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 199011991and 199211993 seasons and at Nobaria region during 1990/1991 and 1991/1992seasons, the two regions belong to Agricultural Research Station, AgriculturalResearch Center, Egypt. The present work aimed to study the response of somewheat cultivars to different levels of nitrogen fertilization and application offoliarin respect of growth characters, yield and its components, chemical content andtechnological properties of wheat grains.Each experiment included 32 treatments which were the combination offourlevels 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 foliarapplication (without and with foliar application). These treatments were arrangedin split plot design in four replications. Nitrogen levels were randomly distributedin the main plots. The combination of wheat cultivars and foliar application werearranged at random in the sub-plots. The area of each sub-plot was 10.5 m2 (3.0 x3.5 m). Wheat seeds were drilled in rows at 20 em apart. Phosphorus fertilizer wasapplied before seeding as calcium superphosphate (15.5% P20S) at a rate of 100kglfeddan. Nitrogen fertilizer in the form of ammonium nitrate was applied at threeequal 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 45days from planting (500 gm foliar micro EDT Nfeddan and dissolved in 400 litersof water).Characters studies:I. Growth characters1. Chlorophyll content i.e. ChI. it, b and carotenoids.2. Plant height (em).3. Flag leaf area.IT. Yield and yield components:1. Peduncle and spike length (em).2. Grain weight/spike (gm).3. Number of grains/spike.4. Number of spikelets/spike.5. 1ODD-grainweight.6. Number of’spikes/m-.7. Grain and straw yield (kg/feddan).ill. Chemical contentI. Zn, Mn and Fe content in wheat grains.V. Technological properties1. 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 asfollows:A. Effect of N levels1. Chlorophyll a and b contents in both seasons and carotenoids in the firstseason at Bahtim were significantly affected by increasing N level up 105kg N/feddan, whereas N levels did not show any significant effect on theabove characters at Nobaria region during the two growing seasons.2. N application significantly affected wheat plant height in the second--z....-season at Bahtim and in both seasons at Nobaria region. The highest plantheight was obtained from adding 105 kg N/feddan in both seasons atNobaria. On the other hand, plant height at Bahtim region was decreasedby increasing N level.3. Flag leaf area was not significantly affected by increasing N level at Bahtimregion during the two growing seasons. On the other hand,. flag leaf areawas significantly increased by increasing N level up to 105 and 35 kgN/feddan in the first and second seasons, respectively at Nobaria region.4. Peduncle length was not significantly affected by increasing N-Ievel inboth seasons at Bahtim, On the contrary, N-Ievel bad a significant effecton peduncle length at Nobaria in the two seasons.5. Nitrogen levels had a significant effect on spike length in one season onlyat Bahtim and Nobaria region. Spike length was increased by increasing Nlevel up to 35 kg N/feddan at Bahtim region and up to 105 kg N/feddan atNobaria region.6. Weight of grains/spike, number of grains/spike and IOOO-grainweightwere not significantly affected by N level in both

seasons at the tworegions except in the first season at Bahtim region. Grain weight/spike,number of grains/spike and 1000-grain weight were significantlydecreased by increasing N level in the first season at Bahtim region.7. Number of spikelets/spike was decreased at Bahtim and it increased atNobaria region by increasing N-Ievel up to 105 kg Nlfeddan.8. Number of spikes/m- was significantly increased by increasing N level inthe first season at Bahtim region and in the two seasons at Nobaria region.9. The increase in N level significantly increased grain and straw yieJdlfeddanin one season at Bahtim region and in the two seasons at Nobaria region.The maximum grain yieldlfeddan was 2014.28 kg produced from applying70 kg N/feddan in the first season at Bahtim region. whereas, applicationof 105 kg N/feddan gave the highest value of grain yield/feddan whichwere 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 Nlevel up to 105 kg N/feddan in both seasons at Bahtim region. On theother hand, application of nitrogen at 35 kg and 70 kg N/feddan gave themaximum values of zinc content at Nobaria region. Fe content in wheatgrains was decreased by increasing N level up to 105 kg/fed at NobariaregIOn.11. Crude protein percentage in wheat grains was not significantly affected byN level in both seasons.12. Protein yield/feddan was significantly affected by N levels in the firstgrowing season at Bahtim and in both seasons at Nobaria region. Themaximum protein yield/feddan was obtained from 70 kg N/feddan in thefirst season at Bahtim and from 105 kg N/feddan in both seasons atNobaria region.13. Nitrogen application had no significant effect on carbohydrate and ashcontents in wheat grains in both seasons at Bahtim and Nobaria regions.In the second season at Nobaria region, carbohydrate content in wheatgrains was significantly increased by increasing N level up to 35 kgN/feddan. Also, ash content was significantly increased by increasing Nlevel 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 wetand dry gluten % in both seasons at the two regions.B. Varietal differences1. Chlorophyll a, band carotenoids contents in the leaves of wheat plantswere significantly affected by wheat cultivars in both seasons at Bahtimregion. Giza 155 and Sakha 92 were superior to the other wheat cultivarsunder study in chlorophyll a, b and carotenoids contents. The differencesbetween wheat cultivars in the above characters were similar at Bahtimand Nobaria regions.2. Giza 155 gave the tallest plants and surpassed all the other studiedcultivars in both seasons at Nobaria region. On the other hand, there wasno remarkable significant differences in plant height among the testedcultivars at Bahtim region.3. Giza 164 and Sakha 92 cultivars were superior to the other wheatcultivars in flag leaf area at the two region.4. Giza 155 cultivar had the highest peduncle length in both seasons atBahtim and Nobaria regions. whereas the lowest peduncle lengthobtained from Sakha 92 cultivar.5. Spike length of Giza 163 and Giza 164 cultivars significantly increased ascompared with Giza 155 and Sakha 92 cultivars in the two growingseasons.6. No significant differences were obtained in weight of grains/spike amongthe tested wheat cultivars in both seasons at the two region except in thefirst season at Bahtim region. Giza 164 cultivar was the best cultivar inweight of grains/spike.7. Giza 164 cultivar had the highest number of grains/spike, number ofspikelets/spike and 1000-grain weight . whereas Giza 155 cultivar gavethe lowest number of grains/spike and Sakha 92 had the lowest number ofspikeletslspike and 1000·grain weight.8. Giza 155 cultivar gave the maximum number of spikes/m- followed byGiza 163 and Sakha 92 at Bahtim region. On the other hand, number ofspikes/m- of Sakha 92 surpassed significantly Giza 163 and Giza 164cultivars at Nobaria region.9. The new wheat cultivars i.e. Salcha 92, Giza 163 and Giza 164 cultivarsproduced the maximum grain yield/feddan as compared with Giza 155cultivars at the two region.10. The old cultivar i.e. Giza 155 was the first cultivar with the greatest strawyield/feddan in the second season at Bahtim and in both seasons atNobaria region. whereas Giza 163 cultivar outyielded Giza 164 and Giza155 cultivars in the first season at Bahtim region.11. Sakha 92 cultivar surpassed the other cultivars under study in Zn, Mncontents in wheat grains at Bahtim region. whereas Giza 155 cultivar hadthe highest values of Zn and Mn content in wheat grains at Nobariaregion. Giza 164 cultivar was the first cultivar with the greatest Fecontent followed by Giza 163 cultivar.12. Wheat cultivars under study had no significant effect on crude proteinpercentage in both seasons at the two regions.13. Sakha 92 cultivar surpassed significantly the other cultivar in proteinyield/feddan, whereas Giza 164 cultivar gave the highest one in the secondseason at Bahtim. Giza 164 and Giza 163 cultivars surpassed significantlythe 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%inthesecond 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 offoliar.5. Crude protein %, protein yield/feddan, total carbohydrate, ash content andthe percentage of wet and dry gluten were significantly increased byapplication offoliar.D. Interaction effectD.a. Interaction effect between N-Ievel 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 weresignificantly 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 of spikelets/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 affectedby the interaction between N level and wheat cultivars in one seasononly at Bahtim and Nobaria regions, respectively.4. The interaction effect between N-Ievel and wheat cultivars weresignificant on protein content in the second season at Bahtim, proteinyield/feddan in both seasons at Bahtim and Nobaria region,carbohydrate content in both seasons at Bahtim and ash content in oneseason only at the two regions.D.b. Interaction effect between N-Ievel and foliar application1. The interaction between N level and foliar application had a significanteffect on peduncle length, spike length and number of grains/spike inthe first season only at Bahtim region.2. Protein yieldlfeddan 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 ofgrains/spike at Bahtim and grain weight per spike at Nobaria region inone seasons out of two were significantly affected by the interactionbetween wheat cultivars and foliar application.2. Sakha 92 cultivar with application offoliar gave the maximum valuesof ash content.Dsd, Interaction effect between N-Ievel, wheat cultivars and foliarapplication1. The interaction effect between N levels, wheat cultivars and foliarapplication 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 leveland application offoliar gave the maximum grain yield/feddan.E. Correlation coefficient1. Significant positive correlation was detected between grain yield/feddanand each of plant height, total chlorophyll, spike length, number ofgrains/spike, grain weight/spike, carbohydrate and ash content in wheatgrains at Bahtim region.2. With regard to Nobaria region, grain yieldJfeddan was positively and highsignificantly 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.