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SUMMARY

Field experiments were conducted at the experimental farm of Rice Research and Training Center (RRTC), Sakha, Kafr El-Sheikh, Egypt during 2000and 2001-rice seasons. To investigate the effect of water qualities some growth attributes, yield, its components and some chemical properties of Giza 182, Giza 178, Sakha 102 and Sakha 101 rice cultivars.

-A strip-plot design with four replicates was used in all experiments.

-The vertical plots were devoted to six water qualities as following:

Canal water (CW), drainage water (DW), mixed water (MW), and 1CW: 1DW, 2CW: 1DW, and 1CW: 2DW alternatively

-The horizontal plots were occupied by the four rice cultivars.(Giza 182, Giza 178, Sakha 102 and Sakha 101)

I- Effect of water qualities

1- Growth analysis and attributes:

Results showed that most of growth analysis and attributed under investigation were significantly affected by the water qualities. Leaf area index, relative growth rate (g/g/week), flag leaf area (cm), and plant height and days to heading were significantly decreased but, chlorophyll content (ppm), light penetration (Lux) were significantly increased when rice plants irrigated with drainage water treatment in both seasons. We can concluded also that all characters above were reached the optimum values when irrigated with canal water or 2CW: 1DW treatments through the growth season in 2000 and 2001 seasons. However the optimum growth characters as affected by different water qualities were as follow: Canal water> 2CW: 1DW> 1CW: 1DW> MW> 1CW: 2DW> DW in both seasons.

2- Yield and its attributes

Data showed that there were significant differences among water qualities on yield and most of its attributes except the grain quality characters under investigation. Number of tillers /m^2, number of panicles/m^2, panicle weight (g), 1000-grain weight (g), grain and straw yield (t/ha), hulling (%) as well as milling (%) were decreased but, unfilled grain (%) and head rice (%) were increased when rice plants were irrigated with drainage water treatment in both seasons. We can note that all characters above were reached the optimum values when were irrigated with canal water or 2CW: 1DW treatments over all the season in 2000 and 2001 seasons. However the effect of the different water qualities on growth characters were as follow: Canal water> 2CW: 1DW> 1CW: 1DW> MW> 1CW: 2DW> DW in both seasons.

3- Chemical compositions:

a- Na^+ %, K^+% concentration and. Na^+/K^+ ratio in rice

The irrigation treatments had significant effect on Na^+ %, K^+% and. Na^+/K^+ ratio in rice straw and grain in both seasons. The drainage water treatment gave the lowest values of the K^+% but gave the highest value of Na^+ % and Na^+/K^+ ratio in straw and in grain in both seasons. While the canal water treatment gave the highest values of K^+% in straw and grain in both seasons.

b- Micro-elements concentration in rice:

The concentrations of Fe, Mn & Zn, Ni, Cd and Pb (ppm) in straw and in grain were significantly affected by water qualities in both seasons. The application of drainage water through the growth season increased the content of Fe, Mn & Zn, Ni, Cd and Pb (ppm) in straw and in grains in both seasons. The minimum concentrations of above microelements were obtained with supplying canal water through the growth season in both straw and grain. However, the optimum concentration of tested micro-elements as affected by the type of waters applied follow the order: drainage > 1CW: 2DW> MW> 1CW: 1DW> 2CW: 1DW> canal water. The concentration of heavy

metals in rice grain increased above the normal range with drainage water treatment in both seasons according to the review mentioned at first.

II- Rice cultivars performance:

1- Growth characteristics:

Varietal differences were detected regarding leaf area index, relative growth rate (g/g/week), flag leaf area (cm), plant height, chlorophyll content (ppm), light penetration (Lux) and days to heading. Giza 182 had the superiority of leaf area index in both seasons while, Sakha 102 had the inferiority of all growth characters except relative growth rate (g/g/week) in both seasons. Sakha 101 gave the highest mean value of chlorophyll content, while the lowest values of chlorophyll content were obtained by Giza 178. Sakha 102 was earlier heading and tallest in plant height, while Sakha 101 came as a later one of both characters.

2-Yield and yield components and some grain qualities:

Varietal differences were detected regarding to plant height, number of tillers /m^2, number of panicles /m^2, panicle length (cm), unfilled grain (%), panicle weight (g), 1000-grain weight (g), grain yield (t/ha), straw yield (t/ha) harvest index (HI), hulling (%), milling (%) and head rice (%). Giza 178 came in the first rank regarding number of tillers /m^2, number of panicles /m^2, panicle weight (g), grain yield (t/ha), straw yield (t/ha) and harvest index but, in case of 1000-grain weight came in the last rank. Sakha 102 occupied the last rank regarding the above-mentioned traits except 1000-grain weight (g), hulling, milling and head rice %, which gave the heaviest 1000-grain weight and the optimum values of hulling, milling and head rice % in both seasons. Giza 182 was the poorest grain quality in both seasons.

3- Chemical compositions:

a- Na^+ %, K^+% concentration and. Na^+/K^+ ratio in rice

The tested rice cultivars differently behaved regarding Na^+ %, K^+% and. Na^+/K^+ ratio in straw and in grain. Giza 178 had the lowest values of Na % and Na^+/K^+ ratio,

either in straw or in grain except K^+ in grain, which was found in high percentage in both seasons and consequently, Giza 178 confirmed his superiority under unfavorable conditions. Sakha 102 exerted the highest values of Na^+ % and Na^+/K^+ ratio and showed its inferiority. Sakha 101 came in the second rank after Giza 178 in both seasons.

b- Micro-elements concentration in rice:

Varietal differences were detected regarding concentrations of Fe, Mn & Zn, Ni, Cd and Pb (ppm) in straw and in grain. Sakha 101had the highest concentrations of Zn, Fe and Mn in straw and in grain except the Fe in grain only as well as Ni, Cd and Pb in straw only in both seasons. Giza 178 contained the highest values of Fe in grain, but with rest microelements came in between. Also it has not affected by drainage water compared with other cultivars under study, and confirmed his superiority under uofavorable conditions, which is more tolerant to the concentration of heavy metals in soil solution. Sakha 102 had the highest concentration of Ni and Pb in grain only, while contain the lowest concentration of Zn in straw and grain and Ni and Cd in straw only. Regarding the rest elements, Sakha 102 came between. Giza 182 gave the lowest concentration of Fe and Mn in straw and in grain, and Cd in grain only, but in case of the rest elements it came in between. in both seasons. Application of drainage water enriched with heavy metals increased significantly most of metals content in most rice cultivars either in grains or in straw.

III- Chemical analysis of tested soil:

i- The electrical conductivity of tested soil was less than 2 dS/m after harvesting under canal water, 1CW: 1DW and 2CW: DW, which are considered as medium saline water. The soil irrigated with 1CW: 2DW, MW and drainage water are considered as high saline soil according to Diagnosis, 1954

(translated by Baker 1999). Soluble salts increased as a result for applying alternative, mixed and drainage water.

b- Soluble cations (K^+ & Na^+ meq/L) increased in the following order: Drainage water> MW> 1CW: 2DW> 1CW: 1DW> 2CW: 1DW> CW in both seasons.

c- Available microelement (Fe, Cu, Mn, Zn, Ni, Cd & Pb ppm) increased with applying drainage water, mixed and alternative water (1CW: 2DW). The total concentrations of microelements under the study were within the normal range except the Ni, Cd and Pb metals in both seasons.