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The effect of ammonia gas and compost on growth, yield and grain nutritional status of wheat crop under Fayoum Governorate conditions

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ABSTRACT:

Current study was conducted to evaluate the effect of applied anhydrous ammonia (AA) and compost (C) on the growth, yield and grain nutritional status of wheat crop. Therefore, a factorial experiment including 6 treatments (3 anhydrous ammonia rates x 2 levels of compost amendment) with 3 replications was conducted at Tamiya farm affiliated to the Agricultural Research Center in Fayoum Governorate during the seasons 2016/2017 and 2017/2018. Anhydrous ammonia was injected directly into the soil at rates of (control (50), 70, 90) kg N fed^{-1}, however compost amendment was added at levels of (control (zero addition) and 5) t fed^{-1}. The results showed that the highest values of dray matter accumulation rate, grain nutritional status, straw yield and grain yield of wheat crop were associated with the addition of AA at a rate of 90 kg N fed^{-1} in combination with 5 t fed^{-1} of compost amendment. Interestingly the use of AA at the rate of 90 kg N fed^{-1} didn't cause significant effect on above-mentioned parameters as compared with AA at the rate of 70 kg N fed^{-1}. Accordingly it could concluded that the use of 70 kg N fed^{-1} instead of 90 kg N fed^{-1} coupled with compost amendment could be applied as a valuable a gro-management and environment-friendly approach for enhancing growth and yield of wheat crop, improving soil quality and increasing fertilization use efficiency under the conditions of Fayoum Governorate-Egypt.

KEYWORDS: anhydrous ammonia, compost, wheat yield, wheat straw, soil properties

1. Introduction:

Wheat (*Triticum aestivum* L.) is the most important cereal crop in Egypt. Any effort to increase wheat yield to face the increasing gap between wheat production and consumption is highly appreciated. This goal could be achieved by increasing productivity as well as the cultivated area which lead to increasing the use of chemical fertilizers, especially nitrogen. Total cultivated area in Egypt 3.32 million feddans. **FAOSTAT (2021)** reported that Egypt's market wheat production of 9 million tons with average productivity of 2.71 t fed^{-1}.

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Anhydrous ammonia (AA) is a favorite N fertilizer of producers as it has proven to be a reliable and economical source of N. Anhydrous application methods and equipment have changed little over the past 70 years. The addition of anhydrous ammonia at 100 kg N feed resulted in considerable increases in straw, grain, and biological wheat yields. The addition treatment of (100kg N fed.-1 as AA + 6 Mg fed.$^{-1}$ compost + bio) resulted in the greatest values (76.9 and 128.4 kg fed.$^{-1}$) for N and K percent, respectively, while 26.8 kg fed.-1 for P-percent was seen due to anhydrous ammonia at 100 kg N fed.$^{-1}$ + 6 Mg fed.$^{-1}$ compost **(El-Rahman et al., 2016**.) The application of AN (Nitrate Nitrogen) in conjunction with AA (12.5 kg NO_3-N / 87.5 kg NH_4-N) was found to be the most effective in increasing the uptake of N, P, and K as well as protein production in wheat grains, achieving increases of 82.3%, 104.8%, 84.9%, and 82.3% as compored to control respectively. The maximum N and P uptake in straw was achieved by increasing the rate of NH4-N as anhydrous ammonia (100 kg N fed.$^{-1}$) in the absence of NO_3-N, with 99.8% and 72.6% increases for both elements, respectively **Abdel Wahab et al., (2017)**. **Abdelkhalek et al., (2015)** revealed that under North Nile Delta conditions, fertilizing the wheat with 75 kg N fed.$^{-1}$ in the form of ammonia gas resulted in the maximum yield and yield components of the Misr-1 wheat cultivar. The findings of **Ismail et al., (2014)** demonstrate that, in comparison to urea, anhydrous ammonia substantially generated tallest and heaviest plants, more spikes m^{-2} and grains spike^{-1} as well as greater 1000 grain weight and grain and straw yields. Additionally, compared to urea, plants infused with anhydrous ammonia absorbed more N, P, and K.

Compost use one of the most important factors, which contribute to increased productivity and sustainable agriculture. Most of investigators confirmed that compost application could improve the physical, chemical and biological characteristics, soil organic matter, and nutrient status of the soils. All long-term compost application trials result in increased SOM concentrations. In addition, due to its multiple positive effects on the physical, chemical and biological soil properties, compost contributes to the stabilization and increase of crop productivity and crop quality **Adugna, (2016).**

Therefore, this study was conducted to evaluate the effect of applied of anhydrous ammonia (AA) and compost amendment at different rates on growth and productivity of wheat crop.

2. MATERIAL AND METHODS:

Two field experiments were conducted in the farm of the Agricultural Research Center (experimental farm) with a texture of clay loam soil during the growing seasons 2016/2017 and 2017/2018. Anhydrous ammonia (AA) has been used as a source of nitrogen fertilizers at different rates of 50, 70 and 90 kg N fed.$^{-1}$ and was injected to a depth of 15 cm from the soil surface. Compost (C) was mixed thoroughly with the soil one month before sowing at rate of (zero and 5 Mg fed^{-1}). The treatments were combined in the complete design of the randomized blocks with three replicates for wheat plants.

The chemical compositions of the Compost are shown in Table (1). Compost manure was prepared according to **Nasef et al., (2009)**.

Table 1. **Chemical composition of the compost used in the experiment:**

Characteristics	Organic carbon %	N %	C \ N ratio	pH (1:2.5 extract)	ECe, (dS/m)	$CaCO_3$, %
Compost	46.5	1.30	35.76	7.76	3.15	1.50

2.1. Location

The experimental Farm of the Agric. Res. Center at Tamia, Fayoum Governorate, Egypt (is situated 29° 27' 57.0" N and 30° 56' 13.5" E). Physical and chemical analyses of experimental site are presented in Table (2).

Table 2. some physical and chemical properties of the study soil.

Particle size distribution				Texture	O.M (%)	$CaCo_3$ (%)
Coarse sand (%)	Fine sand (%)	Silt (%)	Clay (%)	Clay		
10.45	**27.56**	**21.25**	**40.74**	**Loam**	**0.45**	**4.51**

ECe,dS m^{-1} soil paste ex.	pH (1:2.5)	Cations (mmolc L^{-1})				Anions (mmolc L^{-1})			
		Ca^{+2}	Mg^{+2}	Na^{+}	K^{+}	CO_3^{-2}	HCO_3^{-}	Cl^{-}	SO_4^{-2}
2.47	8.1	3.3	1.0	7.4	0.2	-	1.6	3.6	6.7

2.1.1. Experimental design

A factorial experiment including 6 treatments with 3 replications was set up. Each main plot of land has an area of about 135 m^2 and is divided with bridges. Compost levels were established in sub-plots. Each plot of different treatment application has received the P and K in accordance with the recommendations of the Egyptian Ministry of Agriculture. The sub-plot area was (3.75 × 2 = 7.5 m^2) and 3 replicates were used for each treatment (3 × 6 =18).

wheat variety (*Triticum aestivum* cv. Sidis 12) in the 2016/2017 and 2017/2018 planting seasons and using the typical management practices used at each site. The wheat was manually planted from November 20 to November 25. Each planting season, wheat plants were harvested 120 days after being sown.

2.2. Measurements

Soil samples from the experimental field were collected at depths of 0 to 30 cm from each site examined during the 2016/2017 and 2017/2018 planting seasons and before the application of anhydrous ammonia, compost. Then measurements and calculations of some soil properties were done on the collected soil samples according to **Klute and Dirksen (1986)** for physical and **Page et al. (1982)** for chemical analysis.

2.2.1 Growth parameters

1-The dry weight of the wheat plant was recorded in the tillering (45 days after planting).2- Wheat plants were cut, dried in the oven at 70 °C for 48 hours 3- tillers number, spike length 4-1000 grain weight

2.2.2 Yield and yield components

The following harvest parameters were determined grain yield ton $fed.^{-1}$, straw yield ton $fed.^{-1}$ and grain nutritional status (i.e. N %, P %, K % and protein) in grains.

2.3 Statistical and data analysis

The complete randomized blocks (split plot) design with three replicates was used and the collected data were statistically analyzed using the procedures outlined by **Snedecor (1967)**. Data of the two seasons were subjected to statistical analysis of variance (ANOVA), and the least significant differences (L.S.D) at 5% level.

3 RESULTS AND DISCUSSION:

3.1. Soil properties:

The data in table (3) showed the effect of used anhydrous ammonia and compost amendment on soil pH, ECe and % organic matter in the 2016/2017 and 2017/2018 planting seasons. The pH values have been significantly reduced as a result of applied treatments. This flinging could be due to the release of hydrogen ions into the soil solution during the nitrification process, which converts the ammonium ion into the nitrate ion resulting in reduction of soil pH. Furthermore the decomposition of compost and release of organic acids may also induced reduction of pH. **Bouman et al., (1995)** reported that years after the addition of anhydrous ammonia, this reaction may have long-lasting effects on the pH of the soil, and in may be beneficial alkaline soils. The addition of anhydrous ammonia and compost on soil ECe led to a decrease in EC with the increase of anhydrous ammonia and compost application rate. This might be caused by produced acids when organic materials break down, which enhanced particle aggregation and soil porosity, which in turn boosted salt leaching. The following treatments can be placed in descending order based on how well they have reduced the soil EC: AA50 > AA70 > AA90. Similar results were recorded by to **Shaban and Helmy (2006)** who mentioned that organic matter produced conductive holes boosted the leaching process of soluble salts. According to Ismail et al. (2014), the rates of application of anhydrous ammonia led to a decrease in EC soil (90 kg N than 70 kg N). Organic matter also significantly increased due to applied treatment. **Bouajila and Sanaa (2011)** noted that addition of compost, manure and household wastes resulted in significant increase of organic carbon, however the compost treatment being the most efficient.

Table 3. Effect of anhydrous ammonia and compost pH, EC and O.M in soil

S.V		pH		ECe		O.M	
Seasons		**I**	**II**	**I**	**II**	**I**	**II**
anhydrous ammonia (AA) kg (N) fed^{-1}		*	*	*	*	*	*
AA_{50}		7.84 a	7.84 a	1.54 a	1.42 a	1.24 b	1.23 c
AA_{70}		7.82 ab	7.83 ab	1.49 b	1.32 ab	1.37 a	1.38 a
AA_{90}		7.80 b	7.82 b	1.27 c	1.17 b	1.34 a	1.35 b
Compost (C) Mg fed^{-1}		*	*	*	*	*	*
C_0		7.86 a	7.85 a	1.71 a	1.34 a	1.20 b	1.19 b
C_5		7.79 b	7.80 b	1.16 b	1.25 b	1.43 a	1.43 a
AA x C		*	*	*	*	*	*
AA_{50}	C_0	7.87 a	7.85 a	1.85 a	1.54 a	1.05 c	1.04 d
	C_5	7.81 b	7.84 a	1.24 d	1.26 b	1.34 ab	1.23 c
AA_{70}	C_0	7.86 a	7.83 ab	1.79 b	1.42 ab	1.24 b	1.30 c
	C_5	7.79 b	7.83 ab	1.18 e	1.26 b	1.43 a	1.41 a
AA_{90}	C_0	7.85 a	7.84 a	1.48 c	1.34 bc	1.31 b	1.34 b
	C_5	7.75 c	7.80 b	1.07 f	1.08 c	1.44 a	1.46 a

AA: anhydrous ammonia, C: compost amendment. I and II are first and second cultivation seasons respectively Mean values in each column followed by a different lower-case-letter are significantly different by Fisher's least-significant difference test (LSD) at $p \leq 0.05$. Each value is average of 3 replicates.

3.2 Soil available macronutrients content (N, P and K):

data presented in Table (4) indicated a considerable increase in the amount of N, P, and K that was available in the soil response of applied treatments and their combinations soil. The greatest values of these macronutrients were observed for plots fertilized with AA at 90 kg (N) fed^{-1} without significant increase as compared with the addition of AA 70 kg (N) fed^{-1}. Same trend was observed due to applied compost at 5 t $fed.^{-1}$ which significantly increased the amount of these elements compared with control. According to **Bhandari et al., (2002)** a gradual release of N from manure is a contributing factor to compost's beneficial effects. The increases in both P and K could be attributed to the P and K fractions introduced by organic manures that were released during decomposition over time. Additionally, **Mohamed et.al., (2016)** stated that the microorganisms' activities must have caused a decrease in soil pH as a result of the production of organic and inorganic acids during the breakdown of these organic materials, which might be increased the amount of available forms of elements in the rhizosphere zone. These findings are consistent with those of **Ewees and Abdel Hafeez (2010).**

Table 4. Effect of anhydrous ammonia and compost on soil available macronutrients N, P and K content

S.V		N		P		K	
Seasons		**I**	**II**	**I**	**II**	**I**	**II**
anhydrous ammonia (AA) kg (N) fed^{-1}		*	*	*	*	*	*
AA_{50}		46.85 c	46.33 a	6.49 b	6.36 b	210 c	211 b
AA_{70}		50.02 b	50.58 b	6.90 a	6.97 a	213 b	219 a
AA_{90}		52.58 a	54.60 c	7.06 a	6.97 a	233 a	226 a
Compost (C) Mg fed^{-1}		*	*	*	*	*	*
C_0		45.74 b	47.20 b	6.16 b	6.45 b	215 b	213 b
C_5		53.89 a	50.58 a	7.48 a	6.83 a	223 a	221 a
AA x C		*	*	*	*	*	*
AA_{50}	C_0	44.64 e	45.36 f	5.85 d	6.21 c	204 c	210 c
	C_5	49.06 c	47.30 e	7.04 b	6.56 bc	215 b	212 c
AA_{70}	C_0	46.06 d	48.95 d	6.42 c	6.63 b	206 c	216 b
	C_5	53.98 b	53.31 b	7.71 a	7.30 a	220 b	225 b
AA_{90}	C_0	46.53 d	52.21 c	6.54 b	6.64 b	232 a	220 b
	C_5	58.63 a	55.89 a	7.70 a	7.29 a	233 a	242 a

AA: anhydrous ammonia, C: compost amendment. I and II are first and second cultivation seasons respectively. Mean values in each column followed by a different lower-case-letter are significantly different by Fisher's least-significant difference test (LSD) at $p \leq 0.05$. Each value is average of 3 replicates.

3.3 Plant growth traits:

Table (5) show the effect of applied anhydrous ammonia and compost and their interactions the accumulation of dry matter, tillering number and spike length of wheat plants. The used various treatments in both seasons 2016/2017 and 2017/2018 led to significant increases in the plant dry matter. The best results were associated with N application rate of (90 kg N fed.$^{-1}$) followed by (70 kg fed.$^{-1}$) and (50 kg fed.$^{-1}$). Similar trend was observed as a result of applied compost amendment. This increase of dry matter accumulation is According to the **Wyckoff (2012)**, the use of compost fertilizer gave the best growth characters of wheat plants because it affects the physical, chemical and biological considered a good response of improved soil fertility and structure of compost amended soil. The length of wheat panicles was increased significantly in response of conducted treatment, which indicates the beneficial effect of nitrogen fertilization on plant growth. The increase in nitrogen levels by anhydrous ammonia had a positive impact on the length of wheat mutations and tillers number as follows (90 kg N fed.$^{-1}$ > 70 kg N fed.$^{-1}$ > 50 kg N fed.$^{-1}$). These findings are consistent with those of **Ali et al., (2002)**.
properties of the soil which increases the length of the panicles and the number of panicles.

Table 5. Effect of anhydrous ammonia and compost on tillers number, Dry matter at 45 day and Spike length

S.V		Tillers number		Dry matter at 45 day		Spike length	
Seasons		**I**	**II**	**I**	**II**	**I**	**II**
anhydrous ammonia (AA) kg (N) fed^{-1}		*	*	*	*	*	*
AA_{50}		4.25 b	4.29 b	19.45 b	19.06 b	11.45 b	11.75 b
AA_{70}		4.45 ab	4.48 ab	19.85 a	19.70 ab	11.85 ab	12.15 ab
AA_{90}		4.65 a	4.62 a	20.64 a	20.56 a	12.32 a	12.45 a
Compost (C) Mg fed^{-1}		*	*	*	*	*	*
C_0		4.22 b	4.25 b	19.65 b	19.31 b	11.40 b	11.72 b
C_5		4.54 a	4.49 a	20.36 a	20.07 a	11.65 a	12.46 a
AA x C		*	*	*	*	*	*
AA_{50}	C_0	4.30 c	4.29 c	18.65 d	18.18 c	11.33 b	11.75 b
	C_5	4.32bc	4.32bc	19.79 c	19.64 b	11.38 b	11.91 b
AA_{70}	C_0	4.33bc	4.31bc	19.91 bc	19.93 b	11.50 ab	12.22 ab
	C_5	4.52ab	4.55ab	20.62 a	20.45 ab	11.55 ab	12.55 a
AA_{90}	C_0	4.48ab	4.45ab	20.51 ab	20.40 ab	12.71 ab	12.45 ab
	C_5	4.62 a	4.65 a	20.62 a	20.71 a	11.79 a	12.62 a

AA: anhydrous ammonia, C: compost amendment. I and II are first and second cultivation seasons respectively. Mean values in each column followed by a different lower-case-letter are significantly different by Fisher's least-significant difference test (LSD) at $p \leq 0.05$. Each value is average of 3 replicates.

3.4 Yield and yield components:

Data in tables (6) shows 1000 grain weight, straw yield and grain yield of wheat plants. Used compost and anhydrous ammonia treatments caused significant increase by 1000 grain weight, straw yield and grain yield of wheat plants.

Table 6. Effect of anhydrous ammonia and compost on 1000-grain weight, straw and grain yields

S.V		1000 grain weight		Grain yield ton fed^{-1}		Straw yield ton fed^{-1}	
Seasons		I	II	I	II	I	II
anhydrous ammonia (AA) kg (N) fed^{-1}		*	*	*	*	*	*
AA_{50}		68.41 b	66.30 b	1.99 b	2.02 b	4.35 b	3.85 b
AA_{70}		69.56 a	67.50 ab	2.24 ab	2.18 ab	4.64 ab	4.25 ab
AA_{90}		69.93 a	68.30 a	2.25 a	2.24 a	4.95 a	4.37 a
Compost (C) Mg fed^{-1}		*	*	*	*	*	*
C_0		68.45 b	66.20 b	1.96 b	1.98 b	4.25 b	3.92 b
C_5		69.85 a	68.25 a	2.14 a	2.21 a	4.75 a	4.35 a
AA x C		*	*	*	*	*	*
AA_{50}	C_0	67.78 b	66.15 c	1.96 c	1.98 c	4.21 b	3.82 c
	C_5	68.03 b	67.55 b	2.08 bc	2.11 b	4.34 ab	4.21 b
AA_{70}	C_0	68.94 ab	67.20 b	2.13 b	2.18 ab	4.61 ab	4.26 ab
	C_5	69.91 ab	68.37 ab	2.28 a	2.20 a	4.81 a	4.40 a
AA_{90}	C_0	69.04 ab	68.24 ab	2.17 ab	2.18 ab	4.67 ab	4.37 ab
	C_5	70.51 a	68.86 a	2.33 a	2.24 a	4.91 a	4.45 a

AA: anhydrous ammonia, C: compost amendment. I and II are first and second cultivation seasons respectively. Mean values in each column followed by a different lower-case-letter are significantly different by Fisher's least-significant difference test (LSD) at $p \leq 0.05$. Each value is average of 3 replicates.

The applied treatments may be contributed to a stimulation of plant growth, which increases the amount of light energy captured by plant leaves, increases photosynthetic pigments, and increases photosynthesis, which increases complex metabolites and ultimately leads to an increase in growth and yield of wheat crop. The effects of anhydrous ammonia on straw, grain and biological crops have been classified as follows in descending order: AA90 > AA70 > AA50. The results showed that the compost treatment resulted in the best straw yield 4.61- 4.34 tons fed.$^{-1}$ for the 2016 and 2017 planting seasons, respectively. Using 70 kg of nitrogen produced the highest wheat straw yield. **Waggoner et al. (2014)** obtained similar results. The interaction effect of anhydrous ammonia and compost on wheat straw yield was significant. 1000 grain weight (g): current study showed that nitrogen fertilizer induced grain filling. The effect of used anhydrous ammonia levels on weight of 1000 grains followed the descending order of AA70 > AA90 > AA50. These results are similar to those obtained by **Ali et al., (2002)**. Compost levels resulted in a significant increase of weight of 1000 grains of wheat crop. **Adeleke and colleagues (2021)** achieved similar results.

3.6. Macronutrients and protein content in grains:

Data in table (7) showed the effect of anhydrous ammonia additives, compost and their interaction on nitrogen, phosphors, potassium and protein percent in grains of wheat crop. The results showed that raising anhydrous ammonia rates from 50AA to 70AA led to a significant increase in nitrogen percent in grains in both seasons. The positive effect of nitrogen fertilizers on nutrient absorption may come from the improvement of root growth, which increases the root absorption area; additionally the roots grow larger when nitrogen fertilizers under sufficient nitrogen percent. **Artacho et al. (2009)** also found similar results. Also the addition of anhydrous ammonia could be enhanced plant efficiency for absorption of P, which may be responsible for increasing the P percent in response of increased nitrogen application rate. Same results were also noted by **Sarwar et al. (2008)**. This trend may be refer to the valuable effect of anhydrous ammonia on plant development and growth due to its role in regulating physiological and biochemical processes in plants such as photosynthesis, DNA synthesis, protein synthesis and respiration. These results are consistent with those of **Namvar and Khandan (2013) and Diacono et al. (2013).** Addition of compost amendment enhanced P percent in wheat grains might be due to the increase of phosphorus in soil that is readily available to plants. Potassium percent in wheat grains increased significantly as a result of applied treatments. The results showed that when anhydrous ammonia was added, the maximum K% percent in wheat (1.97%) were achieved when 90AA. **Shaban and Helmy (2006)** claimed that raising the rate of N to 90 kg N fed.$^{-1}$ significantly enhanced the absorption of N, P and K by all plant tissues of wheat. Compost contains considerable amounts of valuable plant nutrients including N, P, K, Ca, Mg and S **(Angus et al., 2014).** Grain protein percent significantly increased with increasing nitrogen rate and compost. The rates of anhydrous ammonia improved protein production according the following order: AA90 > AA70 > AA50. Nutritious protein obtained with a maximum percent of 12.5% from the use of 70AA with compost. These results are consistent with those reported by **Mosse, J. (1990).**

Table 7. Effect of anhydrous ammonia and compost on N, P , K and protein content wheat grain

S.V		% N		% P		% K		% protein	
Seasons		I	II	I	II	I	II	I	II
anhydrous ammonia (AA) kg (N) fed^{-1}		*	*	*	*	*	*	*	*
AA_{50}		1.82 b	1.83 b	0.62 b	0.57 b	1.82 b	1.82 b	11.38 c	11.44 c
AA_{70}		190 ab	1.89 ab	0.68 a	0.63 a	1.90 a	1.86 a	11.88 b	11.81 b
AA_{90}		1.95 a	1.92 a	0.69 a	0.64 a	1.92 a	1.87 a	12.19 a	12.00 a
Compost (C) Mg fed^{-1}		*	*	*	*	*	*	*	*
C_0		1.82 b	1.84 b	0.63 b	0.56 b	1.83 b	1.81 b	11.38 b	11.50 b
C_5		1.94 a	1.91 a	0.69 a	0.63 a	1.89 a	1.89 a	12.13 a	11.94 a
AA x C		*	*	*	*	*	*	*	*
AA_{50}	C_0	1.75 c	1.82 c	0.66 c	0.55 c	1.80 c	1.80 b	10.94 c	11.38 c
	C_5	1.62 bc	1.86 b	0.67 bc	0.57bc	1.86 b	1.84 b	11.38 b	11.63 bc
AA_{70}	C_0	1.88 ab	1.90 ab	0.67 bc	0.60 b	1.89 ab	1.85 ab	11.75 ab	11.88 b

	C_5	1.93 a	1.93 a	0.70 ab	0.63 a	1.91 ab	1.88 a	12.06 a	12.06 ab
AA_{90}	C_0	1.90 ab	1.91 ab	0.68 abc	0.62ab	1.90 ab	1.86 ab	11.88 ab	11.94 b
	C_5	1.96 a	1.95 a	0.70 a	0.65 a	1.93 a	1.90 a	12.25 a	12.19 a

AA: anhydrous ammonia, C: compost amendment. I and II are first and second cultivation seasons respectively. Mean values in each column followed by a different lower-case-letter are significantly different by Fisher's least-significant difference test (LSD) at $p \leq 0.05$. Each value is average of 3 replicates.

CONCLUSION

Based on the aforementioned findings, it can be concluded that wheat plants fertilized with anhydrous ammonia at rate of 90 kg N fed.$^{-1}$ in combination with applied compost amendment by 5 Mg fed^{-1} produced the highest values of growth and yield of wheat plants, as well as N, P, and K content in soil and grains of wheat crop. Interestingly the use of AA at a rate of 90 kg N fed^{-1} didn't cause significant effect on above-mentioned parameters as compared with AA at a rate of 70 kg N fed^{-1}. Accordingly it could concluded that the use of 70 kg N fed^{-1} instead of 90 kg N fed^{-1} coupled with compost amendment could be applied as a valuable a gro-management and environment-friendly approach for enhancing growth and yield of wheat crop, improving soil quality and increasing fertilization use efficiency under the conditions of Fayoum Governorate-Egypt.

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الملخص العربي

تاثير غاز الأمونيا والكمبوست على تحسين النمو والمحصول والحالة التغذوية لمحصول القمح تحت ظروف محافظة الفيوم

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أجريت الدراسة الحالية لتقييم تأثير تطبيق الأمونيا اللامائية (AA) والكومبوست (C) على النمو والحمصول والحالة التغذوية للحبوب لمحصول القمح. لذلك تم إجراء تجربة عاملية تضمنت 6 معاملات (3 معدلات أمونيا لا مائية × مستويين من تعديل السماد) مع 3 مكررات بمزرعة طامية التابعة لمركز البحوث الزراعية بمحافظة الفيوم خلال موسمي 2017/2016 و 2018/2017. تم حقن الأمونيا اللامائية مباشرة في التربة بمعدلات (تحكم (50) ، 70 ، 90) كجم نتروجين/ فدان، ومع ذلك تمت إضافة سماد الكمبوست عند مستويات (تحكم (إضافة صفرية) و 5) طن/ فدان. أظهرت النتائج أن أعلى القيم لمعدل تراكم المادة الجافة والحالة التغذوية للحبوب ومحصول القش ومحصول الحبوب لمحصول القمح مع إضافة AA بمعدل 90 كجم نتروجين/ فدان بالتزامن مع 5 طن/ فدان. جدير بالذكر أن استخدام AAبمعدل 90 كجم نتروجين/ فدان لم يسبب تأثيرًا معنويًا على المعلمات المذكورة أعلاه مقارنة مع AA بمعدل 70 كجم نتروجين/ فدان وفقًا لذلك ، يمكن أن يستنتج أن استخدام 70 كجم من النيتروجين فى الفدان بدلاً من 90 كجم من النيتروجين في الفدان إلى جانب اضافة السماد يمكن أن يكون نهجًا مفيدًا للإدارة الزراعية وصديقًا للبيئة لتعزيز نمو وإنتاجية محصول القمح ، وتحسين التربة وزيادة كفاءة استخدام الأسمدة تحت ظروف محافظة الفيوم - مصر.

الكلمات الدالة: الأمونيا اللامائية ، السماد ، محصول القمح ، قش القمح ، خواص التربة.