

Response of some rice varieties to nitrogen fertilizer application under different irrigation intervals

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SUMMARYTwo field experiments were conducted at Rice Research and Training Center (RRTC) Farm, Sakha, Kafr El- Sheikh Governorate during 1997 and 1998 seasons to investigate the performance of two rice cultivars under different irrigation intervals and nitrogen sources on growth yield, yield components and chemical analysis. Each experiment included 24 treatments which were the combination of three irrigation intervals (every 3.6 and 9 days), four N sources (control, ammonium nitrate, urea and ammonium sulphate) and two rice cultivars (Sakha 101 and Sakha 102). Each experiment was performed in a split — split — plot design with four replications. The main plots were devoted to irrigation intervals, where N sources were assigned in the sub plots and rice cultivars were assigned in the sub- sub plots. area of each sub- sub plot was 15-m² (3 x5 m). Different nitrogen fertilizer sources were applied at the rate of 96 kg N / ha in two doses, the first dose was 2/3 incorporated in to dry soil before planting + 1/3 as top dressing before panicle initiation. Characters studied: - I -Growth characters1.Plant height (cm)2.Number of tillers / m² at heading3.Leaf area index4.Crop growth rate5.Light penetration6.Panicle initiation7.Heading dateII Yield and its components: -1.Panicle length (cm)2.Number of filled grains / panicle.3.Panicle weight (gm)4.1000 — grain weight.5.Spikelet formation efficiency6.Utilization efficiency7.Agronomic efficiency8.Number of panicles / m²9.Harvest index10.Grain yield (ton) / ha.11.Straw yield (tom) / ha / III chemical analysis: -1.Chlorophyll content2.N uptake in grains and straw of rice.3.Protein content in grains.4.Protein yield kg/ha.5.Sugar content in stem and panicle of rice at heading date at 14 and 28 days after heading in the second season,6.Starch content in stem and panicle of rice at heading date at 14 and 28 days after heading in the second season. The important results will be summarized as follows: - I Growth characters: -1. Plant height at heading, number of tillers / m² and leaf area index were significantly decreased by increasing irrigation intervals in both seasons. The tallest plant and the highest number of tillers / m² and leaf area index were observed when irrigated every 3 days2.Irrigation intervals had a significant effect on the mean values of light penetration at heading date. Increasing irrigation period from 3 days to 9 days caused a slight increase in light penetration3.Irrigation every 6 and 9 days delayed heading by about 3 and 4 days respectively in the first season as well as 2 and 5 days, respectively in the second season as compared with irrigation every 3 days4.Crop growth rate was influenced by irrigation intervals in both seasons. The highest crop growth rate at 68 — 75 days after sowing was obtained from irrigated every 3 days intervals5.The application of the three different nitrogen sources (ammonium nitrate, urea and ammonium sulphate) caused a significant increase in plant height, number of tillers / m² and leaf area index as compared with the control treatment Ammonium sulphate gave the tallest plant, maximum number of tillers / m² and leaf area index,6.N source caused a significant decrease in light penetration at heading. The minimum value was obtained from application of ammonium sulphate7.Application of ammonium sulphate to rice plants caused a delay in panicle initiation and heading date. whereas no significant difference was obtained between ammonium sulphate and urea in number of days to panicle initiation and heading date8.Crop growth rate at different growth periods was influenced by application of N sources in both seasons.Application of ammonium

sulphate to rice plants gave the maximum crop growth rate at 68-75 days after sowing.9.Sakha 102 cultivars gave the tallest plant and highest light penetration compared with sakha 101 cultivar10.sakha 101 cultivar surpassed significantly sakha 102cultivar in the number of tillers / m² in the first season and leaf area index in both seasons11.Sakha 102 cultivar was earlier in panicle and heading date,12.Sakha 102 cultivar gave the highest crop growth rate at 68— 75 days from sowing in the second season, whereas no difference was obtained between Sakha 101 and Sakha 102 cultivars in the first season13.The tallest plant and highest leaf area index were producedfrom irrigation every 3 days when applied nitrogen fertilizer in the form of ammonium sulphate.14.Sakha 102 cultivar when irrigated every 3 days gave thetallest plant and earlier plants in panicle initiation and heading date whereas no significant difference was obtained between irrigated of rice plants every 3 and 6 days with sakha 102 cultivar in plant height15.The lowest light penetration was obtained from Sakha 101 cultivar when irrigated every 3 days. II Yield and yield components: -1. Irrigation every 3 days gave the longest panicle, panicle weight and highest number of grains / panicle in both seasons. On the other hand no significant difference was obtained between irrigation of rice plants every 3 and 6 days in all yield components characters of rice2.Increasing the interval between irrigations significantly reduced 1000 — grain weight, number of panicles / m² spikelet formation efficiency and harvest index.3.Irrigation every 3 days recorded the highest grain yield / ha which equal 8.88 and 8.31 t/ha in the first and second seasons, respectively Prolonging the interval, mean reduction in the grain yield of about 29.95 and 23.95% when the irrigation intervals increased from 3 to 9 days in the first and second seasons respectively.4.Utilization efficiency and agronomic efficiency were higher with irrigation every 3 days followed by the irrigation every 6 days, whereas prolonging the irrigation intervals up to 9 days gave the lowest ones.5.Panicle length, number of grains / panicle, panicle weight 1000 — grain weight, number of panicles / m², spikelet formation efficiency , harvest index, grain and straw yield ha were significantly increased by the application of nitrogen fertilizer in different sources as compared with thecontrol treatment,6.The application of ammonium nitrate, urea and ammonium sulphate significantly increased the grain yield/ ha over the untreated rice plant by 39.64, 50.28, 56.08%, respectively in the means of the two seasons as compared with thecontrol treatment7.The highest utilization efficiency and agronomic efficiency were calculated from applied nitrogen fertilizer in form of ammonium sulphate followed by urea.8.Sakha 101 cultivar significantly surpass d Sakha 102cultivar in panicle length, number of gr ins / panicle, panicle weight, number of panicles / m² and arvest index9.Sakha 102 cultivar produced the heaviest 1000 — grain weight.10.Sakha 101 cultivar surpassed significantly Sakha 102 cultivar in grain yield / ha (7.96 ton) in the econd seasonand straw yield / ha (15.32 and 14.22 ton) n the first and second seasons, respectively11.Sakha 101 cultivar gave the maximu utilizationefficiency in the first season and maximu agronomic efficiency in the second season.12.Irrigation every 3 days with applied o ammonium sulphate gave the highest panicle lengt , 1000-grainweight, grain and straw yield / ha as well as utilization efficiency and agronomic efficiency13.Sakha 101 cultivar when irrigated every 3 s ays gave the maximum panicle weight and number of panic es / m²14.Sakha 101 cultivar when irrigated every c days withapplied of ammonium sulphate gave the hi hest panicle weight. III Chemical analysis: -1.Chlorophyll content in leaves of rice, N uptak at heading,N uptake in grains and protein yield were significantly decreased by irrigation interval increased in 0 oth seasons.whereas, Irrigation every 3 days gave the hig est values of the above characters.2.The highest grain protein content was obtained from irrigation every 9 days.3.Sugar and starch contents in stem and in panicle were significantly affected by irrigation intervals. The mean values of sugar and starch contents in the stem were increased by increasing intervals of irrigation at different period of growth. On the contrary, sugar and starch contents in panicle were decreased by delaying intervals of irrigation at different period of growth.4.Application of ammonium sulphate gave the highest chlorophyll content, N uptake at heading, N uptake in grains, grain protein content and protein yield / ha5.Application of ammonium nitrate, urea and ammonium sulphate significantly increased the protein yield / ha over the untreated rice plants by 45.26, 65.33 and 80.73% in the first season. While the corresponding increase were 45.68, 70.15 and 84.62% respectively in the second seasons.6.Sugar and starch contents in the stein at the three samples were significantly decreased by application of nitrogen in different sources as compared with unfertilized treatment. The control

treatment gave the highest percentage of sugar and starch in the stem. While ammonium sulphate gave the maximum percentage of sugar and starch in panicle at 28 days after heading⁷. Sakha 101 cultivar surpassed significantly Sakha 102 cultivar in chlorophyll content, N uptake at heading, N uptake in grains and protein yield / ha.⁸ No significant differences were observed among the two rice cultivars in grain protein content in both seasons.⁹ Sakha 101 cultivar gave the highest percentage of sugar and starch in the stem and in panicle at the three samples.¹⁰ The effect of the interaction between irrigation intervals and N — sources was significant for N-uptake in grains and protein yield / ha in the first season only. The highest N-uptake in grains and protein yield / ha were produced from irrigated rice plants every 3 days with application of ammonium sulphate.