



EL EFECTO DE LA MEZCLA DE FERTILIZANTES MINERALES COMPUESTOS CON FERTILIZANTES ORGÁNICOS SOBRE EL CRECIMIENTO Y RENDIMIENTO DEL MAÍZ

The Effect Of Mixing Compound Mineral Fertilizers With Organic Fertilizers On The Growth And Yield Of Maize.

Raji Ali Awadi

 <https://orcid.org/0000-0002-0323-7957>

 raji_ali_1961@yahoo.co.uk

.....
University, Agriculture faculty, Soil department, Kayseri,
Turkey
.....

RESUMEN

El objetivo de este estudio fue evaluar el efecto de reemplazar una parte de fertilizantes minerales con fertilizantes orgánicos, mezclándolos en proporciones, sobre el crecimiento del maíz y algunas propiedades del suelo. Los fertilizantes químicos tienen efectos nocivos para el medio ambiente y los organismos vivos, y el fertilizante orgánico por sí solo se descompone lentamente y contiene pocos nutrientes.

Por lo tanto, se ha optado por mezclar fertilizante orgánico con fertilizante mineral para aumentar la fertilidad del suelo. El experimento se llevó a cabo en los campos del Departamento de Investigación Agrícola Iraquí, Estación Dabouni, en 2022, con los siguientes grupos de tratamiento:

1. Control, sin estiércol, sin fertilizantes... (T1)
2. Fertilizante orgánico (oveja) (SF) 20 ton | ha... (T2)
3. Fertilizante mineral (MF) 320 kg N, 100 kg P_2O_3 , 120 kg K_2O ha...(T3)
4. Estiércol de oveja + 25%, (MF).....(T4)
5. Estiércol de oveja + 50%, (MF) (T5)
6. Estiércol de oveja + 75%, (MF)..... (T6)
7. Estiércol de oveja +,100% (MF)..... (T7)

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El experimento se realizó según un diseño de bloques completamente al azar con tres réplicas. Los resultados indicaron que la combinación de fertilizante orgánico y fertilizante mineral en proporciones de 25, 50, 75 y 100% produjo diferencias significativas en el crecimiento del maíz (altura, longitud de la raíz, longitud de la mazorca, área foliar, peso de la semilla de 500 gramos, rendimiento biológico y rendimiento) y algunas propiedades del suelo (MO, pH y CE) en comparación con el fertilizante mineral solo. Por lo tanto, recomendamos a los agricultores que implementen este estudio.

PALABRAS CLAVE:

Mineral, Fertilizantes, Orgánico, Mezcla, Maíz, Significativo

ABSTRACT

The aim of this study was to evaluate the effect of replacing a portion of mineral fertilizers with organic fertilizers, by mixing them together in proportions, on corn growth and some soil properties. Chemical fertilizers have harmful effects on the environment and living organisms, and organic fertilizer alone is slow to decompose and contains few nutrients.

Therefore, the idea has shifted to mixing organic fertilizer with mineral fertilizer to increase soil fertility. The experiment was conducted in the fields of the Iraqi Agricultural Research Department - Dabouni Station in 2022 with the following treatment groups:

1. Control, no manure, no fertilizer..... (T1)
2. Organic fertilizer (sheep) (SF) was 20 ton | ha (T2)
3. Mineral fertilizer (MF) was (320 Kg N , 100 Kg P₂O₅ ,120 Kg k₂o) | ha...(T3)
4. Sheep manure + 25%, (MF).....(T4)
5. Sheep manure + 50%, (MF) (T5)
6. Sheep manure + 75%, (MF)..... (T6)
7. Sheep manure +,100% (MF)..... (T7)

The experiment was conducted according to a randomized complete block design with three replicates. The results indicated that the combination of organic fertilizer and mineral fertilizer at ratios of 25, 50, 75, and 100% produced significant differences in maize growth (height, root length, ear length, leaf area, 500-gram seed weight, biological yield, and yield) and some soil properties (O.M., pH, and EC) compared to mineral fertilizer alone.

We therefore recommend that farmers implement this study.

KEYWORDS:

Mineral, Fertilizers, Organic, Mixture, Maize, Significan

INTRODUCTION

Maize occupies the second place in terms of importance after wheat and first in terms of production In Iraq (Altaweel, M . S.& Qusay A. Y.,2020)

It is widely cultivated in Iraq but the rate of corn production is still low, which requires improving productivity by using fertilizers (Saleh M.Ibraheem, 2013)

Increasing maize production is one of the most important goals for the Iraqi agricultural policy to face the human and animal demands , the mixing maize with wheat for bread making has also increased the demand of maize in Iraq(A. M. Abd El-Gawad; A. S. M. Morsy, 2017).

The combined application of organic and inorganic fertilizers can increase the activities of soil organisms and available nutrient content, furthermore, the application of organic manure mixed up with chemical fertilizer can prove to be an excellent procedure in maintaining and improving the soil fertility, and increasing fertilizer use efficiency(Wajid.,et al 2012).

The experimental results confirmed that the combination of organic and inorganic fertilizers could increase plant growth, yield, quality and soil fertility. It also confirmed that composted organic wastes can be used to substitute for around 25% of chemical nitrogen fertilizers(Neni Marlina et al., 2017).

It could be concluded that the integration of organic and inorganic fertilizers was better than using organic or inorganic fertilizer separately .

The Iraqi soil lacks organic matter and the pH in it is high, which reduces the absorption of nutrients, especially phosphorous (Al-Hilfy & Al-Temimi, 2017).

The appropriate application of organic with inorganic fertilizers increases the productivity without negative effect on yield quality and improves soil fertility than the values obtained by organic or inorganic fertilizers separately for this, we will follow methods to maintain soil fertility and increase its content of organic matter without affecting the environment by mixing organic fertilizers (Sheep waste (low value) with mineral fertilizer, whose cost is high by reducing its percentage in use (Roba , 2018).

The farmer used to use mineral fertilizers to grow corn, and to enrich the soil with mineral nutrients that could be depleted from the soil by intensive uses of lands. To attain the best results of fertilizers use in agriculture, fertilizers should be added into the soil according to known qualitative and quantitative proportions that should fit the needs of growing plants and their growth stages.

The mixing mineral with organic fertilizer to rise soil fertility and productivity without affecting environment.

The objective of the present review is to assess the effect of mixing organic with inorganic fertilizer on soil fertility and productivity.

Use of organic and inorganic fertilizers in proper combination (50:50) received higher yields than the sole application of either of the fertilizer or manure particularly (Wajid N, et al 2012).

The experimental results confirmed that the combination of organic and inorganic fertilizers could increase plant growth, yield, quality and soil fertility. It also confirmed that composted organic wastes can be used to substitute for around 25% of chemical nitrogen fertilizers (Neni Marlina et al., 2017).

It could be concluded that the integration of organic and inorganic fertilizers was better than using organic or inorganic fertilizer separately (Ab d El-Gawad & Morsy, 2017).

Adding mineral fertilizer at different levels with organic fertilizer has led to a significant increase in plant height (Jibreel Abbas Mohammad Al-Zaidy, 2017).

Experience has shown that the use of 5 ton.ha-1 organic fertilizer + 75 % inorganic fertilizer could increase N, P and K nutrients uptake well as good growth and yield (Neni Marlina et al., 2017).

The organic manure (sheep waste) increased the yield of maize by 3663.4 kg per hectare compared to mineral fertilizer which gave 3262.7 kg | ha at the same time, the organic fertilizer increased the potassium in the soil after harvest by 387 mg | kg, while in mineral fertilizer it was 373 mg | kg (Al-Hamdani and Al-Baidi & 2010)

MATERIAL AND METHODS

The experiment carried out in 2022 at Al-Dabouni Research Station located in the Al-Aziya district at longitude: 45o.063 and latitude 32o.9107 It is bordered to the south by Wasit Governorate, 90 km away, to the north by Baghdad Governorate, 120 km away. It is bordered to the east by Diyala Governorate, 30 km away, and to the west, by Babylon Governorate, 90 km away. To assess the soil fertility status, representative soil samples will be taken from the experimental soil sites before sowing in the laboratories of the Agricultural Research Department of the Iraqi Ministry of Agriculture according to following.

Table 1.

Chemical, physical and biological characteristics of the studied soil before planting

Adjective	Value
Degree of soil reaction pH	6.5
Ece1:1 quer	... 3.0..... Dsm-1
The dissolved ions	 Me q L
Ca++	10.0.....

Mg ⁺⁺	...9.7
Na ⁺	...5.3....
Cl ⁻	...13.0.....
SO ₄ ⁻⁻	 9.6.....
HCO ₃ ⁻	1,5.....
Ready-made elements	g kg ⁻¹
N	78.2
P	15.3
K	120.2
Soil separators	%
Sand	11.6
Silt	47.4
Clay	41.0
O.M	1,5

Experimental Design

Three types of fertilization treatments are taken in addition to the comparison treatment without fertilization (T1)

The first treatment of fertilizer is organic from sheep waste, with a value of 20 tons| ha were added to the soil mixed with the surface layer before planting .

The second treatment of fertilizer is mineral 320 kg N / ha ,100kg P₂O₅/ha and 120Kg K₂O /ha (The fertilizer recommendation of the Iraqi Ministry of Agriculture)

The third treatment blending organic fertilizers with mineral fertilizers spreading it in the soil at rates of 25%, 50%. 75%, 100%

Nitrogen fertilizer will be added in the form of urea 46 % nitrogen in two batches a week after planting and the second after 50 days of germination, while triple superphosphate and potassium sulfate were added before planting and during plowing according to the following percentages above-mentioned.

The treatment was distributed to the experimental units randomly.

The cultivation could on lines of length 5 m lines between one line and another 75 cm and between a hole and another 25 cm. 3 grains of maize placed in each hole and after germination it was removed and only one remained.

The experiment was designed using a completely randomized design with three Replicators.

(T2)Organic fertilizer (sheep) 20 ton | ha

(T3)..... Mineral fertilizer was (320 Kg N , 100 Kg P₂O₅ ,120 Kg k₂o) ha

Experimental treatments for incorporating organic fertilizers with mineral fertilizers in the following percentages

- (T4)....Organic fertilizer + 1/4 (320 Kg N + 100 Kg P₂O₅ +120 Kg k₂o)
 (T5)....Organic fertilizer + 1/2 (320 Kg N + 100 Kg P₂O₅ +120 Kg k₂o)
 (T6)....Organic fertilizer + 3/4 (320 Kg N + 100 Kg P₂O₅ +120 Kg k₂o)
 (T7)....Organic fertilizer + 4/4 (320 Kg N + 100 Kg P₂O₅ +120 Kg k₂o)

Statistical analysis

It was used SPSS statistical analysis to find significant differences between the studied transactions.

RESULTS

We conclude through the study that there are significant differences in the morphological characteristics of maize plants (plant length, root length, ear length, leaf area in the plant, weight of 500 grains, grain yield, biological yield, as well as in the properties of soil EC , PH ,and O.M when using mineral fertilizer or Organic fertilizer compared to the comparison sample without fertilization as a result.

The significant differences started when organic fertilizer was used at rates of 25%, 50%, 75%, 100%, as it increased by increasing the percentage as shown in the following tables, as well as soil properties affected in the same way except for PH, which decreased by increasing the percentage.

		Descriptive							
		95% Confidence Interval for Mean							
		N	Mean	Std. Deviation	Std. Error	Lower Bound	Upper Bound	Minimum	Maximum
Plant height	Control (T1)	3	64.000	1.7321	1.0000	59.697	68.303	62.0	65.0
	Organic Fertilizer (T2)	3	99.000	1.0000	.5774	96.516	101.484	98.0	100.0
	Mineral Fertilizer (T3)	3	109.000	1.0000	.5774	106.516	111.484	108.0	110.0
	O + 25 % M (T4)	3	120.000	.0000	.0000	120.000	120.000	120.0	120.0
	O + 50 % M (T5)	3	133.333	1.5275	.8819	129.539	137.128	132.0	135.0
	O + 75 % M (T6)	3	156.000	4.3589	2.5166	145.172	166.828	151.0	159.0
	O + M (T7)	3	161.000	1.0000	.5774	158.516	163.484	160.0	162.0
	Total	21	120.333	32.1019	7.0052	105.721	134.946	62.0	162.0
Root height	Control (T1)	3	25.000	.0000	.0000	25.000	25.000	25.0	25.0
	Organic Fertilizer (T2)	3	32.000	1.7321	1.0000	27.697	36.303	30.0	33.0
	Mineral Fertilizer (T3)	3	36.000	.0000	.0000	36.000	36.000	36.0	36.0
	O + 25 % M (T4)	3	40.667	1.1547	.6667	37.798	43.535	40.0	42.0
	O + 50 % M (T5)	3	42.000	.0000	.0000	42.000	42.000	42.0	42.0
	O + 75 % M (T6)	3	47.000	2.6458	1.5275	40.428	53.572	45.0	50.0
	O + M (T7)	3	48.000	2.0000	1.1547	43.032	52.968	46.0	50.0
	Control (T1)	21	38.667	7.9394	1.7325	35.053	42.281	25.0	50.0

Ear length	Control (T1)	3	14.000	2.0000	1.1547	9.032	18.968	12.0	16.0
	Organic Fertilizer (T2)	3	17.333	2.0817	1.2019	12.162	22.504	15.0	19.0
	Mineral Fertilizer (T3)	3	18.000	.0000	.0000	18.000	18.000	18.0	18.0
	O + 25 % M (T4)	3	21.000	1.0000	.5774	18.516	23.484	20.0	22.0
	O + 50 % M (T5)	3	22.000	1.0000	.5774	19.516	24.484	21.0	23.0
	O + 75 % M (T6)	3	25.000	1.0000	.5774	22.516	27.484	24.0	26.0
	O + M (T7)	3	27.000	2.6458	1.5275	20.428	33.572	25.0	30.0
	Total	21	20.619	4.5108	.9843	18.566	22.672	12.0	30.0
Leaf area	Control (T1)	3	4314.000	300.4114	173.4426	3567.737	5060.263	4001.0	4600.0
	Organic Fertilizer (T2)	3	4856.000	211.9151	122.3492	4329.574	5382.426	4718.0	5100.0
	Mineral Fertilizer (T3)	3	5363.000	345.9870	199.7557	4503.521	6222.479	5000.0	5689.0
	O + 25 % M (T4)	3	5910.000	10.0000	5.7735	5885.159	5934.841	5900.0	5920.0
	O + 50 % M (T5)	3	6230.000	216.5641	125.0333	5692.025	6767.975	6000.0	6430.0
	O + 75 % M (T6)	3	6760.000	103.9230	60.0000	6501.841	7018.159	6700.0	6880.0
	O + M (T7)	3	6859.333	445.6920	257.3204	5752.173	7966.494	6400.0	7290.0
	Total	21	5756.048	937.4247	204.5628	5329.337	6182.758	4001.0	7290.0
500 grain weight	Control	3	101.000	2.6458	1.5275	94.428	107.572	98.0	103.0
	Control (T1)	3	120.000	5.0000	2.8868	107.579	132.421	115.0	125.0
	Organic Fertilizer (T2)	3	130.000	5.0000	2.8868	117.579	142.421	125.0	135.0
	Mineral Fertilizer (T3)	3	142.000	5.0000	2.8868	129.579	154.421	137.0	147.0
	O + 25 % M (T4)	3	148.000	5.0000	2.8868	135.579	160.421	143.0	153.0
	O + 50 % M (T5)	3	160.000	1.7321	1.0000	155.697	164.303	158.0	161.0
	O + 75 % M (T6)	3	163.000	5.0000	2.8868	150.579	175.421	158.0	168.0
	O + M (T7)	21	137.714	21.4643	4.6839	127.944	147.485	98.0	168.0
Grain yield	Control (T1)	3	4.500	.5000	.2887	3.258	5.742	4.0	5.0
	Organic Fertilizer (T2)	3	6.700	.8000	.4619	4.713	8.687	5.9	7.5
	Mineral Fertilizer (T3)	3	7.890	.3951	.2281	6.909	8.871	7.5	8.3
	O + 25 % M (T4)	3	9.023	.3137	.1811	8.244	9.803	8.8	9.4
	O + 50 % M (T5)	3	9.030	.7554	.4362	7.153	10.907	8.3	9.8
	O + 75 % M (T6)	3	10.467	.5132	.2963	9.192	11.741	9.9	10.9
	O + M (T7)	3	11.133	.7095	.4096	9.371	12.896	10.5	11.9
	Total	21	8.392	2.2094	.4821	7.386	9.398	4.0	11.9
Biological yield	Control (T1)	3	15.000	2.0000	1.1547	10.032	19.968	13.0	17.0
	Organic Fertilizer (T2)	3	20.000	1.0000	.5774	17.516	22.484	19.0	21.0
	Mineral Fertilizer (T3)	3	23.667	3.0551	1.7638	16.078	31.256	21.0	27.0
	O + 25 % M (T4)	3	27.000	2.0000	1.1547	22.032	31.968	25.0	29.0
	O + 50 % M (T5)	3	28.000	.0000	.0000	28.000	28.000	28.0	28.0
	O + 75 % M (T6)	3	32.667	1.1547	.6667	29.798	35.535	32.0	34.0
	O + M (T7)	3	35.667	1.5275	.8819	31.872	39.461	34.0	37.0
	Total	21	26.000	6.9282	1.5119	22.846	29.154	13.0	37.0
O.M	Control (T1)	3	1.023	.1966	.1135	.535	1.512	.8	1.2
	Organic Fertilizer (T2)	3	1.993	.2003	.1157	1.496	2.491	1.8	2.2
	Mineral Fertilizer (T3)	3	1.397	.4000	.2310	.403	2.390	1.0	1.8
	O + 25 % M (T4)	3	2.403	.1002	.0578	2.155	2.652	2.3	2.5
	O + 50 % M (T5)	3	2.607	.1007	.0581	2.357	2.857	2.5	2.7
	O + 75 % M (T6)	3	2.983	.1258	.0726	2.671	3.296	2.9	3.1
	O + M (T7)	3	3.197	.2001	.1155	2.700	3.694	3.0	3.4
	Total	21	2.229	.7833	.1709	1.872	2.586	.8	3.4

PH	Control (T1)	3	5.400	.2000	.1155	4.903	5.897	5.2	5.6
	Organic Fertilizer (T2)	3	7.000	.0000	.0000	7.000	7.000	7.0	7.0
	Mineral Fertilizer (T3)	3	7.500	.3000	.1732	6.755	8.245	7.2	7.8
	O + 25 % M (T4)	3	6.900	.2000	.1155	6.403	7.397	6.7	7.1
	O + 50 % M (T5)	3	6.500	.1000	.0577	6.252	6.748	6.4	6.6
	O + 75 % M (T6)	3	6.300	.0000	.0000	6.300	6.300	6.3	6.3
	O + M (T7)	3	5.900	.3000	.1732	5.155	6.645	5.6	6.2
	Total	21	6.500	.6928	.1512	6.185	6.815	5.2	7.8
EC	Control (T1)	3	2.700	.1000	.0577	2.452	2.948	2.6	2.8
	Organic Fertilizer (T2)	3	3.500	.1000	.0577	3.252	3.748	3.4	3.6
	Mineral Fertilizer (T3)	3	3.100	.1732	.1000	2.670	3.530	3.0	3.3
	O + 25 % M (T4)	3	3.700	.1000	.0577	3.452	3.948	3.6	3.8
	O + 50 % M (T5)	3	4.100	.1000	.0577	3.852	4.348	4.0	4.2
	O + 75 % M (T6)	3	3.900	.1000	.0577	3.652	4.148	3.8	4.0
	O + M (T7)	3	4.300	.1000	.0577	4.052	4.548	4.2	4.4
	Total	21	3.614	.5434	.1186	3.367	3.862	2.6	4.4

Table 2 .
ANOVA analysis showed that there was a significant difference at the 5% significance level for the coefficients

		Sum of Squares	d f	Mean Square	F	Sig
Plant height	Between groups	20556.000	6	3426.000	877.390	0.000
	Within Groups	54.667	14	3.905		
	Total	20610.667	20			
Root plant	Between groups	1230.000	6	205.000	93.587	0.000
	Within Groups	30.667	14	2.190		
	Total	1260.667	20			
Ear length	Between groups	370.286	6	61.714	23.564	0.000
	Within Groups	36.667	14	2.619		
	Total	406.952	20			
Leaf area	Between groups	16552696.286	6	2758782.714	37.769	0.000
	Within Groups	1022606.667	14	73043.333		
	Total	17575302.952	20			
500 grain weight	Between groups	8944.286	6	1490.714	77.296	0.000
	Within Groups	270.000	14	19.286		
	Total	9214.286	20			
Grain yield	Between groups	92.662	6	15.444	43.558	0.000
	Within Groups	4.964	14	0.355		
	Total	97.626	20			
Bio yield	Between groups	916.000	6	152.667	48.576	0.000
	Within Groups	44.000	14	3.143		
	Total	960.000	20			

	Between groups	11.641	6	1.940	43.138	0.000
O.M	Within Groups	0.630	14	0 .045		
	Total	12.271	20			
	Between groups	9.060	6	1.510	39.148	0.000
PH	Within Groups	0.540	14	0.039		
	Total	9.600	20			
	Between groups	5.726	6	0.954	74.222	0.000
EC	Within Groups	0.180	14	0.013		
	Total	5.906	20			

Effects of treatments on plant properties

Plant height(cm)

The effect of mineral fertilization was significant on plant height of 109 cm when treated (T3) compared to organic fertilization with sample (T2) which gave 99 cm, while comparison treatment (T1) gave an average height of less than 64 cm, and this is consistent with what was reached (Saleh M.Ibraheem 2013) and (Hussien J.M. AL-Bayati et al., 2021) but [100% mineral fertilizer with organic fertilizer for sheep manure 20 tons | Hectare of] (T7) treatment gave the highest mean plant height of 161 cm.

different treatments on maize plant height could be arranged in descending order of T7 > T6 > T5 > T4 > T3 > T2 > T1 >

Duncan

Subset for alpha = 0.05

Fertilizer	N	1	2	3	4	5	6	7
Control (T1)	3	64.000 g						
Organic Fertilizer (T2)	3		99.000 f					
Mineral Fertilizer (T3)	3			109.000 e				
O + 25 % M (T4)	3				120.000 d			
O + 50 % M (T5)	3					133.333 c		
O + 75 % M (T6)	3						156.000 b	
O + 100 % M (T7)	3							161.000 a
Sig		1.000	1.000	1.000	1.000	1.000	1.000	1.000

Means for groups in homogeneous subsets are displayed. Uses Harmonic Mean Sample Size = 3.000

Root height(cm)

The results showed that the length of the roots was significantly affected when adding the infectious fertilizer (T3) as it gave a length of 36 cm compared to the average root length in the comparison sample (T1) which gave a root length of 25 cm while the organic fertilizer sample (T2) alone gave an average length of 32 cm.

It is noted that the average length of the root increases with the increase in the proportion of adding mineral fertilizer with organic fertilizer

(Jing Chen et al.,2020) A significant difference was achieved when the addition treatments were (T6) & (T7) gave root length of 47 and 48 cm respectively.

Duncan

Subset for alpha = 0.05

Fertilizer	N	1	2	3	4	5
Control (T1)	3	25.000 e				
Organic Fertilizer (T2)	3		32.000 d			
Mineral Fertilizer (T3)	3			36.000 c		
O + 25 % M (T4)	3				40.667 b	
O + 50 % M (T5)	3				42.000 b	
O + 75 % M (T6)	3					47.000 a
O + 100 % M (T7)	3					48.000 a
Sig		1.000	1.000	1.000	0.288	0.422

Means for groups in homogeneous subsets are displayed.

Uses Harmonic Mean Sample Size = 3.000

Columns with similar letters have no significant differences between them, while columns with different letters have significant differences at a probability $P < 0.05$

Ear length (cm)

The effect of ear length was significant, with the highest average ear length values reaching 27 cm in the treatment with [100% mineral fertilizer with organic fertilizer] (T7) and 25 cm in the treatment with [75% mineral fertilizer with organic fertilizer] (T6), but with the same significance, due to the effect of organic matter on growth (Jamal Deriak and Kamal Abdel-Kader,.(2015)Meanwhile, mineral fertilizer (T3) gave 18 cm and organic fertilizer (T2) 17.333 cm as an average length compared to the control treatment (T1), while (T5) and (T4) gave the same significance.

Duncan

Subset for alpha = 0.05

Fertilizer	N	1	2	3	4
Control (T1)	3	14.000 d			
Organic Fertilizer (T2)	3		17.333 c		
Mineral Fertilizer (T3)	3		18.000 c		
O + 25 % M (T4)	3			21.000 b	
O + 50 % M (T5)	3			22.000 b	
O + 75 % M (T6)	3				25.000 a
O + 100 % M (T7)	3				27.000 a
Sig		1.000	0.622	0.462	0.152

Means for groups in homogeneous subsets are displayed. Uses Harmonic Mean Sample Size = 3.000.

Columns with similar letters have no significant differences between them, while columns with different letters have significant differences at a probability $P < 0.05$

Leaf area (cm²)

The treatment [O +100% M] & [O +75 % M] (T7) & (T6) were given as the area of plant leaves 6859.33 cm² 6760 cm² respectively, but with the same level of significance, while it gave the organic (T2) 4856 cm² and mineral fertilizer (T3) 5363 cm² compared to the control sample (T1) which was 4314 cm² ,this result is consistent with the findings (Al Jobouri,Saleh and Arowl M.AnwerL, 2009)

Duncan		Subset for alpha = 0.05				
Fertilizer	N	1	2	3	4	5
Control (T1)	3	4314.000 e				
Organic Fertilizer (T2)	3		4856.000 d			
Mineral Fertilizer (T3)	3			5363.000 c		
O + 25 % M (T4)	3				5910.000 b	
O + 50 % M (T5)	3				6230.000 b	
O + 75 % M (T6)	3					6760.000 a
O + 100 % M (T7)	3					6859.333 a
Sig		1.000	1.000	1.000	0.169	0.659

Means for groups in homogeneous subsets are displayed. Uses Harmonic Mean Sample Size = 3.000

Columns with similar letters have no significant differences between them, while columns with different letters have significant differences at a probability $P < 0.05$

weight of 500 grain

Fertilizer treatments differed significantly between them, where the treatment [O +100% M] (T7) gave a significant difference in the average weight of 500 grains 163 grams, which is the same amount of significant difference in the sample (T6) [O + 75% M] which gave 160 grams, and the reason may be attributed to the fact that adding the fertilizer increased weight of 500 grain.

(Khalaf, M. Khalifah, Mazin F Said and Mothafer A Almosuly .2017) and (El-Sayed, H.K, et al,.2021)

Duncan		Subset for alpha = 0.05				
Fertilizer	N	1	2	3	4	5
Control (T1)	3	101.000 e				
Organic Fertilizer (T2)	3		120.000 d			
Mineral Fertilizer (T3)	3			130.000 c		
O + 25 % M (T4)	3				142.000 b	
O + 50 % M (T5)	3				148.000 b	
O + 75 % M (T6)	3					160.000 a

O + 100 % M (T7)	3					163.000 a
Sig		1.000	1.000	1.000	0.116	0.417

Means for groups in homogeneous subsets are displayed. Uses Harmonic Mean Sample Size = 3.000.

Columns with similar letters have no significant differences between them, while columns with different letters have significant differences at a probability $P < 0.05$

Grain yield

[100%NPK + organic fertilizers] gave the highest grain yield about 10.467, 11.133 ton per hectare.(Al-Hilfy & Al-Temimi, 2017).

In our experiment, this same treatment of the treatment (T7) gave 11.133 ton per hectare and the treatment[75%M + organic fertilizers] (T6) gave 10.467 ton | hectare with the same significant difference for both treatments, and $T3 > T2 > T1$

They found that the production of grain yield might be due to better growth, development and dry matter accumulation with proper supply of nutrients to plant and increase in the availability (Abd El-Gawad & Morsy, 2017) and (El-Sayed, H.K, et al.,2021)

Duncan		Subset for alpha = 0.05				
Fertilizer	N	1	2	3	4	5
Control (T1)	3	4.500 e				
Organic Fertilizer (T2)	3		6.700 d			
Mineral Fertilizer (T3)	3			7.890 c		
O + 25 % M (T4)	3				9.023 b	
O + 50 % M (T5)	3				9.030 b	
O + 75 % M (T6)	3					10.467 a
O + 100 % M (T7)	3					11.133 a
Sig		1.000	1.000	1.000	0.989	0.192

Means for groups in homogeneous subsets are displayed. Uses Harmonic Mean Sample Size = 3.000

Columns with similar letters have no significant differences between them, while columns with different letters have significant differences at a probability $P < 0.05$

Biological yield

The results showed that biological yield was significantly affected the highest value of biological yield (35.667 and 32.667 kg h⁻¹) in treatments [O + 100% M] & [(O + 75 % M] (T7) & (T6) but with the same meaning While the mineral fertilization treatments(T3) was higher than the organic fertilization(T2) and they are significantly higher than the control sample(T1).

The biological weight increased due to the mineral fertilizer mixed with the organic fertilizer (Gomaa, M.A., E.E. Kandil & Amara M.M. Ibrahim .2020)

Duncan		Subset for alpha = 0.05				
Fertilizer	N	1	2	3	4	5
Control (T1)	3	15.000 e				
Organic Fertilizer (T2)	3		20.000 d			
Mineral Fertilizer (T3)	3			23.667 c		
O + 25 % M (T4)	3				27.000 b	
O + 50 % M (T5)	3				28.000 b	
O + 75 % M (T6)	3					32.667 a
O + 100 % M (T7)	3					35.667 a
Sig		1.000	1.000	1.000	0.501	0.057

izer, which caused an increase in plant height and leaf area. Means for groups in homogeneous subsets are displayed. Uses Harmonic Mean Sample Size = 3.000

Columns with similar letters have no significant differences between them, while columns with different letters have significant differences at a probability $P < 0.01$

Effect treatment on some soil properties(Organic matter) O.M

The data showed that soil OM content was increased by using mixture organic with mineral fertilizer the table explained this .

The treatment (T7) &(T6) recorded the highest value3.197&2.983 but in the same significant ,also treatments (T5) &(T4)recorded the high value 2.607&2.403 and also in the same significant compare with (T3) ,(T2) and control (T1)

Duncan		Subset for alpha = 0.05				
Fertilizer	N	1	2	3	4	5
Control (T1)	3	1.023 e				
Organic Fertilizer (T2)	3		1.397 d			
Mineral Fertilizer (T3)	3			1.993 c		
O + 25 % M (T4)	3				2.403 b	
O + 50 % M (T5)	3				2.607 b	
O + 75 % M (T6)	3					2.983 a
O + 100 % M (T7)	3					3.197 a
Sig		1.000	1.000	1.000	0.260	0.238

Means for groups in homogeneous subsets are displayed. Uses Harmonic Mean Sample Size = 3.000

Columns with similar letters have no significant differences between them, while columns with different letters have significant differences at a probability $P < 0.05$

PH

The table showed that all fertilization treatments were significantly superior to the control in soil interaction.

The level of mineral fertilizer (T3) alone was significantly superior to all fertilizer treatments, and the reason is that the organic fertilizer reduces

different treatments on PH soil height could be arranged in descending order of $T3 > T2 > T4 > T5 > T6 > T7 > T1$ > Because adding organic fertilizers, regardless of their nature, leads to a decrease in soil acidity (Faisal Mahmood et al.,2017)

Duncan		Subset for alpha = 0.05				
Fertilizer	N	1	2	3	4	5
Control (T1)	3	5.400 e				
O + 100 % M (T7)	3		5.900 d			
O + 75 % M (T6)	3			6.300 c		
O + 50 % M (T5)	3			6.500 c		
O + 25 % M (T4)	3				6.900 b	
Organic Fertilizer (T2)	3				7.000 b	
Mineral Fertilizer (T3)	3					7.500 a
Sig		1.000	1.000	0.233	0.543	1.000

Means for groups in homogeneous subsets are displayed. Uses Harmonic Mean Sample Size = 3.000

Columns with similar letters have no significant differences between them, while columns with different letters have significant differences at a probability $P < 0.05$

Electrical Conductivity (EC)

The application of organic fertilizers significantly reduces soil EC and available nitrogen (Yixing Zhang ,et al 2024)

Data in this table showed the soil salinity (EC) as affected by addition of organic fertilizer and inorganic fertilizer and after harvesting maize plant.

The highest increase in soil salinity was recorded in (T3) as compared to the control. Also the value of (T2) was high 3.500 might be due to the high salt content of sheep manure and compost in comparison to the other organic materials.

different treatments on salinity height could be arranged in descending order of $T3 > T4 > T5 > T4 > T6 > T2 > T1 > T7 >$

Duncan		Subset for alpha = 0.05						
Fertilizer	N	1	2	3	4	5	6	7
O + 100 % M (T7)	3	2.700 g						
Control (T1)	3		3.100 f					
Organic Fertilizer (T2)	3			3.500 e				
O + 75 % M (T6)	3				3.700 d			
O + 50 % M (T5)	3					3.900 c		
O + 25 % M (T4)	3						4.100 b	
Mineral Fertilizer (T3)	3							4.200 a

Sig	1.000	1.000	1.000	1.000	1.000	1.000	1.000
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Means for groups in homogeneous subsets are displayed. Uses Harmonic Mean Sample Size = 3.000

DISCUSSION OF RESULTS

The results showed the difference in plant characteristics (height, root length, ear length, leaf area, weight of 500 grains, bio-yield, grain yield) according to the percentage of mineral fertilizer mixed with organic manure (sheep manure 20 tons | hectares.

It can be concluded that application of 5 ton.ha-1 organic fertilizer + 75 % inorganic fertilizer could increase N, P and K nutrients uptake well as good growth and yield (Neni Marlina et al., 2017)

The results indicate the superiority of the nitrogen fertilization treatment 100% and 75% over the control sample and the organic fertilizer sample in plant height, ear length, leaf area, grain yield and weight of 500 grains (Saleh M.Ibraheem 2013)

This result may be attributed to the more photosynthetic activities of the plant because of nitrogen since it is an essential requirement for the growth..

The mineral fertilization mixed with organic fertilization affects the absorption of nutrients, especially nitrogen, which increases cell division and enters the formation of the amino acid tryptophan, of which the growth regulator is formed and helps in the height of the plant.

Adding organic fertilizer to the soil releases CO₂, which combines with water to form carbonic acid Which helps in lowering the soil pH and increases the availability of nutrients in the root zone.

The addition of organic manure leads to a decrease in the values of electrical conductivity as a result of the positive effect of organic compounds in improving the physical and chemical properties of the soil, which contributed to a relative reduction Salts as a result of improving the movement of filtered water.

The mineral fertilization mixed with organic fertilization caused an increase in the area of leaf and stems and the height of the plant so that due to increase biological yield.

The reason of increasing 500 grain weight that was increasing concentration of chlorophyll so that it increases in the area of the leaf, which has an effect on weight gain.

The the leaf area is due to element nitrogen affects cell division, and that the increase in the element nitrogen works to increase the concentration of chlorophyll, so the photosynthesis process increases, which is reflected positively on the leaf area.

reported that integrated use of inorganic fertilizer along with organ ic fertilizer [100% NPK + OF] was improved soil physical conditions and increased in soil organic carbon might have resulted in higher maize yields (R.Al-Bandawy & H.Al-Alawy, 2018)

Experience has shown that mixing mineral fertilizer at a rate of 75% with organic fertilizer is 20 tons| Hectares gave higher significant differences than other mixture ratios 50% and 25% in soil organic matter content compared to mineral and organic fertilization alone.

The mineral fertilization treatment alone outperformed the rest of the treatments for the degree of soil reaction(PH) combination of organic and inorganic fertiliz- ers a realistic option in improving soil fertility and productivity. So the best ways for soil fertility is, therefore, integration of both inorganic and organic fertilizers to increases soil productivity(Roba, 2018)

(Akongwubel et al.,2012) reached when adding 15 tons per hectare of poultry manure results in an increase in the growth rate and yield of yellow maize plants, such as plant height, number of leaves, dry weight of leaves and stems, and grain yield.

Table3.

The effect of mineral and organic fertilization and the mixing ratio between them on the growth and production of maize before harvest

	T1	T2	T3	T4	T5	T6	T7	AVARGE	sig
PL	64 ± 1.0000 g	99 ± 0.5774 f	109 ± 0.5774 e	120 ± 0.0000 d	133 ± 0.8819 c	156 ± 2.5166 b	161 ± 0.5714 a	120 ± 7.0052	.000
RL	25 ± 0.0000 e	32 ± 1.0000 d	36 ± 0.0000 c	40 ± 0.6667 b	42 ± 0.0000 b	47 ± 1.5275 a	48 ± 1.1547 a	38.66 ± 1.7325	.000
EL	14 ± 1.1547 d	17.33 ± 1.2019 c	18 ± 0.0000 c	12 ± 0.5774 b	22 ± 0.5774 b	25 ± 0.5774 a	27 ± 1.5275 a	20.619 ± 0.9843	.000
LA	4314 ± 173.442 e	4856 ± 122.344 d	5363 ± 199.755 c	5910 ± 5.773 b	6230 ± 125.033 b	6760 ± 60.000 a	6859.33 ± 257.320 a	5756.04 ± 204.562	.000
500 wg	101 ± 1.5275 e	120 ± 2.8868 d	130 ± 2.8868 c	142 ± 2.8868 b	148 ± 2.8868 b	160 ± 1.0000 a	163 ± 2.8868 a	137.71 ± 4.68	.000
Yield	4.500 ± 0.2887 e	6.700 ± 0.4619 d	7.890 ± 0.2281 c	9.023 ± 0.1811 b	9.030 ± 0.4362 b	10.467 ± 0.2963 a	11.133 ± 0.4096 a	8.39 ± 0.48	.000
B.yield	15 ± 1.1547 e	20 ± 0.5774 d	23 ± 1.7638 c	27 ± 1.1547 b	28 ± 0.0000 b	32.667 ± 0.6667 a	35.667 ± 0.8819 a	26 ± 1.51	.000

Table 4.

The effect of mineral and organic fertilization and the mixing ratio between them on Some properties of the soil after harvest

	T1	T2	T3	T4	T5	T6	T7	AVARGE	sig
O.M	1.023 ± 0.1135 e	1.1993 ± 0.1157 d	1.397 ± 0.2310 c	2.403 ± 0.0578 b	2.607 ± 0.0581 b	2.983 ± 0.0726 a	3.197 ± 0.1155 a	2.229 ±1.709	.000
PH	5.400 ± 0.1155 g	7.000 ±0.000 b	7.500 ± 0.1732 a	6.900 ± 0.1155 c	6.500 ± 0.577 d	6.300 ± 0.000 e	5.900 ± 0.1732 f	6.500 ± 0.1512	.000
EC	3.100 ±0.1000 f	3.500 ±0.0577 e	4.300 ± 0.057 a	4.100 ± 0.0577 b	3.900 ± 0.0577 C	3.700 ± 0.0577 d	2.700 ± 0.0577 g	3.614 ± 0.1186	.000

COCLUSIONS

All fertilization rates achieved a significant increase over the control in plant and soil properties.

There were no significant differences between the treatments of (T7) [O+100%MF] and (T6) [O + 75% MF] in root length, ear length, leaf area, weight of 500 grains, grain yield , biological yield and The content of organic matter in the soil as well no significant differences between the treatments of (T5) [organic fertilizer + 50% mineral fertilizer] and (T4) [organic fertilizer + 25% mineral fertilizer]

The mineral fertilization treatment alone outperformed the rest of the treatments for as for the degree of soil reaction(PH).

The treatment of mineral fertilization alone outperformed to organic fertilization alone in plant characteristics and soil properties except for the for the organic matter.

RECOMMENDATIONS

Through the findings of the research, we recommend the following

Avoid using mineral fertilizer was alone on any agricultural crop because it was harmful to the environment and humans

The possibility to use organic fertilizer alone to improve soil fertility because of its good role in providing nutrients, Provided that the manure is free from diseases, salts and weed seeds.

It is preferable to use the treatment (organic fertilization + 75% mineral), which achieved high results in maize plant growth and production.

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