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EFFECT OF ORGANIC RESIDUE ON YIELD AND NUTRIENT UPTAKE OF WHEAT UNDER SANDY AND CALCAREOUS SOILS CONDITIONS

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ABSTRACT

Wheat crop production and improvement under unfavorable conditions is the main target for crop growers, breeders and investigators. Sandy and Calcareous soils in dry land areas are marginal for crops production in general. Two field experiments were conducted during 2008/2009 and 2009/2010 at Nubaira region, Al-Behera Governorate. To evaluate the effect of organic matter i.e. farmyard manure (FY) and fly ash or filter mud (FA) in different rates and ratios compared with chemical fertilizers recommended on yield, mineral content and grain quality of wheat Gemaza 9 cultivar under sandy and calcareous soils conditions.

Statistical analysis of the data indicated that all studied characters were significantly affected by different soil types. The highest values of grain, straw, biological yields and the content from N, P and K elements were resulted from planting under sandy soil conditions as compared to calcareous soil.

The results showed that there were significant differences among the fertilizer treatments for all studied wheat characters. Applying of organic manure and fly ash (filter mud) at the rate of 1% with ratio 2:1 produced the highest values of grain yield compared with chemical fertilizers. Also, the highest values of N uptake and protein % were obtained from 2% FY: FA with ratio 2:1 compared with control treatment.

The interaction between soil type and organic residue had a significant effect on all studied characters. Adding FY combined with FA with ratio (1:1) at the rate of 1% produced the highest values of grain yield, crop index and harvest index in sandy soil. It is recommended that application of the FY and FA not only recommended as a fertilizer but also as a soil conditioner to enhance yield of wheat in sandy and calcareous soils. Different levels of farmyard manure and fly ash positively influenced the physico-chemical properties of soil and improved yield of wheat crop in response to its favorable effects on the soil characteristics.

Generally, it can be concluded from this study that highest values of grain and straw yields, nutrient uptake and quality of grains could be achieved from wheat cultivar Gemaza 9 by addition the amendments of farmyard manure and fly ash as organic residues into newly reclaimed soils of Egypt as sandy and calcareous soils. Also, it is suggested that the recycling of organic materials from the agricultural usage as an organic-matter resource is recommended alternative to chemical fertilization in Egypt. In addition, the long-term applications of organic residue and/or manure have the most beneficial effects on grain yield and soil quality among the investigated types of fertilization.

Keywords: *Triticum aestivum*, yield, N, P & K uptake, organic fertilizer, sandy and calcareous soils.

INTRODUCTION

Wheat (*Triticum aestivum* L.) is the main diet for the Egyptian population so, it is considered one of the most important and strategic crops in Egypt. Wheat is the main winter cereal crop and is widely distributed all over the country in the valley, Delta and new reclaimed regions. There are several ways for increasing wheat production; one of them is the appropriate application of organic residues especially in the newly reclaimed areas.

Recently, great attention has been devoted to cultivate field crops in new reclaimed sandy soils. In general, under such unfavorable conditions and in soil characterized as low fertile, low organic matter content and high leaching rate thus the production of most crops in not economic and farmers have to apply high rates of chemical fertilizers to maintain satisfactory yield (Nofal and Salem, 2003; Zeidan *et al*., 2005 and Abd El-Ghany, 2007).

Adequate soil organic matter can greatly reduce the difficulties of good crop production system. Animal manure is commonly applied to the soil to improve soil fertility and increase crop yield; also; farmyard manure exhibited good potential as N sources for winter wheat production.

Many investigators (Fliessbach *et al*., 2000; Abd El-Ghany, 2007 and Enke *et al*., 2010) suggested that organic manure application increased the elements transfer between the solid phase and soil solution by the higher microbial activity. They also, reported that organic soil management improved the soil structure by increasing soil activity, thus reducing the risk of soil erosion and promoted the development of earth condition for plant. The activity of soil microorganisms was higher in organic farming system than others, which helped the nutrient more and faster.

Singh and Siddigui (2003) found that the farmyard manure application significantly enhanced the yield and uptake of N, P and K in wheat plant. The conjunctive use of fertilizers and local manure organic material in the newly cultivated desert soil had high favorable influence on wheat productivity than the recommended dose of NPK fertilizers alone (Abd El-Ghany, 2007 and Enke *et al*., 2010).

A tremendous mass of fly ash as a by–product obtained from the clarification of sugar cane industries. These waste residues present a problem for disposal; therefore it is useful to be used as an organic source. Sugar cane filter mud (fly ash) contain a considerable amount of plant nutrients mainly nitrogen. In addition, sugar cane fly ash is a good source of available N when applied to soil and its application can reduce the amount of nitrogen fertilizer required for optimum crop yield and play a role in decreasing the pollution effect of excessive N mineral fertilizer in soil (Yaduvanshi, 2003 and Mohammed, 2004).

There are a large volume of literature reporting the efficiency and effectiveness of FYM and other organic nutrient sources in maintaining soil fertility; most of the yield parameters of wheat crop improved in response to its favorable effects on the soil characteristics and sustaining productivity and that display their increased potential when integrated with inorganic fertilizers (Grant, 1981; Soliman *et al*., 2001; Nofal and Salem, 2003 and Yaduvanshi, 2003).

The objective of this investigation is study the effect of different sources and ratios of organic residues on yield and chemical composition of wheat under two types of new reclaimed sandy and calcareous soils.

MATERIALS AND METHODS

To improvement of wheat crop production under marginal and unfavorable sandy and calcareous soils in dry land areas conditions is the main target for crop growers. Therefore, two field experiments were conducted in two winter successive seasons of 2008/2009 and 2009/2010 on wheat in two different location at Nubaira region, Al-Behera Governorate, Egypt to study the effect of two types of organic residue in rate and ratio form on grain and straw yields and minerals content of wheat cultivar Gemaza 9. some properties of farmyard manure (FY) and filter mud or fly ash (FA) used during the two seasons are illustrated in Table 1.

Table 1: Some of properties of farmyard manure (FY) and fly ash (FA).

Characteristics	pH	EC dSm-1	Organic matter %	Organic carbon %	Total (%)			Available micro. nutrient (ppm)		
					N	P	K	Fe	Zn	Mn
Farmyard manure	7.97	2.6	66.68	38.76	1.78	0.31	0.89	412	138	281
Filter mud (fly ash)	8.82	0.72	69.14	40.20	2.37	1.48	0.49	1854	121	253

The experimental field design included 12 treatments, which include the check control, recommended dose of mineral fertilizer and some combinations between two types of organic residue as follows:

1. Control (without fertilizer)
2. NPK (recommended dose 100:50:50 kg /fed)
3. FY (1 %)
4. FY (2 %)
5. FA (1 %)
6. FA (2 %)
7. FY: FA (1%) 1: 1
8. FY: FA (1%) 2: 1
9. FY: FA (1%) 1: 2
10. FY: FA (2%) 1: 1
11. FY: FA (2%) 2: 1
12. FY: FA (2%) 1: 2

The experimental design of each experiment was a randomized complete block design in three replicates. Each experimental unit was (3.5 m length and 3 m width) occupying an area of 10.5 m^2 (i.e. 1/400 fed). The organic materials were thoroughly mixed with 0 – 30 cm of the surface soil layer according to each treatment before sowing and its maturity was detected by narrowing C/N ratio approximately 20/1. As well, some chemical and physical characteristics of soil were estimated according to Jackson (1986) and corresponding data are presented in Table 2.

Table 2: Some chemical and physical characteristics of the two types of soil under investigated.

Characteristics	Sandy soil	Calcareous soil
pH 1.2.5	8.25	8.09
EC 1:5	0.15	3.99
CaCO3	1.73	18.43
Organic matter %	0.31	0.48
Available N ppm	33.0	24.0
Available P ppm	11.0	9.00
Available K ppm	4.00	2.00
Mechanical analysis		
Sand %	82.52	58.07
Silt %	10.68	18.5
Clay %	6.8	23.15

Starting point of doses of 50 kg P_2O_5/fed and 50 kg K_2O/fed in the form of Superphosphate (15.5%) and potassium sulphate (48% P_2O_5) were added before planting, the recommended dose of nitrogen was added at the rate of 100 kg N/fed as ammonium nitrate (33.5% N) four times; the first one 21 days after sowing and then every 7- 10 days.

Wheat grains at the rate of 60 kg/fed were sown in hand drilled in rows 15 cm apart in the chosen soil on the last third of November for both seasons. Wheat plants in all treatments were irrigated by sprinkler irrigation at 4-5 days interval, for two hours through each irrigation with 300 L/h sprinkler discharge. The other practices of growing wheat were properly used for the management of the experimental plots throughout the cropping season. At the maturity stage, the plants were harvested in the first half of May in both seasons. Where plants of square meter per each plot were collected and separated into grains and straw to estimate grain and straw yields (Kg/fed). Crop index (grain yield/straw yield × 100) has been calculated. Harvest index was estimated according to the formula, grain yield/biological yield × 100. Samples of grains and straw from each treatment were oven dried, ground finely and stored in small bags for chemical analysis. Nitrogen percentage was estimated by using micro kjeldahel apparatus as well as phosphorus and potassium percentages were determined according to the method described by A.O.A.C. (1988). N, P and K uptake of grains and straw were calculated in Kg/fed by multiplying element percentage by dry weight of plants/fed.

Statistical analysis of all the obtained field data and the chemical analysis of nitrogen, phosphorus and potassium contents was done using Fisher analysis of variance methodology. A least significant difference test was applied at 5% probability level to determine the difference among treatment means (Steel and Torrie, 1984). In addition, the data of the two seasons showed nearly the same trend and the homogeneity of error test for two seasons was not significant. Thus, a combined analysis was done. The MSTAT computerized package program was subjected to the regular statistical analysis of variance (Nissen *et al*., 1985).

RESULTS AND DISCUSSION

Yield characters:

Effect of soil types:

Data reported in Table 3 show the effect of soil types on studied yield characters of wheat. The data indicated that the soil types *i.e.,* sandy and calcareous caused significant differences regarding all studied characters. The differences in the most of traits were more pronounced in sandy soil (the sandy soil showed the higher values for grain, straw and biological yield) than calcareous soil. Theses differences may be due to the influence of soil type by adding the organic residue as a soil conditioner in addition the characteristics of soil and its effect on wheat growth further, the resulted variation of microbial biomass carbon (MBC) and microbial biomass nitrogen. In this respect, many investigators reported the variation among soil types in their response to fertilization, changes in soil acidity and the size and activity and suitable sandy or calcareous soil (Dee *et al*., 2003; Muhammad and Muhammad, 2008 and Enke *et al*., 2010).

Table 3: Effect of soil type and fertilization treatments on yield characters of wheat (combined data).

Treatments	Grain yield kg/fed	Straw yield kg/fed	Biological yield kg/fed	Crop index	Harvest index
A- Soil types:					
Sandy	1971.85	3510.96	5482.81	55.88	35.55
Calcareous	1639.73	2904.6	4544.33	56.20	35.81
F. test	*	*	*	*	*
B-Fertilization treatments:					
Control	592.72	1535.74	2128.45	38.68	27.88
NPK	1939.95	3454.77	5394.72	56.36	36.03
FY 1%	1722.89	3224.37	4947.26	54.02	35.03
FY 2%	1910.78	3712.30	5623.08	52.75	34.41
FA 1%	1570.82	2752.01	4322.83	57.13	36.36
FA 2%	1677.01	2955.69	4632.70	56.87	36.24
FY : FA 1%					
1 : 1	2211.43	3073.30	5284.73	71.27	41.44
2 : 1	2246.85	3165.52	5412.37	70.99	41.52
1 : 2	1933.68	3736.65	5670.33	51.70	34.07
FY : FA 2%					
1 : 1	1928.01	3152.92	5080.93	60.91	37.84
2 : 1	2041.94	3797.96	5839.90	53.83	34.98
1 : 2	1893.42	3932.17	5825.59	47.99	32.38
LSD at 5%	**13.73**	**24.25**	**22.48**	**0.70**	**0.30**

FY: farmyard manure, FA: fly ash and ⁎: significant of F ratio at 0.05 level of probability.

Effect of organic residues:

Mean performances of the all fertilization treatments under investigation over all the two types of soils for all studied characters of wheat are presented in Table 3. The data indicated that the addition of farmyard manure and fly ash residue within all tested rates induced significant increase

in grain (grain yield in cereal crops, is an important factor in determining the fertility and productivity of a certain soil) and straw yield compared to both the control treatment and in some cases for recommended dose of NPK, and consequently the biological yield of wheat plant. Malewar *et al*. (1999) reported that a significant increase in dry matter weight of wheat crop treated with fly ash. This result was supported by Mlynkowiak *et al*. (2001) in response to the application of different doses of fly ash, which increased the grain yield in wheat crop. Dee *et al*. (2003) illustrated that the application of sugar industry wastes, including boiler ash, also increased grain yield in maize crop. Singh and Siddigui (2003) showed that the application of different doses of fly ash induced similar effect to the grain yield in rice crop. It is noteworthy that composted manure gave the highest grain yield (Deluca and Deluca, 1997 and Eghball *et al*., 2004). Blackshaw *et al*. (2005) similarly found that the manure fertilizer increased winter wheat shoot and production.

It is worthy to mention that obtained data of FY: FA (2:1) and (1:1) in the rate of 1% had beneficial and highly pronounced effect on grain yield production than other treatments, while the treatment FY: FA (1:2) in the rate of 2% gave high value of straw and yield than other treatments. Also, the treatment FY: FA (2:1) and (1:2) in the rate of 2% gave the maximum values of biological yield than other treatments. In respect to crop and harvest indexes, the highest values (71.27%) for crop index and (41.44% without significant differences with 41.52% which resulted from FY: FA (2:1) in rate of (1%) for harvest index obtained when the FY: FA (1:1) in rate of 1% was applied.

The results showed also that a maximum grain yield of 2246.85 kg per feddan was obtained from the treatment receiving FY: FA (2:1) in rate of 1% with significant difference with all of the remaining treatments. A minimum grain yield was recorded in the control (592.72 kg per feddan). With regard to chemical dose of NPK fertilizer; significant differences were recorded between this treatment and the one or more at least from the all of organic residue treatments. Several researchers (Hue *et al*., 1994; Tiwari *et al*., 1998; Abd El-Ghany, 2007 and Muhammad and Muhammad, 2008) had also stated that adding organic waste to soil improved the yield, yield components, and nutrient contents of several crops.

Effect of interaction:

Data in Table 4 represent wheat production under different sources and ratios of organic residues through the two types of soil. The addition of farmyard manure and fly ash residue within all tested rates resulted in significant increase in grain and straw yields as compared to the control treatment, and consequently the biological yield of wheat plant. Many investigators found that the addition of farmyard manure and filter mud had beneficial effect on grain and straw yields of wheat plant (Singh *et al*., 1991; Zeidan *et al*., 2005 and Abd El-Ghany, 2007).

Concerning the use of farmyard manure and fly ash (filter mud), the data showed increments regarding grain and straw yields in sandy soil in comparison to calcareous soil in response to all treatments. In the same time the data showed that applying farmyard manure and filter mud as a solo at

rate 2% were more effective in producing grain and straw than 1% for both soils.

The results also, indicated that application of farmyard manure and filter mud ratio at (1:1), (2:1) and (1:2) in both rate at 1% and 2% improve grain, straw and biological yields as compared with application farmyard manure and filter mud alone in both soil. Farmyard manure addition combined with filter mud may adjust the final C/N ratio mixture in order to obtain a preferable condition for enhancing the mineralization of the organic N.

The data also, indicated that the application FY and FA increased crop index and harvest index as compared with the control under the two types of soil. In addition it noticed that farmyard manure combined with filter mud at ratio (1:1) markedly increased grain yield, crop index and harvest index in sandy soil while increased crop and harvest indexes at ratio (2:1) in calcareous soil at rate 1%.

Table 4: The interaction effect between different sources and ratios of organic residues and the two types of soil on yield characters of wheat (combined data).

Treat-ments	Grain yield (kg/fed)		Straw yield (kg/fed)		Biological yield (kg/fed)		Crop index		Harvest index	
	Sandy soil	Calcareous soil	Sandy soil	Calcareous soil	Sandy soil	Calcareous soil	Sandy soil	Calcareous soil	Sandy soil	Calcareous soil
Control	621.33	564.10	1649.60	1421.87	2270.93	1985.97	37.68	39.68	27.36	28.40
NPK	2050.75	1829.15	3782.46	3127.08	5833.21	4956.23	54.23	58.50	35.16	36.91
FY 1%	1865.15	1580.62	3714.60	2734.15	5579.75	4314.77	50.22	57.83	33.43	36.64
FY 2%	2031.57	1789.99	4414.80	3009.81	6446.37	4799.80	46.02	59.48	31.51	37.30
FA 1%	1671.15	1470.48	2959.44	2544.58	4630.60	4015.06	56.47	57.79	36.09	36.62
FA 2%	1734.79	1619.23	3155.09	2756.29	4889.88	4375.52	54.99	58.75	35.48	37.01
FY : FA 1%										
1 : 1	2658.73	1764.13	3305.27	2841.32	5964.00	4605.45	80.44	62.10	44.58	38.31
2 : 1	2473.70	2020.00	3485.92	2845.12	5959.62	4865.11	70.97	71.00	41.51	41.52
1 : 2	2139.22	1728.14	4086.39	3386.91	6225.61	5115.05	52.36	51.03	34.36	33.79
FY : FA 2%										
1 : 1	2228.57	1627.45	3541.75	2764.10	5770.31	4391.55	62.93	58.88	38.62	37.06
2 : 1	2061.09	2022.79	3939.68	3656.25	6000.77	5679.04	52.32	55.33	34.35	35.62
1 : 2	2126.13	1660.71	4096.55	3767.79	6222.68	5428.49	51.90	44.08	34.17	30.60
LSD at 5%	**19.41**		**34.29**		**31.79**		**0.99**		**0.42**	

FY: farmyard manure, FA: fly ash and ⁎: significant of F ratio at 0.05 level of probability.

Chemical composition:

Nitrogen concentration, uptake and protein content:

Effect of soil types:

Regarding to the effect of soil types on the concentration and uptake of nitrogen in grains and straw of wheat as well as protein percentage, it clear that these characters significantly affected by soil conditions (Table 5). The highest values of these traits were resulted from the sandy soil as compared to the calcareous soil. The increments in nitrogen content and uptake as well as grain protein percentage may be due to the differences physiological and chemical properties of the two soil types under study.

Effect of organic residues:

Table 5 presented the obtained results regarding the concentration, uptake of nitrogen and grain protein in wheat plant which was treated with different rates and ratios of farmyard manure and fly ash. The results indicated that all applied treatments tended to significant increase nitrogen concentration and uptake in grain and straw plus grain protein percentage as compared with the control treatment. These results are in a harmony with that obtained by Lee *et al*., 2006 and Uyanoz *et al*., 2006. They stated that applying organic matter to the soil increased N content and uptake by grain and straw due to the beneficial effect of organic matter for improving the nutritional statue particularly nitrogen in the different soils.

Table 5: Effect of soil type and fertilization treatments on N content %, uptake kg/fed and protein content% of wheat (combined data).

Treatments	Grain			Straw	
	N content %	N uptake kg/fed.	Protein %	N content %	N uptake kg/fed
A- Soil types:					
Sandy	1.67	34.08	9.60	0.57	20.56
Calcareous	1.38	23.32	7.94	0.44	13.35
F. test	*	*	*	*	*
B- Fertilization treatments:					
Control	0.94	5.59	5.41	0.24	3.71
NPK	1.61	31.30	9.23	0.58	20.28
FY 1%	1.51	26.36	8.68	0.57	18.59
FY 2%	1.49	28.58	8.54	0.54	20.33
FA 1%	1.15	18.14	6.59	0.34	9.33
FA 2%	1.29	21.65	7.39	0.39	11.65
FY : FA 1%					
1 : 1	1.70	38.13	9.75	0.55	16.90
2 : 1	1.63	36.82	9.35	0.59	18.90
1 : 2	1.71	33.27	9.84	0.56	20.76
FY: FA 2%					
1 : 1	1.74	34.06	10.01	0.58	18.42
2 : 1	1.84	37.49	10.55	0.60	22.90
1 : 2	1.73	33.00	9.92	0.55	21.73
LSD at 5%	**0.13**	**4.60**	**0.73**	**0.06**	**2.87**

FY: farmyard manure, FA: fly ash and *: significant of F ratio at 0.05 level of probability.

It is importance to pronounce that, the nitrogen concentration in grain and straw yields with respect to ratio, rate and type of organic residue (FY: FA) were very bright. As well, the presented data also showed that N uptake was increased. This increase seems to be due to the increase in dry matter formation. In respect to the effect of farmyard manure and filter mud at different rates (1% - 2%) and ratios (1:1), (2:1) and (1:2); the data declared that applying the two source with other gave higher increase in total nitrogen for both grain and straw compared to farmyard manure or fly ash when applied alone. The same tendency was observed in nitrogen uptake and grain protein. The pronounced increment and highest values in N content and uptake in addition to the protein percentage in grains were noticed when

farmyard manure was combined with fly ash at rate 2% for all used ratios. Lee *et al*. (2006) concluded that fly ash (filter mud) could be mixed as a supplement with other inorganic soil amendments to improve the nutrient balance in paddy soils. These results are in line with those stated by Abd El-Ghany, 2007 and Enke *et al*., 2010).

Effect of interaction:

With reference to the effect of the interaction between soil types and organic residues on N content, uptake and grain protein percentage of wheat, it was significantly differed as presented in Table 6. The highest values of N and protein % were obtained from 2% FY: FA with ratio 2:1 (1.95% and 11.21%), respectively, for grains with sandy soil. Also, the highest values of N- uptake produced from 1% FY: FA (1:1) in the same soil (48.92 kg/fed). On the other hand the maximum values of N % and N- uptake for straw yield (0.68% and 26.79 kg/fed), respectively, resulted from 2% FY: FA (2:1).

Table 6: The interaction effect between different sources and ratios of organic residues and the two types of soil on N content %, uptake kg/ fed and protein content % of wheat (combined data).

Treatm-ents	Grain						Straw			
	N %		N uptake Kg / fed		Protein %		N %		N uptake Kg / fed	
	Sandy soil	Calcareous soil	Sandy soil	Calcareous soil	Sandy soil	Calcareous soil	Sandy soil	Calcareous soil	Sandy soil	Calcareous soil
Control	0.99	0.89	6.15	5.02	5.69	5.12	0.26	0.22	4.29	3.13
NPK	1.75	1.46	35.89	26.71	10.06	8.40	0.70	0.45	26.48	14.07
FY 1%	1.75	1.27	32.64	20.07	10.06	7.30	0.64	0.49	23.77	13.40
FY 2%	1.65	1.32	33.52	23.63	9.49	7.59	0.58	0.50	25.61	15.05
FA 1%	1.30	0.99	21.72	14.56	7.48	5.69	0.39	0.28	11.54	7.12
FA 2%	1.46	1.11	25.33	17.97	8.40	6.38	0.45	0.33	14.20	9.10
FY : FA 1%										
1 : 1	1.84	1.55	48.92	27.34	10.58	8.91	0.61	0.48	20.16	13.64
2 : 1	1.76	1.49	43.54	30.10	10.12	8.57	0.66	0.52	23.01	14.79
1 : 2	1.81	1.61	38.72	27.82	10.41	9.26	0.56	0.55	22.88	18.63
FY : FA 2%										
1 : 1	1.91	1.57	42.57	25.55	10.98	9.03	0.65	0.50	23.02	13.82
2 : 1	1.95	1.72	40.19	34.79	11.21	9.89	0.68	0.52	26.79	19.01
1 : 2	1.87	1.58	39.76	26.24	10.75	9.09	0.61	0.49	24.99	18.46
LSD at 5%	**0.18**		**6.50**		**1.03**		**0.08**		**4.02**	

FY: farmyard manure, FA: fly ash and ⁎: significant of F ratio at 0.05 level of probability.

Phosphorus concentration and uptake:

Effect of soil types:

From data in Table 7, it can clearly seen that phosphorus concentration and uptake in grains and straw of wheat plant were significantly affected by different soil conditions. Phosphorus content and uptake in grains and straw were higher in the sandy soil as compared to the calcareous soil. The increments in phosphorus content and uptake in grain and straw may be due to the differences physiochemical of the soil properties.

Table 7: Effect of soil type and fertilization treatments on P content % and uptake kg/fed of wheat (combined data).

Treatments	Grain		Straw	
	P content %	P uptake kg/fed	P content %	P uptake kg/fed
A- Soil types:				
Sandy	0.39	7.82	0.16	5.89
Calcareous	0.35	5.92	0.13	3.85
F. test	*	*	*	*
B- Fertilization treatments:				
Control	0.22	1.31	0.10	1.55
NPK	0.36	7.03	0.13	4.56
FY 1%	0.30	5.20	0.14	4.38
FY 2%	0.34	6.42	0.15	5.57
FA 1%	0.35	5.43	0.13	3.62
FA 2%	0.37	6.21	0.15	4.32
FY : FA 1%				
1 : 1	0.37	8.27	0.14	4.35
2 : 1	0.39	8.81	0.16	5.13
1 : 2	0.43	8.34	0.17	6.42
FY : FA 2%				
1 : 1	0.39	7.58	0.14	4.36
2 : 1	0.43	8.78	0.18	6.68
1 : 2	0.48	9.09	0.19	7.52
LSD at 5%	**0.03**	**1.00**	**0.01**	**0.78**

FY: farmyard manure, FA: fly ash and *: significant of F ratio at 0.05 level of probability.

Effect of organic residues:

With respect to the effect of different organic residue farmyard manure either alone or with mixed fly ash and different rates and ratios on phosphorus content and uptake in grains and straw of wheat plant. The results showed an obvious increase for the different treatments as compared with control. The data also reported that the addition of organic material was effective either individual or mixed with other. The highest values of phosphorus content and uptake were produced from application of 2% FY: FA (1:2) which were 0.48% and 9.09 Kg/fed for grains and 0.19% and 7.52 Kg/fed for straw compared with the other treatments. Similar conclusion was reported by Singh and Siddigui (2003).

Effect of interaction:

Table 8 indicated that there was a significant effect of the interaction between different soil conditions and organic residues on phosphorus content and uptake in grains and straw of wheat plant. .The highest values of P % and P uptake were obtained from 2% FY: FA with ratio 1:2 (0.48 and 0.48%, 10.21 and 7.97 Kg/fed), respectively, for grain yield with sandy and Calcareous soils .There is no significant differences between FY: FA 2% with ratio 1:2 and 1% FY: FA (1:1) in P uptake (10.21 and 10.37 Kg/fed) for grain under sandy soil. In turn the increase in P and K levels of farmyard manure and fly ash enhanced microbial activates which increase nutrients availability

and their uptake and increasing root distribution. Similar results have been reported by Mohammed, 2004; Lee *et al*., 2006; Uyanoz *et al*., 2006 and Enke *et al*., 2010.

Table 8: The interaction effect between different sources and ratios of organic residues and the two types of soil on P content % and uptake kg/ fed of wheat (combined data).

Treatments	Grain				Straw			
	P %		P uptake Kg / fed		P %		P uptake Kg / fed	
	Sandy soil	Calcareous soil	Sandy soil	Calcareous soil	Sandy soil	Calcareous soil	Sandy soil	Calcareous soil
Control	0.25	0.19	1.55	1.07	0.11	0.09	1.81	1.28
NPK	0.40	0.32	8.20	5.85	0.15	0.11	5.67	3.44
FY 1 %	0.32	0.28	5.97	4.43	0.14	0.13	5.20	3.55
FY 2%	0.35	0.32	7.11	5.73	0.15	0.15	6.62	4.51
FA 1%	0.35	0.34	5.85	5.00	0.15	0.11	4.44	2.80
FA 2%	0.38	0.36	6.59	5.83	0.16	0.13	5.05	3.58
FY : FA 1%								
1 : 1	0.39	0.35	10.37	6.17	0.16	0.12	5.29	3.41
2 : 1	0.41	0.37	10.14	7.47	0.18	0.14	6.27	3.98
1 : 2	0.44	0.42	9.41	7.26	0.19	0.15	7.76	5.08
FY : FA 2%								
1 : 1	0.41	0.37	9.14	6.02	0.16	0.11	5.67	3.04
2 : 1	0.45	0.41	9.27	8.29	0.20	0.15	7.88	5.48
1 : 2	0.48	0.48	10.21	7.97	0.22	0.16	9.01	6.03
LSD at 5%	**0.04**		**1.41**		**0.02**		**1.10**	

FY: farmyard manure, FA: fly ash and $_*$: significant of F ratio at 0.05 level of probability.

Potassium concentration and uptake:

Effect of soil types:

Data in Table 9 revealed significant differences in K content and uptake in grains as well as K uptake in straw due to variation in soil conditions, except K content in straw. The highest values of K content and K uptake were produced from sandy soil as compared to calcareous soil. These increases may be due to the differences of the soil properties.

Effect of organic residues:

With regard to the effect of different organic residues on K content and uptake in grains and straw, it was clear that a significant effect for these treatments was found as shown in Table 9. The maximum values of K content and K uptake for grains which were 0.82% and 18.44 Kg/fed, respectively, were obtained from application of 1% FY: FA (2:1). In addition, the highest values of K content and uptake were recorded from 2% FY: FA (2:1) which were 2.71% and 102.83 Kg/fed for straw. While the lowest values of these traits resulted from the control (1.44% and 2.59 Kg/fed) for grains and (1.38% and 21.17 Kg/fed) for straw. Abd El-Ghany, 2007 and Enke *et al*., 2010 obtained similar results.

Table 9: Effect of soil type and fertilization treatments on K content % and uptake kg/fed of wheat (combined data).

Treatments	Grain		Straw	
	K content %	K uptake kg/fed	K content %	K uptake kg/fed
A- Soil types:				
Sandy	0.68	13.76	2.40	85.93
Calcareous	0.57	9.64	2.39	71.28
F. test	*	*	NS	*
B- Fertilization treatments:				
Control	0.44	2.59	1.38	21.17
NPK	0.59	11.42	2.67	92.77
FY 1%	0.61	10.57	2.14	68.76
FY 2%	0.65	12.44	2.37	84.60
FA 1%	0.54	8.54	2.26	61.88
FA 2%	0.60	10.04	2.30	67.89
FY : FA 1%				
1 : 1	0.66	14.69	2.71	83.21
2 : 1	0.82	18.44	2.52	79.86
1 : 2	0.64	12.44	2.70	101.21
FY : FA 2%				
1 : 1	0.64	12.47	2.44	77.36
2 : 1	0.65	13.18	2.71	102.83
1 : 2	0.72	13.64	2.59	101.74
LSD at 5%	**0.04**	**1.80**	**0.16**	**9.90**

FY: farmyard manure, FA: fly ash and *: significant of F ratio at 0.05 level of probability

Effect of interaction:

Concerning to Table 10 statistical analysis indicated that significant interaction was recorded between soil type and fertilization on K content and uptake in grains and straw. Application of fertilization treatment at the rate of 1% FY: FA with ratio 2:1 gave the highest values of K% and K uptake (0.87 and 0.76 %, 21.52 and 15.35 Kg/fed) for grains in both soils, respectively. Regarding to K % in straw yield, the highest values obtained from NPK fertilizer and the treatment of 1% FY: FA with ratio 1:2 in both soils. Also, with regard to K uptake in straw yield the maximum values (116.05 Kg/fed) resulted from 1% FY: FA (1:2) in sandy soil, but the treatment of 2% FY: FA (2:1) gave the highest value of K uptake (101.64 Kg/fed) in calcareous soil. In turn the increase in P and K levels of farmyard manure and fly ash enhanced microbial activates which increase nutrients availability and their uptake and increasing root distribution. These results are in a good agreement with that obtained by Mohammed, 2004; Lee *et al*., 2006; Uyanoz *et al*., 2006 and Enke *et al*., 2010.

Tisdale *et al*. (1985) illustrated that soil organic matter increases the availability of nutrients. These effects contributed to the increments of increasing the nutrient contents of leaves when compared with the control (Hue *et al.*, 1994; Tiwari *et al*., 1998 and Enke *et al*., 2010). Incorporations of organic amendments and plant residues to agricultural soils are a primary means to sustain soil organic-matter content and thereby enhance the soil biological activity, improve its physical properties, and increase its nutrient availability (Smith *et al*., 1993).

Table 10: The interaction effect between different sources and ratios of organic residues and the two types of soil on K content % and uptake kg/ fed of wheat (combined data).

Treatments	Grain				Straw			
	K %		K uptake Kg / fed		K %		K uptake Kg / fed	
	Sandy soil	Calcareous soil	Sandy soil	Calcareous soil	Sandy soil	Calcareous soil	Sandy soil	Calcareous soil
Control	0.46	0.41	2.86	2.31	1.42	1.33	23.42	18.91
NPK	0.65	0.52	13.33	9.51	2.88	2.45	108.93	76.61
FY 1 %	0.71	0.50	13.24	7.90	2.09	2.19	77.64	59.88
FY 2%	0.74	0.55	15.03	9.84	1.91	2.82	84.32	84.88
FA 1%	0.59	0.49	9.86	7.21	2.17	2.34	64.22	59.54
FA 2%	0.69	0.50	11.97	8.10	2.32	2.27	73.20	62.57
FY : FA 1%								
1 : 1	0.68	0.64	18.08	11.29	2.74	2.67	90.56	75.86
2 : 1	0.87	0.76	21.52	15.35	2.59	2.44	90.29	69.42
1 : 2	0.67	0.61	14.33	10.54	2.84	2.55	116.05	86.37
FY : FA 2%								
1 : 1	0.71	0.56	15.82	9.11	2.55	2.33	90.31	64.40
2 : 1	0.67	0.62	13.81	12.54	2.64	2.78	104.01	101.64
1 : 2	0.72	0.72	15.31	11.96	2.64	2.53	108.15	95.33
LSD at 5%	**0.06**		**2.55**		**0.23**		**14.00**	

FY: farmyard manure, FA: fly ash and $_{*}$: significant of F ratio at 0.05 level of probability.

Generally, the presented results indicated that, maximum values of grain and straw yields, nutrient uptake and quality of grains could be achieved from wheat cultivar Gemaza 9 by addition the amendments of farmyard manure and fly ash as organic residues into newly reclaimed soils of Egypt as sandy and calcareous soils. Also, the usages of organic residue have beneficial impacts on the environment from chemical pollution induced via the use of chemical fertilization and its harmful effect on human and animal health and nutrition plus saving the cost of chemical fertilizer. In addition, manipulation of wheat fertilization should be considered an important component of long-term crop management and sustainable crop production systems in sandy and calcareous soils. In the mean time, it produced significantly higher grain and straw yield of wheat as well as improving the soil mechanical characteristics. It is suggested that recycling of organic materials for agricultural usage as an organic-matter resource is an alternative organic fertilization option in Egypt.

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تأثير المخلفات العضوية على المحصول وإمتصاص العناصر فى القمح تحت ظروف الأراضى الرملية والجيرية

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يعتبر انتاج وتحسين محصول القمح تحت الظروف غير الملائمة (وبخاصة فى الأراضى الصحراوية حديثة الإستصلاح قليلة المادة العضوية وفى ظل قلة مياه الرى) من الأهداف الهامة لمربى المحاصيل بصفة خاصة ولزيادة الإنتاجية على المستوى القومى بصفة عامة. ولهذا أجريت تجربتان حقليتان خلال الموسمين الزراعيين ٢٠٠٨/٢٠٠٩ و٢٠٠٩/٢٠١٠ بمنطقة النوبارية – محافظة البحيرة. وكانت إحدى التجربتين بأرض رملية والتجربة الأخرى بأرض جيرية، وجميعها حديثة الإستصلاح غير ملحية فقيرة فى العناصر الغذائية. ولقد استهدفت التجارب دراسة تأثير المخلفات العضوية (المخلفات الحيوانية ومخلفات إستخلاص السكر) بمعدلات ونسب مختلفة ومقارنتها بالتسميد الكيماوى الموصى به على المحصول وامتصاص العناصر وجودة الحبوب فى القمح صنف جميزة ٩ تحت ظروف الأراضى الرملية والجيرية.

أشار التحليل الإحصائى للبيانات إلى وجود إختلافات معنوية كبيرة بين نوعى التربة تحت الدراسة ونتجت أعلى القيم لمحصول الحبوب ومحصول القش والمحصول البيولوجي ومحتوى الحبوب والقش من النيتروجين والفوسفور والبوتاسيوم من التربة الرملية مقارنة بالتربة الجيرية.

أوضحت النتائج أن هناك اختلافات معنوية لإضافة نظم التسميد العضوى المختلفة لجميع الصفات تحت الدراسة. حيث أن إضافة المخلفات الحيوانية والنباتية بمعدل ١% بنسبة ٢ : ١ أعطت أعلى قيم لمحصول الحبوب مقارنة بالسماد الكيماوى. أيضا نتجت أعلى القيم من النيتروجين الممتص والنسبة المئوية للبروتين من التسميد العضوى بمعدل ٢% بنسبة ١:٢ بالمقارنة بمعاملة الكنترول.

كان للتفاعل بين نوعى التربة ومعاملات التسميد تأثيراً معنوياً على جميع الصفات تحت الدراسة. ونتجت أعلى القيم لمحصول الحبوب ودليل المحصول ودليل الحصاد من إضافة المخلفات العضوية بمعدل ١% بنسبة ١:١. ونتجت أعلى قيمة للبروتين والنيتروجين الممتص من إضافة المخلفات العضوية بمعدل ١% بنسبة ١:٢ تحت ظروف الأراضى الرملية .

عموماً يمكن التوصية من خلال هذه الدراسة بإضافة المصلحات التى تتمثل فى المخلفات العضوية الحيوانية والنباتية الى الأراضى المصرية الحديثة الإستصلاح مثل الأراضى الرملية للحصول على أعلى محصول للحبوب والقش وامتصاص للعناصر وجودة الحبوب من القمح صنف جميزة ٩. كذلك ينصح بإعادة تدوير وإستخدام المخلفات الزراعية كمورد للأسمدة العضوية وبديلاً عن الإفراط فى التسميد الكيماوى وهذا ليس فقط لتحسين إنتاجية المحاصيل فحسب بل أيضاً لما له من تأثير إيجابى على تحسين خواص التربة حديثة الإستصلاح.

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