Study on irrigation water requirements and fertilization and their effects on some physiological traits of wheat under newly reclaimed nubaria region

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Two field experiments were conducted at Nubaria Agric. Res, Sta., in 1995/96 and 1996/97 seasons to evaluate 3 irrigationregimes (including 3 water duties of 1090,1490 and 1890 m3/fad),applied to 3 bread wheat varieties (Sakha 8, Sakha 69 and Sahel 1)grown under 3 different N levels (80, 100 and 120 kg/fad).The soil of the experiments is calcareous (31.40/0CaC03) with a sandy loam texture, a very low O.M. content (0.450/0)and a pH value of 8.19.A split split plot design with 4 replication was used .The mainplots were devoted to irrigation regimes, the sub plots to varieties andthe sub sub plots to N levels.>The results could be summarized as follows : 1- Plant height: of wheat plants at the harvest was not significantly affected by irrigation regimes in both seasons. Also the 3 varieties did not show significant differences in plant height.The increase in N level from 80 to 100 kg/fad significantlyincreased plant height in the first season.Significant effects of the interaction between Irrig. x Var , Var. xNand Irrig. x Var. x N on plant height in the first season and betweenall experimental factors in the second season were observed on plantheight.Maximum plant height was recorded by Sahel 1 supplied withthe medium water level and receiving 80 kg N/fad. being 105.4 cm inthe first season, and by Sahel 1 grown at the higher water level andsupplied with 100 kg N/fad being 115 cm. in the second season.2- Spike length: was not affected by irrigation regimes in bothseasons. Sakha 69 cultivar produced longer spikes than Sakha 8and Sahel1, which were on a par in this trait. The increase in N level significantly increased spike length inboth seasons.The interaction between Irrig. x N and among Irrig. x Var. x Nin 1996/97 season significantly affected spike length. The longestspikes in that season were those of Sakha 69 supplied with the lowerwater level and receiving 100 kg N/fad, being 9.63 cm.3- Heading date: was delayed due to increasing the irrigation supplywith significant differences in the first season.The three tested varieties were of similar heading date in bothseasons. Plants reached heading after 100 and 99 days in 1995/96and 1996/97 season, respectively.The increase in N level significantly increased number of daysto 500/0heading in both seasons.The effects of the interaction between Irrig. x VaL, and Irrig. xVar. x N on heading date were significant in 1995/96 season,whereas Irrig. x Nand Var. x N significantly affected heading date in1996/97 season.In 1995/96 season, the earliest heading was reached after 95.5days by Sakha 8 plants supplied with 1090 m3 water/fad andreceiving 80 kg N/fad. On the other hand, Sahel 1 plants supplied98with 1490 m3 waterlfad +120 kg Nlfad recorded the latest headingdate, whch was reached after 107.5 days 4- Number of splke/m2: increased by applying the medium waterduty compared with the lower and higher water levels. This increasewas sgnificant in the first season.Sakha 8 produced higher spike/m2, followed by Sakha 69,whereas Sahel 1 was inferior with significant differences comparedwith Sakha vareties.The increase in N level increased spikeslm2with significantdfferences in 1995/96 season.The interactions between the 3 factors significantly affectedspikeslm2 in the first season. In the second season, Inig. x Var. andVar. x N had significant effect on ths tratt, The greatest spikes/m2 in 1995/96 season was obtained bySakha 8 supplied by 1490 m3 water + 100 kg Nlfad, being 341.5- Number of kernels/spike: was

significantly higher at the mediumwater level compared with the lower level. Applying 1490 m3/fad significantly increased kernelslspike by 3.57 and 13.86% in the firstand second season, respectively compared with the application of1090 m3. Sakha 8 was superior in the first season in number of kernels,Ispike, whereas Sahel 1 was the best variety in this trait in thesecond season.The increase in N application significantly increasedkernels/spikes in both season.The interaction Irrig. x Var. and Var. x N in the first season andall interactions in the second season significantly affected this trait.Combining Sahel 1 + 1090 m3 water + 100 kg N/fad produced the maxinum kernels/spike in 1996/97 season, being 55.25.6. Weight of 1000 kernels: was not significantly affected by irrigationlevels.Sakha 8 significantly surpassed Sakha 69 and Sahel 1 in grainindex in the first season.Also Sakha 69 was significantly superior to Sahel 1 in this trait.In the second season Sakha 69 was superior to Sahel 1 in thistrait. whereas Sakha 8 was inbetween.The increase in N level significantly increased grain index thefirst season.The interaction between all experimental factors significantlyaffected grain index in the first season, whereas in the secondseason Irrig. x Var. as well as Irrig. x Var. x N had significant effectson grain index.The heaviest 1000 - kernel weight was recorded in the firstseason by Sakha 8 supplied with 1490 m3/water + 100 kg N/fad,being 44.10 g. and by Sakha 69 supplied with 1890 m3 water + 80 kgN/fad, being 49.18 g in the second season.7. Leaf Area Index <.bAll: at anthesis was increased in both seasonswith increasing water level. Also increasing N application to 120 kgN/fad enhanced LAI. Sakha 8 was significantly superior in this trait,while Sahel 1 was inferior and Sakha 69 was inbetween.All interactions between the experimental factors significantlyaffected this trait. The best combination was that including Sakha 8 +1490 m3/fad water + 80 kg N/fad in the first season, and Sakha 69 +1890 m3/fad water + 120 kg N/fad in the second season. with anaverage value of 2.57 and 3.97, in bah seasons. respectively.8~ Grain yield lkg/fadt significantly increased when wheat wassupplied with the medium water level (1490 m3/fad). At this level yieldincreased by 10.34 and 5.18°/ocompared with the lower and higherlevels, respectively in the first season, corresponding to 11.10 and9.22°/0 in the second season.Sakha 8 surpassed Sakha 69 and Sahel 1 in grain yield by15.95 and 94.58°/01 respectively in the first season. corresponding to3.56 and 15.830/0 in the second season. Sakha 8 yielded 13.91 and18.19 ardabs/fad in 1995/96 and 1996/97 season respectively.Increasing N level significantly increased grain yield in the firstseason. but the increase in the second season was not significant.Raising N level from 80 to 120 kg/ fad increased grain yield by 17.53and 6.66°/0 in the first and second season. respectively.The interaction Irrig. x VaL. Irrig. x N. Var. x Nand Irrig. x Var.x N significantly affected grain yield in the first season, whereas lrrigxVar .•.Var. x Nand Irrig. x VaL x N had significant effect on grainyield in the second season.The interaction between Sakha 8 + 1490 m3 water + 120 kg N/fad produced the maixmum grain yield 1 being 17.00 and 21.00 ardabs per faddan in the first and second season, respectively.9- Harvest index Il::!JJ.;. was significantly affected by irrigation level in the first season. The application of 1090, 1490 and 1890 m3 /fad recorded H.I. of 36.33, 39.67 and 36.78% respectively.Varieties differed in H.I. in the first season. Sakha 8, Sakha 69and Sahel 1 recorded 41.00, 37.33 and 34.450/0 H.I. in 1995/96season. N level had no significant effect on H.I. The interaction Var. x Nand Irrig. x Var. x N in the first seasonand between Irrig x Var., Var. x Nand Irrig. x Var. x N in the secondone , significantly affected H.1. Sakha 8 + 1490 m3 water + 100 kgN/fad produced the maximum H.I. in the first season, being 48.00%and combining Sahel 1 + 1090 m3 water + 100 kg N/fad in the second season produced the highest H.I. o~42.00%.10- Water use efficiency (WUE): significantly reduced by increasingwater level. Applying 1090, 1490 and 1890 m3 water/fed recordedWUE of 1.16, 0.99 and 0.77 kg grain/m3 water in the first season,respectively, being 1.72, 1.53 and 1.12 kg in the second season. Theforementioned results showed that WUE was 4.87, 4.15 and 3.22kggrain per faddan per one mm of applied water in 1995/96 season, inthe first (1090m3) , the second (1490m3) and the third (1890m3)irrigation regime, respectively.In 1996/97 season, the corresponding WUE values were 7.20,6.26 and 4.71 kg grain/fad/ one mm, respectively.Varieties differed significantly in WUE. Sakha 8 was superior,Sahel 1 was inferior and Sakha 69 was inbetween. Sakha 8 recordedWUE of 1.22 and 1.53 kg in the first and second season)respectively. Sakha 8 produced about 5 kg grain /fad per one mm of_ applied water in the first season against 6.23 kg grain/fad / one mmof applied water, in the second season..The increase in N level increasedWUE in both seasons. Allinteractions between the

experimental factors showed significanteffects on WUE.The best combination was that between Sakha 69 + 1090 m3water + 120 kg N/fad in the first season, and between Sakha 8 +1090 m3 water + 120 kg N/fad in the second season. The WUEreached 1.46 and 2.03 kg grain/m3 water, respectively.11- Nitrogen use efficiency: was higher at the medium water levelwith significant differences in the first season.Varieties varied in NUE. Sakha 8 was the best, Sahel 1 wasthe worst and Sakha 69 was inbetween. NUE of 21.05, 18.23 and11.10 kg in the first season and 27.74,27.06 and 24.21 kg grain IkgN in the second one for Sakha 8, Sakha 69 and Sahel 1,respectively.The increase in N level reduced NUE markedly. Applying 80,100 and 120 kg N/fad resulted in NUE of 18.37, 17.62 and 14.40 kg,respectively in the first season, correspending to 31.30, 25.46 and22.27 kg grain /kg N in the second season. All effects of the interactions significantly affected NUE. Thebest combination was that between Sakha 8 + the medium waterlevel (1490 m3) + 100 kg N/fad in the first season and betweenSakha 8 + the medium level of water + 80 kg N/fad in the secondseason.