Effect of fertilization on growth, yield and some technological characteristics of some new bead wheat cultivars

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SUMMARYFour field experiments were conducted at Bahtim region during 1990/1991 and 1992/1993 seasons and at Nobaria region during 1990/1991 and 1991/1992 seasons, the two regions belong to Agricultural Research Station, Agricultural Research Center, Egypt. The present work aimed to study the response of some wheat cultivars to different levels of nitrogen fertilization and application of foliar in respect of growth characters, yield and its components, chemical content and technological properties of wheat grains. Each experiment included 32 treatments which were the combination of four levels of nitrogen fertilization (0, 35, 70 and 105 kg N/fed), four wheat cultivars (Giza 155, Giza 163, Giza 164 and Sakha 92) and two treatments of foliar application (without and with foliar application). These treatments were arranged in split plot design in four replications. Nitrogen levels were randomly distributed in the main plots. The combination of wheat cultivars and foliar application were arranged in the sub-plots. The area of each sub-plot was 10.5 m² (3.0 x 3.5 m). Wheat seeds were drilled in rows at 20 cm apart. Phosphorus fertilizer was applied before seeding as calcium superphosphate (15.5% P2O5) at a rate of 100 kg/feddan. Nitrogen fertilizer in the form of ammonium nitrate was applied at three equal doses before the first three irrigations. Application of foliar containing 8% Zn-EDTA, 2% Mn-EDTA and 3% Fe-EDTA was applied after 30 days and 45 days from planting (500 gm foliar micro EDT N/feddan and dissolved in 400 liters of water). Characters studies: I. Growth characters 1. Chlorophyll content i.e. Chl. a, b and carotenoids. 2. Plant height (cm). 3. Flag leaf area. II. Yield and yield components: 1. Peduncle and spike length (cm). 2. Grain weight/spike (gm). 3. Number of grains/spike. 4. Number of spikelets/spike. 5. 1000-grain weight. 6. Number of spikes/m². 7. Grain and straw yield (kg/feddan). III. Chemical content: 1. Zn, Mn and Fe content in wheat grains. IV. Technological properties: 1. Crude protein content %. 2. Protein yield (kg/feddan). 3. Total carbohydrate (ppm). 4. Wet and dry weight of gluten %. 5. Ash content %. The important results of this study could be summarized as follows: A. Effect of N levels: 1. Chlorophyll a and b contents in both seasons and carotenoids in the first season at Bahtim were significantly affected by increasing N level up to 105 kg N/feddan, whereas N levels did not show any significant effect on the above characters at Nobaria region during the two growing seasons. 2. N application significantly affected wheat plant height in the second--2nd--season at Bahtim and in both seasons at Nobaria region. The highest plant height was obtained from adding 105 kg N/feddan in both seasons at Nobaria. On the other hand, plant height at Bahtim region was decreased by increasing N level at Bahtim region during the two growing seasons. 3. N application significantly affected wheat plant height in the second--2nd--season at Bahtim and in both seasons at Nobaria region. The highest plant height was obtained from adding 105 kg N/feddan in both seasons at Nobaria. On the other hand, plant height at Bahtim region was decreased by increasing N level at Bahtim region during the two growing seasons. On the other hand, flag leaf area was significantly increased by increasing N level up to 105 and 35 kg N/feddan in the first and second seasons, respectively at Nobaria region. 4. Peduncle length was not significantly affected by increasing N-level in both seasons at Bahtim. On the contrary, N-level had a significant effect on peduncle length at Nobaria in the two seasons. 5. Nitrogen levels had a significant effect on spike length in one season only at Bahtim and Nobaria region. Spike length was increased by increasing N level up to 35 kg N/feddan at Bahtim region and up to 105 kg N/feddan at Nobaria region. 6. Weight of grains/spike, number of grains/spike and 1000-grain weight were not significantly affected by N level in both
seasons at the two regions except in the first season at Bahtim region. Grain weight/spike, number of grains/spike and 1000-grain weight were significantly decreased by increasing N level in the first season at Bahtim region.7. Number of spikelets/spike was decreased at Bahtim and it increased at Nobaria region by increasing N level up to 105 kg N/ feddan.8. Number of spikes/m- was significantly increased by increasing N level in the first season at Bahtim region and in the two seasons at Nobaria region.9. The increase in N level significantly increased grain and straw yield/feddan in one season at Bahtim region and in the two seasons at Nobaria region. The maximum grain yield/feddan was 2014.28 kg produced from applying 70 kg N/feddan in the first season at Bahtim region whereas, application of 105 kg N/feddan gave the highest value of grain yield/feddan which were 1963.71 and 2022.85 kg in the first and second seasons, respectively.10. Zn, Mn and Fe contents in wheat grains were increased by increasing N level up to 105 kg N/feddan in both seasons at Bahtim region. On the other hand, application of nitrogen at 35 kg and 70 kg N/feddan gave the maximum values of zinc content at Nobaria region. Fe content in wheat grains was decreased by increasing N level up to 105 kg/fed at Nobaria region.11. Crude protein percentage in wheat grains was not significantly affected by N level in both seasons.12. Protein yield/feddan was significantly affected by N levels in the first growing season at Bahtim and in both seasons at Nobaria region. The maximum protein yield/feddan was obtained from 70 kg N/feddan in the first season at Bahtim and from 105 kg N/feddan in both seasons at Nobaria region.13. Nitrogen application had no significant effect on carbohydrate and ash contents in wheat grains in both seasons at Bahtim and Nobaria regions. In the second season at Nobaria region, carbohydrate content in wheat grains was significantly increased by increasing N level up to 35 kg N/feddan. Also, ash content was significantly increased by increasing N level up to 70 kg N/feddan in both seasons at Bahtim region.14. Application of nitrogen at 105 kg N/feddan gave the highest values of wet and dry gluten % in both seasons at the two regions. B. Varietal differences1. Chlorophyll a, b, and carotenoids contents in the leaves of wheat plants were significantly affected by wheat cultivars in both seasons at Bahtim region. Giza 155 and Sakha 92 were superior to the other wheat cultivars under study in chlorophyll a, b, and carotenoids contents. The differences between wheat cultivars in the above characters were similar at Bahtim and Nobaria regions.2. Giza 155 gave the tallest plants and surpassed all the other studied cultivars in both seasons at Nobaria region. On the other hand, there was no remarkable significant differences in plant height among the tested cultivars at Bahtim region.3. Giza 164 and Sakha 92 cultivars were superior to the other wheat cultivars in flag leaf area at the two region.4. Giza 155 cultivar had the highest peduncle length in both seasons at Bahtim and Nobaria regions whereas the lowest peduncle length obtained from Sakha 92 cultivar.5. Spike length of Giza 163 and Giza 164 cultivars significantly increased as compared with Giza 155 and Sakha 92 cultivars in the two growing seasons.6. No significant differences were obtained in weight of grains/spike among the tested wheat cultivars in both seasons at the two region except in the first season at Bahtim region. Giza 164 cultivar was the best cultivar in weight of grains/spike.7. Giza 164 cultivar had the highest number of grains/spike, number of spikelets/spike and 1000-grain weight whereas Giza 155 cultivar gave the lowest number of grains/spike and Sakha 92 had the lowest number of spikelets/spike and 1000-grain weight.8. Giza 155 cultivar gave the maximum number of spikes/m- followed by Giza 163 and Sakha 92 at Bahtim region. On the other hand, number of spikes/m- of Sakha 92 surpassed significantly Giza 163 and Giza 164 cultivars at Nobaria region.9. The new wheat cultivars i.e. Salcha 92, Giza 163 and Giza 164 cultivars produced the maximum grain yield/feddan as compared with Giza 155 cultivars at the two region.10. The old cultivar i.e. Giza 155 was the first cultivar with the greatest straw yield/feddan in the second season at Bahtim and in both seasons at Nobaria region whereas Giza 163 cultivar outyielded Giza 164 and Giza 155 cultivars in the first season at Bahtim region.11. Sakha 92 cultivar surpassed the other cultivars under study in Zn, Mn contents in wheat grains at Bahtim region whereas Giza 155 cultivar had the highest values of Zn and Mn content in wheat grains at Nobaria region. Giza 164 cultivar was the first cultivar with the greatest Fe content followed by Giza 163 cultivar.12. Wheat cultivars under study had no significant effect on crude protein percentage in both seasons at the two regions.13. Sakha 92 cultivar surpassed significantly the other cultivar in protein yield/feddan whereas Giza 164 cultivar gave the highest one in the second season at Bahtim. Giza 164 and Giza 163 cultivars surpassed significantly the other cultivars
in the first and second seasons, respectively at Nohariaregion.14. Giza 163 cultivar produced the highest values of carbohydrates content atBahtim region, whereas Giza 155 cultivar produced the highest one atNobaria region.15. Wheat cultivars were varied in ash, wet and dry gluten contents in wheatgrains in both seasons at the two regions.c. Effect of foliar application1. Application of foliar significantly increased chlorophyll a, b andcarotenoids contents as well as plant height and flag leaf area in bothseasons at the two regions except chlorophyll a in the second season atNobaria region.2. Peduncle length, spike length, number of grains/spike, number ofspikelets/spike,.1ODD-grainweight, number of spikes/m', grain and strawyields per feddan were significantly increased by foliar application in thetwo seasons at Bahtim and Nobaria regions. whereas, grain weight/spikewas not significantly affected by foliar application in one season at Bahtimand in both seasons at Nobaria region.3. Application of foliar increased grain and straw yield/feddan over thecontrol treatment by 11.05 and 14.21 in the first season and 18.05 and18.37% in the second season, respectively at Bahtim region.Corresponding increase in grain and straw yield at Nobaria region were17.36% and 14.20% in the first season and 12.19%and8.55%in thesecond season, respectively.4. Application of foliar caused an increase in Zn, Mn and Fe content inwheat grains in both season at the two regions except in the first season atBahtim region, Zn and Mn contents were decreased by application of offoliar.5. Crude protein %, protein yield/feddan, total carbohydrate, ash content andthe percentage of wet and dry gluten were significantly increased byapplication of offoliar.D. Interaction effectD.a. Interaction effect between N-level and wheat cultivars1. Chlorophyll a at Bahtim, chlorophyll b at the two regions in bothseasons, carotenoids content at Bahtim region in the second season,plant height and flag leaf area at Nobaria region in both seasons were significantly affected by the interaction between N levels and wheatcultivars.2. There were a significant differences of peduncle length, spike length,number of grains/spike, number ofspikelets/spike, number ofspikes/m', grain yield per feddan at the two region and grainweight/spike due to the interaction effect between N-level and wheatcultivars. Giza 164 cultivar with applied 70 kg N/feddan produced themaximum grain yield/feddan at Bahtim region, whereas at Nobariaregion, the maximum grain yield/feddan was obtained from Giza 163with 105 kg N/feddan.3. Grain weight/spike and straw yield/feddan were significantly affected by the interaction between N level and wheat cultivars in one season only at Bahtim and Nobaria regions, respectively.4. The interaction effect between N-level and wheat cultivars was significant on protein content in the second season at Bahtim, protein yield/feddan in both seasons at Bahtim and Nobaria region, carbohydrate content in both seasons at Bahtim and ash content in one season only at the two regions.D.b. Interaction effect between N-level and foliar application1. The interaction between N level and foliar application had a significanteffect on peduncle length, spike length and number of grains/spike in thefirst season only at Bahtim region.2. Protein yield/feddan in both seasons at Nobaria region and ash contentin the first season at Bahtim region were significantly affected by theinteraction between N level and foliar application.D. «, Interaction effect between wheat cultivars and foliar application1. Peduncle length,spike length, grain weight/spike and number of grains/spike at Bahtim and grain weight per spike at Nobaria region in one season out of two were significantly affected by the interaction between wheat cultivars and foliar application.2. Sakha 92 cultivar with application of foliar gave the maximum values ofash content.Dsd, Interaction effect between N-level, wheat cultivars and foliar application1. The interaction effect between N levels, wheat cultivars and foliar application were significant on peduncle length, spike length, grainweight/spike, number of grains/spike, grain yield/feddan and ashcontent in wheat grains in one season only at Bahtim region.2. In general, the new wheat cultivars under study with increasing N level and application of offoliar gave the maximum grain yield/feddan.E. Correlation coefficient1. Significant positive correlation was detected between grain yield/feddan and each of plant height, total chlorophyll, spike length, number of grains/spike, grain weight/spike, carbohydrate and ash content in wheat grains at Bahtim region.2. With regard to Nobaria region, grain yield/feddan was positively andhigh significantly correlated with plant height, flag leaf area, spike length,number of spikelets/spike, number of spikes/m', wet and dry gluten andprotein content.F. Stability analysis for grain yield1. The bread wheat cultivar Giza 163 was the best stable cultivar among thetested cultivars.2. The other tested cultivars, Giza ISS, Giza 164 and Sakha 92 showed lessstability.