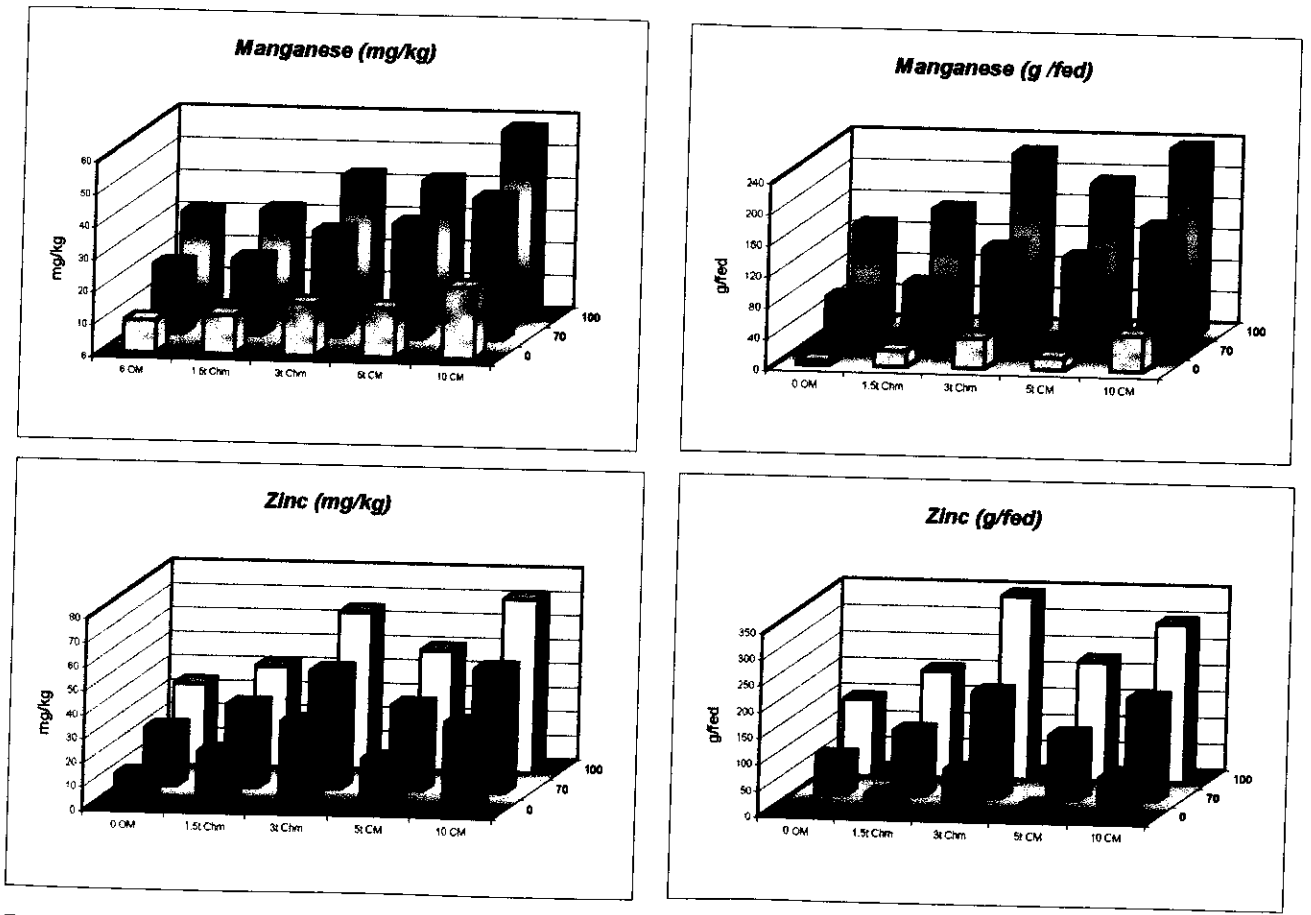


Fig (19) : Manganese and Zinc concentration and uptake by maize grain at harvesting (120 days) .

organic manure or di-interaction effect with mineral fertilizer. Data revealed
that 3 ton/fed ChM and 10 ton/fed CM were more effective on the mean values of Mn-concentration and uptake. Also, treatments of 3 ton/fed ChK with 100 MF as well as 10 ton/fed CM with 100 MF were superior for values of Mn-concentration and uptake. Thus, treatments of 3 ton/fed ChM and 10 ton/fed CM both with zero MF were superior for others organic manure with zero fertilizer.

The values of zinc in the grains ranged between 13 and 72 mg/kg for concentration and 8 and 346 g/fed for uptake, (Table, 23 and Fig.,19). The behaviour of either individual or di-interaction effects of organic matter alone or with mineral fertilizers on Zn-concentration and uptake of maize grain were similar to those concern Mn, and the superior was for 3 ton/fed ChM and 10 ton/fed CM, especially at zero MF.

4.2.3.4. Maize yield:

Yield data are presented in Table (24) and depicted in Fig. (20). The yield values of maize organs ranged between 704 and 6075 kg/fed for ear, 613 and 5285 kg/fed for grain and 3532 and 7392 kg/fed for straw. The data were significantly affected by the used treatments. The result showed that treatment of 3 ton/fed ChM was more effective on ear, grain and straw yields followed by 10 ton/fed CM for either of individual organic manure individually organic manure or di-interaction effects. Also, treatment of organic manure with zero mineral fertilizer, 3 ton/fed ChM was more effective for ear, grain and straw yield followed by 10 ton/fed CM than the others. Note straw yield

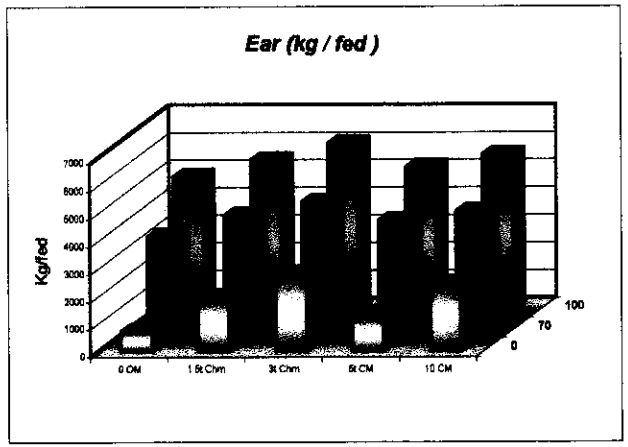
Table (24) : Maize yield of grain and straw at harvesting (120 days).

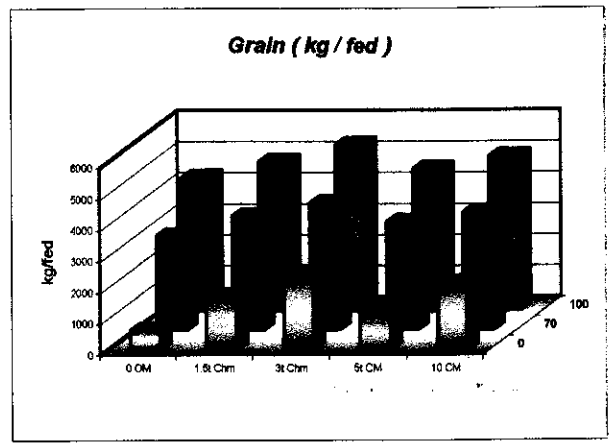
Organic ton/fed	Fertilizer %*	Ear (kg/fed)	Grain (Kg/fed)	Straw (kg/fed)
0	0	704 o	613 o	3532
	70	3422 j	2993 j	4483
	100	4869 e	4255 e	5174
1.5t ChM	0	1960 m	1705 m	3874
	70	4177 h	3634 h	4743
	100	5460 c	4750 c	5701
3t ChM	0	2800 k	2436 k	5325
	70	4659 f	4053 f	6502
	100	6075 a	5285 a	7392
5t CM	0	1244 n	1083 n	3627
	70	3982 i	3464 i	4360
	100	5195 d	4520 d	5503
10t CM	0	2427 l	2111 l	5270
	70	4317 g	3755 g	6386
	100	5647 b	4913 b	7337
Means of organic manure				
0		2998 e	2620 e	4396 c
1.5t ChM		3866 c	3363 c	4773 b
3t ChM		4511 a	3925 a	6406 a
5t CM		3474 d	3022 d	4497 bc
10t CM		4130 b	3593 b	6331 a
Means of mineral fertilizer				
0		1827 c	1589 c	4326 c
70		4111 b	3580 b	5295 b
100		5449 a	4744 a	6221 a

ChM = chiken manure ; CM = compost

*Fertilizer % = percent of recommended dose of N ,P & K fertilizers

Similar letters are in significant , while the different letters are at different significancies .





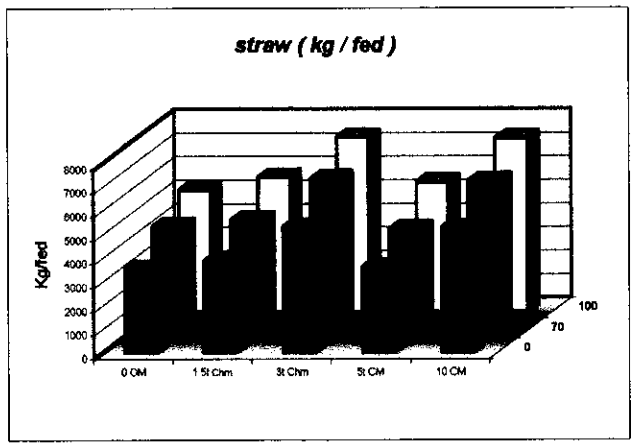


Fig (20) : Maize yields of grain and straw at harvesting (120 days).

was previously discussed with plant dry weight. Simillar results reported by **Tadese and Abdisa (1996), Radwan et al (1999),** and **Magid et al (1996).**

4.2.3.5. Data outlined and conclusion:

The periority of 3 ton/fed ChM and 10 ton/fed CM at 100% MF on measured and estimated parameters were pronounced in Table (25), which represent 33 and 30 parameters for them, respectively , on soil , root , shoot , grain nutrients and yield .

While zero, 1.5 ton/fed ChM and 5 ton/fed CM were very little effects .

The treatment of 3 ton/fed ChM at 100% MF was more effective on measured and estimated parameters of root and crop yield than 10 ton/fed CM, which distinguished on parameters concern shoot and grain nutrients .

The treatment of 3 ton/fed ChM was more effective on parameters at 120 day than those at 60, while 10 ton/fed CM distinguished on grain nutrients at 120 days more than 60, and the opposit trend was true for the root and shoot .

Table (25): The signification periority effect of organic treatments under 100 MF on the tabulated measured parameters

a- Soil , Shoot and Root

	0		1.5 ton/ ChM		3 ton/ ChM		5 ton/CM		10 ton/CM	
	60	120	60	120	60	120	60	120	60	120
Soil	N	–	N	N	K	Zn	–	–	K	Fe
	–	–	P	–	Zn	–	–	–	Fe	Mn
	–	–	–	–	–	–	–	–	Mn	
Root	K- con.	–	–	–	Dw	Dw	–	–	Mn- conc.	Mn- conc.
	k-upk	–	–	–	N-con c.	N-upk	–	–	Mn- upk	Zn- conc.
	–	–	–	–	N-upk	K-upl:	–	–	Zn- con.	–
	–	–	–	–	Fe - upk	P-upk	–	–	–	–
	–	–	–	–	Mn - upk	Fe-conc.	–	–	–	–
	–	–	–	–	Zn- conc.	Fe-upk	–	–	–	–
	–	–	–	–	Zn- upk.	Mn- upk	–	–	–	–
	–	–	–	–	–	Zn-conc.	–	–	–	–
	–	–	–	–	–	Zn-upk	–	–	–	–
Shoot	K-conc.	K-conc.	P-conc.	K-upk	K-conc.	Fe - upk	–	K-conc.	Dw	Fe-conc.
	–	–	–	–	Fe-conc.	Mn-upk	–	–	K-conc.	Fe-upk
	–	–	–	–	Mn-conc.	Zn-conc.	–	–	K-upk	Mn-conc.
	–	–	–	–	Zn- conc.	Zn-upk	–	–	Fe-conc.	Mn-upk
	–	–	–	–	–	–	–	–	Fe-upk	Zn-conc.
	–	–	–	–	–	–	–	–	Mn-conc.	Zn-upk
	–	–	–	–	–	–	–	–	Mn-upk	–
	–	–	–	–	–	–	–	–	Zn-upk	–

Table (25):Cont. The signification periority effect of organic treatments under 100 MF on the tabulated measured parameters

b- Grain and Yield

	0		1.5 ton/ ChM		3 ton/ ChM		5 ton/CM		10 ton/CM	
	60	120	60	120	60	120	60	120	60	120
Grain	–	–	–	–	–	K-conc.	–	–	–	N-conc.
	–	–	–	–	–	Fe-upk	–	–	–	K-conc.
	–	–	–	–	–	Mn-upk	–	–	–	Fe-conc.
	–	–	–	–	–	Zn-upk	–	–	–	Mn-conc.
	–	–	–	–	–	–	–	–	–	Mn-upk
	–	–	–	–	–	–	–	–	–	Zn-conc.
Yield	–	–	–	–	–	Ear	–	–	–	–
	–	–	–	–	–	Grain	–	–	–	–

(Note : conc. = concentration , upk = uptake)