ISSN: 0975-833X

Available online at http://www.journalcra.com

International Journal of Current Research
Vol. 12, Issue, 01, pp.9778-9785, January, 2020

DOI: https://doi.org/10.24941/ijcr.37678.01.2020

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

RESEARCH ARTICLE

IMPACT OF COMPOSTED OR UNCOMPOSTED ORGANIC RESIDUES INTEGRATED WITH INORGANIC FERTILIZERS ON N, P AND K CONTENT IN LEAVES AND SEED QUALITY OF SUNFLOWER

[1]Hussein Finjan Al-delfi and [2]Mohammed A. Abdulkareem

[1]Department Dujaila Agric., Wasit Agric. Directorate, Wasit province, Iraq
[2]Department Soil Sci. Water Res., Coll. Agric, Univ. Basra, Iraq

ARTICLE INFO

Article History:
Received 14th October, 2019
Received in revised form
10th November, 2019
Accepted 29th December, 2019
Published online 30th January, 2020

Key Words:
Composting.
Sunflower,
Integrated system,
Oil . Protein .

ABSTRACT

A field trial was conducted on a farm at Al- Dujaila area, 36 km southeast of Kut city, Wast province, Iraq during the growing season of 2018 to study the response of sunflower to eight organic fertilizer treatments added with four levels. Treatments included: control (T0); 100% composted poultry manure (T1); 100% uncomposted poultry manure (T2);composted (66%poultry manure + 16.5% wheat straw + 16.5% conocarpus) (T3); uncomposted (66%poultry manure + 16.5% wheat straw + 16.5% conocarpus) (T4); composted (50% poultry manure + 25% wheat straw + 25 conocarpus) (T5); uncomposted (50%poultry manure + 25% wheat straw + 25 conocarpus) (T6); composted (33%poultry manure + 33% wheat straw + 33% conocarpus) (T7) and uncomposted (33%poultry manure + 33% wheat straw + 33% conocarpus) (T8). The organic fertilizer levels were: 0% organic fertilizer + 100% chemical fertilizers (L0); 50% organic fertilizer + 50% chemical fertilizers (L50); 75% organic fertilizer + 25% chemical fertilizers (L75); 100% organic fertilizer + 0% chemical fertilizers (L100). The chemical fertilizers 200 kg N ha^{-1}, 80 kg P ha^{-1} and 120 kg K ha^{-1}. The experiment was conducted in a three replicates with randomized complete block design. All fertilizer were applied by mixing method with 20 cm upper layer of the raw. Sunflower seeds (Vr. Panam) were sowing in 1 March 2018 and plants were harvested in 20 June 2018. The results revealed that N, P, and K concentrations in leaves, oil content and protein content in seeds were significantly increased in plants received organic fertilizers alone or in combination with chemical fertilizers over plants received chemical fertilizers alone. Composted organic fertilizers recorded highest values of growth parameters as compared with uncomposted fertilizers. The crop under integrated treatment T1L50 recorded highest N concentration (35.03 g kg^{-1}) and highest seed oil content (45.38%). However, crop under treatments T3L100 and T1L100 recorded the highest P (3.93 g kg^{-1}), K (35.08 g kg^{-1}) and protein content of seeds (26.97%), respectively.

Citation: ***Hussein Finjan Al-delfi and Mohammed A. Abdulkareem.*** **2019.** "Impact of composted or uncomposted organic residues integrated with inorganic fertilizers on N, P and K content in leaves and seed quality of sunflower", *International Journal of Current Research*, 12, (01), 9778-9785.

INTRODUCTION

The use of chemical fertilizers in excessive quantities is one of the practices that lead to an environment and health problems as well as imbalance of nutrients in soil solution. Many farmers resort to excessive fertilization of the soil with chemical fertilizers in order to increase production. Although production increased in the first years of application, there is an imbalance between nutrients in the soil solution, leading to reflected on plant growth and product quality. In addition most of the synthetic chemical fertilizers, especially phosphate, have a high content of toxic elements, such as cadmium, which may reach 36 mg kg^{-1} in concentrated superphosphate fertilizer and 34 mg kg^{-1} in DAP fertilizer (Modaihsh *et al.,* 2004). On the other hand, the production of chemical fertilizers is costly process , for example, the price of phosphate rock from which phosphate fertilizers are manufactured has increased sevenfold over the past few years (Cordell *et al*, 2009). In this context, many attention has been directed towards the using of organic fertilization as an appropriate solution for sustainable production. Organic fertilizer increases organic matter content in soil, thus improving the CEC, increasing soil water retention and promoting soil aggregates (Chen,2006). Organic fertilizers enhance soil biological activity that improve nutrient availability, release nutrients slowly and contribute to the residual pool of organic N and P in the soil, reducing N leaching and P fixation as well as supplying micronutrients (Mahrous *et al.* 2014).

***Corresponding author:** **Hussein Finjan Al-delfi,**
Dept. Dujaila Agric., Dept., Soil Sci. Water Res, Wasit Agric Directorate Coll. Agric., Univ. Basra , Iraq.

Many studies were conducted to evaluate the impact of inorganic and organic fertilizers application on plant. It is important to the farmers to manage soil fertility with an integrated way of using inorganic and organic fertilizers as correcting nutrient imbalance as well as reduce the need of inorganic fertilizers (Buriro *et al.,* 2015). The properties of organic fertilizer and its impact on soil and plant growth depends on the composting and the degree of maturity. Composting is defined as the process of microbial transformation of biodegradable organic residues to more stable materials by microorganisms originally in the waste include bacteria, fungi and Actenomysetes (Prasad and Power, 1997).The composting of residues is convert nitrogen and phosphate compounds into plant-ready forms and to encourage decomposition of non-nitrogen-containing organic compounds in order to reduce C/N and C/P ratios as well as to reduce nitrogen damage to the plant (Stanchev *et al.,* 1990).Composting also killing weed seeds and eliminating pathogens (Pandy *et al.,* 2016). The final product at the end of composting Should be stable and can be used to improve different soil properties.

Among the controlling of manure composting, using of appropriate bulking agent (always plant raw materials) that could be used as a carbon source will enhance composting process during the modification of moisture, porosity, aeration and pH (Mahdy *et al.,*2012). Zhang and Sun (2016) stated that bulking agents could be used to adjusted C/N ratio and enhance the porosity. Also bulking agents is an odour control due to the absorption of excess moisture (Imbeah, 1998). The objective of this study was to evaluate the effect of composted or uncomposted organic residues and their combination with chemical fertilizers on some growth parameters and seed quality of sunflower.

MATERIALS AND METHODS

Experimental site: This study was conducted at a private field in Al-Dujaila area (32º42" N,46º15" E)36 km southeast of Kut city center of Wast province, Iraq during the growing season of 2018.Soil samples were taken randomly from different locations of the study area before planting at layer (0-30) cm to form a composite sample, air dried then sieved by 2mm sieve for physical and chemical properties(table 1) according methods described by Richards (1954), Black (1965), and Page *et al.* (1982).

Organic fertilizers preparation: Poultry residue was used as an animal source while wheat straw and vegetative part of *conocarpus lancifolius* trees as a plant sources for the preparation of organic fertilizers. Raw materials were cleaned then mixed thoroughly with different ratios based on their volumes as shown in table 2. Each mix was divided of two parts, first was uncomposted by storing in low hill at shady place till drying The another part was composted in plastic padded hall (2x1x1m diameters) for 14 weeks. The mixes were manually turned once a week in order to homogenize the materials as well as to minimize the formation of anaerobic condition. The moisture content of mix was initially adjusted at 60% and kept along the composting period by addition of water. The chemical properties of organic fertilizers (composted and uncomposted) were listed in table 3.

Fertilizer treatments: The experiment included 36 treatments which were the combination of:

- organic fertilizer types:
- control treatment without any fertilizer (T0)
- 100% composting poultry manure (T1)
- 100% uncomposting poultry manure (T2)
- composted (66% poultry manure + 16.5% wheat straw + 16.5% conocarpus) (T3)
- uncomposted (66% poultry manure + 16.5% wheat straw + 16.5% conocarpus) (T4)
- composted (50% poultry manure + 25% wheat straw + 25% conocarpus) (T5(
- uncomposted (50% poultry manure + 25% wheat straw + 25% conocarpus) (T6)
- composted (33% poultry manure 33% wheat straw + 33conocarpus) (T7)
- uncomposted (33% poultry manure + 33% wheat straw + 33% conocarpus) (T8)
- organic fertilizer level:
- 0% organic fertilizer (L0)
- 50% organic Fertilizer(L50)
- 75% organic fertilizer (L75)
- 100% organic Fertilizer (L100)

Each ratio was calculated based on the nitrogen content in organic fertilizers equivalent to recommended nitrogen level

Experimental design: The experiment was laid out in factorial design (organic fertilizer treatment vs. organic fertilizer level) with three replicates arranged as Randomized Complete Blocks Design (RCBD).

Agricultural practices: The field plowed perpendicularly and divided into three equal blocks, each block represents a replicate. Distance between one block and another was 2 m. The individual plots within blocks were a single rows of 10m.Row spacing was 1 m, and plant density was 50 plant per unit. Sunflower (*Helianthus annuus* L.) Panam variety was used. Three seeds per hill were planted in 1 March 2018. One plant per hill was maintained at 3 full leaf stage. For chemical fertilizers, diammonium phosphate (DAP), urea and potassium sulfate were used at rates of 200kg N ha^{-1}, 80 kg Pha^{-1} and 120 kg ha^{-1}, respectively. All mineral fertilizers were applied by mixing method with 20 cm upper layer of the row at the time of sowing for DAP and 30 days after sowing for urea and potassium sulfate. Organic fertilizers were applied by mixing method with upper layer of the row just before sowing. River water (1.5 dSm^{-1}salinity) was used to irrigate plants, and the amount of water was a jousted based on Evap. Pan class A with 20% leaching requirements. All standard local practices were followed all over the season.

Sampling and analysis: Ten plants in the center of row were selected before harvest for determination of N, P and K concentrations in leaves. The fourth leaf from the top of each plant was selected, oven dried at 65ºc, then wet digested by using the acid mixture (4% $HClO_4$+96% H_2SO_4) as described by Cresser and Parsons (1979). N concentration was assayed in digest by steam distillation procedure according to Bremner (1970). P concentration was assayed by blue colure development described by Murphy and Riley (1962) and K concentration was assayed using flame photometer as described by Page *et al.* (1982). After full maturity stage, heads of the ten plants were harvested manually by cutting the disk in 20 June 2018 for determination of oil and protein continents.

For oil content, seeds were dried, crushed then refluxed with petroleum ether in weighed flask using Soxhlet apparatus according to Bedocv (1970). The oil was trapped by drying the solvent to reach a constant weight. Oil content was the following formula: oil content (%)= total weight of oil / total weight of seeds x 100. For protein content, a dried seeds were digested by using wet method of Cresser and Parsons (1979) and N concentration was assayed in digest according to Bremner (1970), then the protein content was determined by using the formula: protein content (%) = total N (%) x 6.25.

Data analysis: Data were analyzed with analysis of variance (ANOVA) using GenStat procedure Library release PL 18.2. Differences among means were evaluated with R.L.S.D at 5% level of significant F test.

RESULTS AND DISCUSSION

Nitrogen concentration in leaves: The effect of organic fertilizer type and levels on N concentration in sunflower leaves was presented in table 4.The results indicated that all organic fertilizer treatments significantly increased N concentration in leaves as compared with control (T0).The highest value was observed when adding composted poultry residue alone (T1) without significant difference with treatment include addition of composted (66% poultry manure + 16.5% wheat straw + conocarpus residue) (T3), but these treatments had statistically significant differences to other treatments. The minimum N concentration (30.51g kg^{-1}) was recorded in the treatment where uncomposted of (33% poultry residue + 33% wheat straw + 33% conocarpus residue) (T8) was applied. These results are in agreement with Al-Mohammady (2009) and Read *et al.* (2019). This means that increasing the proportion of composted poultry manure in pile will increase N concentration in leaves. These results may be due to the high content of N and low C/N ratio of composted treatment and poultry manure (table 3) leading to release high amount of available N in soil solution and its uptake. Cooper (2008) pointed out that nitrogen uptake by plant is a good function of available nitrogen in soil. Gijsman (1990) stated that the presence of organic residues, especially composted leads to increase the percentage of small particles in the soil, which increases the retention of soil moisture, that provides movement of nitrogen and increased uptake in plant. Data of table 4 illustrated that increasing organic fertilizer level decreased N concentration in leaves with highest value at treatment of 75% organic fertilizer + 25% chemical fertilizer (L75). However, treatment of 50% organic fertilizer + 50% chemical fertilizer (L50) and treatment of 75% organic fertilizer + 25% chemical fertilizer (L75) gave a significant higher values as compared with the treatment of 100% chemical fertilizer (L0), that means the combinations of organic fertilizer with chemical fertilizer recorded a highest N concentration as compared with chemical fertilization. The positive effect of application of organic fertilizer with inorganic fertilizer may be attributed to improve soil conditions such as pH, EC and organic matter content and supply of continuous nitrogen doses as well as prevent the N of chemical fertilizer against loss by volatilization and leaching. Lamyaa *et al.* (2016) observed an increase fertilizer in N uptake by sunflower at treatment involved mixing organic fertilizer with chemical fertilizer. The superiority of combination treatments compared to the chemical fertilization treatment is an encouraging result to reduce the amount of mineral nitrogen added to the soil, thus reduce its adverse environmental impact as well as reduce the economic cost**.** Data presented in table 4 also showed that T1 treatment in combined with L50 level recorded the highest N concentration value (35.03 g kg^{-1}) without a significant differences with the rest treatments belong T1 and T5 in presence of organic fertilizer. This result indicated clearly that the presence of high amount of poultry residue in the composted pile has an advantage in supplying more nitrogen to soil solution for long time. Similar result has been reported by Gijsman*et al.* (1995) who reported that addition of organic fertilizer have great effect on plant growth and yield as well as promote the different soil properties.

Phosphorus concentration in leaves: Data in table 5 showed that all fertilizer treatments significantly increased P concentration as compared with control treatment (T0), however, the greatest values (3.56 and 3.47 g kg^{-1}) were associated with plants received T3 and T1 with out significant difference the between two treatments. The use of organic fertilizers showed un useful practice as a source of slow release phosphorus which is available for uptake through different growth stages. Jones *et al.*(1991) reported that the enhancement of nutrient uptake is depended on biological activity that affected by soil temperature, moisture, aeration and pH. Thereby the increments in available phosphorus encouraged its uptake. These results were similar to Esmaeilian *et al.* (2012) and Mustafa (2019) who reported that phosphorous uptake was increased after addition of organic fertilizer. Similar to data of N concentration (table4) the superiority ofT1 and T3 may be attributed to high P contents and low C/P ratios (table3) which resulted an increasing in available phosphorous to soil solution and encouraged its uptake. The results of table 5 showed that increasing organic fertilizer level increased phosphorous concentration in leaves with significant superiority for L100 level over the other levels. It is evident that the increasing phosphorous uptake as a result of increasing applied rate is confirmed by the enrichment of organic fertilizers of phosphorous content as well as enhancing its availability, mobility and uptake. This finding is accordance with those obtained by Hosseny and Ahmed (2009) who found that addition of organic fertilizer at rate of 6 tons of $Fedan^{-1}$resulted an increasing of phosphorous availability in soil over chemical fertilizer.

The greatest values of phosphorous concentration were obtained in plants supplied by T3and T1 treatments at all fertilizer levels. On the other hand, the greatest values were associated with the L100 level at all fertilizer treatments. In addition, some uncomposting treatments gave significantly less phosphorus concentration in leaves than chemical fertilization treatment (L0).These behaviors suggests that composting of organic residues as well as increasing the proportion of poultry manure in pile are more suitable management practices to improve phosphorous uptake under present study conditions. This is possible due to improve phosphorus availability in soil.

Potassium concentration in leaves: Data in table 6 revealed that their was a significant positive effect of applied organic fertilizers on potassium concentration as compared with control treatment which gave 19.30 g kg^{-1} potassium in leaves. The highest values were associated with plants treated with T3 and T1 (32.55 and 31.63 g kg^{-1}, respectively), however, these obtained values showed insignificant differences. Addition of organic fertilizers to the soil promote increase soil content of

Table 1. Physical and chemical properties of soil

parameter	unit	value	parameter	unit	value
pH	——	7.74	Mg^{++}	m mole L^{-1}	3.23
EC	dS m^{-1}	2.87	HCO_3^{-1}	m mole L^{-1}	2.10
CEC	$Cmole^{(+)}kg^{-1}$	26.40	CO^{-2}	m mole L^{-1}	-
Available K	mg kg^{-1}	136.89	Na^{+}	m mole L^{-1}	4.60
Available P	mg kg^{-1}	25.24	Cl^{-}	m mole L^{-1}	5.09
Total N	g kg^{-1}	0.45	$SO^{=}$	m mole L^{-1}	7.83
Available N	mg kg^{-1}	94.13	$CaCO_3$	g kg^{-1}	340
OM	g kg^{-1}	9.67	bρ	Mg m^{-3}	1.38
C/N	——	12.49	MWD	mm	0.27
Ca^{++}	m mole L^{-1}	5.20			
		Soil texture			
	Sand		g kg^{-1}	170	
	Slit		g kg^{-1}	570	
	Clay		g kg^{-1}	260	
	Texture				Silty loam

Table 2. Component Percentage of different organic fertilizers

Pile type	%Poultry residue	%Straw wheat	% Conocarpus residue
1	100%	-	-
2	66%	16.50%	16.50%
3	50%	25%	25%
4	33%	33%	33%

Table 3. Some chemical properties of organic fertilizers

Parameters	Unit	T1	T2	T3	T4	T5	T6	T7	T8
pH	-	6.87	6.24	6.73	5.92	7.14	5.60	7.45	5.75
EC	dS m-1	17.18	17.46	16.63	15.03	16.42	10.58	13.75	13.44
TOC	g kg-1	277.31	372.13	321.24	436.72	330.65	444.3	315.11	450.37
Total N	g kg-1	29.60	21.89	20.20	17.60	18.40	16.70	16.10	14.50
Total P	g kg-1	21.10	18.7	18.70	16.20	14.60	14.20	14.40	14.10
Total K	g kg-1	20.30	22.90	19.10	21.70	16.80	20.60	16.30	19.70
C/N Ratio	-	9.37	17.00	15.90	24.81	17.97	26.60	19.57	31.06
C/P Ratio	-	13.14	19.90	17.18	26.96	22.64	31.29	21.88	31.94

Table 4. Effect of type and level of organic fertilizers on Nconcentration (g kg^{-1}± SE) in sunflower leaves

Organic fertilizer treatment	organic fertilizer level				Mean
	L0	L50	L75	L100	
T1	31.73±0.23	35.03±1.15	34.30±0.77	34.01±1.08	33.77±0.81
T2	31.73±0.23	31.73±0.47	31.73±0.62	30.10±0.40	31.32±0.43
T3	31.73±0.23	34.30±0.81	34.30±0.58	33.60±0.40	33.48±0.51
T4	31.73±0.23	31.54±0.51	31.03±0.47	29.63±0.84	30.98±0.51
T5	31.73±0.23	33.13±0.62	33.60±1.07	32.43±0.62	32.72±0.64
T6	31.73±0.23	31.50±0.70	31.03±0.47	28.47±0.62	30.68±0.51
T7	31.73±0.23	33.60±0.40	33.13±0.23	30.80±0.81	32.32±0.42
T8	31.73±0.23	30.81±0.23	30.57±0.62	28.93±0.84	30.51±0.48
T0	19.60±0.40	19.60±0.40	19.60±0.40	19.60±0.40	19.60±0.40
Mean	30.38±0.25	31.25±0.59	31.03±0.58	29.73±0.60	
RLSD for treatment		RLSD for level		RLSD for treatment * level	
0.84		0.56		1.69	

T0: control treatment without any fertilizer; T1:**100** % composting poultry manure ; T2:**100**% uncomposting poultry manure ;T3: composted (66% poultry manure + 16.5% wheat straw + 16.5% conocarps) ; T4: uncomposted (66% poultry manure + 16.5% wheat straw + 16.5% conocarpus) ; T5: composted (50% poultry manure + 25% wheat straw + 25% conocarpus) ; T6: uncomposted (50% poultry manure + 25% wheat straw + 25% conocarpus) ; T7: composted (33% poultry manure 33% wheat straw + 33 conocarpus) ; T8: uncomposted (33% poultry manure + 33% wheat straw + 33% conocarpus). L0:0% organic fertilizer; L50:50% organic Fertilizer; L75:75% organic Fertilizer; L100:100% organic Fertilizer.

organic matter that lead to increase availability of potassium in soil in addition to the role of organic residues in the release of soil potassium and keep it from loss. The results of table 6 showed that potassium concentration increased with increasing organic fertilizer level. All levels of addition gave a higher potassium concentration in leaves compared with chemical fertilization treatment (L0) with significant superiority of L100 level compared to other levels except L75.This was true, since the enhancement of soil properties as a results of organic fertilizer application should be resulting in potassium availability. These results are consistent with those of Balyan et al. (2006) and Lamyaa et al. (2016).With the regard to the interactive effect of the organic treatment and organic fertilizers level, the statistical analysis indicated no significant effect, in potassium concentration in leaves, however, it can be noted that T3L50 and T3L100 treatments gave the highest values of potassium concentration in the leaves. The effect of application of composted residues alone or with inorganic fertilizer may be attributed to providing a favorable soil condition such as pH, EC, organic matter which improving

Table 5. Effect of type and level of organic fertilizer on phosphorus concentration (g kg $^{-1}$± SE) in sunflower leaves

Organic fertilizer treatment	organic fertilizerlevel				Mean
	L0	L50	L75	L100	
T1	3.11±0.04	3.55±0.04	3.60±0.03	3.63±0.04	3.47±0.04
T2	3.11±0.04	3.06±0.12	3.02±0.03	3.52±0.03	3.18±0.06
T3	3.11±0.04	3.56±0.06	3.64±0.04	3.93±0.02	3.56±0.04
T4	3.11±0.04	2.91±0.08	2.95±0.10	3.17±0.05	3.04±0.07
T5	3.11±0.04	3.31±0.04	3.36±0.04	3.55±0.06	3.33±0.05
T6	3.11±0.04	2.71±0.05	2.77±0.04	2.91±0.03	2.88±0.04
T7	3.11±0.04	3.23±0.08	3.22±0.03	3.47±0.06	3.26±0.05
T8	3.11±0.04	2.59±0.01	2.60±0.01	2.84±0.05	2.79±0.03
T0	2.10±0.03	2.10±0.03	2.10±0.03	2.10±0.03	2.10±0.03
Mean	3.00±0.04	3.00±0.06	3.03±0.04	3.24±0.04	
RLSD for treatment		RLSD for level		RLSDfor treatment * level	
0.12		0.12		0.23	

T0: control treatment without any fertilizer; T1:**100** % composting poultry manure ; T2:**100**% uncomposting poultry manure ;T3: composted (66% poultry manure + 16.5% wheat straw + 16.5% conocarps) ; T4: uncomposted (66% poultry manure + 16.5% wheat straw + 16.5% conocarpus) ; T5: composted (50% poultry manure + 25% wheat straw + 25% conocarpus) ; T6: uncomposted (50% poultry manure + 25% wheat straw + 25% conocarpus) ; T7: composted (33% poultry manure 33% wheat straw + 33 conocarpus) ; T8: uncomposted (33% poultry manure + 33% wheat straw + 33% conocarpus). L0:0% organic fertilizer; L50:50% organic Fertilizer; L75:75% organic Fertilizer; L100:100% organic Fertilizer.

Table 6: Effect of type and level of organic fertilizers on potassium concentration (g kg $^{-1}$ ± SE) on sunflower leaves

Organic fertilizer treatment	organic fertilizer level				Mean
	L0	L50	L75	L100	
T1	27.95±0.78	30.51±0.29	34.02±0.95	34.06±1.11	31.63±0.78
T2	27.95±0.78	30.33±0.95	29.31±1.96	30.67±0.45	29.57±1.04
T3	27.95±0.78	35.00±1.67	32.37±0.74	35.08±0.88	32.55±1.02
T4	27.95±0.78	29.82±1.03	31.01±1.06	30.67±2.00	29.86±1.22
T5	27.95±0.78	29.82±2.13	29.99±0.59	31.01±1.06	29.69±1.14
T6	27.95±0.78	26.60±1.03	28.29±1.67	30.50±1.35	28.34±1.21
T7	27.95±0.78	27.10±2.23	28.12±1.19	29.14±1.03	28.08±1.31
T8	27.95±0.78	25.41±0.95	27.44±1.35	29.99±1.84	27.70±1.23
T0	19.30±1.06	19.30±1.06	19.30±1.06	19.30±1.06	19.30±1.06
Mean	26.99±0.81	27.90±1.26	29.16±1.17	30.05±1.20	
RLSD for treatment		RLSD for level		RLSD for treatment * level	
1.72		1.15		ns.	

T0: control treatment without any fertilizer; T1:**100** % composting poultry manure ; T2:**100**% uncomposting poultry manure ;T3: composted (66% poultry manure + 16.5% wheat straw + 16.5% conocarps) ; T4: uncomposted (66% poultry manure + 16.5% wheat straw + 16.5% conocarpus) ; T5: composted (50% poultry manure + 25% wheat straw + 25% conocarpus) ; T6: uncomposted (50% poultry manure + 25% wheat straw + 25% conocarpus) ; T7: composted (33% poultry manure 33% wheat straw + 33 conocarpus) ; T8: uncomposted (33% poultry manure + 33% wheat straw + 33% conocarpus). L0:0% organic fertilizer; L50:50% organic Fertilizer; L75:75% organic Fertilizer; L100:100% organic Fertilizer.

Table 7. Effect of type and level of organic fertilizer on oil content in seed (%± SE) of sunflower

Organic fertilizer treatment	organic fertilizer level				Mean
	L0	L50	L75	L100	
T1	38.65±1.17	45.38±1.08	43.98±0.58	40.15±0.68	42.04±0.88
T2	38.65±1.17	40.78±1.05	40.07±0.58	39.30±1.28	39.70±1.02
T3	38.65±1.17	44.27±1.59	44.25±0.04	40.23±0.17	41.85±0.74
T4	38.65±1.17	40.97±1.22	40.19±0.45	39.68±0.55	39.87±0.85
T5	38.65±1.17	43.92±0.53	43.51±1.43	39.84±0.55	41.48±0.92
T6	38.65±1.17	40.58±1.40	39.62±0.56	39.94±0.78	39.70±0.98
T7	38.65±1.17	43.81±0.44	40.38±1.05	40.17±1.40	40.75±1.02
T8	38.65±1.17	40.65±1.08	38.40±1.11	37.24±0.17	38.74±0.88
T0	34.56±0.65	34.56±0.65	34.56±0.65	34.56±0.65	34.56±0.65
Mean	38.20±1.11	41.66±1.00	40.55±0.60	39.01±0.69	
RLSD for treatment		RLSD for level		RLSD for treatment * level	
1.29		0.86		2.58	

T0: control treatment without any fertilizer; T1:**100** % composting poultry manure ; T2:**100**% uncomposting poultry manure ;T3: composted (66% poultry manure + 16.5% wheat straw + 16.5% conocarps) ; T4: uncomposted (66% poultry manure + 16.5% wheat straw + 16.5% conocarpus) ; T5: composted (50% poultry manure + 25% wheat straw + 25% conocarpus) ; T6: uncomposted (50% poultry manure + 25% wheat straw + 25% conocarpus) ; T7: composted (33% poultry manure 33% wheat straw + 33 conocarpus) ; T8: uncomposted (33% poultry manure + 33% wheat straw + 33% conocarpus). L0:0% organic fertilizer; L50:50% organic Fertilizer; L75:75% organic Fertilizer; L100:100% organic Fertilizer.

potassium availability as well as preventing potassium from loss.

Oil content in seeds: It can be seen from results of table 7 that oil content significantly increased in response to addition of organic fertilizers as compared to control treatment (T0). The highest oil content (42.04%) was recorded in T1 treatment without significant differences with T3 and T5 treatments. The oil content continued declining with decreasing poultry residue proportion in pile, with minimum value (34.56%) at T8 treatment. These findings are in harmony with those obtained by Lamyaa *et al.* (2016) and Abumere *et al.* (2019). Al-Hafiz (2011) pointed out that organic fertilizers contain vitamins such as thiamine riboflavin that stimulate growth and activate photosynthesis and carbohydrate synthesis, which is reflected positively in increasing the percent of oil.

Table 8. Effect of type and level of organic fertilizer on protein content in seeds (%± SE) of sunflower

Organic fertilizer treatment	organic fertilizer level				Mean
	L0	L50	L75	L100	
T1	22.02±0.39	24.27±0.41	26.33±0.53	26.79±0.29	24.85±0.41
T2	22.02±0.39	22.02±0.29	22.52±0.39	23.00±0.25	22.39±0.33
T3	22.02±0.39	23.62±0.51	24.56±0.44	25.19±0.23	23.84±0.39
T4	22.02±0.39	21.44±0.25	22.08±0.29	22.71±0.53	22.06±0.37
T5	22.02±0.39	22.90±0.39	23.25±0.51	24.46±0.39	23.15±0.29
T6	22.02±0.39	21.20±0.44	24.20±0.29	25.10±0.39	23.13±0.38
T7	22.02±0.39	23.19±0.25	23.90±0.15	23.44±0.51	23.01±0.33
T8	22.02±0.39	23.29±0.51	24.44±0.39	24.27±0.53	23.50±0.46
T0	18.23±0.39	18.23±0.39	18.23±0.39	18.23±0.39	18.23±0.39
Mean	21.60±0.39	22.24±0.38	23.27±0.38	23.68±0.39	
RLSD for treatment		RLSD for level		RLSD for treatment * level	
0.55		0.37		1.10	

T0: control treatment without any fertilizer; T1:**100** % composting poultry manure ; T2:**100**% uncomposting poultry manure ;T3: composted (66% poultry manure + 16.5% wheat straw + 16.5% conocarps) ; T4: uncomposted (66% poultry manure + 16.5% wheat straw + 16.5% conocarpus) ; T5: composted (50% poultry manure + 25% wheat straw + 25% conocarpus) ; T6: uncomposted (50% poultry manure + 25% wheat straw + 25% conocarpus) ; T7: composted (33% poultry manure 33% wheat straw + 33 conocarpus) ; T8: uncomposted (33% poultry manure + 33% wheat straw + 33% conocarpus). L0:0% organic fertilizer; L50:50% organic Fertilizer; L75:75% organic Fertilizer; L100:100% organic Fertilizer.

Rady and El-Yazal(2009) also suggested that some vitamins such as ascorbic acid can affect oil content due to that vitamin is regard as coenzyme involved in specific biochemical reactions in plants such as oxidative and non-oxidative decarboxylations. Lamyaa *et al*. (2016) revealed that increasing oil and protein in plant treated with organic residues to the improvement of different soil properties and fertility status, then enhancing growth parameters of crop. The superiority effect of T1 and T3 treatments on oil content strongly related to their enhancing effect on nutritional status (tables 4,5 and 6). Data presented in table 7 showed that L50 level (50% organic fertilizer + 50% chemical fertilizer) recorded the highest oil content in seeds (41.66%) with significant difference with the rest levels. The effect of application of organic fertilizer with dose of chemical fertilizer may be attributed to the positive effect on soil properties and supplying a proper nutrients for better growth resulting a higher oil content. This finding is in harmony with those obtained by Munir *et al.* (2007) and Lamyaa *et al.* (2016) who obtained the superiority of oil content in sunflower seeds treated with organic and chemical residues mixture as compared to individual organic or chemical fertilizer. The highest oil content (45.38%) was observed under T1L50 treatment followed by T3L50 and T3L75 treatments with oil content of 44.27 and 44.25%, respectively without significant differences among the three treatments. This result clearly indicated that there was marked effect of composted poultry residue and 50% recommended dose of chemical fertilizer (NPK) for obtaining higher oil content of sunflower seeds. However, mixing plant residues with high proportion of poultry residue (T3) also proved to be effective in improving oil content as compared to rest of combination treatments.

Protein content in seeds: The results of table 8 showed that all organic fertilizer treatments significantly increased seed protein content compared with control treatment. The highest protein content (24.85%) was recorded in T1 treatment followed by T3 treatment. The protein well correlated with plant growth, especially the leaf area. The higher the leaf area, the higher N uptake and nitrate reduction during the grain filling stage, resulting an increase in protein content (Wardlaw *et al.,* 1965). Greef (1994) stated that high value of reduced nitrogen (protein fraction) were found in in active leaf with high photosynthetic rate. Moreover, the increase in nitrogen content in plants plays an important role for increasing protein by converting cationic organic acids such as oxaloacetic acid and α-ketoglutaric acid into amino acids by a series of enzymatic reactions which bound together to form proteins (Mengel and Kirkby, 1982). Sugiyama *et al.* (1984) stated that soluble protein increased with suitable N supply and favorable growth conditions. In present study, there are high correlation between N in plant tissue (table4) and protein content in seeds.

Except that of T1 and T3, there are no clear differences among organic fertilization treatments, this may be due to the fact that higher oil content was associated with lower protein content of seeds. It can be believed that the treatments with high oil content (Table 7) will recorded low protein content leading to be more closer values to other treatments. This finding is consistent with many researchers who have pointed out a negative relationship between oil and protein content in sunflowers (Scheiner *et al.,* 2002 and Akbari *et al.,* 2011). Muhammad and Yunus (1991) suggest that carbon compounds resulting from the decomposition of carbohydrates convert into fatty acids rather than amino acids are more likely to form oil than protein. Increasing organic fertilizer level increased protein content with highest value (23.68%)in L100 level (table 8). Based on the negative correlation between oil and protein content in seeds, this result suggested that increasing protein content with increasing organic fertilizer level (table 8) was corresponded with decreasing oil content (table 7). The results of table 8 showed that application of organic fertilizer at L100 level gave the highest protein content at all fertilizer treatments. The minimum protein content (26.79%) was recorded in the treatment of T1L100 followed by treatment of T1L75 (26.33%) without significant differences between the two treatments. However, application of chemical fertilizer treatment (L0) recorded protein content of 22.02% which was higher than treatments belong L50 level while was lower than treatments belong L75 and L100 levels.

Conclusion

On the basis of results, it can be concluded that addition of organic fertilizers alone or integrated with chemical fertilizer improved nutrients status of plant and seed quality as compared with chemical fertilization treatment. It is important to compost organic residues proved to be more efficient manure influencing plant growth. It is further concluded that sunflower fertilizer with composted poultry residue along with 50% recommended dose of NPK, or fertilized with composted of (66% poultry residue + 16.5 wheat straw + 16.5% conocarpus residue) alone or integrated with 25% recommend dose of NPK appeared to be most appropriate for plant growth and seed oil content.

REFERENCES

Abumere, V. I., Dada, O. A., Adebayo, A. G., Kutu, F. R. and Togun, A. O. (2019). Different rates of chicken manure and NPK 15-15-15 Enhanced performance of sunflower (Helianthus annuus L) on ferruginous soil. *Inter. J. of Agron*.

Akbari, P., Ghalavand, A., Modarres, S. A. M. and Agha A. M. 2011. The effect of bio fertilizers, nitrogen fertilizer and farmyard manure on grain yield and seed quality of sunflower (*Helianthus annus* L.). *J. Agri. Tech*., 7(1): 173-184.

Al-Hafiz, A. A. 2011. Using algae and seaweed extracts to improve the growth and efficiency of horticultural crops. https: // kenan online. com. Pdf.

Al-Mohammady, 2009. The use of animal fertilizers and whey as a method of organic cultivation and its impact on the growth and production of potatoes. Ph.D. thesis. Facul. Agri. Univ. Baghdad.

Al-Mohammady, A. H. M. 2009. The use of animal fertilizers and whey as a method of organic cultivation and its impact on the growth and production of potatoes. Ph. D. Facul. Agri. Univ. Baghdad.

Balyan, J. K., Singh, P., Kumpawat, B. S. and Jain, L. K. 2006. Effect of integrated nutrient management on maize (Zea mays L.) growth and its nutrients uptake. Curr. Agric. 30(1-2): 79-82.

Bedcov, S. 1970. Modified soxhlet. Method for determination of oil content in sunflower seed. Belton Biljna Uljamasti. Br 2-3.

Black, C. A. 1965. Methods of soil analysis. Part 1. Physical Properties Amer. Soc. Agron, Inc. Pub., Madison, Wisconsin, U.S.A. PP: 770.

Bremner, J. M. 1970. Regular Kjeldahl methods. In: A.L. Page; R.H. Miller and D. R. Keeney 1982. (eds.) Methods of soil analysis. Part 2, 2nd ed. ASA. Inc. inadison, Wisconsin, U.S.A.

Buriro, M., Rais, M. N., Solangi, A. W., Soomaro, A., Gandahi, A. W. and Kashani, S. 2015. Impact of organic and inorganic manures on sunflower yield and components. Sci. Int. (Lahore). 27 (4): 3267-3270.

Chen, J. 2006. The combined use of chemical and organic fertilizers and/ or biofertilizer for crop growth and soil fertility. In International Workshop on Sustained Management of the soil-rhizosphere system for efficient crop production and fertilizer use. 16: 20.

Cooper, O. J. 2008. Soil tests and their value as indices of N availability to crops . In: Ir. G. L. Vander Burgt and Ir. B. Timmernans (eds.) soil nitrogen; Res. and Exten. Lois Bolk Inst. The Netherlands.

Cordell, D., Drangert, J. O. and White, S. 2009. The story of phosphorus: global food security and food for thought. *Glob. environ. Chang*., 19(2): 292-305.

Cresser, M. S. and J. W. Parsons 1979. Sulphuric perchloric and digestionof plant material for the determination of nitrogen, phosphorus, potassium, calcium and magnesium. *Anal. Chem. Acta.*, 109:431-436.

Esmaeilian, Y., Sirousmehr, A. R., Asghripour, M. R. and Amiri, E. 2012. Comparison of Sole and Combined Nutrient Application on Yield and Biochemical Composition of Sunflower under Water Stress. Inter. J. Appl. 2(3).

Gijsman, A. J. 1990. Soil water content as a key factor determining the source of nitrogen (NH_4^+ or NO_3^-) absorbed by Douglas-fir (pseudotsuga menziesii) and the pattern of rhizosphere pH along its roots. Canadian J. Res. 21: 616 - 625.

Gijsman, P., Tummers, D. and Janssen, K. 1995. Differences and similarities in the thermo oxidative degradation of polyamide 46 and 66. Pol. Degrade degradation of polyamide 46 and 66. Pol.Degrade. and stab. 49(1): 121-125.

Greef, J. M.1994. Productivity of Maize (*Zea mays* L.) in Relation to Morphological and Physiological Characteristics Under Varying Amounts of Nitrogen Supply. J. Agro.and Crop Sci. 172:317-326.

Hosseny, M. H. and Ahmed, M. M. M. 2009. effect of nitrogen organic and bio fertilization on productivity of lettuce (c. v. Romane) in sandy soil under Assiut conditions. Assiut. unv. Bull. Environ. Res. 12:79-93.

Imbeah, M. 1998. Composting piggery waste: a review. Bioresour. Technol. 63:197-203.

Jones, J. B., Wolf, B. and Mills, H. A. 1991. Plant analysis handbook. Micro. Macro. Pub. Inc. Georgia. USA.

Lamyaa, A. A., Dalia, A. S. and Magda, A. E. (2016). Seed Yield and Quality Of Sunflower (Helianthus annuus L) As influenced by integrated mineral and organic nitrogen fertilization systems. J. Soil Sci. and Agric. Eng. Mansoura Univ. 7 (1): 53-63.

Mahdy, A. M. 2011. Comparative effects of different soil amendments on amelioration of saline-sodic soils. Soil and Water Res.6(4): 205-216.

Mahrous, N. M., Ragab, A. A., Abotaleb, H. H., Taha, M. H., and El-Metwally, M. S. 2014. Effect of inorganic, organic and bio fertilizers on yield and yield components of sunflower under newly reclaimed soils. J. Plant Prod. 5(3): 427-441.

Mengel, K. and E.A. Kirkby 1982. Principle of Plant Nutrition. 4th ed.int. potash inst. Bern, Switzerland.

Modaihsh, A. S., M. S. Al-Swailem and M. O. Mahjoub 2004. Heavy metels content of commercial in organic fertilizers used in the kingdom of Saudi Arabia. Agric. and Mar. Sci. 9(1): 21-25.

Muhammad, A. K. and Yunus, K. M. A. 1991. Basics of plant physiology.Dar Al-Hekma. Print. Pub. Iraq.(In Arabic).

Munir, M. A., Malik, M. A. and Saleem, F. M. 2007. Impact of Intergration of crop manuring and Nitrogen Application on Growth Yield and Quality of Spring Planted Sunflower. Univ. Faisalabad, Afghanstan.

Murphy, T. and Riley, J. R. 1962. A modified single solution method for the determination of phosphate in natural waters. *Anal.Chem. Acta*. 27:31-36.

Mustafa, M. J. 2019. Effect of phosphorus fertilization through integrated nutrient management on some soil properties and growth of sunflower *(Helianthus annuus* L*.)*. M. Sc. Thesis. Facul. Agri. Univ. Basra..(In Arabic).

Page, A. L., Miller, R. H. and Keeney, D. R. 1982. Methods of soil analysis. Part (2) 2nd Agronomy 9.

Pandey, A. K., Sain, S. K. and Singh, P. 2016. A Perspective on integrated disease management in agriculture. *Bio. Bullet*., 2(2): 13-29.

Prasad, R. and J. F. Power 1997. Soil fertility management for substainable agriculture. Lewis pub. New York.

Rady, M. M. and El-Yazal, S. S. 2009. Response of sunflower seeds to soaking in maize grains extract and foliar spray with micronutrients under the newly reclaimed soil conditions. Egyptian J. Soil Sci. 49(3): 453-478.

Read, J.J., Adeli, A., Lang, D. J. and McGrew, N. R. 2019. Use of poultry litter, swine mortality compost, and FGD gypsum on reclaimed lignite mine soil in mississippi. *J. Amer. Soci. Min. and Rec*., 8(2).

Richards, L. A. 1954. Diagnosis and improvement of saline and alkalsoils. Agric. Handbook no 60. U.S. Dept. Agric. Washington D.C.

Scheiner, J. D., Gutie, F. H. and Lavado, R. S. 2002. Sunflower nitrogen requirement and 15N fertilizer recovery in Western Pampas, Argentina. *European J. Agron*., 17: 73-79.

Stachev, L., Velchev, E., Gorbanov, S., Matev. E. and Tanev, Z. 1990. Agro-chemistry, Zimazadat pub. Sofya.(In Arabic).

Sugiyama, T., Mizuno, M. and Hayashi, M. 1984. Partitioning of Nitrogen Among Ribulose- 1, 5-Biophosphate Carboxylase/oxygenase, Phosphoenolpyruvate Carboxylase, and Pyruvate Orthophosphate Dikinase as Related to Biomass Productivity in MaizeSeedlings. *Plant Physio*., 75: 665-669.

Wardlaw, J. F., Carr, D. J. and Anderson, M. J. 1965. The relative supply of carbohydrate and nitrogen to wheat grain and an assessment of the shady and defoliation techniques used for theses determination. *Aust. J. Agric. Res*. 16: 893-901.

Zhang, L. and Sun, X. 2016. Influence of bulking agents on physical, chemical, and microbiological properties during the two-stage composting of green waste. *Waste Manag*. 48: 115-126.

****