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THE EFFECT OF ORGANIC FERTILIZATION AND INORGANIC NITROGEN FERTILIZER ON PERFORMANCE OF SOME BARLEY CULTIVARS GROWTH, YIELD AND CHEMICAL COMPOSITION OF GRAINS

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Abstract

Tow field experiment were conducted during 2016/17 and 2017/18 seasons At Wadi El-Rayan, Fayoum Governorate, Egypt; to study the effect of organic fertilization and inorganic nitrogen fertilizer on performance of two covered barley cultivars on growth; yield and chemical composition of dry. The results could be summarized as follows:

1. There were significant differences in growth characters at 95 and 110 days after sowing; yield and its component; as well as; chemicals composition per dry grains of barley plant. Giza -127 cultivar significantly exceeded Giza-123 cultivar on growth characters; yield and its component (except RPP_{Veg}) and percentages of nutritional values of barley dry grains, i.e. N%, P%, K%, total carbohydrate% and crude protein% at harvest date . It is worthy that, growth characters of barley plants observed that plant height, number and dry weight of spikes/plant, flag leaf blade area, and SLW were increased with advancing plant age from 95 to 110 days, whereas, number and dry weight of each of tillers as well as blades, blades area / plant and LAI seemed to be decreased with advancing plant age from 95 to 110 days after sowing date.
2. With respect of organic fertilization, adding 3, 6, and 9 Ton/fed. organic fertilizer caused significant effect on growth characters (except SLW at 110 days age); yield and its components (except on crop index) and chemical composition of dry grains at harvest date, in addition, adding 9 ton/fed organic manure to barley during preparation of soil to growing barley had the greatest mean values from growth characters (except SLW at 95 and 110 days ago), yield and its components (except RRP_{gr} and RPP_{veg}, harvest index a and crop index) and chemical composition of dry grains. The most effective rate of organic fertilizer was 9 ton / fed.
3. Inorganic nitrogen fertilizer caused significant increment in growth characters at 95 and 110 days age (except on SLW); yield and its components (RPP_{veg}, harvest index and crop index); also in chemical composition of dry grains at harvest data. The most favorable rate from inorganic fertilizer in this study was 80 kg N/ fed.
4. Regarding the effect of the interaction between the combination of the treatments in our study, data observed that the interactions between cultivars* organic fertilization, cultivars* inorganic N fertilizer rates organic fertilizer* inorganic fertilization rates, as well as, the three -way interaction cultivars* organic fertilization* inorganic N fertilizer rates caused significant effects on growth characters at 95 and 110 days age, chemical composition of dry grains and yield as well as its components except on the effect of each of cultivars* inorganic N fertilizer rate caused insignificant effects on crop index.

Finally, for improving grain yield of covered barley under Wadi El-Rayan, Fayoum Governorate, Egypt the best treatment was Giza–127 cultivar under treatment with 9 ton / fed organic fertilizer and 80 kg N/fed inorganic N fertilizer.

***Keywords*:** Sorghum, water stress, amino cat, yield.

Introduction

Hordum vulgare L. (Barley) is considered one of the important cereal crops in the world and in Egypt. The national production of cereal crops is relatively less than the consumption demand, thus, it was suggested to used barley as a completer cereal crop to shortage the gaps between production and consumption because barley's ability; in comparison with other cereal crops, to grow well under the drought conditions common in Egypt and its mainly used to animal feeding including both grains and straw.

Furthermore, barley cultivated at normal sowing date 1-15November in Egypt, thus barley may be exposed to high temperature stress during grain filling period (and March or April) due to the hot wind of EL-Khamasseen winds for more days which damage growth, yield and its components due to shortening the growth and reproductive growth phase (Magda Shalaby *et al.*, 2018).

Barley cultivars differed in growth characters, chemical constituents of barley plant organs, as well as, yield and its components (Alberta, 2007; Skribanek and Tomesanyi, 2008; Nassar, 2008; Rashed and Khan, 2008; Hussein *et al.*, 2009; Ahmed *et al.*, 2013 and Magda Shalaby, 2014 and 2018).

The increase in harvested yield of barley in Egypt can be achieved by the introduction of new barley cultivars such as the covered cultivars Giza-123, Giza – 124, Giza – 125, Giza- 126, Giza – 127,and the necked cultivars Giza-129, Giza-130 and Giza-131 in newly cultivated lands when grown under modern production techniques. The yield potential of barley can be defined as the total biomass produced or the agricultural important part of the plant (grain yield). The total biomass is a result of integration of metabolic reaction of the plant. Consequently, any factor influencing the metabolic activity of the plant at any period of its growth can affect the yield. Metabolic processes in barley plant are greatly governed by both internal, i.e. genetic makeup of the plant and external condition which involve two main factors namely climatic and edaphic environmental factors. In addition, the yield potential of barley could be regulated through alternation of genetic makeup and the reconstitution of genetically structure through breeding program and or modification of environment through improving cultural treatment such as nitrogen organic manure fertilizer and inorganic fertilizer.

Moreover, sustainable barley production demands the use of organic manure. The organic matter content of soil is one of the keys to their productivity, before inorganic fertilizers were known. The major practice in soil fertility improvement centered on the application of manure to the soil. The principal that makes organic manure useful and important in soil fertility maintenance is their impact on soil

fertility supplies, moisture holding capacity and structural characteristic (FAO, 2000and Udoh *et al.*, 2005).

The benefit of organic matter to the soil are through binding the soil particles together to form aggregates, improving the moisture – holding capacity of soil (especially in sandy and loamy soils), improving soil permeability to water increasing the cations exchange capacity of soils, buttering the soil against excessive or abrupt ph change when soil amendments are added, favoring the formation of metal-organic matter complexes (i.e. with the F, Mn, Cu and Zn) which enhances the stable availability of these micronutrients throughout the growing period. Organic nutrients are important source of the micronutrients and also some secondary nutrients (S, Mg, Fe and Cu).

Thus the objective of this study was effect of rates and organic manure fertilizer (chicken manure) and inorganic N fertilizer on growth, chemical constituents and yield, as well as, its components of two covered barley cultivars under newly cultivated sandy soils in Wadi El–Rayan, El–Fayoum Governorate, Egypt.

Material and Methods

Two field experiments were conducted at newly cultivated sandy land in Wadi EL-Rayan, EL-Fayoum Governorate, Egypt, during 2016/17 and 2017/18 seasons. The experiments were carried out to study the effect of the organic and inorganic nitrogen fertilizer rate on growth, chemical constituents and yield, as well as, yield components of two covered barley cultivars (*Hordeum vulgare* L.) grown under sandy soil conditions . The physical and chemical characters of soil (30-60 depth) in the experimental site were as follows:

Sand 73.4%, silt 22.65 %, clay 3.44 % pH 8.02, organic matter 0.48%, available N 84.00 ppm, available K 133.0 ppm and available P 12.5 ppm. The physical and chemical analysis of experimental site was made according to the methods described by Chapman and Pratt (1978). Each experiment consisted of 18 treatments which were the combination of two covered barley cultivars (Giza – 123 and Giza-127), three rates of organic manure fertilizer (3.0, 6.0 and 9.0 ton/fed) and three rate of inorganic nitrogen fertilizer (20, 40 and 60 kg N/ fed). The experiment design was split–split blocks with four replication. The experimental consisted of 20 rows, 15 cm apart and 3.5 meter length (10.5 sqm). The grains of covered barley cultivars were obtained from Agriculture Research Centre, Ministry of Agriculture, occupied the main plots and were sown at the second week of November of the both experimental seasons at a rate of 60 kg grains/fed. Organic manure fertilizer as chicken manure was allocated at random in the sub – plots at three rates 3.00, 6.00 and 9.00 ton / fed and applied during preparing of the experimental site, whereas, inorganic N fertilizer was occupied in the sub–sub plots at three rates; 20, 40 and 60 kg N fed in the form of ammonium nitrate (33% N) in four equal doses starting from before the first irrigation and seven days intervals. The chemical analysis of chicken manure used in this study was solid materials 52%, N 2.75%, P 1.75% and K 1.00% respectively.

The normal cultured treatments of growing barley were followed:

Samples of ten guarded plants were taken at random of each plot of the replications to determine growth characters at 95 and 110 days after sowing, while, plant height cm, number of tillers; leaves and spikes/plant, as well as, tillers sheats; blades and spikes dry weight g/plant. Furthermore, blades area "cm^2"/ plant and flag leaf blade area "cm^2" were estimated according to Bremmner and Taha (1966), whereas, leaf area index (LAI) was estimated according to the method described by Watson (1952) and specific leaf weight (SLW) was determined according to Pearce *et al* (1969).

At harvest date, randomly ten guarded plants were taken from the middle three rows of each plot at harvest time to determine number of spikes/plant, spikes weight "g/plant", main spike length "cm", main spike dry weight g, grain index "1000 grains in gm", also, grain; straw and biological yield "g/plant". Moreover grain, straw and biological yields "ton/fed" were determined for the all plot area and then converted to "ton/fed". In addition migration coefficient, harvest index and crop index were calculated according to the method described by Abdel – Gawad *et al.* (1987).

Relative photosynthetic potential (RPP) for grain yield (RPP_{gr}); biological yield (RPP_{bio}) and for vegetative organs (RPP_{veg}) were calculated according to the method described by Vidovic and Pokorny (1973).

Chemmical composition of covered barley grains

The dried barley grains were finally ground. Total carbohydrate content were determined calorimetrically according to the methods described by Dubois *et al.* (1956), while, crude protein in dry grains was determined as total nitrogen to A.O.C.S (1984) and was multiplied by 5.75 to calculate protein% In addition, chemical analysis to determination N , P and K were determined according to A.O.A.C (1984); Watanab *et al.* (1965) and Jackson (1965) respectively.

Statistical analysis:

Data were analyzed by analysis of variance and differences among means were determined by least significant differences (L.S.D) at 5 %. level according to Snedecor and Cochran (1990).

Result and Discussion

(a) Cultivar differences:

Data reported in Table (1) indicate that a significant difference were found between the two covered barley cultivars Giza-123 and Giza-127 in growth characters at 95 and 110 days after sowing date. Furthermore, plant height, number and dry weight of spikes / plants, flag leaf blade area and S L W tended to increase with advancing plant age from 95 to 110 days after sowing, whereas, number and dry weight of the tillers+ sheets as well as blades / plant, blades area/plant and LAI seemed to be decreased with advancing of plant age from 95 to 110 days after sowing. Moreover, Giza-127 cultivar outweighed significantly Giza-123 cultivar in all previous growth parameters studied at 95- and 110-days age. Regarding yield and its components, date illustrated in Table (4) indicate clearly that there were cultivar differences and this differences were significant, in addition, Giza-127 cultivar significantly surpassed Giza-123 cultivar in spikes dry weight/ plant, main spike dry weight, main spike length, number of grains /plant, yields of grains and biological yield per plant and or fed, migration coefficient, RPP_{gr}, RPP_{bio}, harvest index and crop index. On the contrary, Giza-123

cultivar gave the greatest values from straw yield per plant and or/fed and RPP_{veg}.

With respect of chemical composition of dry grains, table (7) indicate that cultivar differences between barley cultivars in N%, P%, K%, total carbohydrate % and crude protein % per dry grains were significant, also, Giza-127 cultivars significantly exceeded Giza-123 cultivar in all pervious nutritional values of barley grains.

It is worthy that significant superiority of Giza-127 cultivar over Giza-123 cultivar in grain yield production, per plant and or per fed may be due to its superiority in growth characters at 95 and 110 days age, (Table 1), in spikes dry weight /plant, main spike dry weight, number of grains/plant, migration coefficient, RPP_{gr}, RPP_{bio}, grain index, harvest index and crop index (Table 4), to the differences in genetic structure, also to the widely differences between cultivars for mineral elements concentrations and cultivar differences in photosynthetic partitioning and migration of photosynthesis between barley plant organic (Ahmed *et al.*; 2013). Moreover, the significant differences in growth parameters, yield and its components, as well as, chemical composition of dry barley grain herine, are in good harmony with previous results obtained by Alberta (2007), Sarwat and Sheriff, (2007), Skrinbanch and Tomesanyi (2008); Ahmed *et al*. (2013), Shalaby *et al.* (2018).

(b) Effect Organic fertilization:

Organic fertilization caused significant increases in plant height, number and dry weight of tillers; blades and spikes/plant, flag leaf blade area, blades area/plant and LAI at 95 and 110 days after sowing. On the other hand, the effect on SLW was significant at 95 days age and insignificant at 110 days after sowing. From the same table increasing organic fertilization from 3.0 to 6.0 Ton/fed. Caused significant increase in all growth characters studied at 95 and 110 days and SLW at 95days age only, compared with 3 Ton/fed . Another increase in organic fertilizer rate from 6.0 to 9.0 Ton/fed. caused additional significant increases in all growth characters studied (except SLW) at 95 and 110 days age compared with 6.0 Ton/fed.

On the contrary, SLW decreased with increasing organic fertilization rate from 6 to 9 Ton/fed. Furthermore, plant height, number and dry weight of spikes/plant, flag leaf blade area, were increased with advancing plant age from 95 to 110 days age, whereas, number and dray weight of tillers + sheet and blades/plant, blades area/plant and LAI seemed to be decreased with advancing plant age from 95 to 110 days age (Table 1).

Moreover, Table (4) show clearly that effect of organic fertilization on yield and its components (except crop index) was significant. It is clear that adding 6 ton/fed. caused significant increases in spikes dry weight/plant, main spike dry weight, main spike length, number of grains/plant, grain; straw and biological yield per plant and/or per fed, migration coefficient, RPP_{gr}, RPP_{bio}, RPP_{veg}, grain index and harvest index and insignificant increases in crop index in comparison with 3.0 to 9 Ton/fed. organic fertilizer. In addition increasing organic fertilizer rates from 6.0 to 9 Ton/fed. significantly increased significantly increased spikes dry weight/plant, main spike dry weight, main spike length, number of grains/plant, grain; straw and biological yields/plant, migration coefficient, Rpp_{gr} and grain index; on the contrary; caused significant decrement in Rpp_{bio}, RPP veg and harvest index and insignificant decrement in crop index compared with 6 ton/fed organic fertilization rate.

It is worthy to mention that Table (7) observed the effect of organic fertilization on chemical composition of dry grains was positive and significant, where increasing organic fertilizer rate from 3 to 6 ton/fed significantly increased 9 ton/fed significantly increased N%, P%, K%, total carbohydrate%, protein% compared with 3 Ton/fed., also increasing organic fertilization rate from 6 to 9 ton lfed significantly increased the previous chemical composition of dry grain compared with 6 ton/fed.

Organic fertilizer enhances the macro and micronutrient contents of the soil, soil water holding capacity pH and soil structure (Agricola, 1978 and Lekasi *et al.*, 2000) and plant grown with biological sources of nutrient is less susceptible to insects than conventionally grown plants (Lotter, 2003). In addition, adding organic fertilizer in crop cultivation give organic products and has comparatively long term beneficial residual effect than inorganic fertilizer is residual benefit do not last beyond one season (Rutunge and Neel, 2006) might be due to leaching of nutrients. Moreover, organic fertilizer has been used for improving physical and chemical properties of soil as recorded by Tennakon *et al.*, 1995 and Miller (2009) in order to better plant root system. Furthermore, Arisha and Bardisi (1999) on common bean plants, also, Sawon *et al.* (2001) found that increasing organic fertilizer rates from 0 to 16 ton/fed significantly increased growth characters of pea plants, yield/plant and fed, number of seeds/pod and seed weight/pod, nitrogen, phosphorus, potassium, total carbohydrates, total protein and TSS in seeds were significantly increased with application of 15 and 30 m^3/fed organic manure (El-Shafie and El-Shikha, 2003, Nour (2004) and Khairy (2007).

It is worthy to mention that the positive effect of organic fertilization on growth parameters, yield and its components, as well as, chemical composition of barley dry grains are in full harmony with those oblained by Sawan *et al.* (2001), El-Sofie and El-Shikha (2003), Lotter (2003), Mohamed *et al.* (2009), El-Sifie *et al.* (2013), Hlisni Kovshy and Kunzova (2014), Gobarah *et al*. (2015), Adams *et al.* (2015) and Amal G-Ahmed *et al.* (2016).

(c) Effect the inorganic nitrogen fertilizer rates:

Nitrogen inorganic fertilization significantly increased growth parameters (i.e. plant height, number and dry weight of tillers; blades and spikes/plant, flag leaf blade area, blades area/plant and LAI (Table 1). Data in Table (1) also, observed that adding nitrogen inorganic fertilizer at the rate of 80 kg N/fed, harvested the maximum values from the previous growth characters studied compared with 20 and 40 kg N/fed (except spikes dry weight at 95 days where 40 kg N/fed gave the highest values from this parameters) and this was true under newly cultivated sandy land in Wadi El-Rayan–El-Fayoum Governorate, Egypt. On the country, SLW was decreased with increasing nitrogen fertilization rate from 20 to 40 and 80 kg N/fed; respectively. On the other hand, plant height, number and dry weight of spikes/plant flag leaf blade area and SLW were increased with advancing plant age from 95 to 105 days, meanwhile, number and dry weight of tillers and blades/plant, blades area/plant and LAI tended to decreased with advancing plant age from 95 to 110 days after sowing.

Regarding yield and its components, data reported in Table (4) show clearly that increasing nitrogen inorganic fertilizer rate from 20 to 40 and/or 80 kg N/fed caused significant increament in spikes dry weight/plant, main spike dry weight, main spike length, number of grains/plant, grain,

straw and biological yield per plant and/or per fed, RPP_{gr}, Rpp_{bio} and grain index, also, inorganic nitrogen fertilizer rate 80 kg/fed. Significantly outweighed the tow rate 20 and 40 kg N/fed. It is worthy that, the effect of nitrogen fertilizer rates on harvest index and crop index was not significant, also, the differences between 20 and 40 kg N fertilizer rate on its effects for main spike length was not significant, whereas, RPP_{veg} significantly decreased with increasing nitrogen fertilizer rate from 40 to 80 kg N/fed.

The data illustrated in Table (7) indicate that the effect of nitrogen fertilizer rates on chemical composition of barley dry grains were significant, in addition, increasing nitrogen fertilizer rate from 20 to 40 and 80 kg N/fed resulted an increment in N%, P%, K%, total carbohydrate% and crude protein % per dry grains.

Moreover, the maximum chemical composition studied per dry grains were collected under 80 kg N/fed rates compared with 20 and 40kg N/fed.

It is worthy to mention that, plants required nitrogen element in comparatively large amount than other elements for plant growth. An essential component of many compound of the plant is nitrogen such as chlorophyll, carotenoids, protein, alkaloids, enzymes, hormones and vitamins (Marschner, 1995). For giving an optimal yield, must be insufficient to improving plant yield, where, nitrogen deficiency generally results in growth parameters, chlorotic leaves because the lake of nitrogen limits the synthesis of proteins and chlorophyll (Ihsanullah *et al.*, 2008). In addition, nitrogen application with proper amount of nitrogen can case to increase plant growth, chlorophyll content and yield also, yield attributes (Mam Rasul, 2017).

Generally, our results of the positive response of barley plants to nitrogen fertilizer, i.e. growth characters; yield and its components; as well as; chemicals composition are confirmed with previous results reported by. Moreno *et al.* (2003), Safina (2010), Shafa *et al.* (2011), Khaled *et al.* (2014), Dostlove *et al.* (2015), /kassa and Sorsa (2015), Abdel-Fattah and Merwad (2015), Reddy *et al.* (2018), Wali *et al.* (2018) and Dinka *et al.* (2018). Nitrogen positively influenced the leaf area and its chlorophyll concentration, thereby including crude protein content and the rheological properties of dough (Blandion and Reyneri, 2009). Nitrogen positively influences root biomass formation and creates optimal condition for successful growth (Rieger *et al.,* 2008) and for high protein content (Kindred *et al.*, 2018).

(d) Effect of interaction:

Effect of the interaction between barley cultivars and organic fertilization:

Date presented in table (2) indicate clearly that the interaction between barley cultivars and organic fertilization were great enough to reach the significant level at 5% for plant height, number and dry weight of tillers; blades and spikes/plant, flag leaf blade area, blades area/plant, LAI and SLW at 95 and 110 days after sowing. The interaction results showed that plant height, number and dry weight of spikes/plant, flag leaf blade area and LAI tended to increase with advancing plant age until 110 days after sowing, meanwhile, number and dry weight of tillers and blades / plant, blades area / plant and LAI tended to increase with advancing plant age from 95 to 110 days after sowing.

It is worthy to mention that adding 9 ton/fed to Giza-127 cultivar gave the greatest mean values from growth characters at 95 and 110 days after sowing. Moreover, table (5) show that there was significant effect on yield and its components of barley plant as a result of the interaction between barley cultivars and organic fertilization. Furthermore, adding 9 ton/fed organic fertilizer for Giza-127 cultivar produced the maximum values from spikes dry weight/plant, main spike dry weight/plant, main spike length, number of grain/plant, grain; straw and biological yield per plant and / or per fed, migration coefficient, RPP gr and grain index.

On the contrary, adding 6.0 ton/fed for Giza-127 cultivar gave the greatest values from RPP bio, harvest index and crop index, whereas, the Giza-123 cultivar had the greatest value from RPP veg with 3 ton/fed organic fertilizer.

Regarding the chemical composition of barley grains; Table (8) show clearly that the effect of the interaction between barley cultivars and organic fertilization rate was significant. The interaction result showed that N%, P %, K% total carbohydrate % and crude protein % reached their maximum mean values from Giza-127 cultivar under 9 ton/fed treatment.

Effect of the interaction between barley cultivars inorganic N fertilizer rates:

It is obvious from Table (2) that the interaction between barley cultivars and inorganic N fertilization rates seemed to have significant effect on growth characters of barley plants at 95 and 110 days after sowing. In general, plant height, number and dry weight of spikes/plant, flag leaf blade area and LAI was increased with advancing plant age from 95 to 110 days after sowing, meanwhile, number and dry weight of tillers and blades/plant, blades area/ plant and LAI tended to increase with advancing plant age from 95 to 110 days after sowing. It is worthy that Giza-127 cultivar harvested the highest mean values from growth characters of barley plants with 80 kg N/fed fertilizer treatment. With respect of yield and its components table (5) indicate clearly that the effect of the interaction between barley cultivars and organic fertilization was significant and were great enough to reach the significant level at 5 % level for spikes dry weight/plant, main spike dry weight/plant, main spike length, number of grains/plant, grain; straw and biological yields per plant and/or per fed, migration coefficient, RPP gr, RPP bio, RPP veg, grain index and harvest index , but the effect on crop index failed to reach the significant level at 5%.

The greatest mean values from yield and its components were collected from Giza-127 cultivar under 80 kg N/fed treatments except RPP veg the greatest value was harvested from Giza-123 cultivar under 40 kg N/fed, treatment.

Data illustrated in Table (8) indicated clearly that the interaction between barley cultivars and inorganic nitrogen fertilizer rates was significant with respect of N%, P%, K%, total carbohydrate %, and crude protein% per barley dry grains. The interaction date indicated that the previous chemical composition of barley dry grains recorded the greatest mean values by Giza-127 cultivar at rate 80 kg N/fed, meanwhile, Giza-123 cultivar gave the minimum values from chemical constituents studied of dry grains under at rate of 20 kg N/fed, treatment. In addition, our results confirmed with results of Amos *et al.* (2015).

Effect of the interaction between organic fertilization and inorganic N fertilizer rates

With respect of the interaction between organic fertilization and nitrogen fertilizer rates, date respected in Table (2) show clearly that effect on growth characters at 95 and 110 days after sowing was significant. Furthermore, soil applied with 9 ton/fed organic fertilization characterized by

its greatest men values from growth parameters of barley plants (except SLW) under fertilization at rate of 80 kg inorganic N/fed treatment. On the other hand the highest mean values from SLW were collected from 3 ton organic fertilizer rate and 80 kg N/fed in the form of ammonium nitrate (33.3%) at 95 days age and 3 ton organic fertilization 20 kg inorganic N fertilizer at 110 days age, respectively.

Data in table (5) raveled that yield and its components (Except crop index) of barley plant significantly responses to the interaction between organic fertilization and inorganic N fertilizer rates in the form of ammonium nitrate (33.3%). Data harvested indicate that the most favorable treatment to gave the greatest mean values from spikes dry weight/plant, main spike dry weight, main spike length, number of grains/plant, grain; straw and biological yields per plant and/or per fed, migration coefficient, RPP_{gr}, RPP_{bio} and grain index was 9 ton/fed organic fertilization under 80 kg N organic fertilizer/fed treatment, on the other hand, the treatment 3 ton/fed 40 kg N/fed and ton/fed 80 kg inorganic N fertilizer/fed gave the highest RPP veg, while, adding 40 kg inorganic N fertilizer/fed or 80 kg inorganic M fertilizer to 6 ton organic fertilizer treatment gave the greatest harvest index. Regarding the chemical composition of dry grains Table (8) observed that interaction was significant, in addition 9 ton/fed organic fertilizer 80 kg inorganic N fertilizer/fed gave the highest N%, P%, k%, total carbohydrate % and crud protein % per dry grains. It is worthy that our results are in full agreement Zhao and Zaou (2011), Yu *et al.* (2012) and Lukas and Kunzova (2014).

Effect of the three-way interaction cultivar , organic

Fertilization and inorganic N fertilizer : The effect of the three way interaction between cultivars x organic fertilization x inorganic N fertilizer on growth parameters at 95 and 110 days after sowing (Table 3), yield and its components except migration coefficient, RPP_{veg}, as well as, crop index (Table 6), also, on chemical composition of dry grain (Table 9) was significant. On the other hand the effect on migration coefficient, RPP veg and crop index failed to reach the significant level at 5%. Generally, the highest values from plant height, number and dry weight of tillers; blades and spikes at 95 and 110 days ago, flag leaf blade area, blades area and LAI (Table 3); spikes dry weight/ plant; main spike dry weight; main spike length; number of grains/plant; grain; straw and biological yield per plant and/or per fed; migration coefficient; RPP gr and grain index at harvest date (Table 6), as well as N%; P%, K%, total carbohydrate % and crude protein % per dry grains at harvest date were harvested under Giza-127 fertilized by 9 ton/fed organic fertilizer and 80 kg inorganic N fertilizer/fed in a form of ammonium nitrate 33.3% N.

On the other hand; Giza-127 cultivar t 6 ton/fed organic fertilizer and 80 kg inorganic N fertilizer fed, harvested the greatest mean values from; harvest index and crop index, whereas, Giza-123 cultivar treated under 6 ton/fed organic fertilizer and 40 kg inorganic N fertilizer/fed had the greatest RPP_{veg} compared with other treatment.

Generally; the use of organic fertilizer together with chemical fertilizers, compared to the addition of organic fertilizer alone had a higher positive effect on microbial biomass and hence soil health (Dutta *et al.*, 2003) and resulted the high value of economical yield (Lukas and Kunzova, 2014).

Table 1 : Effect of cultivars; organic fertilizer and inorganic N fertilizer on growth characters of barley plants (Average of 2016/2017 and 2017/2018 season)

Treatments	Plant height cm		No. of tillers/plant		No. of blades/plant		No. of Spikes/plant		Filters +sheds dry et-g/plant		Blades dry ut-g/plant		Spikes dry/ut-g/plant		Flag leaf		Blades areas cm^2/plant		LAI		SLW mg/cm^2	
	95	105	95	110	95	110	95	116	95	110	95	110	95	110	95	110	95	110	95	110	95	110
Cultivars																						
Giza-123	68.84	75.67	4.14	3.66	30.3	26.27	3.09	3.56	3.23	3.05	2.57	2.36	1.40	2.48	28.56	34.08	486.79	440.17	3.24	2.93	5.30	5.38
Giza-127	74.96	81.2	4.80	4.43	32.79	29.39	3.52	4.11	3.55	3.24	2.72	2.48	1.57	2.84	32.22	36.18	501.08	449.39	3.34	3.00	5.44	5.52
L.S.D. at 5% level	3.12	2.32	0.51	0.43	1.22	1.43	0.19	0.27	0.06	0.08	0.10	0.07	0.03	0.04	0.29	0.42	4.62	2.58	0.02	0.05	0.09	0.11
Organic fertilizer																						
Ton/fed																						
3 Ton/fed	69.39	74.98	4.00	3.68	27.10	23.47	2.73	3.42	3.26	2.98	2.53	2.30	1.34	2.52	27.81	32.35	477.86	425.09	3.19	2.84	5.29	5.41
6 Ton/fed	72.63	77.79	4.49	4.11	32.10	28.14	3.21	3.9	3.40	3.17	2.66	2.42	1.44	2.65	30.35	35.16	491.71	442.0	3.25	2.95	5.41	5.41
9 Ton/fed	77.15	82.73	4.77	4.36	35.55	31.88	3.70	4.20	3.52	3.30	2.75	2.55	1.68	2.82	33.11	37.39	509.67	467.25	3.40	3.12	5.39	5.41
L.S.D. at 5% level	1.55	1.21	0.23	0.08	1.18	0.37	0.31	0.17	0.03	0.10	0.01	0.08	0.06	0.05	0.97	1.11	3.35	8.07	0.09	0.03	0.02	n.s
Inorganic N fertilizer																						
KgN/fed:																						
20 kg N/fed	68.54	72.6	4.09	3.80	28.83	24.85	2.71	3.59	3.25	3.05	2.60	2.34	1.39	2.38	20.93	30.11	464.37	413.58	3.07	2.76	5.59	5.65
40 Kg N/fed	72.53	78.85	4.42	4.02	31.93	28.20	3.17	3.74	3.39	3.13	2.65	2.43	1.76	2.72	30.46	33.62	482.29	441.92	3.22	2.95	5.49	5.51
60 Kg/fed.	78.11	83.87	4.76	4.34	34.22	30.44	3.76	4.20	3.54	3.27	2.70	2.50	1.56	2.88	39.78	42.4	537.93	478.83	3.53	3.19	5.02	5.21
L.S.D. at 5% level	1.72	1.84	0.19	0.12	1.43	0.65	0.28	0.25	0.10	0.05	0.02	0.04	0.07	0.13	1.06	1.20	11.23	11.45	0.11	0.14	0.01	0.03

Table 2 : Effect of the interaction between cultivars X organic fertilizer, cultivars x inorganic N fertilizer and organic fertilizers x inorganic N fertilizer on growth characters of barley plants (Average of 2016/2017 and 2017/2018 seasons).

Cultivar	Organic fertilizer ton/fed	Inorganic fertilizer kg N/fed	Plant height cm		No. of tillers/plant		No. of blades/ plant		No. of Spikes/ plant		Tilters + sheats dry wt.-g/plan		Blades dry wt.-g/plan		Spikes dry/wt.-g /plant		Flag leaf area cm^2/plant		Blades areas cm^2/plant		LAI		SLW mg/cm^2	
			95	110	95	110	95	110	95	110	95	110	95	110	95	110	95	110	95	110	95	110	95	110
Giza-123	3 ton/fed		66.80	70.75	3.73	3.39	27.7	23.81	2.42	3.37	3.05	2.90	2.51	2.22	1.33	2.33	19.44	28.55	450.66	408.5	3.00	2.72	5.57	5.61
	6 ton/fed		69.60	76.40	4.11	3.64	30.57	26.67	3.17	3.47	3.22	3.04	2.56	2.36	1.39	2.50	28.67	32.42	478.18	436.0	3.19	2.91	5.35	54.1
	9 ton/fed		76.13	49.8	4.56	3.94	32.63	28.33	3.42	3.84	3.41	3.21	2.85	2.43	1.48	2.60	37.57	41.27	531.53	476.0	3.54	3.17	4.99	5.11
Giza-127	3 ton/fed		70.28	74.43	4.42	4.19	29.56	25.88	3.0	3.83	3.42	3.18	2.68	2.37	1.44	2.42	22.4	31.72	471.4	418.67	3.14	2.79	5.69	5.66
	6 ton/fed		74.51	31.23	4.72	4.39	33.02	29.73	3.5	4.0	3.56	3.21	2.73	2.51	1.63	2.94	32.25	33.48	487.5	447.83	3.29	2.99	5.60	5.60
	9 ton/fed		80.08	87.94	4.95	4.72	35.8	32.55	4.1	4.5	3.67	3.33	2.74	2.4	1.64	3.19	42.0	43.35	544.33	481.67	3.63	3.21	5.03	5.31
L.S.D. at 5% level			1.90	1.71	0.32	0.11	1.66	0.52	0.44	0.24	0.94	0.14	0.01	0.11	0.08	0.07	1.37	1.57	1.18	11.38	0.13	5.04	0.03	0.02
		20 kg/N/fed	67.66	72.33	3.61	3.25	25.11	22.31	2.36	3.22	3.10	2.88	2.44	2.25	1.25	2.33	26.17	33.02	47.8	419.5	3.14	2.80	5.18	5.36
Giza-123		40 kg/N/fed	70.60	74.73	4.25	3.72	30.87	26.22	2.92	3.67	3.21	3.07	2.60	2.33	1.35	2.46	28.69	34.12	485.44	437.0	3.24	2.91	5.36	5.33
		80 kg/N/fed	75.22	79.95	4.56	4.0	39.27	30.28	3.39	3.84	3.38	3.20	2.69	2.50	1.60	2.64	31.02	36.10	499.01	464.0	3.33	3.09	5.39	5.39
		20 kg/N/fed	71.12	77.63	4.39	4.08	28.42	24.63	3.10	3.61	3.41	3.07	2.62	2.35	1.43	2.70	29.45	32.67	484.91	430.87	3.23	2.87	5.4	5.46
Giza-127		40 kg/N/fed	74.67	80.48	4.72	4.5	33.32	30.05	3.5	4.17	3.58	3.27	2.72	2.50	1.53	2.83	32.0	37.4	487.97	447.0	3.32	2.98	5.46	5.28
		80 kg/N/fed	79.08	85.5	4.97	4.72	36.82	33.48	40	4.56	3.66	3.39	2.80	2.80	1.8	2.99	35.2	38.67	520.33	170.5	3.47	3.14	5.38	5.53
L.S.D. at 5% level			2.43	2.59	0.27	0.17	2.02	.94	0.39	0.35	0.14	0.07	0.07	0.06	1.00	0.18	1.5	1.82	15.83	16.14	0.16	0.20	0.01	0.11
		20 kg/N/fed	65.63	69.65	3.67	3.38	25.18	21.83	2.25	3.17	3.12	2.80	2.42	2.22	1.20	2.21	18.56	26.63	441.78	388.5	2.94	2.59	5.48	5.71
	3 ton/fed	40 kg/N/fed	67.87	71.75	4.13	3.92	21.8	25.46	2.63	3.75	3.25	3.11	2.63	2.31	1.31	2.32	20.59	3.43	472.47	405.5	3.08	2.70	5.57	5.70
		80 kg/N/fed	72.12	76.4	4.46	4.09	31.38	27.29	3.25	3.84	3.37	3.23	2.74	2.48	1.65	2.62	23.63	32.76	478.85	446.5	3.19	2.98	5.72	5.59
		20 kg/N/fed	68.68	74.55	4.00	3.63	27.40	23.59	2.67	3.34	3.27	3.02	2.54	2.32	1.34	2.59	26.58	29.41	471.5	423.0	3.14	2.82	5.39	5.48
	6 ton/fed	40 kg/N/fed	71.84	77.9	4.5	4.09	31.9	27.79	3.25	3.79	3.38	3.13	2.65	2.43	1.50	2.72	30.16	35.55	480.67	443.0	3.20	2.95	5.51	5.49
		80 kg/N/fed	77.08	84.09	4.75	4.34	6.48	33.27	3.59	4.13	3.52	3.24	2.76	2.55	2.45	2.86	34.05	35.90	496.35	459.75	3.31	3.07	5.56	5.55
		20 kg/N/fed	73.87	80.75	4.34	4.0	29.10	25.00	3.28	3.75	3.39	3.12	2.63	2.37	1.50	2.76	38.3	41.4	520.3	463.5	3.47	3.09	5.05	5.11
	9 ton/fed	40 kg/N/fed	78.2	83.17	4.84	3.34	35.05	31.20	3.75	4.25	3.57	3.27	2.71	2.51	1.52	2.91	40.0	42.3	532.0	477.5	3.55	3.18	5.10	5.26
		80 kg/N/fed	82.26	87.7	8.09	4.68	38.5	35.13	4.25	4.59	3.67	3.43	2.75	2.61	1.67	2.97	41.05	43.5	561.5	495.5	3.74	3.31	4.90	5.27
L.S.D. at 5% level			2.55	2.72	0.28	0.18	2.12	0.96	0.41	0.37	0.15	0.07	0.07	0.06	0.10	0.19	1.57	1.41	16.62	16.95	0.16	0.21	0.01	0.11

Table 3 : Effect of the three way interaction between cultivars x organic fertilizer x inorganic N fertilizer on growth characters of barley plants (Average of 2016/2017 and 2017/2018 season).

Cultivar	Organic fertilizer ton/fed	Inorganic fertilizer kg N/fed	Plant height cm		No. of tillers/plant		No. of leaves/plant		No. of Spikes/plant		Tilters +sheds dry wt-g/plant		Blades dry wt g/plant		Spikes dry/wt.g/plant		Flag leaf area		Blades areas cm^2/plant		LAI		SLW mg/cm
			95	110	95	110	95	110	95	110	95	110	95	110	95	110	95	110	95	110	95	110	95
Giza-123	3 ton/fed	20 kgN/fed	63.75	68.2	24.6	20.75	3.33	3.0	2.0	3.0	2.95	2.68	2.31	2.15	1.1	2.13	17.5	25.6	430.3	38.25	.8	.5	.35
		40 kgN/fed	66.4	69.8	28.5	24.17	3.75	3.5	2.25	3.5	3.04	2.95	2.52	2.26	1.27	2.27	18.67	29.45	453.0	4.00	.0	.3	.63
		80 kgN/fed	70.24	74.3	30.0	26.5	4.17	3.67	3.00	3.60	3.21	3.09	2.66	2.47	1.62	2.59	22.15	30.6	468.7	14.43	.1	.9	.68
	6 ton/fed	20 kgN/fed	66.9	72.3	25.9	22.17	3.5	3.25	2.33	3.17	3.09	2.92	2.43	2.27	1.26	2.37	25.3	28.67	468.5	41.4	.1	.7	.15
		40 kgN/fed	69.5	75.4	30.0	26.5	4.33	3.67	3.00	3.50	3.17	3.04	2.56	2.32	1.37	2.49	28.4	31.90	457.33	43.6	.1	.9	.39
		80 kgN/fed	75.25	81.67	35.6	31.33	4.5	4.0	3.17	3.75	3.39	3.17	2.70	2.48	1.54	2.64	31.9	35.6	490.7	45.8	.2	.05	.5
	9 ton/fed	20 kgN/fed	72.33	76.5	26.8	24.0	4.0	3.5	2.75	3.5	3.27	3.05	2.57	2.33	1.39	2.50	35.7	40.8	5136.6	46.2	.4	.0	.06
		40 kgN/fed	75.90	79.0	34.1	28.0	4.67	4.0	3.5	4.0	3.43	3.22	2.68	2.42	1.41	2.61	38.6	41.0	528.0	47.5	.5	.1	.05
		80 kgN/fed	80.17	83.9	37.0	93.0	5.0	4.33	4.0	4.17	3.54	3.35	2.71	2.54	1.63	2.68	39.0	42.0	553.0	49.1	.6	.2	.90
Giza-127	3 ton/fed	20 kgN/fed	67.5	71.1	25.75	22.9	4.0	3.75	2.5	3.33	2.38	3.91	2.52	2.28	1.29	2.92	14.6	26.85	453.95	39.5	.0	.6	.56
		40 kgN/fed	69.33	73.7	30.17	26.75	4.5	4.33	3.	4.0	3.45	3.26	2.70	2.75	1.35	2.34	22.5	33.4	471.94	41.1	.4	.7	.72
		80 kgN/fed	74.00	78.5	32.75	28.0	4.79	4.5	3.5	4.17	3.52	3.37	2.81	2.49	1.68	2.65	25.1	24.91	489.0	45.0	.2	.0	.75
	6 ton/fed	20 kgN/fed	70.45	76.8	28.1	25.0	4.5	4.0	3.0	3.5	3.44	3.11	2.64	2.36	1.41	2.80	27.86	29.15	475.5	43.2	.1	.8	.56
		40 kgN/fed	74.17	80.9	33.8	29.0	4.67	4.5	3.5	1.0	3.59	3.22	2.73	2.54	1.62	2.95	31.5	35.2	486.0	45.0	.3	.0	.62
		80 kgN/fed	78.9	86.5	37.17	25.2	5.00	4.67	4.0	4.5	3.64	3.31	2.81	2.62	1.86	3.08	37.4	36.1	502.0	461.5	.3	.05	.66
	9 ton/fed	20 kgN/fed	75.4	85.0	31.4	2.60	4.67	4.5	3.8	4.0	3.5	3.18	2.64	2.41	1.60	3.01	40.9	42.0	527.0	46.5	.5	.1	.10
		40 kgN/fed	80.5	87.33	36.0	34.4	5.0	4.67	4.0	4.5	3.7	3.32	2.74	2.60	1.63	3.19	42.0	43.6	536.0	48.0	.5	.2	.11
		80 kgN/fed	84.35	91.50	40.0	37.25	5.17	5.0	4.5	5.0	3.81	3.50	2.79	2.60	1.70	3.25	43.1	45.0	570.0	50.0	.8	.3	.89
L.S.D. 5% level			2.70	2.89	2.25	1.02	0.30	0.19	0.44	0.39	0.16	0.08	0.03	0.06	0.11	0.20	1.66	2.03	17.63	17.38	.1	.1	.02

Table 4 : Effect of cultivars; organic fertilizer and inorganic N fertilizer on yield and its components of barley plants (Average of 2016/2017 and 2017/2018 seasons).

Treatments	Spikes dry wt.g/ plant	Main spike dry wt.g	Main spike length C	No. of grains/ plant	Grain yield g/plant	Straw yield g/plant	Biological yield g/plant	Grain yield ton/fed	Straw yield ton/fed	Biological yield ton/fed	Migrate coefficient	RPP gr/ g/LA	RPP bio/g/ LAI	RPPveg g / LAI	Grian ndex 1000 grain/g	Harvest index	Crop Index
Cultivars:																	
Giza-123	22.63	7.38	9.96	34.95	15.31	29.4	44.71	2.27	3.16	5.43	0.50	4.92	14.45	9.53	40.57	0.72	0.42
Giza-127	25.32	8.27	10.79	38.5	17.33	29.92	47.29	2.60	3.26	5.86	0.54	5.44	14.89	9.45	41.31	0.80	0.45
L.S.D. at 5% level	1.60	0.56	0.41	0.31	0.48	0.47	1.49	0.24	0.08	0.26	0.01	0.40	0.13	0.05	0.36	0.04	0.02
Organic fertilizer:																	
3 ton/fed	21.29	7.43	9.94	8.5	14.19	28.24	42.43	2.30	3.05	5.35	0.50	4.84	14.52	9.68	40.29	0.75	0.43
6 ton/fed	24.03	7.81	10.22	39.86	16.4	29.89	46.13	2.47	3.12	5.59	0.52	5.25	14.95	9.70	40.69	0.80	0.44
9 ton/fed	26.61	8.25	10.98	41.91	18.54	30.87	49.41	2.54	3.47	5.01	0.54	5.45	14.55	9.10	41.89	0.73	0.43
L.S.D at 5% level	1.05	0.18	0.52	0.71	1.39	0.65	2.01	0.07	0.18	0.40	0.02	0.17	0.18	0.02	0.42	0.05	n.s.
Inorganic N fertilizer																	
20 kgN/fed	20.78	7.32	10.06	34.94	13.94	28.51	42.45	2.31	3.09	5.4	0.49	4.61	14.10	9.49	40.53	0.75	0.43
40 kgN/fed	24.05	7.88	10.35	36.9	16.49	29.61	46.1	2.15	3.22	5.67	0.52	5.28	14.79	9.51	40.92	0.69	0.43
80 kgN/fed	27.17	8.29	10.77	38.42	18.54	30.87	48.41	2.54	3.33	5.87	0.55	5.65	15.12	9.47	41.38	0.76	0.43
L.S.D. at 5% level	1.29	0.22	0.31	0.89	0.61	0.45	1.54	0.05	0.03	0.14	0.02	0.07	0.04	0.01	0.36	n.s	n.s

Table 5 : Effect of interaction between cultivars x organic fertilizer, cultivars x inorganic N fertilizer and inorganic fertilizer x N inorganic fertilizer and yield and its components of barley plants (Average of 2016/2017 and 2017/2018 seasons).

Treatment	Organic fertilizer ton/fed	norganic N fertilizer kgN/fed.	Spikes dry wt.g/plant	Main spike dry wt.g	Main spike length Ca	No. of grains/plant	Grain yield g/plant	Straw yield g/plant	Biological yield g/plant	Grain yield ton/fed	Straw yield ton/fed	Biological yield ton/fed	Migration coefficient	RPP gr/ /LR	RPP bio/g/LRI	RPP g/g/L/K	Grain index 1000 grain/g	Harves index	Crop Index
Giza-123	3 ton/fed		19.56	6.83	9.45	27.74	12.99	28.02	41.1	2.18	2.97	5.15	0.47	4.51	14.29	9.78	40.13	0.73	0.42
	6 ton/fed		22.63	7.38	9.77	37.54	15.11	29.82	44.93	2.29	3.08	5.37	0.50	4.95	14.74	9.79	40.48	0.75	0.42
	9 ton/fed		25.69	7.94	10.67	39.57	17.83	30.36	48.19	2.33	3.43	5.76	0.53	5.29	14.33	9.04	41.10	0.68	0.41
Giza-127	3 ton/fed		23.02	8.02	10.47	29.26	15.38	28.45	43.83	2.42	3.12	5.54	0.92	5.16	14.74	9.58	40.45	0.77	0.44
	6 ton/fed		25.43	8.23	10.66	42.17	17.36	29.95	47.3	2.65	9.15	5.80	0.54	5.55	15.15	9.60	40.9	0.84	0.46
	9 ton/fed		27.52	8.56	11.29	44.24	19.25	31.34	50.62	2.74	3.51	6.25	0.55	5.61	14.77	9.16	42.59	0.78	0.44
L.S.D. at 5% level			1.48	0.25	0.73	1.00	1.96	0.92	2.83	0.10	0.25	0.56	0.03	0.24	0.25	0.03	0.59	0.07	0.01
Giza-123		20 kgN/fed	18.42	6.82	9.63	33.66	13.28	28.21	41.49	2.19	3.04	5.23	0.46	4.46	14.00	9.54	40.22	0.72	0.42
		40 kgN/fed	22.43	7.43	9.99	34.83	15.10	29.42	44.52	2.26	3.19	5.45	0.50	4.88	14.45	9.57	40.52	0.71	0.41
		80 kgN/fed	26.03	7.91	10.26	36.37	17.21	30.57	47.78	2.35	3.27	5.62	0.54	5.41	14.91	9.50	40.98	0.72	0.42
Giza-127		20 kgN/fed	23.4	7.82	10.49	36.22	14.59	28.8	43.39	2.43	3.14	5.57	0.51	4.76	14.20	9.44	40.84	0.78	0.44
		40 kgN/fed	25.66	8.33	10.72	38.89	12.87	29.46	47.33	2.65	3.26	5.91	0.54	5.67	15.12	9.45	41.32	0.81	0.45
		80 kgN/fed	28.32	8.66	11.28	39.63	19.53	31.17	50.70	2.73	3.38	6.11	0.56	5.89	15.38	9.44	41.78	0.81	0.45
L.S.D. at 5% level			1.82	0.33	0.44	1.25	0.86	0.63	2.17	0.07	0.04	0.20	0.03	0.10	0.06	0.01	0.51	0.04	m.s
	3 ton/fed	20 kgN/fed	18.28	6.89	9.70	27.97	11.82	26.8	38.82	2.20	2.92	5.12	0.47	.26	13.94	4.68	39.90	0.75	0.43
		40 kgN/fed	21.49	7.55	10.03	28.44	14.53	28.09	42.62	2.30	3.05	5.35	0.50	5.00	14.69	9.69	40.23	0.75	0.43
		80 kgN/fed	24.3	7.84	10.25	29.10	16.22	29.82	46.04	2.41	3.21	5.62	0.53	5.25	14.92	9.67	40.75	0.75	0.43
	6 ton/fed	20 kgN/fed	20.80	7.37	9.96	37.24	14.04	28.8	42.84	2.34	3.00	5.34	0.49	4.71	14.38	9.67	40.32	0.79	0.44
		40 kgN/fed	24.12	7.77	10.24	40.13	16.71	29.92	46.63	2.50	3.09	5.59	0.52	5.42	14.69	9.27	40.70	0.80	0.44
		80 kgN/fed	27.19	8.29	10.45	42.2	17.97	30.93	48.90	2.57	3.21	5.78	0.56	5.63	15.32	9.69	41.03	0.80	0.44
	9 ton/fed	20 kgN/fed	23.45	7.70	10.52	39.6	15.96	29.93	45.89	2.40	3.36	5.76	0.51	4.87	13.99	9.12	41.38	0.72	0.42
		40 kgN/fed	26.54	8.32	10.79	42.17	18.23	30.82	49.05	2.56	3.51	6.07	0.54	5.47	14.55	9.08	41.80	0.73	0.42
		80 kgN/fed	30.03	8.74	11.62	43.93	21.43	31.86	53.29	2.65	3.56	6.21	0.57	6.08	15.12	9.04	42.37	0.75	0.43
L.S.D. at 5% level			1.91	0.33	0.46	1.32	0.90	0.67	2.32	0.07	0.04	0.21	0.03	0.10	0.06	0.01	0.53	0.01	n.s

Table 6 : Effect of the through interaction between cultivars x organic fertilizer x inorganic N fertilizer on yield and its components of barley plants (Average of 2016/2017 and 2017/2018 seasons).

Treatment	Organic fertilizer ton/fed	norganic N fertilizer kgN/fed.	Spikes dry wt.g/plant	Main spike ry wt.g	Main spike ength C	No. of grains/ plant	Grain yield g/plant	Straw yield g/plant	Biological yield g/plant	Grain yield ton/fed	Straw yield ton/fed	Biological yield ton/fed	Migrate coefficient	RPP gr/ /LR	RPP bio/g/LRI	RPP g/g/L/K	Grain ndex 100 grain/g	Harves index	Crop Index
Giza-123	3 Ton/fed.	20 kgN/fed	16.3	6.24	9.14	27.29	11.23	26.59	37.82	2.07	2.86	4.93	0.43	4.14	13.96	9.82	39.8	0.72	0.42
		40 kgN/fed	19.56	6.95	9.57	27.74	12.54	27.82	40.36	2.16	2.99	5.15	0.48	4.40	14.16	9.76	40.07	0.72	0.42
		80 kgN/fed	22.81	7.31	9.63	28.20	15.4	29.64	44.85	2.31	3.12	5.43	0.51	5.00	14.75	9.75	40.53	0.74	0.43
	6 Ton/fed.	20 kgN/fed	19.45	6.85	9.58	35.48	13.40	28.60	42.00	2.23	2.95	5.18	0.46	4.56	14.29	9.73	40.15	0.76	0.43
		40 kgN/fed	22.28	7.32	9.81	37.76	15.33	30.00	45.33	2.29	3.10	5.39	0.50	5.04	14.91	9.87	40.48	0.74	0.42
		80 kgN/fed	26.17	7.98	9.92	39.10	16.60	30.86	47.46	2.34	3.18	5.52	0.55	5.25	15.02	9.77	40.83	0.74	0.42
	9 Ton/fed.	20 kgN/fed	22.50	7.36	10.16	38.2	15.2	29.45	44.65	2.28	3.30	5.58	0.50	4.68	13.74	9.06	40.72	0.69	0.41
		40 kgN/fed	25.45	8.01	10.58	39.0	17.45	30.43	47.88	2.32	3.49	5.81	0.53	5.21	14.29	9.08	41.00	0.66	0.40
		80 kgN/fed	29.11	8.45	11.24	41.50	20.83	31.20	52.03	2.39	3.51	5.90	0.56	5.99	14.95	8.96	41.59	0.68	0.41
Giza-127	3 Ton/fed.	20 kgN/fed	19.86	7.53	10.25	28.65	12.4	27.00	39.4	2.32	2.97	5.29	0.50	4.38	13.92	9.54	40.0	0.78	0.44
		40 kgN/fed	23.42	8.15	10.49	29.14	16.15	28.35	44.86	2.43	3.11	5.54	0.52	5.60	15.21	9.61	40.38	0.78	0.44
		80 kgN/fed	25.79	8.37	10.86	30.0	17.22	30.0	47.22	2.50	3.29	5.79	0.55	5.50	15.8	9.59	40.97	0.76	0.43
	6 Ton/fed.	20 kgN/fed	22.14	7.88	10.34	39.0	14.67	29.0	43.61	2.45	3.04	5.49	0.51	4.86	14.46	9.60	40.48	0.81	0.45
		40 kgN/fed	25.95	8.22	10.66	42.5	18.09	29.84	47.93	2.71	3.17	5.88	0.54	5.80	15.36	9.56	41.00	0.85	0.46
		80 kgN/fed	28.21	8.59	10.98	12.0	19.33	31.00	50.3	2.79	3.24	6.03	0.56	6.00	15.62	9.62	41.22	0.86	0.46
	9 Ton/fed.	20 kgN/fed	24.40	8.01	10.88	41.00	16.71	30.40	47.11	2.51	3.41	5.92	0.52	5.05	14.29	9.18	42.04	0.74	0.42
		40 kgN/fed	27.62	8.61	11.00	45.33	19.00	31.20	50.20	2.80	3.53	6.33	0.55	5.60	14.80	9.20	42.59	0.79	0.44
		80 kgN/fed	30.95	9.02	1.99	46.40	22.04	32.51	54.65	2.91	3.62	6.51	0.57	6.17	15.28	9.11	43.14	0.81	0.45
L.S.D. at 5% level			2.03	0.35	0.49	1.40	0.96	0.71	2.42	0.08	0.05	0.22	11.5	0.11	0.06	n.s	0.57	0.02	n.s

Table 7 : Effect of cultivars organic fertilizer, and inorganic N fertilizer on chemical composition of day grains for bacly plants (Average of 2016/2017 and 2017/2018 seasons).

Treatments	N	P%	K%	Total Carbohydrate %	Crude protein %
Cultivars:					
Gize-123	2.08	0.56	2.10	80.64	11.9
Giza-127	2.12	0.60	2.13	82.05	12.20
L.S.D. at 5% level	0.4	0.03	0.01	0.46	0.20
Organic fertilizer Ton/fed					
3 Ton/fed.	2.07	0.55	2.09	79.66	11.86
6 Ton/fed.	2.11	0.59	2.13	81.56	12.14
9 Ton/fed.	2.1	0.62	2.15	82.82	2.32
L.S.D. at 5% level	0.03	0.01	0.02	0.27	0.14
Inorganic N fertilizer kgN/fed.					
3 Ton/fed.	2.07	0.50	2.08	80.52	11.92
6 Ton/fed.	2.10	0.54	2.11	81.24	12.04
9 Ton/fed.	2.15	0.72	2.17	82.29	12.35
L.S.D. at 5% level	0.03	0.12	0.05	0.76	0.10

Table 8 : Effect of the interactions between cultivars x organic fertilizer; cultivars x inorganic N fertilizer and organic fertilizer x inorganic N fertilizer of barley plants, (Average of 2016/2017 and 2017/2018 seasons).

Cultivars	Organic fertilizer Ton/fed	Inorganic N fertilizer KgN/fed.	N%	P%	K%	Total carbohydrate	Crude protein %
Giza-123	3 Ton/fed		2.04	0.53	2.07	78.85	11.75
	6 Ton/fed		2.09	0.57	2.11	80.73	12.0
	9 Ton/fed		2.12	0.60	2.13	82.33	12.21
Giza-127	3 Ton/fed		2.08	0.56	2.09	80.47	11.96
	6 Ton/fed		2.13	0.60	2.14	82.38	12.22
	9 Ton/fed		2.16	0.63	2.16	83.30	12.42
L.S.D. at % level			0.04	0.014	0.03	0.38	0.16
Giza-123		20kgN/fed.	2.05	0.48	2.07	79.64	11.79
		40kgN/fed.	2.07	0.53	2.09	80.46	11.90
		80kgN/fed.	2.13	0.70	2.15	81.80	12.27
Giza-127		20kgN/fed.	2.09	0.51	2.09	81.38	12.06
		40kgN/fed.	2.13	0.55	2.12	82.01	12.17
		80kgN/fed.	2.16	0.73	2.18	82.76	12.42
L.S.D. at % level			0.04	0.17	0.07	1.06	0.14
	3 Ton/Fed.	20kgN/fed.	2.03	0.46	2.06	78.60	11.73
		40kgN/fed.	2.05	0.52	2.07	79.68	11.70
		80kgN/fed.	2.11	0.66	2.13	80.71	12.14
	6 Ton/Fed.	20kgN/fed.	0.07	0.50	2.08	80.04	11.88
		40kgN/fed.	2.11	0.54	2.12	81.39	12.13
		80kgN/fed.	2.16	0.73	2.18	82.67	12.40
	9 Ton/Fed.	20kgN/fed.	2.12	0.53	2.10	82.34	12.16
		40kgN/fed.	2.14	0.57	2.14	82.65	12.28
		80kgN/fed.	2.18	0.76	2.20	83.48	12.51
L.S.D. at 5% level			0.04	0.18	0.07	1.12	0.15

Table 9 : Effect of the three way interaction between cultivar x organic fertilizer x inorganic N fertilizer on chemical compositions of barley grains (Average of 2016/2017 and 2017/2018 seasons).

Cultivars	Organic fertilizer Ton/fed	Inorganic N fertilizer KgN/fed.	N%	P%	K%	Total carbohydrate	Crude protein %
Giza-123	3 Ton/Fed.	20kgN/fed.	2.01	0.44	2.05	77.71	11.56
		40kgN/fed.	2.03	0.51	2.06	78.64	11.67
		80kgN/fed.	2.09	0.63	2.11	80.21	12.02
	6 Ton/Fed.	20kgN/fed.	2.05	0.48	2.07	79.51	11.79
		40kgN/fed.	2.07	0.53	2.09	80.47	11.90
		80kgN/fed.	2.14	0.71	2.17	82.2	12.31
	9 Ton/Fed.	20kgN/fed.	2.09	0.51	2.08	81.70	12.01
		40kgN/fed.	2.11	0.55	2.12	82.29	12.13
		80kgN/fed.	2.17	0.75	2.18	83.00	12.48
Giza-127	3 Ton/Fed.	20kgN/fed.	2.04	0.47	2.06	79.48	11.90
		40kgN/fed.	2.07	0.53	2.08	80.72	11.73
		80kgN/fed.	2.13	0.69	2.14	81.20	12.25
	6 Ton/Fed.	20kgN/fed.	2.08	0.51	2.09	81.70	11.96
		40kgN/fed.	2.15	0.54	2.14	82.30	12.36
		80kgN/fed.	2.17	0.74	2.19	83.14	12.48
	9 Ton/Fed.	20kgN/fed.	2.14	0.54	2.11	82.95	12.31
		40kgN/fed.	2.16	0.58	2.15	83.00	12.42
		80kgN/fed.	2.18	0.71	2.21	83.9	12.54
L.S.D. at 5% level			0.05	0.19	0.08	1.19	0.16

Conclusion

Barley cultivars were significantly differed in growth characters, yield and its components and percentages of nutritional value of dry grains. Adding organic fertilization at a rate 9 Ton/fed. improving growth, yield and its components and chemical constituents of dry grains. Furthermore, inorganic fertilizer caused significant increase in growth parameters, yield and its component and chemical constituents of barley grains, also, the most favorable rate from inorganic nitrogen fertilizer was 80 kg N/fed. Finally,

for improving grain yield of covered barley under Wadi El−Rayan, El−Fayoum Governorate, Egypt; the best treatment was Giza −127 cultivars under treatment with 9 ton/fed. organic fertilizer and 80 kg N/fed.

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