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RESPONSE OF SOME BARLEY CULTIVARS TO ORGANIC MANURING AND FOLIAR APPLICATION OF THE MICRONUTRIENTS MIXTURE FERTILAN 10 UNDER NEW RECLAIMED SANDY SOIL CONDITIONS.

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ABSTRACT

Two field experiments were conducted at a private farm at El-Salhia region, Sharkia Governorate, Egypt during 2004/2005 and 2005/2006 seasons to study the response of three barley cultivars viz. Giza 123, Giza 124 and Giza 125 to fertilization with three levels from farmyard manure (30, 35 and 40 m^3/fad.) and foliar spray with Fertilan 10 (containing micronutrients mixture) under sandy soil conditions. A split-split plot design with three replicates was used in both seasons.

The results revealed that, barley cultivars differed significantly where Giza 124 produced the highest grain and straw yields/fad. and the lowest grain protein content. However, Giza 125 recorded the highest grain protein content and the highest harvest index.

Foliar spray with Fertilan 10 had favourable significant effect on most studied traits. Grain yield/fad. was increased significantly by 14.54% over the two seasons due to this treatment.

The increase of farmyard manure rate up to 40m^3/fad. produced significant increases in grain and straw yields/fad. and most of their attributes. These increases were at for with those produced by the addition of 35 m^3/fad.

No significant interaction effect could be detected between each two of the factors under study on grain yield/fad. or any of its attributes.

The results indicated that grain yield/fad. was positively and highly significantly correlated with all studied traits including number of spikes/m^2, number of grains/spike, weight of grains/spike and 1000-grain weight.

Results cleared that the highest yield could be obtained from sowing Giza 124 barely cv. and addition of 35 m3 FYM with the foliar application of Firtlan 10 , under sandy soil conditions of El- Salhia region , Sharkia Govern orate.

Key words : Barley cultivars, organic manuring and foliar application.

INTRODUCATION

In Egypt, barley is the main winter crop in the North western coast and North Sinai were it is rain fed and as well under sprinkler irrigation in the newly reclaimed lands. It is used mainly for feeding animals and for bread making, either alone or

mixed with wheat. Also, it is used for malting in the brewing industry. Most of barley is grown in marginal lands which suffer from adverse conditions such as poor fertility levels. As most of the areas in the newly reclaimed lands are sandy soils, organic manuring and micronutrients fertilization are considered among the most important cultural practices for increasing barley productivity. Many investigators concluded that these cultural practices increased yields of barley cultivars and its components in addition to its quality.

Several workers reported that barley cultivars showed significant differences in yield and yield attributes (Noaman *et al.*, 1995; Gomaa, 1997; El-Hindi *et al.*, 1998; El-Bawab, 1999; Abdel-Hamid and Mohamed, 2000; El-Bawab *et al.*, 2003 and Abd Alla, Moha, 2004). However, Jha *et al.*, 1981; Noworolnik and Pecio, 1989 and Abdel-Hamid *et al.*, 2001 stated insignificant differences between cultivars regarding grain yield and grain protein content.

Soil application of micronutrients to alkaline soils is partially useless due to the fixation of most of these elements in the soil or because of leaching in the drainage water (Reuther, 1957). Mahmoud *et al.(*1987) found that foliar spray with 0.3% ZnSO enhanced significantly number of spikes and grain yield of barley variety CC89.

El-Sayed and Abdel-Hadi, (1991) found that grain yield of barley grown on calcareous soil was increased by 38%, 36%, 34% and 9% over the check treatment by spraying the plants with Zn, Mn, Fe and mixture of Zn+Mn+Fe, respectively. Also, Sanjay and Singh, 2004 reported that grain and straw yields were increased significantly with the soil application of Zn at the rate of 5.0 kg Zn/ha. Yield components like effective tillers, ear length, number of grains per ear and test weight were increased significantly due to the application of 5.0 kg Zn/ha. compared to lower levels.

The response of barley plants to the increase of organic manure application was studied by many workers. Sharma *et al.*,(2001) found that grain and straw yields obtained with 75 kgN/ha. alone was at par with that obtained with 60 kgN/ha along with 10 tons of farmyard manure/ha. El-Toukhy and Abd-Alla, (2002) grew Acacia saligna with both barley and ryegrass under three levels of organic manure (0, 20 and 40 m^3/fad.). they mentioned that application of 40 m^3/fad. organic manure gave significant increase of fresh and dry yields. Madlain Salib *et al.*(2002) reported that addition 7.5 m^3 farmyard manure (FYM)/fad. was the best treatment for barley plants regarding grain, straw yields, harvest index and 1000-grain weight. Addition of organic manure increased significantly grain yield/ha. compared with treatments without organic manuring (Kismanyoky, 2005 and Berecz *et al.*, 2005).

This investigation aimed to study the response of some barley cultivars to fertilization with organic manure and foliar micronutrients application under new reclaimed sandy soils.

MATERIALS AND METHODS

Two field experiments were conducted at a private farm at El-Salhia region, Sharkia Governorate, Egypt during 2004/2005 and 2005/2006 seasons to study the responses of three barley cultivars viz. Giza 123, Giza 124 and Giza 125 to fertilization with three levels from farmyard manure (30, 35 and 40 m^3/fad.) and foliar spray with Fertilan 10 which is a mixture of only micronutrients (3.5% Fe, 3.25% Mn, 2.75% Zn, 0.025% Cu, 0.25% B, > 0.1% Mo) in addition to cobalt (> 0.1%) and Nickel (> 0.1%). The soil of the experimental site is sandy in texture, it had an average pH value 8.09. and available N, P and K of 11.32, 3.74 and 91.5 ppm, respectively (average over the two seasons for the upper 25cm of soil depth). Nitrogen fertilization (Ammonium sulphate 20.6%) was applied at rate of 70 kgs N/fad. in three equal doses as well as a basal dose of calcium superphosphate (15.5% P_2O_5) and potassium sulphate (48% K_2O) at a rate 31 kgs P_2O_5 and 48 kgs K_2O/fad., respectively were soil applied during seedbed preparation. The other agronomic practices were adopted as recommended in the area. Surface irrigation was followed.

A split-split plot design with three replicates was used in both seasons. The three barley cultivars were assigned to the main plots. The sub plots included foliar spray with micro elements (treated and untreated), while farmyard manure treatments were distributed in the sub-sub plots. Plot area was $9m^2$ (3×3) including 15 rows 20 cm. part and 3m. long . The preceding crop was peanut in both seasons. Barley seeds were sown by hand drilling on 20^{th} and 17^{th} of November in the first and second seasons, respectively. Foliar treatment with micro elements (Fertilan 10) at rate 900cm^3/fad. was sprayed in 600 liter of water after 30, 40, 50 and 60 days from sowing.

At harvest, ten competitive plants were randomly taken from the second inner rows of each plot to determine plant height (cm). In the meantime, 10 spikes were randomly taken to determine spike length (with awn), number of grains/spike and grain weight/spike(g). Also a fixed area of $2m^2$ was harvested from each plot to determine number of tillers/m^2, number of spikes/m^2, 1000-grain weight(g), grain yield ton/fad., straw yield ton/fad., biological yield (grain+straw) in ton/fad. and harvest index. Grain protein content was determined as a total nitrogen percentage by micro-Kjeldahle method according to A.O.A.C.(1980), then converted to protein percentage by multiplying 6.25 as used by Tripathi and Kdward (1978).

The results were subjected to standard analysis of variance according to the procedure described by Snedecor and Cochran (1967). For comparison between means, Duncan's multiple range test was used (Duncan, 1955). The combined analysis of variance of the two seasons was used to calculate the simple correlation coefficient as described by Svab (1973).

RESULTS AND DISCUSSION

1- Varietal differences:

Highly significant differences were detected among barley cultivars in their, plant height, number of spikes/m^2, spike length, number of grains/spike, grain weight/spike, 1000-grain weight, grain yield, straw yield, protein percentage and biological yield in both seasons and the combined. Also, barley cultivars showed significant differences in numbers of tillers/m^2 during the second season and the combined while these cultivars showed significant differences in harvest index of the 1^{st} season and combined (Tables1, 2 and 3). Relevant results indicated that Giza 124 was superior to the other cultivars in all characters except, protein percentage and harvest index where Giza 125 produced the highest values in this respect. However, the differences did not reach the level of significant between Giza 123 and Giza 125 of number of tillers/m^2, number of spikes/m^2, number of grains/spike, grain weight/spike and grain yield in combined data. Moreover, the differences was not significant between Giza 123 and Giza 124 in harvest index (combined data) . It could be concluded that differences between barley cultivars could be due to genetic differences. These results are in a good line with those reported by El-Kholy and El-Bawab, 1998; El-Hindi *et al.*, 1998; Abdel-Hamid and Mohamed, 2000; El-Bawab *et al.*, 2003 and Abd Alla, Maha, 2004.

2- Effect of Fertilan 10 application:

Foliar spray with Fertilan 10 had significant favourable effects on number of grains/spike, grain weight/spike, 1000-grain weight, grain yield, straw yield and biological yield. This was true in both seasons and in the combined data. Also, foliar nutrition with Fertilan 10 produced significant increase in plant height, number of spikes/m^2 and spike length during the second season and the combined compared with the control. However, significant differences were observed between these treatments in number of tillers/m^2 and harvest index in combined data only. Grain yield/fad. was increased significantly by 16.69% in the first season, and by 12.77% in the second one giving average of 14.54% over the two seasons. These results indicate that Fertilan 10 enhanced the growth processes such as stem and root elongation and leaf expansion (Prasad and Power, 1997 and Trostle *et al.*, 2001). This favourable effect was in turn, reflected in grain and straw yields and almost all of their attributes as observed herein. These results are in accordance with those of Mohmoud *et al.*, 1987, El-Sayed and Abdel-Hadi, 1991 and El-Sayed *et al.*, 1992.

3- Organic manuring effect:

The data illustrated in Tables 1, 2 and 3 indicate clearly that plant height, number of grains/spike, grain weight/spike, 1000-grain weight, grain yield, straw yield and biological yield were increased significantly with increasing rates of Farmyard manure up to 35 m^3/fad. in both seasons and the combined. Also, number of tillers/m^2 and number of spikes/m^2 were increased significantly with increasing

rate of farmyard manure in the second season and over the two seasons. Furthermore, the differences among the three rates of organic manure were not great enough to reach the level of significance in spike length, protein percentage and harvest index in the two seasons and combined. Also, the differences were not significant between the 35 and 40m^3 farmyard manure rate in number of tillers/m^2, number of spikes/m^2, number of grains/spike, grain weight/spike, 1000-grain weight, grain yield/fad., straw yield/fad. and biological yield in the combined data and most seasons. Application of farmyard manure up to 40m^3/fad. increased grain and straw yields/fad. significantly by 20.77% and 34.62% in the first season, 23.21% and 32.56% in the second season and 22.12% and 33.51% in the combined compared with 30 m^3 rate. The increment in barley yield and its attributes might be attributed to the role of farmyard manure, as a sources of the essential macro and micro nutrients, in enhancing the growth of barley plants as well as dry matter accumulation (Yakout *et al.*, 1998). These results are in agreement with those obtained by Shrma *et al.(*2001); El-Toukhy and Abd-Alla, (2002) and Kismanyoky (2005).

4- Interaction effect:

The data presented in Tables 1, 2 and 3 show no significant interaction effects between the three factors under study on all regarding studied trait in both seasons and combined. This indicates that the effect of each factor was independent from the effect of the other. Therefore, all cultivars under study showed similar response to spraying micronutrients and addition of farmyard manure.

5- Correlation study:

The interrelationships between grain yield/fad. and yield contributing characters measured as simple correlation coefficients are shown in Table 4.

Grain yield showed positive and significant correlation with each of plant height, number of tillers/m^2, number of spikes/m^2, spike length, number of grains/spike, weight of grains/spike, 1000-grains weight, straw yield/fad., grain protein content, biological yield and harvest index. Similar results were reported by Sarhan *et al*.(2002) and Abd Alla, Maha,(2004).

Conclusively, results cleared that the highest yield could be obtained from sowing Giza 124 barely cv. and addition of 35 m3 FYM with the foliar application of Firtlan 10 , under sandy soil conditions of El- Salhia region , Sharkia Govern orate.

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استجابة بعض أصناف الشعير للسماد العضوى والتغذية الورقية بمركب العناصر الصغرى فرتيلان ١٠ تحت ظروف الأرض الرملية حديثة الاستصلاح

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أقيمت تجربتان حقليتان بإحدى المزارع الخاصة بمنطقة الصالحية محافظة الشرقية خلال موسمي ٢٠٠٤/٢٠٠٥ ، ٢٠٠٥/٢٠٠٦ بغرض دراسة استجابة ثلاث أصناف من الشعير (جيزه ١٢٣ ، جيزه ١٢٤ وجيزه ١٢٥) للتغذية الورقية بمركب فرتيلان ١٠ وثلاث معدلات من السماد العضوى (٣٠ ، ٣٥ ، ٤٠م^{3}/فدان) وصممت التجربة بنظام القطع المنشقة مرتين فى ثلاث مكررات تحت ظروف الأراضى الرملية حديثة الاستصلاح وتتلخص أهم النتائج فيما يلى :

اختلفت الأصناف معنوياً فى جميع الصفات حيث تفوق الصنف جيزه ١٢٤ فى محصولى الحبوب والقش/فدان ومعظم الصفات المدروسة ، بينما تفوق الصنف جيزه ١٢٥ فى النسبة المئوية للبروتين فى الحبوب وكذلك دليل الحصاد.

أدت التغذية بمركب فرتيلان ١٠ إلى تحسين معظم الصفات المدروسة وحققت زيادة معنوية فى محصول الفدان من الحبوب بنسبة ١٤.٥٤% وفى محصول القش بنسبة ٨.٣٧% لمتوسط الموسمين.

أدت زيادة معدل التسميد العضوى إلى ٤٠م٣/ فدان إلى زيادة معنوية فى محصولى الحبوب والقش/فدان كذلك أغلب مساهمات المحصول ولم تصل الفروق لحد المعنوية مع معدل التسميد بـ ٣٥ م^{3}/فدان .

ارتبط محصول الحبوب معنوياً بارتفاع النبات ، عدد الاشطاء/م^{2} ، عدد السنابل /م^{2} ، طول السنبلة ، عدد الحبوب بالسنبلة ، وزن حبوب السنبلة ، وزن ١٠٠٠ حبه ، محصول القش ، المحصول البيولوجى ودليل الحصاد .

التوصية: توصى الدراسة من خلال النتائج المتحصل عليها بزراعة الصنف جيزه ١٢٤ والتسميد بمعدل ٣٥م^{3} سماد عضوى للفدان مع التغذية الورقية بمركب فرتيلان١٠ للمحصول على إنتاجية عالية من الشعير تحت ظروف الأراضى الرملية المستصلحة بمنطقة الصالحية محافظة الشرقية .