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Improving Wheat Productivity by Application Types Different of Fertilizer under Newly Reclaimed Soil Conditions

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TWO FIELD experiments were carried out at the Experimental Farm (Demo) of the Faculty of Agriculture, Fayoum University, during 2015/2016 and 2016/2017 seasons, to study the effect of organic and mineral nitrogen fertilizers under foliar application of micronutrients treatments on yield and its components of wheat plants. The experimental design was split-split plot arrangement in randomized complete blocks design with four replications where organic fertilizers were considered in the main plot, nitrogen levels arranged in the sub plot and the sub-sub plot was foliar application treatments. Results indicated that significant differences between organic fertilizers. Applying poultry manure at the rate of 10m^3/fad. gave the highest values of all studied characters. Addition, mineral nitrogen fertilizer at 80kg N/fad led to significantly increased in the all studied characters as compared to using (60kg N/fad and 40kg N/fad). Significant differences were observed among the foliar spraying treatments. Spraying in the mixture micronutrients (Fe, Mn and Zn at 100g/200L water/fad) recorded the highest values for all studied characters. From the above results it could be recommended that fertilizing wheat plants by poultry manure at the rate of 10m^3/fad and foliar spraying with mixture micronutrients (Fe, Mn and Zn at 100g/200L water/fad) as well as addition 80kg N/fad, to improve the productivity of wheat yield under newly reclaimed soil conditions in Fayoum Governorate.

Keywords: Wheat, Organic fertilizer, Mineral nitrogen fertilizer, Foliar application, Newly reclaimed soil, Yield and its components.

Introduction

Wheat (*Triticum aestivum* L.) is the major cereal crop in Egypt. In 2015 wheat cultivated area in Egypt was about 3.3 million faddan which producing about 9.4 million tones. However, it covers less than 55% of local consumption demand which reflects on the demand import about 45% of wheat grains (FAO, 2016).

To reduce the gap between production and consumption of wheat crop to confront its consumption exaggerated is an urgent prerequisite. Increasing wheat production is considered as one of the most important strategic goals in order to decrease the great gap between production and human consumption.

Solving these problems needs more hard effects to increase wheat yield. It can happen through some ways. One of that can go through increasing the cultivated area and the second way increasing wheat yield per unit area. Increasing the cultivated area within the old land of Nile Valley, however, in which wheat face severe competition with other winter crops especially clover. So, calls for the cultivation of wheat additional parcels in the newly reclaimed soil.

Growing wheat on the newly reclaimed soil especially calcareous soil faces various problems. This soil has poor physical properties and lacks organic materials, microorganisms; macro and micronutrients. To solve some of such problems, organic material and micronutrients in combination with inorganic fertilizers are needed.

Organic fertilizers reduce the application rate of chemical fertilizers and also help to solve the problem of micro-nutrient deficiency in the soil. Farmyard manure (FYM) is an organic material which its continuous addition to the soil increases its humus content year after year and improving physical and chemical conditions (Agamy et al., 2012). Poultry manure (PM) has long been recognized the most desirable organic fertilizer. It improves soil fertility by adding both major and essential nutrients as well as soil organic matter

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which improve moisture and nutrient retention (Farhad et al., 2009).

Nitrogen fertilization is an important and essential factor affecting wheat production all over the world especially in Egypt, because most of Egyptian soils contain insufficient nitrogen. Several research conducted in Egypt proved that there is a significant effect of nitrogen levels on most of growth characteristics, yield and yield components. The optimum nitrogen fertilizer levels for wheat in Egypt vary widely in amounts, they ranged between 40 and 120kg N/fad according to environmental conditions such as type and properties of soil (Mosaad & Fouda, 2016).

In Egypt, most soils suffer from micronutrients deficiency due to intensive cropping system and no interesting by micronutrients foliar at Egyptian local farmers. The micronutrients play an important role in increasing crop yield. Micronutrients have prominent effects on dry matter, grain yield and straw yield in wheat (Asad & Rafique, 2000). Iron plays role in biological redox system, enzyme activation and oxygen carrier in nitrogen fixation (Romheld & Marschner, 1991); Mn utilized in enzyme activation, electron transport and in disease resistance (Burnell, 1988); Zinc is important to membrane integrity and photochromic activities (Shkolnik, 1984).

Therefore, this investigation was established to study the effect of organic and mineral fertilizers under foliar application treatments and their interactions on yield and its components of wheat plants under newly reclaimed soil conditions in Fayoum Governorate.

Materials and Methods

Experimental site and plant materials

The present investigation was carried out at the Experimental Farm of Faculty of Agriculture, at Demo, Fayoum University, during the two successive growing seasons 2015/2016 and 2016/2017. The objective of this research was to study the effect of organic and mineral nitrogen fertilizers under foliar application of micronutrients treatments and their interactions on yield and its components of wheat plants.

Layout and experimental design

A split-split plot design arranged in randomized complete block with four replicates was used. Three Organic fertilizers treatments (O_1= Control, O_2= Farmyard manure at 20m^3/fad and O_3= Poultry manure at 10m^3/fad) were considered as the main plot. The sub plot was designated to three nitrogen levels (N_1= 40kg N/fad, N_2= 60kg N/fad and N_3= 80kg N/fad). Foliar application in the three treatments (F_1= Control, F_2= Spraying of water and F_3= Spraying of elements, i.e., Fe, Mn and Zn at 100g/200L water/fad) were arranged in the sub-sub plot. The size of each plot was 10.5m^2 (3.5m long and 3.0m width).

Cultural practices

Wheat variety Sakha 93 was obtained from the Wheat Department, Field Crops Institute Research, Agricultural Research Center, Giza, Egypt. Wheat grains variety Sakha 93 were sown at seed rate of 50kg/fad in rows 15cm and sowing date was November 24 and harvested in May 10th in both seasons. The preceding summer crop was maize (*Zea mays* L.) in both seasons. N fertilizer was added as ammonium nitrate (33.5% N). Phosphorus fertilizer was applied in the form of calcium superphosphate (15.5% P_2O_5) at the rate of 150kg P_2O_5/fad, added during the soil preparation. Potassium fertilizer was added in the form of potassium sulphate (48% K_2O) at the rate of 50kg K_2O/fad, added in one dose before first irrigation. Irrigation was carried out every two weeks. Other cultural practices were followed as recommended.

Soil analysis

Soil samples were taken from 0.0 to 60cm depth. Samples were air-dried, ground, sieved through a 2mm sieve and analyzed to obtain the physical and chemical properties of the soil.Mechanical analysis was determined according to the international pipette method as described by Piper (1950).

The organic matter was determined by Walkley and Black method as described by Hesse (1971). PH value was measured in the 1:2:5 soil-water suspension using Beckman glass ectrode, as described by Black et al. (1965). Electrical conductivity was measured in saturation extract of soil paste in dS m^{-1} as described by Jackson (1967).

The total nitrogen was determined using the conventional method of kjeldahl (Black et al,. 1965). Available phosphorus was calorimetrically determined at a wave length of 725n.m in the sodium bicarbonate saturations as described by Olsen & Sommers (1982).

The available potassium was determined by a flame photometer in the extraction with 1.0N ammonium acetate at pH 7 according to Knudsen et al. (1982). Physical and chemical analyses of the experimental soil are presented in Table 1.

Samples from the two organic fertilizers (farmyard manure and poultry manure) were collected at random before planting to measure the (NPK) as shown Table 2.

Field sampling and data collection:

At harvest, five guarded plants were taken at random from each sub-sub plot in the four replications to determine the agronomic data:

1- Plant height at harvest (cm).
2- Number of tillers/plant.
3- Number of spikes/plant.
4- Spike length (cm).
5- Number of spikelets/spike.
6- Number of grains/spike.
7- Weight grain/plant (g).
8-1000-grain weight (g).
9- Biological yield (ton/fad) which was calculated on the plot bases.
10- Grain yield (ton/fad) which was calculated on the plot bases.
11- Harvest index (%) which was estimated as: Grain yield/biological yield x 100.

Statistical analysis

Data were subjected to the proper statistical analysis as mentioned by Snedecor & Cochran (1980). Treatment means were compared using the Least Significant Difference (LSD) test at a probability level of ($P \leq 0.05$). The combined data across the two seasons were subjected to an ANOVA using MSTAT-C computer software.

Results and Discussion

Effect of organic fertilizers

Results in Table 3 indicate that organic fertilization treatments had a significant effect on all characters under study in the combined data of the two successive seasons. Application of organic fertilizers such as farmyard or poultry manure caused significant increases in all studied characters as compared to control treatment (without organic fertilization).Using poultry manure at the rate of $10m^3$/fad recorded the highest values for yield and its components. The increase in studied characters, due application of both farmyard and poultry manure, may be attributed to the role played by both in enhancement of plant growth due to enrichment of soil (increase in soil fertility, improvement of soil physical properties and water holding capacity, reduced the soil pH especially in the rhizosphare, decrease of the effect of salinity stress) and providing wheat plants with necessary growth nutrients. These results are in coincidence with those reported by Ghafoor et al. (2015), Jan & Boswal (2015) and Attia & Shaalan (2016).

TABLE 1. Some physical and chemical analysis of the experimental site "Demo Experimental Farm" (combined data over 2015/2016 and 2016/2017 seasons).

Physical analysis						
Depth (cm)	Particle size distribution				Bulk density (g/cm^3)	Hydraulic conductivity (cm/h)
	Sand(%)	Silt(%)	Clay(%)	Texture class		
0-20	72.50	12.90	14.60	Sandy loam	1.53	2.70
20-40	74.20	12.40	13.40	Sandy loam	1.56	2.47
40-60	73.20	12.10	14.70	Sandy loam	1.58	2.38
Mean	73.30	12.47	14.23	Sandy loam	1.56	2.52

Chemical analysis												
Depth (cm)	pH	EC_e $dS\ m^{-1}$	Soluble cations (meq/L)				Soluble anions (meq/L)				$CaCO_3$%	Organic matter%
			Ca^{++}	Mg^{++}	Na^+	K^+	$CO_3^=$	HCO_3^-	Cl^-	$SO_4^=$		
0-20	7.70	4.01	13.10	10.00	17.20	1.20	0.00	3.20	25.10	13.30	4.50	0.76
20-40	7.60	3.30	10.00	8.70	14.10	1.00	0.00	3.00	20.20	10.70	5.02	0.68
40-60	7.80	3.00	9.20	8.00	12.20	1.10	0.00	3.30	19.50	7.60	4.25	0.66
Mean	7.70	3.40	10.80	8.90	14.50	1.10	0.00	3.20	21.60	10.50	4.59	0.70

TABLE 2. Chemical analysis of farmyard manure and poultry manure used in both seasons.

Samples	N%	P%	K%
Farmyard manure	0.90	0.20	3.66
Poultry manure	3.30	0.60	2.26

Effect of nitrogen levels

Data presented in Table 3 reveal that yield and its components were significantly increased with increasing nitrogen levels in the combined data of the two successive seasons. The maximum means of yield and its components were produced from fertilizing wheat plants with 80kg N/fad as compared to 60kg N/fad or 40kg N/fad. The increase in these characters may be due to nitrogen fertilization role inactivation cells division, size, elongation, also metabolic and photosynthesis processes, therefore improving productivity of yield. Also, increased nitrogen fertilization led to increase production of wheat yield due to strong response to additions of nitrogen, which is regarded as the main element in the construction of amino acids, proteins and enters in many physiological processes in plant. These results are in harmony with those recorded by Abd El-Lattief (2013), Abou-Keriasha & Essa (2014), Bavar et al. (2016) and El-Temsah (2017).

Effect of foliar application

Foliar application with the applied micronutrients had a significant effect on all characters under study in the combined data of the two successive seasons (Table 3). The mixtures of three micronutrients (Fe, Mn and Zn) at the rate of 100g/200L water/fad, significantly ranked first and produced the highest values of yield as well as all its components as compared to control treatment (without spraying). Spraying of water at the same times came the second rank after mentioned treatment with significant differences. These results might be due to foliar application twice with mixture micronutrients (Fe, Mn and Zn) may be due to the role of micronutrients in increasing meristematic activity reflecting increases in yield and its components. These results were parallel with those reported by Ali et al. (2013), Mekkei et al. (2014), Gomaa et al. (2015), Gosavi et al. (2017) and Zaki et al. (2018).

Interaction effects:

Results in Table 4 showed that the effect of OxN interaction was significant on plant height, number of spikes/plant, spike length, weight of grains/plant, biological yield, grain yield and harvest index. While, number of tillers/plant, number of spikelets/spike, number of grains/spike and 1000 grain weight were insignificant. The interaction (O_3xN_3) recorded the highest values of yield, its components in the combined data of the two successive seasons. These results are in agreement with these obtained by Ahmad et al. (2013), Khan et al. (2016), Khatab et al. (2016) and Zhang et al. (2017).

Data in Table 5 revealed that OxF interaction effect was significant on number of tillers/plant, number of spikes/plant, spike length, number of grains/spike, weight of grains/plant, biological yield, grain yield and harvest index. However, plant height, numbers of spikelets/spike and 1000 grain weight were insignificant. The interaction (O_3xF_3) gave the highest values of all studied characters in the combined data of the two successive seasons. These results are in accordance with the results of Radwan et al. (2015) and Nadim et al. (2016),

As shown in Table 6 reported that the effect of NxF interaction was significant on number of tillers/plant, number of spikes/plant, spike length, number of grains/spike, weight of grains/plant, 1000 grain weight, biological yield, grain yield and harvest index. However, plant height and numbers of spikelets/spike were insignificant. The interaction (N_3xF_3) produced the highest values of all studied characters in the combined data of the two successive seasons. These results came in the similar point view with those reported by Faizy et al. (2017).

From obtained results in Table 7 indicated that OxNxF interaction effect was significant on number of tillers/plant, spike length, weight of grains/plant, biological yield, grain yield and harvest index. However, plant height, number of spikes/plant, numbers of spikelets/spike number of grains/spike, and 1000 grain weight were insignificant. The interaction ($O_3xN_3x F_3$) recorded the highest values of all studied characters in the combined data of the two successive seasons. Similar obtained by Al-Dulaimi et al. (2015).

Conclusion

It can be concluded that fertilizing wheat plants by poultry manure at the rate of 10m^3/fad and foliar spraying with mixture micronutrients (Fe, Mn and Zn at 100g/200L water/fad) with addition 80kg N/fad may be the best combination to improve the productivity of wheat under newly reclaimed soil conditions in Fayoum Governorate.

TABLE 3. Effect of organic, mineral nitrogen fertilizers and foliar application of micro elements on yield and its components of wheat plants (combined data over 2015/2016 and 2016/2017 seasons).

Factors	Traits	Plant height (cm)	No. of tillers/plant	No. of spikes/plant	Spike length (cm)	No. of spikelets/spike	No. of grains/spike	Weight of grain/plant (g)	1000 grain weight (g)	Biological yield (ton/fad)	Grain yield (ton/fad)	Harvest index%
Organic fertilizers (O)	O_1	87.57	4.12	3.90	9.39	16.76	42.78	9.58	48.82	4.58	1.62	35.37
	O_2	90.58	4.69	4.57	9.84	19.32	54.33	12.58	52.36	5.99	2.13	35.56
	O_3	95.04	4.87	4.61	10.29	19.88	56.74	13.09	52.96	6.28	2.33	37.10
Nitrogen fertilizers (N)	N_1	86.19	4.05	3.87	9.26	16.88	43.91	9.00	49.04	4.64	1.56	33.62
	N_2	89.82	4.63	4.46	9.82	18.66	51.68	12.06	51.56	5.59	2.04	36.49
	N_3	97.19	5.01	4.74	10.45	20.42	58.25	14.19	53.55	6.61	2.48	37.52
Foliar application (F)	F_1	88.14	4.31	4.14	9.47	17.56	46.40	10.29	49.60	5.07	1.73	34.12
	F_2	90.49	4.49	4.31	9.78	18.54	51.46	11.82	51.43	5.52	1.96	35.51
	F_3	94.57	4.87	4.62	10.29	19.85	55.98	13.15	53.11	6.27	2.39	38.12
$LSD_{0.05}$ for O		4.18	0.50	0.51	0.61	2.19	10.57	2.41	1.76	0.52	0.16	0.75
$LSD_{0.05}$ for N		3.55	0.43	0.41	0.71	1.39	4.84	1.65	1.67	0.48	0.20	0.93
$LSD_{0.05}$ for F		2.54	0.36	0.34	0.45	1.07	2.55	0.88	1.05	0.31	0.14	1.03

TABLE 4. Effect of organic fertilizers (O) x mineral nitrogen fertilizer (N) interaction on yield and its components of wheat plants (combined data over 2015/2016 and 2016/2017 seasons).

Factors (O)	Traits (N)	Plant height (cm)	No. of tillers/plant	No. of spikes/plant	Spike length (cm)	No. of spikelets/spike	No. of grains/spike	Weight of grain/plant (g)	1000 grain weight (g)	Biological yield (ton/fad)	Grain yield (ton/fad)	Harvest index %
O_1	N_1	83.71	3.57	3.43	8.61	16.03	34.67	7.67	46.73	4.27	1.36	31.85
	N_2	88.14	4.28	4.08	9.52	16.95	44.15	10.00	49.72	4.59	1.69	36.82
	N_3	90.85	4.50	4.18	10.05	19.48	49.51	11.07	50.02	4.89	1.82	37.22
O_2	N_1	84.99	4.28	4.28	9.36	17.51	47.82	9.89	50.30	4.96	1.68	33.87
	N_2	89.28	4.65	4.45	9.70	19.69	53.56	13.07	51.99	5.73	2.07	36.13
	N_3	97.48	4.71	4.98	10.47	21.23	61.61	14.78	54.78	7.27	2.63	36.18
O_3	N_1	89.84	4.29	3.91	9.81	17.09	49.26	9.43	50.08	4.70	1.64	34.89
	N_2	92.05	4.98	4.84	10.27	19.33	57.34	13.11	52.96	6.46	2.34	36.22
	N_3	103.25	5.33	5.07	10.82	20.54	63.61	16.74	55.84	7.66	3.00	39.16
$LSD_{0.05}$ for OxN		5.82	N.S	0.38	0.40	N.S	N.S	1.90	N.S	0.79	0.23	1.53

TABLE 5. Effect of organic fertilizers (O) x foliar application of micro elements (F) interaction on yield and its components of wheat plants (combined data over 2015/2016 and 2016/2017 seasons).

Factors (O)	Traits (F)	Plant height (cm)	No. of tillers/plant	No. of spikes/plant	Spike length (cm)	No. of spikelets/spike	No. of grains/spike	Weight of grain/plant (g)	1000 grain weight (g)	Biological yield (ton/fad)	Grain yield (ton/fad)	Harvest index %
O_1	F_1	84.43	3.92	3.79	8.78	16.28	39.42	8.88	47.07	4.26	1.45	34.04
	F_2	86.90	3.94	3.81	9.47	16.99	43.54	9.79	48.55	4.65	1.65	35.48
	F_3	91.37	4.48	4.10	9.94	17.01	45.37	10.06	50.86	4.85	1.77	36.49
O_2	F_1	88.95	4.35	4.07	9.62	18.49	49.36	10.89	50.87	5.44	1.77	32.54
	F_2	89.67	4.63	4.64	9.48	18.85	54.12	12.70	52.90	5.91	2.10	35.53
	F_3	93.13	5.09	4.99	10.43	20.61	59.50	14.17	53.30	6.61	2.52	38.12
O_3	F_1	91.03	4.67	4.56	10.02	17.91	50.43	11.11	50.85	5.49	1.96	35.70
	F_2	94.89	4.91	4.48	10.37	19.78	56.70	12.96	52.83	5.98	2.15	35.95
	F_3	99.20	5.04	4.78	10.49	21.93	63.08	15.23	55.19	7.35	2.87	39.05
$LSD_{0.05}$ for OxF		N.S	0.32	0.26	0.34	N.S	5.61	1.79	N.S	0.22	0.24	1.13

TABLE 6. Effect of mineral nitrogen fertilizer (N) x foliar application of micro elements (F) interaction on yield and its components of wheat plants (combined data over 2015/2016 and 2016/2017 seasons).

Factors (N)	Traits (F)	Plant height (cm)	No. of tillers/plant	No. of spikes/plant	Spike length (cm)	No. of spikelets/spike	No. of grains/spike	Weight of grain/plant (g)	1000-grain weight (g)	Biological yield (ton/fad)	Grain yield (ton/fad)	Harvest index %
N_1	F_1	83.10	3.93	3.70	8.95	16.34	41.25	7.98	46.94	4.22	1.26	29.86
	F_2	86.42	4.03	3.82	9.35	16.24	42.81	9.68	49.39	4.63	1.54	33.26
	F_3	89.02	4.18	4.09	9.49	18.07	47.68	9.34	50.78	5.09	1.88	36.94
N_2	F_1	87.57	4.45	4.41	9.58	17.61	45.35	10.85	50.71	5.28	1.84	34.85
	F_2	88.77	4.66	4.40	9.61	18.61	52.56	11.92	51.26	5.44	1.97	36.21
	F_3	93.11	4.79	4.56	10.27	19.75	57.13	13.41	52.70	6.06	2.30	37.95
N_3	F_1	93.74	4.56	4.31	9.88	18.74	52.60	12.04	51.13	5.69	2.09	36.73
	F_2	96.28	4.77	4.71	10.37	20.77	58.99	13.84	53.63	6.48	2.39	36.88
	F_3	101.56	5.64	5.22	11.09	21.75	63.14	16.70	55.87	7.66	2.97	38.77
$LSD_{0.05}$ for NxF		N.S	0.28	0.27	0.35	N.S	2.87	1.99	1.04	0.42	0.18	1.55

TABLE 7. Effect of organic fertilizers (O) x mineral nitrogen fertilizer (N) x foliar application of micro elements (F) interaction on yield and its components of wheat plants (combined data over 2015/2016 and 2016/2017 seasons).

Factors / Traits (O)	(N)	(F)	Plant height (cm)	No. of tillers/plant	No. of spikes/plant	Spike length (cm)	No. of spikelets/spike	No. of grains/spike	Weight of grain/plant (g)	1000 grain weight (g)	Biological yield (ton/fad)	Grain yield (ton/fad)	Harvest index %
O_1	N_1	F_1	78.44	3.25	3.08	7.97	15.20	33.74	6.73	44.44	3.98	1.18	29.65
		F_2	84.04	3.57	3.38	8.83	15.24	34.40	8.31	47.13	4.35	1.33	30.57
		F_3	88.67	3.88	3.82	9.03	16.23	35.87	7.97	48.60	4.49	1.57	34.97
	N_2	F_1	84.07	4.17	4.12	9.20	16.67	39.13	9.99	48.44	4.29	1.54	35.90
		F_2	87.14	4.17	4.10	9.37	16.80	44.70	9.92	49.07	4.65	1.77	38.06
		F_3	93.20	4.49	4.03	10.00	15.50	48.60	10.07	51.67	4.84	1.78	36.78
	N_3	F_1	90.78	4.34	4.17	9.18	16.97	45.37	9.92	48.34	4.50	1.64	36.44
		F_2	89.54	4.10	3.93	10.20	18.93	51.52	11.14	49.44	4.95	1.86	37.58
		F_3	92.24	5.07	4.45	10.77	19.30	51.64	12.14	52.30	5.22	1.95	37.36
O_2	N_1	F_1	84.84	3.94	3.82	9.30	16.70	44.10	8.70	49.20	4.53	1.36	30.02
		F_2	84.50	4.27	4.27	9.04	16.17	46.27	10.70	51.14	5.10	1.79	35.10
		F_3	85.64	4.65	4.75	9.73	18.00	53.07	10.28	50.57	5.27	1.90	36.05
	N_2	F_1	88.62	4.30	4.07	9.50	19.17	47.13	10.64	51.44	5.53	1.93	34.90
		F_2	88.57	4.55	4.43	9.02	19.10	53.77	13.18	51.84	5.65	2.04	36.11
		F_3	90.64	5.09	4.85	10.57	21.40	59.77	15.40	52.70	6.01	2.25	37.44
	N_3	F_1	93.40	4.80	4.33	10.03	19.60	56.83	13.32	51.97	6.25	2.03	32.48
		F_2	95.94	5.07	5.22	10.40	21.27	62.33	14.21	55.74	7.00	2.46	35.14
		F_3	103.10	5.54	5.38	10.97	22.44	65.67	16.81	56.64	8.56	3.40	39.72
O_3	N_1	F_1	86.04	4.60	4.20	9.57	17.10	45.90	8.51	47.17	4.15	1.24	29.88
		F_2	90.70	4.27	3.80	10.17	17.30	47.77	10.03	49.90	4.43	1.49	33.63
		F_3	92.77	4.00	3.72	9.70	19.95	54.10	9.76	53.17	5.53	2.18	39.42
	N_2	F_1	90.03	4.88	5.05	10.04	16.98	49.77	11.92	52.27	6.02	2.07	34.39
		F_2	90.60	5.25	4.67	10.44	19.94	59.20	12.67	52.87	6.02	2.09	34.72
		F_3	95.49	4.80	4.80	10.24	22.34	63.04	14.75	53.74	7.32	2.87	39.21
	N_3	F_1	97.04	4.54	4.42	10.44	19.63	55.60	12.89	53.10	6.31	2.59	41.05
		F_2	103.37	5.15	4.98	10.50	22.10	63.14	16.17	55.74	7.49	2.85	38.05
		F_3	109.34	6.32	5.82	11.54	23.52	72.10	21.17	58.67	9.19	3.57	38.85
$LSD_{0.05}$ for OxNxF			N.S	0.33	N.S	0.39	N.S	N.S	1.63	N.S	0.57	0.23	1.05

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تحسين إنتاجية القمح بتطبيق أنواع مختلفة من الأسمدة تحت ظروف الأراضي المستصلحة حديثاً

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اقيمت تجربتان حقليتان بمنطقة دمو بمزرعة كلية الزراعة بجامعة الفيوم خلال موسمي 2016/2015 و2017/2016 بهدف دراسة تأثير الأسمدة العضوية والنيتروجين المعدني تحت معاملات الرش الورقي بالعناصر الصغرى على المحصول ومكوناتة لنباتات القمح. تم ترتيب المعاملات بنظام القطع المنشقة مرتين في تصميم القطاعات الكاملة العشوائية فى أربعة مكرارات. حيث وزعت الأسمدة العضوية في القطع الرئيسية ومستويات التسميد النيتروجيني المعدني في القطع المنشقة ومعاملات الرش الورقى في القطع تحت المنشقة. أظهرت النتائج وجود اختلافات معنوية بين الأسمدة العضوية حيث أعطي سماد الدواجن المضاف بمعدل 10م^3/فدان أعلى القيم لجميع الصفات المدروسة. أدت إضافة التسميد النيتروجيني المعدني بمعدل 80كجم/فدان إلى زيادة معنوية في جميع الصفات المدروسة مقارنة بمستويات الإضافة الإخرى (60كجم/فدان، 40كجم/فدان). سجلت معاملة الرش بمخلوط العناصر الصغري من الحديدوالمنجنيز والزنك أعلى القيم معنوياً لجميع الصفات المدروسة. يمكن التوصية بتسميد نباتات القمح بسماد الدواجن بمعدل 10م^3/فدان ورشها بمخلوط العناصر الصغرى من الحديد والمنجنيز والزنك بمعدل 100جم/200 لترماء/فدان مع إضافة التسميد النيتروحيني المعدني بمعدل 80كجم/فدان لتحسين إنتاجية محصول القمح تحت ظروف الأراضي المستصلحة حديثاً بمنطقة دمو بمحافظة الفيوم.