Original Research Article

Performance evaluation of some rice varieties under the System of planting in Egypt

ABSTRACT

Rice is planting in different ways in Egypt; including direct seeding and transplanting seedling, so most of farmers facing problems in select any method and variety which may be led to highly income. Experiments ware conducted carried out during summer season at years 2016 and 2017, in privet Farm in east Delta Egypt, to investigate production of three varieties of Rice (Sakha 102, Giza 178 and Giza 182), affected by two sowing methods (direct seeding and seedling transplanting) under treatment of NPK concentration (0.0, 2% and 4%) as form 20:20:20 NPK, were arranged in split split-plot design with three replications. The results showed the superiority of the method of planting on the method of planting in both seasons. Increase in NPK concentration with Giza 178 under direct seeding recorded highly data for vegetative and physiology parameter; yield and yield component, and contents from some chemical contents in leaves and grains, while all parameter in this study recorded lowest data with Giza 182 under control NPK and transplanting.

Keywords: methods of planting, varieties, NPK, yield, rice.

Introduction

Rice is the staple food for more than half of the world population. Rice is a major food crop in Egypt. To meet the challenge of increased food demand, the productivity per unit area per unit time has to be necessarily increased, while all other approaches are obviously static. Enhancing productivity from the existing rice areas of Egypt has to be achieving by narrowing the existing gap between the realized and potential. The rice growing area is about half million hectares with a national average yield of 10 tons/ ha in Egypt. This significantly high productivity is mainly due to the development of short duration varieties with a higher yield potential (10 t ha-1), resistance to biotic and a biotic stresses, better grain quality (high milling and low amylase content) in combine with an excellent extension network through the national campaign of rice [1]

The productivity and sustainability of rice-based systems are threatened because of (1) the inefficient use of inputs (fertilizer, water, labor); (2) increasing scarcity of resources, especially water and labor; (3) changing climate; (4) the emerging energy crisis and rising fuel prices; (5) the rising cost of cultivation; and (6) emerging socioeconomic changes such as urbanization, migration of labor, preference of nonagricultural work, concerns about farm-related pollution [2]. Agronomic management and technological innovations are needed to address these issues in Egypt.

Transplanting is commonly practiced as a method of weed control for wet or puddled fields. It requires less seed but much more labor. Also, transplanted crops take longer to mature due to transplanting shock. Moreover, puddling and transplanting require large amount of water and labor, both of which are becoming increasingly scarce and expensive, making rice production less profitable. Also, the drudgery involved in transplanting a job largely done by women is of serious concern. All these factors demand a major shift from puddled transplanted rice production to direct seeding of rice in irrigated areas. According to [3], low wages and adequate availability of water favor transplanting, whereas high wages and low water availability favor direct seeding of rice. Depending on water and labor scarcity, farmers are changing either their rice establishment methods only (from transplanting to direct seeding in puddled soil).

Direct seeding is primarily done to manage the labor shortage, and is currently practiced in many countries as Malaysia, Thailand, Vietnam, the Philippines, Sri Lanka and Egypt [4-6]. Water seeding is widely practiced in the United States, primarily to manage weeds such as weedy rice, which are normally difficult to control [7].

On-farm studies in the Philippines observed on average 67–104 mm (11–18%) of savings in irrigation water in direct seeding [8]. Similar observation was to saving in recent developments in direct seeding of rice water, [8-10]. Cleaning and plastering of bunds are an important component of field preparation for both weed and water management in direct seeding in Sri Lanka [6]. A mix of traditional and modern practices based on farmers' long experiences and research innovations are being followed.

Varieties for direct seeding rice varieties selected for direct seeding and transplanting must have flexible but strong stems to resist lodging at maturity, along with resistance to major biotic stresses. These varieties should possess enhanced foliar growth to combat weeds at the vegetative stage, moderate tiller, less foliar growth, enhanced assimilate export from leaves to stems during the late vegetative and reproductive phases, sustained high foliar NPK concentration at the reproductive stage, and improved reproductive sink capacity with a prolonged ripening period [11, 12].

In Egypt, varietal improvement plays an important role in increasing rice yields. Increases in rice production depend on the availability of high yielding varieties [13]. Varieties differ in their ability to impact productivity. Cooking and eating quality of rice have never been serious problems in Egypt as nearly more than 95% of the rice area is planted with Japonica rice varieties because of their moistness, tenderness, gloss and taste. Recently, however, emphasis of development of long grain Indica rice has been brought into focus with respect to cooking and eating quality in breeding program quality. Newly released Japonica hybrids (Giza 178 and Sakha 102) mostly have low amylose content (17-18%) which its cooking quality is acceptable to the local consumers. Amylose content, gel consistency, gelatinization temperature and grain elongation are the main factors that affect the cooking and eating quality of rice grain, [14].

The application of mineral fertilizers is the most advantageous and the fastest way to increase crop yields. In the last few decades the rate of nitrogen (N), phosphorous (P) and potassium (K) or NPK fertilizer application has tremendously increased in crop production [15]. This is due to low use efficiency of externally applied fertilizers by the plants, long-term application, leaching, and evaporation to atmosphere [16-18]. Therefore, the reduced use of synthetic agrochemicals in crop production and to maintain soil fertility by alternative means is the subject of investigation.

The main objectives of the present study are to consider the effects of compound of NPK and two methods planting on varieties of rice for effect this on growth and yield and yield components and some chemical contents of rice and to determine the best compound for top dressing.

Materials and methods

Experimental site characteristics

Field Experiments ware conducted carried out in privet Farm in north Delta at Biddin village followed to Mansoura center, Dakahlia Governorate, Egypt, during the growing in summer seasons at years 2016 and 2017. Experiment location was situated within 31°, (04457)$^{-}$ N latitude and 31° 4757^{-} E longitude. Soil samples (0 to 30 cm) were taken at sowing and analyzed for some parameters. The soil was a Loam were sand % 12.3, silt % 21.9 and clay % 66.5 with 13.93% organic matter content, an electrical conductivity (EC) of

1.49 ds m^{-1} and a pH of 7.8. Total nitrogen (N) content was 0.19%, available phosphorus (P) was 15.32 mg kg^{-1}, available potassium (K) was 6.42 mg kg^{-1}, SO_4-N was 2.12 mg kg^{-1} and available Zn ppm 0.85. No salinity problems were observed, analysis of the experimental soil according to the methods given by Jackson (1978). The experimental area has an arid climate with hot dry summers and cool winters.

Experimental material

The experimental material used in the present study comprised of three rice cultivars viz., Sakha 102, Giza 178 and Giza 182 are characterized for improved quality, and are insect-resistance and need low amount of fertilizer. The seed of cultivars was obtained from Rice Research and Training Department in Sakha, Kafr EL-Sheikh followed to Field Crops Institute, Agricultural Research Center, in Giza, Egypt, (table 1).

Table (1): Genotypic and phenotypic characteristics of rice viz, Sakha 102, 178 and Giza182.

Characters	Sakha 102	Giza 178	Giza 182
Crosses	Giza 176/Milyang 79	Giza 175/Milyang	Giza 171/yomji 1/ Pi. No. 4
Leaves type	Bright erect	Bright erect	Bright erect
Tiller capacity	High	High	High
Stature	Short	Short	Short
Grain	Short	Medium	Long
Response to nitrogen	High	High	High
Blast resistance	Resistant	Resistant	Resistant
Salt sensitivity	Moderately tolerant	Tolerant	Moderately tolerant
Drought resistance	Moderately tolerant	Tolerant	Moderately tolerant
Duration	130-135 days	130-135 days	125 days
Type	Japonica	Japonica x Indica	Japonica

Nitrogen, Potassium and phosphorus (NPK) at form 20:20:20 were used applied on rice plant after direct seeding and seedling transplanting.

Experimental Designs and Treatments

The experiment was conducted as split split-plot design based on randomized complete block design with three replications. Sowing methods (direct seed and seedling transplanting) were arranged in main plots and rive cultivars viz., (Sakha 102, Giza 178 and Giza 182) were allocated in sub plots while, treatments including (NPK rates were used 0.0, 2% and 4% g/l) in sub subplot. The research field and treatment plot was irrigated with flood irrigation system.

AGRONOMIC MANAGEMENT

The experimental field was sown on May 08, 2016, emerged on May 15, and in 2017, the same cultivars ware planted on May 9, emerged on May 15. The seed rate of 144 kg seed ha^{-1} was use. Clean seeds were soaked in water for 24 hours and incubated for 48 hours and seeding in nursery at first of May in all seasons. Transplanting after 30 days old was transplanted at 20 X 20 cm distance between hills and rows in the first of June in both the years of study, while another experiment was seeding at fifteen from may direct in permanent field. The plot size measured 3.5 X 3 m. Operations of land preparation were conducted a week before planting through plowing, disc, leveler and implementing experiment plan. 200 kg calcium superphosphate (15.5% P_2O_5) per hectare was applied during seed bed preparation. Potassium sulfate (75 kg ha^{-1}, 48% K_2O) was applied. Nitrogen fertilizer in the form of Urea (46% N) was added at the rate of 90 kg N ha^{-1} was divided into three equal doses prior to the first irrigations and the second after thirty days in direct seeding or after transplanting then third divided after fifty days after sowing. Regular pest and disease control were undertaken as needed. The cultural practices were done as per need of the crop according to Agriculture ministry. Three NPK rates were used 0.0, 2% and 4% g/l at form NPK 20:20:20 this treatment applied at 15 days after transplanting and 40 days after direct seeding on three rice varieties: Sakha 102, Giza 178 and Giza 182 and repeat after fifteen days.

Data collection

Fifty days after sowing: five plants of samples were taken randomly from each plot to estimate dry weight of stem and leaves and leaf area/plant, and then spray NPK on plant.

At sixty-five days take another sample to measure plant height, dry weight of stem and leaves, number of tiller, and physiology parameters as crop growth rate (CGR g/day), leaf area index (LAI), leaf area ratio LAR (cm^2 /g) and net assimilation rate (NAR) (g / cm^2 /days), According to the formula of (Charles 1982). At harvest; Plant height (cm), Panicles /m^2, Length of panicle, 1000 grain, Yield/m^2 (g), Yield (t ha^{-1}), Straw yield (t ha-1), Biological yield, Harvest index (%).

Chemical contents as Photosynthetic pigments, Total soluble carbohydrates, Nitrogen content, Protein/ grain%, Phosphorus, Potassium, Zinc, manganese and iron.

Statically analysis

The data were statistically analyzed as the Technique of the analysis of variance (ANOVA) of the split plot design according to [19]**.** The treatment means were compared using the least significant difference (LSD).

Results and discussion

Vegetative growth was significantly influence by NPK treatment (Table 1). The highest of plant Height, dry weight of Leaves, dry weight of Stem and number of tiller were found in treatment NPK2, which was similar to direct seeding treatment, while the lowest plant Height, dry weight of Leaves, dry weight of Stem and number of tiller were recorded for control and NPK1 with transplanting treatment as shown in (Table 1). These results are similar to those obtained by[20].

Leaf area index LAI, crop growth rate CGR g/day, leaf area ratio LAR (cm^2 /g), and net assimilation rate NAR (g/cm^2 /days) increased with increasing NPK amounts, which could be attributed to the influence of NPK on tiller production and increasing leaf photosynthetic activity [21]. However, this necessarily did not result in cause yield increase, because net photosynthesis of canopy, total dry matter production and grain yield could decrease with increase in leaf development and tiller number [22].

Data in Table (2) indicated that plant height, dry weight of leaves, dry weight of stem, number of tiller, plant height (cm), dray weight of stem (g), dray weight of leaves (g), number of tiller, leaf area index LAI, crop growth rate CGR g/day, leaf area ratio LAR (cm^2 /g), and net assimilation rate NAR (g/cm^2 /days) at 60 days after sowing were significantly affected by the application of NPK in the two seasons of study. This increase could be due to the fact that NPK plays an important role in formation of auxin which involved in cell division and internodes elongation. These findings are supported by the work done by [23].

Dry matter accumulation at 60 days after sowing was significantly affected by interaction between NPK and direct seeding application in both seasons (Table 1). Application of NPK increased significantly dry matter and leaf area of plant as compared with control. This may be due to the important role of NPK for the activation of various types of enzymes, such as those required for the CO_2 assimilation pathway and chlorophyll biosynthesis. Similar trend was found by [24]. The greatest dry matter accumulation was obtained when rice received NPK foliar application in vegetative stage to increase growth of plant before productive stage.

Cultivar Giza 178 recorded higher number of total and productive tillers per square meter under direct seeding than under transplanting method compare with another cultivar Sakha 102 and Giza 182. Growth characters in rice plants depend on its genetic potential, agroclimatic condition and various management practices [25]. Beside, NPK is the key element in rice plant nutrition to promoting growth and yield. However, under direct seeding, in the early establishment stage alternate welting and drying of soil causing losses of basally nitrogen applied, so NPK supply especially at late season affects the growth, yield and quality of drill -rice [26].

Table (2): Effect of fertilization of NPK, some varieties and methods of planting on some growth characters of rice plants.

Treatments			**Plant Height (cm)**	**DW Stem (g)**	**DW Leaves (g)**	**Number of tiller**	**LAI**	**CGR g/day**	**LAR (cm^2 /g)**	**NAR (g/cm^2 /days),**
Direct seeding	**Sakha 102**	**NPK1**	75.46	126.02	135.66	683	4.799	0.3355	144.10	1.458
		NPK2	80.03	135.54	145.91	705	5.207	0.3608	149.98	1.518
		NPK3	77.74	145.40	156.53	726	5.411	0.3871	149.75	1.515
	Giza 178	**NPK1**	81.56	151.55	163.15	715	5.309	0.4035	138.76	1.404
		NPK2	70.88	163.20	175.68	729	5.616	0.4345	139.05	1.407
		NPK3	73.93	175.13	188.53	756	5.718	0.4662	136.77	1.384
	Giza 182	**NPK1**	76.98	133.74	143.97	710	4.901	0.3560	144.10	1.458
		NPK2	74.58	142.93	153.86	714	5.105	0.3805	141.28	1.430
		NPK3	77.72	150.46	161.97	723	5.309	0.4006	141.38	1.431
Transplanting	**Sakha 102**	**NPK1**	70.30	122.87	132.27	673	4.703	0.3271	142.65	1.444
		NPK2	73.26	132.22	142.34	694	5.103	0.3520	148.47	1.502
		NPK3	77.70	141.91	152.76	716	5.303	0.3778	148.24	1.500
	Giza 178	**NPK1**	75.48	147.88	159.19	705	5.203	0.3937	137.36	1.390
		NPK2	79.18	159.29	171.47	719	5.503	0.4240	137.64	1.393
		NPK3	68.82	170.78	183.84	745	5.603	0.4546	135.39	1.370
	Giza 182	**NPK1**	71.78	130.48	140.47	699	4.803	0.3474	142.65	1.444
		NPK2	74.74	139.46	150.12	703	5.003	0.3713	139.85	1.415
		NPK3	72.41	146.83	158.07	713	5.203	0.3909	139.95	1.416
LSD 5% M			5.585911	14.47127	9.358572	65.95683	0.161259	0.005825	21.0803	0.011052
LSD 5% V			5.561834	14.4089	9.318233	65.67254	0.160564	0.0058	20.98944	0.011004
LSD 5% T			5.321062	13.78513	8.914846	62.82957	0.153613	0.005549	20.08081	0.010528
LSD 5% M x V			4.767286	12.35048	7.987057	56.29074	0.137626	0.004971	17.99095	0.009432
LSD 5% M x T			4.285742	11.10296	7.180284	50.60481	0.123725	0.004469	16.17368	0.008479
LSD 5% V x T			3.491194	9.044545	5.849107	41.22302	0.100787	0.003641	13.17519	0.006907
LSD 5% M x V x T			0.770471	1.996038	1.290837	9.097494	0.022243	0.000803	2.907628	0.001524

Data in table (3) reported that the effect of NPK on increasing Plant height (cm), Panicles /m^2, Length of panicle, 1000 grain, Yield/m^2 (g), Yield (t ha-1), Straw yield (t ha-1), Biological yield, Harvest index (%) in per unit area is the main factor of yield increment as result of nitrogen application [27]. Due to NPK fertilization, there was significant increase in Plant height (cm), Panicles /m^2, Length of panicle, 1000 grain, Yield/m^2 (g), Yield (t ha-1), Straw yield (t ha-1), Biological yield, Harvest index (%) under fertilized condition compared to under unfertilized condition direct seeding.

Cultivar Giza 178 recorded higher number of total and productive tillers per square meter, panicle length, number of spikelet's and yield per meter under direct seeding than under transplanting method. Rice yield was 9.8169 and 9.5250 tons per hectare in drilling and transplanting methods, respectively. [28] studied the effect of planting methods on the yield of rice cultivars he found that higher tiller number/m^2, 1000 grain weight and yield of meter as compared with the other. [29] studied four treatments of planting method then reported that the grain yield was highly significant affected by the planting methods.

Table 3. Effect of fertilization of NPK, some varieties and methods of planting on some y**ield and yield components** of rice plants.

Treatments			Plant Height (cm)	Panicles /m^2	Length of panicle	1000 grain	Yield/ m^2 (g)	Yield (t ha-1)	Straw yield (t ha-1)	Biological yield	Harvest index (%)
Direct seeding	Sakha 102	NPK1	101.9	663	24.42	27.1	8951	8.4168	12.399	21.136	0.4134
		NPK2	108.5	684	24.61	27.8	9234	8.7174	12.299	21.348	0.4239
		NPK3	105.6	705	24.73	28.2	9518	8.9178	11.656	20.913	0.4427
	Giza 178	NPK1	110.2	694	22.34	22.4	9369	9.3186	13.727	23.401	0.4134
		NPK2	95.7	708	22.52	23.1	9558	9.6192	13.571	23.557	0.4239
		NPK3	99.9	734	22.61	23.4	9909	9.8196	12.834	23.028	0.4427
	Giza 182	NPK1	104.3	689	27.44	28.1	9302	8.3166	12.338	20.971	0.4117
		NPK2	100.7	693	27.72	28.8	9356	8.5170	12.016	20.858	0.4239
		NPK3	105.2	702	28.14	29.6	9477	8.6172	11.263	20.208	0.4427
Transp lanting	Sakha 102	NPK1	95.2	653	24.16	26.8	8816	8.1643	12.366	20.841	0.4067
		NPK2	99.4	674	24.35	27.5	9099	8.4559	11.930	20.708	0.4239
		NPK3	105.3	695	24.45	27.9	9383	8.6503	11.306	20.286	0.4427
	Giza 178	NPK1	102.2	684	22.08	22.2	9234	9.0390	13.691	23.074	0.4067
		NPK2	107.1	698	22.28	22.9	9423	9.3306	13.164	22.850	0.4239
		NPK3	93.4	723	22.37	23.2	9761	9.5250	12.449	22.337	0.4427
	Giza 182	NPK1	97.5	679	27.13	27.8	9167	8.0671	12.219	20.593	0.4067
		NPK2	101.6	683	27.42	28.5	9221	8.2615	11.655	20.232	0.4239
		NPK3	97.8	692	27.82	29.3	9342	8.3587	10.925	19.602	0.4427
LSD 5% M			11.0705	44.586	2.59744	2.0415	329.78	2.96888	2.08504	2.61874	0.01547
LSD 5% V			11.0228	44.394	2.58625	2.0327	328.36	2.95608	2.07606	2.60746	0.01540
LSD 5% T			10.5456	42.472	2.47429	1.9447	314.14	2.82811	1.98618	2.49458	0.01473
LSD 5% M x V			9.44811	38.052	2.21678	1.7423	281.45	2.53378	1.77948	2.23496	0.01320
LSD 5% M x T			8.49376	34.208	1.99287	1.5663	253.02	2.27785	1.59973	2.00921	0.01187
LSD 5% V x T			11.0705	44.586	2.59744	2.0415	329.78	2.96888	2.08504	2.61874	0.01547
LSD 5% M x V x T			11.0228	44.394	2.58625	2.0327	328.36	2.95608	2.07606	2.60746	0.01540

These findings are in close agreement with those reported by [23, 30-32].

The analyses of variance in (Table 3) showed that NPK and methods of plant treatment of direct seeding on varieties of rice especially Giza 187 effects for grain yield and yield components were significant.

Length of panicle, number of tiller per meter, weight of 1000 grain, yield/m^2 and yield/ha were significantly influenced by NPK treatment (Table 3). This showed that stimulating vegetative plant growth and increasing tiller numbers by nitrogen could cause a decrease of panicle length [23, 32-37].

Nitrogen increased straw yield with effect on plant vegetative growth by increasing tiller number and plant height. [20] also showed that maximum straw yield was obtained with the highest dose of N level. This result was supported also by [38, 39].

Data in table 4 showed that the Chlorophyll A, Chlorophyll B and Carotene in leaves, content of grain from nitrogen, protein, phosphor, potassium, zinc, and manganese and iron concentration changed according to NPK concentration and methods of planting under varieties of rice. [40] reported that NPK application significantly increased N, K, manganese (Mn), and zinc (Zn) concentrations. Nitrogen concentration was significantly higher under fertilized condition than under unfertilized condition.

Table (4): Effect of fertilization NPK, some varieties and methods of planting on some chemical content grains of rice plants

Treatments			Chlorophyll			N/ grain%	Protein/ grain%	P%	K %	Zn $mgkg^{-1}$	Mn $mgkg^{-1}$	Fe $mgkg^{-1}$
			Chlo. A $mgkg^{-1}$	Chlo. B $mgkg^{-1}$	Carotenoids $mgkg^{-1}$							
Direct seeding	Sakha 102	NPK1	2.4281	1.2196	0.9339	51.658	307.37	14.432	21.833	15.274	1.707	0.6281
		NPK2	2.4501	1.1866	0.9669	69.067	410.95	17.546	22.218	15.790	2.191	0.7494
		NPK3	2.4940	1.2305	1.0108	83.778	498.48	20.213	22.543	15.790	2.445	0.8485
	Giza 178	NPK1	2.6738	1.3430	1.0284	57.909	344.56	16.178	22.117	16.718	2.180	0.6281
		NPK2	2.6980	1.3067	1.0647	77.424	460.67	19.669	22.269	16.925	2.268	0.6722
		NPK3	2.7464	1.3551	1.1131	93.915	558.79	22.659	22.980	18.163	2.456	0.7163
	Giza 182	NPK1	2.4308	1.2209	0.9349	53.265	316.92	16.105	21.772	18.473	2.169	0.6281
		NPK2	2.4528	1.1879	0.9679	71.215	423.73	19.580	22.208	18.679	2.434	0.6502
		NPK3	2.4968	1.2319	1.0119	86.383	513.98	22.556	22.929	14.228	2.489	0.7494
Transplanting	Sakha 102	NPK1	2.4014	1.2061	0.9236	51.090	303.98	14.216	21.768	15.259	1.707	0.6276
		NPK2	2.4231	1.1735	0.9562	68.307	406.43	17.283	22.153	15.774	2.191	0.7487
		NPK3	2.4666	1.2170	0.9997	82.856	493.00	19.910	22.477	15.774	2.444	0.8478
	Giza 178	NPK1	2.6444	1.3282	1.0171	57.272	340.77	15.936	22.051	16.702	2.180	0.6276
		NPK2	2.6683	1.2923	1.0530	76.572	455.60	19.374	22.203	16.908	2.268	0.6716
		NPK3	2.7162	1.3401	1.1008	92.882	552.65	22.319	22.912	18.146	2.455	0.7157
	Giza 182	NPK1	2.4040	1.2075	0.9246	52.679	313.44	15.863	21.707	18.455	2.169	0.6276
		NPK2	2.4258	1.1748	0.9573	70.431	419.07	19.286	22.143	18.661	2.433	0.6496
		NPK3	2.4693	1.2183	1.0008	85.433	508.33	22.217	22.861	14.242	2.488	0.7487
LSD 5% M			0.232	0.21112	0.199086	10.08451	135.435	3.569917	2.927332	0.296978	0.006237	3.569917
LSD 5% V			**0.231**	0.21021	0.198228	10.04104	134.8512	3.554529	2.914714	0.295698	0.00621	3.554529
LSD 5% T			**0.221**	0.20111	0.189647	9.606365	129.0135	3.400653	2.788536	0.282897	0.005941	3.400653
LSD 5% M x V			**0.198**	0.18018	0.16991	8.606608	115.5867	3.046739	2.498326	0.253455	0.005323	3.046739
LSD 5% M x T			**0.178**	0.16198	0.152747	7.737254	103.9113	2.738988	2.24597	0.227854	0.004785	2.738988
LSD 5% V x T			**0.145**	0.13195	0.124429	6.302819	84.64686	2.231198	1.829582	0.185611	0.003898	2.231198
LSD 5% M x V x T			**0.032**	0.02912	0.02746	1.390967	18.68069	0.492402	0.40377	0.040962	0.00086	0.492402

NPK distribution of rice in fertilizer treatments at flowering stage are shown in table 4. [41] showed that rice stems represent the majority of plant biomass. [42] reported same results with application of urea. Due to N fertilization, there was significant increase under fertilizer treatment and N, K, Na, and Mg uptake in grain were significantly high.

Conclusion

NPK application only or together with methods of planting increased vegetative and yield characters with all varieties of rice plant. The application of NPK was due to the increased Plant height (cm), dray weight of stem (g), dray weight of leaves (g), number of tiller, leaf area index LAI, crop growth rate CGR g/day, leaf area ratio LAR (cm^2 /g), and net assimilation rate NAR (g/cm^2 /days); Plant height (cm), Panicles /m^2, Length of panicle, 1000 grain, Yield/m^2 (g), Yield (t ha-1), Straw yield (t ha-1), Biological yield, Harvest index (%); Total of chlorophyll (Chlo. A $mgkg^{-1}$, Chlo. B $mgkg^{-1}$ and Carotenoids $mgkg^{-1}$), Protein/ grain%, nitrogen N/ grain%, phosphorus P%, potassium K %, zinc Zn $mgkg^{-1}$, and manganese Mn $mgkg^{-1}$ and iron Fe $mgkg^{-1}$ were found in treatment were obtained to increase of NPK concentration and direct seeding with Giza 178 variety. But the low data recorded under control of NPK with transplanting for Giza 182 variety.

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