

Response of Wheat Productivity to Different Rates of Compost and Nitrogen Fertilizer Under New Valley Conditions

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Abstract:

Two field experiments were conducted at El-Dakhla Oasis, New Valley Governorate, Egypt, during the two winter growing seasons of 2011/2012 and 2012/2013 to investigate the effect of three date palm compost rates (0, 5 and 10 m³ fed.⁻¹) and three nitrogen fertilizer rates (50, 70 and 90 kg N fed.⁻¹) on the yield and yield components of bread wheat in the New Valley. The most important findings could be summarized as follow:

- Generally, yield and its attributes of wheat increased by adding compost. Application of 5 m³ fed.⁻¹ compost treatment gave the tallest plants and the maximum straw and grain yields fed.⁻¹, while application of 10 m³ fed.⁻¹ compost treatment gave the highest values of spike length, spikelets number spike⁻¹ and 1000-grains weight in both seasons, as well as application 10 m³ fed.⁻¹ and 5 m³ fed.⁻¹ compost treatments gave the maximum spikes number/m² in the 1st and the 2nd seasons, respectively.

- Increasing nitrogen fertilizer rate up to 70 kg fed.⁻¹ increased yield and its components of wheat in both growing seasons. The maximum values of plant height, spikes number/m² and straw and grain yields fed.⁻¹ were obtained by using 70 kg N fed.⁻¹, while the tallest spike and the heaviest 1000-grains were obtained by using 90 kg N fed.⁻¹ in both seasons.

- The tallest plants and the maximum values of spikes number m⁻² and straw yield fed.⁻¹ were recorded by applying 5 m³ fed.⁻¹ compost with 70 kg N fed.⁻¹ rate interaction treatment, while the maximum grain yield was recorded by applying 10 m³ fed.⁻¹ compost with 70 kg N fed.⁻¹ rate interaction treatment in both seasons. On the other hand, the highest values of spike length and spikelets number spike⁻¹ were recorded by applying 10 m³ fed.⁻¹ compost with 90 kg N fed.⁻¹ rate in both seasons, while the heaviest 1000-grains weight were recorded by applying 10 m³ fed.⁻¹ or 5 m² fed.⁻¹ compost with 90 kg N fed.⁻¹ rate interaction treatments in both seasons.

Keywords: Date palm compost, grain yield, nitrogen fertilizer and wheat.

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Introduction:

Wheat is the dominant grain crop of the world commerce. It is occupying an important part of the daily diet of millions of people. In Egypt, increasing productivity of wheat becomes a most to overcome unusual increase in population. Using compost considered one of many ways to reduce the applied quantities of mineral nitrogen fertilizer. The organic matter is used to improve soil health as well as supplying plant nutrients. Various types and sources of organic wastes are utilized in agricultural but most of these materials remain unutilized, especially in resource poor countries. Composting provides an effective and environment friendly procedure of organic waste disposal (Millner *et al.*, 1998). Compost application improved all the growth parameters (Bajpai *et al.*, 2002). Additions of 50 m³ farmyard manure ha⁻¹ significantly increased plant height, number of panicles m⁻², panicle length, 1000-grain weight and grain and straw yields (Bassal and Zahran, 2002). The organic manure and compost are important in sustaining farming by providing plant N-supply (Korsaeth *et al.*, 2002). The organic matter in various forms and at various stages of decomposition has been used in soil in tons ha⁻¹ for improvement and crop productivity (Terrance *et al.*, 2004). The organic manures and date palm compost significantly increased the plant height, number of spikes m⁻², spike length, grain yield, straw yield, biological yield and 1000-grain weight over untreated control (Ibrahim *et al.*, 2008; El-Ghamry *et al.*, 2009 and Mohammed, 2009). Long-term additions of organic manure have the most beneficial effects on grain yield of wheat

and maize (Liu *et al.*, 2010). The application of bio and/or farmyard manure in combination with NPK significantly increased plant height, number of spikelets spike⁻¹, spike length, 1000-grain weight and grain yield fed.⁻¹ (Agamy *et al.*, 2012).

Egyptian soil are known to be poor in available nitrogen due to their low content of organic matter and the small amounts of organic manures added to them annual. Therefore, nitrogen application is considered one of the key factors for obtaining higher grain yield, as well as nitrogen is the most important plant nutrient needed to obtain high wheat yields in Egypt. A beneficial effect of nitrogen application on wheat gave the highest values of number of spikes m⁻², plant height, spike length number of spikelets spike⁻¹, 1000-grain weight and grain and straw yields of wheat with increasing N level (Sawires, 2000 and Sobh *et al.*, 2000). Increasing chemical nitrogen fertilizer level from 75 to 150 or 225 kg N ha⁻¹ caused significantly increased growth, yield and yield attributes (Abd El-Maksoud, 2002 and Saleh, 2002). Increasing nitrogen fertilizer rates from 72, 144 to 216 kg N ha⁻¹ significantly increased number of spikes m⁻² and straw and grain yields ha⁻¹ (Salem, 2005; Saad, 2007; El-Gizawy, 2005 and Abedi *et al.*, 2010). However, the highest yield was produced due to application of 180 kg N ha⁻¹ (Abd El-Razek and El-Sheshtawy, 2013) as well as increasing N up to 75 kg fed.⁻¹ increased yield and its attributes of wheat in both growing seasons (Noureldin, Nemat, *et al.*, 2013). On the other hand, the application of different N rates had no significant effect on the number of spikes m⁻², number of

spikelets spike⁻¹ and 1000-kernel mass in both seasons (Maali and Agenbag, 2004). Therefore, the present work was undertaken to determine the quantitative requirements different rates of compost and N fertilization limits in relation to grain yield response under New Valley condition.

Materials and Methods:

Two field experiments were conducted out at El-Dakhla Oasis, New Valley Governorate, Egypt, dur-

ing the two winter growing seasons of 2011/2012 and 2012/2013 to investigate the effect of date palm compost and nitrogen fertilizer rates on the yield and yield components of bread wheat grown in the New Valley. The soil texture was clay loam. Soil samples were collected to depth of 30 cm from the experimental site. Detailed results as the mechanical and chemical analysis of the soil in both seasons are presented in Table (1).

Table 1: Some physical and chemical properties of a representative soil sample from the experimental site in 2011/2012 and 2012/2013.

Season	Physical				Chemical						
	Sand (%)	Silt (%)	Clay (%)	Texture	CaCO ₃ (%)	OM (%)	EC (1:1 extract) dS m ⁻¹	pH 1:1	Total N (%)	Available-P (ppm)	Available-K (meq kg ⁻¹ soil)
2011/ 2012	29	40	31	Clay loam	1.12	1.90	1.21	7.9	0.35	16.2	2.0
2012/ 2013	28.5	41	30.5	Clay loam	1.10	1.91	1.19	7.7	0.32	16.4	2.1

Some properties of date palm compost are presented in Table 2 .Date palm compost was mixed with the soil before two weeks from sowing.

Table 2: Some properties of date palm compost (organic fertilizer).

Characters	Value
pH (1:10 suspension)	8.38
E _{Ce} (1:10) dS/m	3.45
Total-N (%)	0.90
Total-P (%)	0.79
Total-K (%)	0.94
Organic matter (%)	26.97
Organic carbon (%)	15.64
C/N ratio	17.38
Ash (%)	73.00

The preceding crop was maize in both seasons of the study. A randomized complete block design using split-plot arrangement of treatments with three replications was employed.

The main plots were allocated for three rates of date palm compost i.e. 0, 5 and 10 m³ fed.⁻¹. The sub-plot assigned for three nitrogen fertilization rates i.e. 50, 70 and 90 kg N

fed.⁻¹ as ammonium nitrate (33.5% N), which was applied into three equal doses, before the first, second and third irrigations. The experimental unit area was 10.5 m² (3 m width x 3.5 m length). An activation dose at a level of 15 kg N fed.⁻¹ was added to each sub-plot including those of the control at sowing. The grains of Sids-12 cultivar were sown by hand-broadcasting at a seeding rate of 60 kg fed.⁻¹ on 26th and 24th Nov. in the first and second seasons, respectively. All agricultural practices were done as recommended for wheat production, at El-Dakhla Oasis.

Data recorded:

At harvest (at the end of April) a sample of ten plants from square meter was randomly chosen from each sub-plot in three replicates to measure number of spikes m⁻², spike length, spikelets number spike⁻¹ and weight of 1000-grains as well as plant height. Grain and straw yields per feddan were calculated from the whole plants of each plot for the three replicates in kilograms, and converted into ardad and ton per feddan, respectively.

Statistical analysis:

The obtained data from each season were exposed to the proper statistical analysis of variance according to Gomez and Gomez (1984), using the computer MSTAT statistical analysis described by CoStat (2004). The revised least significant difference test (Rev. L.S.D.) at 5% level of probability was computed to detect the differences among means.

Results and Discussion:

Effect of date palm compost:

Data in Table 3 showed that the plant height, spikelets number spike⁻¹ and straw yield in the 1st season and grain yield in the 2nd season as well as spikes number m⁻² in both seasons

had a significantly affected by the date palm compost. The other traits had non-significant affected by this treatment either in the 1st or the 2nd season. It is clear that the compost application gave a significant increase in plant height and straw yield fed.⁻¹ in the 1st season and spikes number m⁻² and grain yield fed.⁻¹ in the 2nd season as compared with the control treatment. The tallest plant (98.03 and 97.83 cm) and the maximum straw yield (3.46 and 3.92 ton fed.⁻¹) were achieved as 5 m³ fed.⁻¹ compost in the 1st and the 2nd seasons, respectively. This is logic, the high straw yield depend on the length of plant. Likewise, the highest spikes number m⁻² (500.7) in the 2nd season and the maximum grain yield (18.80 and 19.10 ard. fed.⁻¹) in both seasons were recorded by applying 5 m³ fed.⁻¹ compost. Also, this is logic, because of the spikes number m⁻² one of the important factor for the crop triangle, therefore, the increase of spikes number m⁻² may be realized the increase as in grain yield fed.⁻¹. It is indicated that the highest spikelets number spike⁻¹ (19.43 and 17.00) were observed at 10 m³ fed.⁻¹ compost in both seasons. Although the insignificant effect of compost on the spike length in both seasons, the tallest spike (15.80 and 15.84) was detected by 10 m³ fed.⁻¹ compost in the 1st and the 2nd seasons, respectively and consequently the increase in spikelets number spike⁻¹ was expected.

Ibrahim *et al.* (2008) mentioned that the tallest plant was recorded by the application of compost at 500 kg ha⁻¹. They added that the spike length was non-significant and the maximum value was observed at 500 kg ha⁻¹ compost, while the minimum one was observed at 400 kg ha⁻¹ compost.

Compost not only slowly releases nutrient but also prevents the losses of chemical fertilizers through denitrification and volatilization as well as waste may be improve the efficiency of chemical fertilizer and thus reduce their use in order to improve crop productivity as well as sustain soil health and fertility (Abedi *et al.*, 2010). Previous studies have shown that organic materials (compost, manures) enhance nutrient use efficiency by slow releasing of nutrients and reducing their losses (Muneshwar *et al.*, 2001 and Nevens and Reheul, 2003). These findings are in conformity with those obtained by Bassal and Zahran (2002), Terrance *et al.* (2004), El-Ghamry *et al.* (2009) and Agamy *et al.* (2012).

Effect of nitrogen fertilizer rates:

Data in Table 3 revealed that the spike length and 1000-grains weight in both seasons, as well as spikes number/m² in the 1st season and straw and grain yields in the 2nd season had a significantly or highly significantly affected by the application of nitrogen fertilizer rates. The other studied traits either in the 1st or in the 2nd season had non-significant affected by the same treatment. Generally, increasing nitrogen up to 70 and 90 kg fed.⁻¹ increased yield and its components of wheat in both growing seasons (Table 3). It is clear that nitrogen application gave a significant increase for the spike length, 1000-grains weight, spikes number m⁻², straw yield and grain yield in the 1st and / or in the 2nd season as compared with the control treatment. Also, the plant height and spikelets number spike⁻¹ had insignificant increasing values with increasing nitrogen fertilizer rates as compared with the control treatment. The maximum straw

yields (3.42 and 3.87 ton fed.⁻¹) were accompanied with the tallest plants (98.10 and 98.07 cm), where were realized with applying 70 kg N fed.⁻¹ in the 1st and the 2nd seasons, respectively. The favorable effect of N fertilization on plant height and number of spikes m⁻² may explain according to the role of nitrogen in stimulating cell division and elongation, consequently internodes elongation in addition and development. Meanwhile, the maximum grain yields (18.85 and 17.01 ard. fed.⁻¹) accompanied with the highest values of spikes number m⁻² (489.0 and 497.3) were achieved by applying 70 kg N fed.⁻¹ in the 1st and the 2nd seasons, respectively. Also, the tallest spikes (16.00 and 15.08 cm) and the heaviest 1000-grains (45.57 and 45.97 g) were detected by adding 90 kg N fed.⁻¹ in the 1st and the 2nd seasons, respectively. The increments in yield and its attributes of wheat with increasing N rates up to adequate N need might be attributed to the effective role of N as essential constituent of chlorophyll on dry matter accumulation. The improvement in wheat yield and its components under the acceptable increasing of N rates were obtained by Sobh *et al.* (2000) and Saudy *et al.* (2008). This indicates that presence of nitrogen led to less competition among plants for nitrogen and retarded leaf senescence, which increased period of photosynthesis and dry matter production and this turn help increasing grain yield. Noureldin, Nemat *et al.* (2013) concluded that increasing N up to 70 kg fed.⁻¹ increased yield and its attributes of wheat in both growing seasons. This was in accordance with results of Saleh (2002), Salem (2005), Maali and Agenbag (2004), Saad (2007),

Abedi *et al.* (2010) and Abd El-Razek and El-Sheshtawy (2013).

Effect of the interaction:

Data in Table 4 showed that spike length in both seasons and spikelets number/ spike and spikes number/m² in the 1st season and 1000-grains weight, straw yield and grain yield in the 2nd season, had a high significantly affected by the interaction between compost x nitrogen fertilizer rates. The other studied traits either in the 1st and/or in the 2nd season had non-significant affected by this interaction. It is clear that, the tallest spikes (17.21 and 16.05 cm) followed by (15.55 and 15.25 cm) were obtained by the 10 m³ fed.⁻¹ compost with 90 kg N fed.⁻¹ interactions followed by 5 m³ fed.⁻¹ with 70 kg N fed.⁻¹ interactions in the 1st and

the 2nd seasons, respectively. The shortest spikes (14.57 and 13.45 cm) were observed by zero compost with 50 kg N fed.⁻¹ interactions in the 1st and the 2nd seasons, respectively. Furthermore, the highest spikelets number spike⁻¹ 20.10, 19.20 and 19.00 were recorded by 10 m³ fed.⁻¹ compost with 50, 70 and 90 kg N fed.⁻¹ interactions in the 1st season, respectively. Also, the highest spikes number m⁻² (526.3 and 516.0) followed by (497.0 and 486.0) were realized by 10 m³ fed.⁻¹ compost with both 90 and 70 kg N fed.⁻¹ interactions, as well as the highest spikes number m⁻² (493.0 and 530.0) followed by (485.0 and 500.0) were recorded by 5 m³ fed.⁻¹ compost with both 70 and 50 kg N fed.⁻¹ interactions in the 1st and the 2nd seasons, respectively.

Table 3: Wheat plant height, yield and yield attributes as affected by date palm compost and nitrogen fertilizer rates in 2011/2012 and 2012/2013 seasons.

Variables		Plant height (cm)		Spike length (cm)		Spikelets number spike ⁻¹		Spikes number m ⁻²		1000-grains weight (g)		Straw yield (ton fed. ⁻¹)		Grain yield (ardab fed. ⁻¹)	
		2011/ 2012	2012/ 2013	2011/ 2012	2012/ 2013	2011/ 2012	2012/ 2013	2011/ 2012	2012/ 2013	2011/ 2012	2012/ 2013	2011/ 2012	2012/ 2013	2011/ 2012	2012/ 2013
Compost (m ³ fed. ⁻¹)	0	92.38 C	95.87	15.07	14.05 B	17.9 B	15.93	433.8 B	453.3 B	42.92	44.88	3.02 B	3.48 B	17.72	17.98 B
	5	98.03 A	97.83	15.43	14.52 AB	18.17 B	15.67	472.3	500.7 A	44.87	44.78	3.46 A	3.92 A	18.80	19.10 A
	10	96.10 B	96.73	15.80	15.83 A	19.43 A	17.00	484.1	486.0 B	45.48	44.25	3.22 AB	3.69 AB	17.83	18.00 B
F-test		**	NS	NS	NS	**	NS	*	**	NS	NS	*	NS	NS	*
Rev. LSD 5%		0.90	-	-	1.01	0.63	-	24.33	25.91	-	-	0.37	0.37	0.93	0.67
Nitrogen rate (kg fed. ⁻¹)	50	93.57 B	96.67 A B	15.06 B	14.11 C	18.07	16.67 A	438.8 C	462.0	42.90 B	43.00 B	2.98	3.43 B	17.69	17.59 B
	70	98.10 A	98.07 A	15.25 B	14.75 B	18.57	15.87 B	489.0 A	497.3	44.80 A	44.43 A B	3.42	3.87 A	18.58	19.01 A
	90	95.88 A B	95.70 B	16.00 A	15.08 A	18.89	16.07 A B	460.2 B	480.7	45.57 A	45.97 A	3.25	3.80 A	18.13	18.48 A B
F-test		NS	NS	**	**	NS	NS	**	NS	*	*	NS	**	NS	*
Rev. LSD 5%		4.28	2.42	0.43	0.25	-	0.74	20.62	-	1.84	1.70	0.36	0.21	-	1.38

NS = Non-significant differences.

*, ** indicated a significant and highly significant at 5% and 1% levels of probability.

Rev. LSD = Revised least significant difference.

Means have the same letter within column did not differ significantly at 5%

NS (-) indicated the all trait means did not differ significantly.

Table 4: Wheat plant height, yield and yield attributes as affected by the interaction of date palm compost with nitrogen fertilizer rates in 2011/2012 and 2012/2013 seasons.

Variables		Plant height (cm)		Spike length (cm)		Spikelets number spike ⁻¹		Spikes number m ⁻²		1000-grains weight (g)		Straw yield (ton fed. ⁻¹)		Grain yield (ardab fed. ⁻¹)	
Compost m ³ fed. ⁻¹	N-rate kg fed. ⁻¹	2011/2012	2012/2013	2011/2012	2012/2013	2011/2012	2012/2013	2011/2012	2012/2013	2011/2012	2012/2013	2011/2012	2012/2013	2011/2012	2012/2013
0	50	90.60 c	94.70	14.57 c	13.45 d	17.60 e	15.40	402.0 d	430.0	44.30 b	42.07 c	2.92 b	3.70 c	16.92 b	16.84 c
	70	95.50 ab	97.10	15.35 bc	13.90 cd	17.90 de	15.80	477.0 ab	476.0	44.17 a	44.00 bc	3.14 ab	3.75 ab	17.89 ab	18.88 ab
	90	94.03 c	95.80	15.30 bc	14.25 c	18.27 e	15.80	415.0 cd	454.0	44.30 a	44.07 bc	3.09 ab	3.60 abc	17.47 ab	18.21 abc
5	50	96.00 ab	96.50	15.25 bc	14.00 c	17.60 de	15.40	485.0 b	500.0	44.50 a	43.47 bc	3.22 ab	3.63 ab	18.52 ab	18.85 ab
	70	100.30 a	99.30	15.55 b	15.25 b	18.60 bcd	15.80	493.0 b	530.0	45.73 a	43.60 A	3.62 a	4.08 a	18.84 a	18.96 ab
	90	97.80 ab	97.70	15.50 b	14.95 b	18.30 cde	16.60	439.3 c	427.0	46.20 a	47.27 a	3.54 a	4.06 ab	19.04 a	19.50 a
10	50	94.10 bc	95.70	15.35 bc	14.88 b	19.00 b	16.60	429.0 cd	456.0	42.90 ab	43.47 bc	3.03 ab	3.55 bc	17.56 a	17.08 bc
	70	98.50 ab	97.80	14.85 b	15.10 b	19.20 b	16.80	497.0 ab	486.0	44.50 a	45.70 ab	3.50 ab	3.77 ab	19.01a	19.20 a
	90	95.80 ab	96.70	17.21 a	16.05 a	20.10 a	17.60	526.3 a	516.0	46.20 a	46.57 ab	3.12 ab	3.74 ab	17.80 ab	17.73 abc
F-test		NS	NS	**	**	**	NS	**	NS	NS	*	NS	*	NS	**
Rev. LSD 5%		4.81	-	0.79	0.46	0.71	-	36.44	-	3.43	3.20	0.62	0.52	1.71	1.92

NS = Non-significant differences.

*, ** indicated a significant and highly significant at 5% and 1% levels of probability.

Rev. LSD = Revised least significant difference.

Means have the same letter within column did not differ significantly at 5%

NS (-) indicated the all trait means did not differ significantly.

The lowest spikes number /m² (402.0 and 430.0) was obtained by zero compost with 50 kg N fed.⁻¹ interaction in the 1st and the 2nd seasons, respectively. It is observed that the maximum straw yields (3.62 and 4.08 ton fed.⁻¹) followed by (3.54 and 4.06 ton fed.⁻¹) were recorded by 5 m³ fed.⁻¹ compost with 70 kg N fed.⁻¹ interaction followed by 10 m³ fed.⁻¹ compost with 90 kg N fed.⁻¹ rate interactions in the 1st and the 2nd seasons, respectively. Meanwhile, the maximum grain yields (19.04 and 19.50 ard. fed.⁻¹) followed by (19.01 and 19.20 ard. fed.⁻¹) then (18.84 and 18.96 ard. fed.⁻¹) were realized by 10 m³ compost with 90 kg N fed.⁻¹ rate interaction followed by 5 m³ fed.⁻¹ compost with 70 kg N fed.⁻¹ rate interactions in the 1st and the 2nd seasons, respectively. Abedi *et al.* (2010) found that the use of chemical fertilizer N, in combination with compost, further enhanced the grains yield. Similar results were obtained by Parmer and Sharma (2002), Sarwar *et al.* (2007) and Sarwar *et al.* (2008). Also, N-fertilizer in the presence of bio and organic fertilizers increased the decomposition and mineralization rate of organic fertilizers and the availability of nutrients for plant growth. The combination between the three kinds of fertilizers was significantly increased yield and its components than each of them singly. This was owing to the presence of nutrient elements and organic matter that prevented leaching of such mineral fertilizer (Agamy *et al.*, 2012). Similar finding was reported on wheat plants by Salantur *et al.* (2006).

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استجابة إنتاجية القمح لمعدلات مختلفة من الكومبست والسماذ النيتروجيني تحت ظروف الوادي الجديد

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الملخص:

أقيمت تجربتان حقليتان بواحة الداخلة محافظة الوادي الجديد بمصر خلال موسمي الزراعة الشتوي ٢٠١٢/٢٠١١ و ٢٠١٣/٢٠١٢ لبحث تأثير ثلاث معدلات لكومبست نخيل البلح (صفر ، ٥ م^٣ ، ١٠ م^٣/فدان) وثلاث معدلات للسماذ النيتروجيني (٥٠ ، ٧٠ ، ٩٠ كجم ن / فدان) علي المحصول ومكوناته لقمح الخبز المنزرع بالوادي الجديد.

وكانت أهم النتائج هي:

- عامة زاد محصول القمح ومكوناته بإضافة الكومبست ، وأعطت المعاملة ٥ م^٣/فدان كومبست أطول النباتات وأعظم محصول للقش والحبوب / فدان ، بينما أعطت المعاملة ١٠ م^٣/فدان كومبست أعلا القيم لطول السنبله وعدد السنييلات / سنبله ووزن ١٠٠٠ حبة في كلا الموسمين ، كما أعطت المعاملتين ١٠ م^٣/فدان و ٥ م^٣/فدان أعظم عدد سنابل / م^٢ للموسم الأول والثاني علي الترتيب.

- زاد محصول القمح ومكوناته بزيادة معدل السماذ النيتروجيني حتي ٧٠ كجم / فدان في كلا موسمي الزراعة، وتم الحصول علي أعلا القيم لطول النبات، عدد السنابل/م^٢ ومحصولي القش والحبوب / فدان باستخدام ٧٠ كجم ن / فدان ، بينما تم الحصول علي أطول سنبله وأثقل ١٠٠٠ حبة باستخدام ٩٠ كجم ن/فدان في كلا الموسمين.

- سجلت معاملة التفاعل ٥ م^٣/فدان كومبست مع معدل ٧٠ كجم ن / فدان أطول النباتات وأعظم قيم لعدد السنابل / م^٢ ومحصول قش / فدان ، بينما سجلت معاملة التفاعل ١٠ م^٣/فدان كومبست مع معدل ٧٠ كجم ن/فدان أعظم محصول حبوب / فدان في كلا الموسمين . ومن ناحية أخرى سجلت معاملة التفاعل ١٠ م^٣/فدان كومبست مع معدل ٩٠ كجم ن / فدان أعلا القيم لطول السنبله وعدد السنييلات / سنبله في كلا الموسمين ، بينما سجلت معاملة التفاعل ١٠ م^٣/فدان أو ٥ م^٣/فدان كومبست مع معدل ٩٠ كجم ن / فدان أثقل ١٠٠٠ حبة في كلا الموسمين.