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RESPONSE OF SEASHORE PASPALUM (*PASPALUM VAGINATUM* SWARTZ.) LAWN TO DIFFERENT NPK FERTILIZATION TREATMENTS AND PLANTING DENSITY AT NEW VALLEY REGION UNDER SPRINKLER SYSTEM

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ABSTRACT: A field study was carried out at East Owainat Agric., Res. Station, New Valley, Egypt during two successive seasons (2022/2023 and 2023/2024) to investigate the most suitable NPK fertilization rate and five planting densities (70, 60, 50, 40 and 30 plants/m^2) for the best growth performance of seashore paspalum turfgrass under the environmental conditions of New Valley Region. The obtained results showed that all vegetative growth characters were gradually augmented during Dec. and Jan., but again increased till the end of the experiment. Regarding the NPK fertilization rates the four tested growth traits, the three photosynthetic pigments and N, P and K % and uptake were all promoted gradually parallel to the gradual increase in NPK fertilization rate where the highest rate resulted in the highest values. So, it is recommended to supply seashore paspalum turfgrass with the highest two NPK rates (0: 0: 0, 10: 7.5: 7.5, 15: 10: 10, 20: 12: 12 and 25: 15: 15) from ammonium nitrate (33.5% N), calcium superphosphate (15.5 P_2O_5) and potassium sulphate (48% K_2O), at one month interval after planting date along the growing season in order to obtain the ideal turf. On another side, the four vegetative growth characters of plants gradually increased from planting date on May 15th and up to Nov. 15th, decreased throughout Dec., Jan. and Feb. but again increased in March. Regarding the five density treatments (70, 60, 50, 40 and 30 plants/m^2) all growth characters as well as, the three photosynthetic pigments concentration, and N, P and K % were gradually and consistently increased according to the gradual increase in planting densities. Therefore, the highest values were obtained from the highest density treatments (70 followed by 60 plants/m^2), while the lowest values were given due to the lowest density treatment (30 plants/m^2).

Keywords: seashore paspalum turfgrass, fertilization, covering density

INTRODUCTION

Turfgrass plants are considered the main element of the landscape. Turfgrass plant is often referred to as the background for all construction and plant materials. Among the newly introduced warm season turfgrass species to Egypt is seashore paspalum. It has been found to be suitable and well adapted under different environmental and soil conditions in Egypt, such turfgrass species is an excellent low light intensity tolerant with dark green color and perfect for golf course, fairways, tees and roughs. It is also salt tolerant and can be irrigated with brackish, gray, effluent and even ocean, and freshwater blends.

Different investigators such as Busey (1989) on bahiagrass, Yufen and Jixiong (1994) on sport field turf, Surour (2001) on *Cynodom dactylon*, Sbrissia *et al.* (2001) on coast cross bermudagrass, Roscher *et al.* (2008) on *Lolium perenne*, Abo-Feteih *et al.* (2010) on Tunis grass and Braz *et al.* (2011), Magalhaes *et al.* (2011) and Freitas *et al.* (2012) on Tanzania grass pointed out that increasing the distance between plants caused a notable reduction in plant height, clipping, fresh and dry weights and covering density % as well as the contents of chlorophyll a, b and carotenoids and the leaves N, P and K %.

The role of NPK mineral fertilization in enhancing vegetative growth characters, plant height, clipping fresh and dry weight and covering density % and promoting the photosynthetic pigments and N, P and K % uptake of different turfgrass species was reported by many authors. Examples are Skogley (1980) on *Agrostis* turfgrass, Johnson *et al.* (1988) on centipede grass, Fry *et al.* (1989) on creeping bentgrass and Doernoden (1991), Overman *et al.* (1991) Hossni (1993), Overman and Wilkinson (1995), Manoly (2000) and Rodrigaez-Fuentes *et al.* (2009) on bermudagrass, Similar findings were also obtained on bahiagrass (Overman and Evers, 1992); on *Lolium perenne*, (Soliman, 1997); four turfgrass cultivars, (Li *et al.*, 2000); different turfgrass species, (Trenholm *et al.*, 2000) and 2 warm-season turfgrasses (Trenholm and Unruh, 2005).

MATERIALS AND METHODS

The present study was conducted at East Owainat, Agric. Res. Station, New Valley Governorate Egypt, during the two successive seasons (2022/2023 and 2023/2024). The study dealt with two experiments, the first one examined the effect of planting densities (70, 60, 50, 40 and 30 plants/m^2) on vegetative growth and chemical constituents of seashore paspalum turfgrass.

In the second experiment, the effect of five different planting density planting was done by 2 × 2 cm pieces obtained from the sod of seashore paspalum on the second week of May for both seasons at five different planting density treatments namely 30, 40, 50, 60 and 70 plants/m^2 plot (3×10, 4×10, 5×10, 6×10 and 7×10 plants/m^2 in the replicates). Physical and chemical soil properties of the used soil are shown in Table (a).

Table a. Physical and chemical properties of the used soil.

Character	Soil depth (cm)	
	0-20	20-40
Clay	2.10	2.10
Silt	33.90	29.90
Sand	64.00	64.00
Texture	Sandy loam	Sandy loam
pH (1:2.5)	7.41	7.74
EC (dsm^{-1})	3.27	4.28
$CaCO_3$ (%)	11.36	9.66
Cations (meq /100 g soil)		
Ca_2	2.13	1.21
Mg	0.94	2.07
Na	3.55	4.34
K	0.11	0.08
Anions (meq/100 g soil)		
Cl	2.39	1.21
HCO_3	0.13	0.29
SO_4	4.23	6.21
Available N (ppm)	70.0	52.50
Available P (ppm)	23.2	40.0
Available K (ppm)	300.0	700.0

Before planting, farm yard manure was added at the rate of 30 m^3/fed and 3 weeks later, roundup herbicide was sprayed at the rate of 1 cm^3/l, while irrigation was carried out at the timing schedule of twice daily from planting date through sprinkler system till June 15th , once daily till Sep. 15th, every one day till Nov. 15th, every 2 days till Feb. 15th then once every day till the end of the experiment on March 15th, water quantity was 10 liters/m^2.

All plots were supplied with NPK fertilizers at the rate of 40 kg ammonium nitrate (33.5%N), 30 kg calcium superphosphate (15.5% P_2O_3 and 30 kg potassium sulphate (48% K_2O)/fed (10, 7.5, 7.5 g/m^2). These fertilizer amounts were added after one month from the planting date and repeated every month thereafter.

The second experiment deals with studying the effect of five NPK fertilization rates, namely 0:0:0, 10:7.5:7.5, 15:10:10, 20:12:12 and 25:15:15 g/m^2, in this experiment in plots with replicates. These fertilizer amounts were supplied one month after the planting date and repeated every month thereafter with 2 days elapsed left between the addition of each fertilizer source under drip irrigation system.

Mowing was executed after 2, 4, 6, 8 and 10 months from the planting date at 2 cm height and each of plant height of clipping (cm), fresh and dry weights (g) and covering density %, were recorded for each cut and the three photosynthetic pigments of chlorophyll a, b and carotenoids (mg/g f.w.), were determined three times, after 4, 7 and 10 months from planting date according to Fadl and Seri-Eldeen (1979), while nitrogen, phosphorus and potassium % in the dry clippings were determined, on Sep. 15th according to Page *et al.* (1982).

Statistical analysis for all the experimental design was a complete randomized block design (CRD). L.S.D. (least significant differences) test at $p \leq 0.05$ was used to compare the means of the treatments according to Little and Hills (1978).

RESULTS AND DISCUSSION

Vegetative growth characters:

The four vegetative growth characters of plant height, clipping fresh and dry weights and covering density % were gradually increased during spring, summer, and autumn months, then declined during winter months and again enhanced during February and March for all the five planting density treatments and fertilization upward from date of planting and up to Nov. 15th then decreased-on Jan. 15th and again enhanced on March 15th.

Regarding the effect of density treatments, all four vegetative growth characters were gradually and consistently decreased by widening the distances (decreasing planting density) between plants which means that the highest values were given due to the widest density (70 plants/m^2), while the lowest values were given by the narrowest density treatment (30 plants/m^2). Numerically, plant height, clipping fresh and dry weights and covering density %, at the end of the experiment (March 15th) recorded in the first season were 12.64 cm, 141.4 g, 15.76 g and 98.8%, respectively, for the widest density (70 plants/m^2), while recorded only 6.69 cm, 88.6 g, 9.54 g and 74.8%, respectively for the narrowest density (30 plants/m^2). Almost, a similar trend was given in the second season (Tables, 1 and 2) with significant differences being obtained among the different density treatments for all growth traits taken after 2, 4, 6, 8 and 10 months from the planting date in both seasons as clearly shown in Tables (1 and 2). In agreement with these results was the finding of Suorour (2001) and Sbrissia *et al.* (2001) on bermudagrass, Roscher *et al.* (2008) on *Lolium perenne*, Abou-Feteih *et al.* (2010) on Tunis grass and Braz *et al.* (2011) and Magaihaes *et al.* (2011) on Tanzania grass.

However, fertilization treatments recorded the tallest plants, the heaviest clipping fresh and dry weights and the highest

Table 1. Effect of planting density on plant height (cm) and covering density % of seashore paspalum turfgrass after 2, 4, 6, 8 and 10 months from planting date during 2022/2023 and 2023/2024 seasons.

Number of plants/m²	Plant height (cm)					Covering density%				
	Number of months from planting date									
	2	4	6	8	10	2	4	6	8	10
	1st season									
70	7.12	9.40	11.61	10.32	12.64	69.7	83.2	92.6	86.0	98.8
60	6.42	8.63	10.12	9.10	10.97	64.2	78.0	88.7	81.8	95.5
50	5.33	7.12	8.33	7.59	9.28	58.3	73.7	81.2	76.5	88.0
40	4.72	6.78	7.87	7.10	8.70	52.5	68.0	76.3	70.5	82.7
30	3.04	4.63	5.70	4.58	6.69	50.5	61.2	69.8	63.1	74.8
L.S.D 5%	0.32	0.42	0.40	0.47	0.52	4.6	7.1	7.7	5.4	8.2
	2nd season									
70	7.07	9.21	11.80	10.66	31.10	70.1	85.5	91.6	88.3	100.0
60	6.62	8.82	10.32	9.30	11.18	65.9	79.0	89.7	82.6	96.4
50	5.50	7.30	8.51	7.76	9.45	59.0	74.5	82.0	77.3	88.7
40	4.87	6.93	8.03	7.25	8.84	53.1	68.6	76.6	70.8	83.3
30	3.15	4.75	6.08	4.71	6.81	50.8	61.5	69.5	63.3	75.3
L.S.D 5%	0.22	0.37	0.50	0.42	0.44	6.1	8.2	6.7	7.0	8.8

Table 2. Effect of planting density on clipping fresh and dry weight (g) of seashore paspalum turfgrass after 2, 4, 6, 8 and 10 months from planting date during 2022/2023 and 2023/2024 seasons.

Number of plants/m²	Clipping fresh weight (g)					Clipping dry weight (g)				
	Number of months from planting date									
	2	4	6	8	10	2	4	6	8	10
	1st season									
70	96.4	118.8	136.0	120.1	141.4	12.51	14.60	15.01	12.91	15.76
60	85.2	110.4	122.9	108.7	128.3	11.32	13.20	13.30	10.85	14.52
50	82.4	102.2	113.4	104.8	116.3	10.90	12.51	12.36	9.50	14.04
40	71.9	91.3	102.5	94.0	109.6	8.91	10.63	11.35	8.82	12.21
30	58.3	75.7	85.2	76.9	88.6	6.78	8.35	8.62	7.21	9.54
L.S.D 5%	5.1	7.4	6.9	6.4	10.2	0.66	0.92	0.81	0.74	10.61
	2nd season									
70	94.6	116.2	133.3	121.1	139.2	12.62	14.87	15.41	12.97	16.22
60	85.7	110.9	123.7	109.4	128.2	11.52	13.64	13.50	11.05	14.71
50	82.8	103.7	113.8	102.7	116.7	10.40	12.62	12.36	10.42	13.41
40	72.2	92.1	102.8	92.6	107.3	8.81	10.78	11.05	9.80	12.07
30	58.4	75.9	85.6	77.1	88.9	6.83	8.49	9.39	7.88	9.88
L.S.D 5%	6.2	9.4	8.8	6.7	9.3	0.72	0.91	0.74	0.90	0.98

percentage of covering density due to the highest NPK rate (25:15:15 g/m^2) followed by (20:12:12 g/m^2) as clearly shown in Tables (3 and 4). The role of NPK fertilizers in promoting different vegetative growth characters of turfgrass was recorded by Skogley (1980) on *Agrostis* turfgrass; Johnson *et al.* (1988) on centipede grass; Fry *et al.* (1989) on creeping bentgrass; Doernoden *et al.* (1991), Hossni (1993) and Rodriguez-Fuentes *et al.* (2009) on bermudagrass, Overman and Evers (1992) on bahiagrass and Li *et al.* (2000) on 4 turfgrass cultivars.

Photosynthetic pigments:

The three photosynthetic pigments of chlorophyll a, b and carotenoids (mg/g f.w.), estimated after 4, 7 and 10 months from planting date were promoted upward parallel to the increase in planting density with the highest values being given due to the highest density treatment (70 plants/m^2), in the two seasons with significant differences among the different density treatments for the measurements taken after 4, 7 and 10 months as illustrated in Table (5). It was also noticed that the three photosynthetic pigments for each density treatment were declined on Dec. 15th reading. In accordance with these findings were those reported by Yufen and Jixong (1994) on sport field turf, Surour (2001) on bermudagrass and Braz *et al.* (2011) and Magaihaes *et al.* (2011) on Tanzania grass.

All five NPK fertilization treatments gave lower values in the second measuring time (Dec. 15th) than those estimated on either Sep. 15th or March 15th. However, among NPK fertilization treatments, significant differences were obtained for chlorophyll a, b and carotenoid in the three measuring times (Sep. 15th, Dec. 15th and March 15th) in both seasons. Gradual and consistent increases in the three photosynthetic pigments were shown parallel to the gradual increase in the used NPK rate and always the highest rate (25:15:15) was capable of giving significantly the highest values of chlorophyll a and b and carotenoids in both seasons and for the three cuts as illustrated in Table (6). In accordance with these results were the findings of Doernoden *et al.* (1991), Hossni (1993) and Manoly (2000) on bermudagrass, Soliman (1997) on *Lolium perenne*, Trenholm *et al.* (2000) on different turfgrass species and Trenholm and Unruh (2005) on two warm-season turfgrasses.

Nitrogen, phosphorus and potassium %:

Table (7) shows that each of N, P and K % in the clipping of seashore paspalum turfgrass were significantly increased in the two seasons. They were gradually increased upward according to the gradual increase in planting density where the highest N, P and K % values were given by the widest two densities (60 and 70 plants/m^2), while the lowest values were those of the narrowest density treatment (30 plants/m^2). The lowest N, P and K % in both seasons, in comparison with all other density treatments as clearly shown in Table (7). Such trend of increasing N, P and K % by increasing plant density was pointed out by Busey (1989) on bahiagrass, Surour (2001) on bermudagrass and Braz *et al.* (2011), Magaihaes *et al.* (2011) and Freitas *et al.* (2012) on Tanzania grass.

An explanation for the obtained results indicated that the increase in the four studied vegetative growth characters of plant height, clipping fresh and dry weight and covering density % were paralleled to the increase in planting density during the five clipping dates along the growing season which could be attributed to the fact that narrowing the distance between plants force them to compete for light, nutrients, water and root zone area, so they tended to be shorten than those planted at wider spacing. For clipping fresh and dry weights, the 70 plants/m^2 treatment resulted in heavier vegetative growth traits than the other lower density treatments (60, 50, 40 and 30 plants/m^2). Similarly, covering density % was gradually increased parallel to the increase in plant density due to narrowing the distance between plants. The increase in chemical constituents (N, P and K % and chlorophyll a, b and carotenoids content) parallel to the increase in

Table 3. Effect of NPK fertilization on plant height (cm) and covering density % of seashore paspalum turfgrass after 2, 4, 6, 8 and 10 months from planting date during 2022/2023 and 2023/2024 seasons.

NPK fertilization	Plant height (cm)					Covering density %				
	Number of months from planting date									
	2	4	6	8	10	2	4	6	8	10
					1st season					
0:0:0	2.86	4.13	5.22	4.30	6.42	47.2	57.7	66.3	60.5	71.2
10:7.5:7.5	3.42	6.71	7.72	6.25	8.80	51.0	65.0	74.2	69.2	77.8
15:10:10	5.27	7.75	8.53	7.25	9.53	55.5	70.1	77.7	70.7	81.7
20:12:12	6.15	8.34	9.15	7.62	10.28	59.7	74.2	84.8	77.6	88.2
25:15:15	6.38	8.55	9.63	8.13	10.61	61.6	78.2	87.5	80.8	93.1
L.S.D 5%	0.32	0.69	0.60	0.54	0.71	5.4	7.0	6.6	6.8	6.8
					2nd season					
0:0:0	3.32	4.63	5.68	4.81	6.89	47.8	58.3	66.9	61.1	71.8
10:7.5:7.5	3.90	7.20	8.25	6.78	9.27	51.3	65.6	74.8	69.8	78.2
15:10:10	5.73	8.25	9.02	7.73	10.02	56.0	70.2	78.2	71.3	82.4
20:12:12	6.60	8.84	9.60	8.02	10.73	60.2	74.3	85.2	78.0	88.8
25:15:15	6.83	9.05	10.13	8.60	11.10	61.7	78.8	88.0	81.2	94.0
L.S.D 5%	0.25	0.53	0.76	0.48	0.66	4.8	6.5	8.0	6.1	7.7

Table 4. Effect of NPK fertilization on clipping fresh and dry weight (g) of seashore paspalum turfgrass after 2, 4, 6, 8 and 10 months from planting date during 2022/2023 and 2023/2024 seasons.

NPK fertilization	Clipping fresh weight (g)					Clipping dry weight (g)				
	Number of months from planting date									
	2	4	6	8	10	2	4	6	8	10
					1st season					
0:0:0	54.2	69.6	77.8	72.5	82.7	4.73	6.18	6.75	5.03	7.45
10:7.5:7.5	67.3	86.8	98.8	85.4	104.0	7.17	9.03	9.73	7.65	10.72
15:10:10	75.8	94.2	110.1	97.8	113.5	8.23	9.93	10.80	8.12	11.43
20:12:12	80.4	104.2	113.7	101.5	119.2	8.95	10.45	11.02	8.86	12.30
25:15:15	89.0	108.2	122.1	109.4	127.7	9.44	10.92	11.85	9.67	12.82
L.S.D 5%	5.1	6.9	10.0	8.5	10.2	0.72	0.68	0.99	0.61	0.82
					2nd season					
0:0:0	54.7	69.9	79.4	72.7	83.1	5.25	6.67	7.32	5.53	7.98
10:7.5:7.5	67.7	87.2	99.2	85.7	104.3	7.72	9.52	10.20	8.15	11.21
15:10:10	76.1	94.6	110.5	97.9	113.8	8.73	10.40	11.28	8.73	11.90
20:12:12	81.0	103.8	114.0	101.8	119.5	9.42	10.93	11.75	9.32	12.78
25:15:15	89.5	108.6	122.7	109.7	127.6	10.00	11.42	12.33	10.00	13.14
L.S.D 5%	7.2	9.0	11.4	8.6	9.4	0.63	0.87	0.85	0.76	1.04

Table 5. Effect of planting density on chlorophyll a, b and carotenoids (mg/g f.w.) of seashore paspalum turfgrass after 4, 7 and 10 months from planting date during 2022/2023 and 2023/2024 seasons.

Number of plants/m²	Chlorophyll a			Chlorophyll b			Carotenoids		
	Number of months from planting date								
	4	7	10	4	7	10	4	7	10
				1st season					
70	3.26	2.82	3.29	2.04	1.86	2.01	2.44	2.08	2.42
60	3.15	2.74	3.12	1.98	1.78	1.96	2.39	2.13	2.53
50	2.61	2.17	2.58	1.66	1.38	1.64	1.96	1.57	2.08
40	2.45	1.83	2.28	1.50	1.22	1.42	1.76	1.32	1.72
30	1.54	1.26	1.64	1.01	0.08	0.98	1.13	0.92	1.13
L.S.D 5%	0.06	0.04	0.07	0.06	0.04	0.08	0.03	0.04	0.06
				2nd season					
70	3.24	2.86	3.28	2.05	1.84	2.03	2.48	2.26	2.51
60	3.18	2.77	3.14	2.01	1.82	1.99	2.43	2.15	2.56
50	2.63	2.20	2.61	1.64	1.41	1.66	1.98	1.59	2.11
40	2.47	1.86	2.32	1.52	1.25	1.44	1.77	1.34	1.76
30	1.56	1.28	1.68	1.04	0.82	1.25	1.15	0.94	1.16
L.S.D 5%	0.09	0.05	0.08	0.05	0.03	0.06	0.06	0.05	0.07

Table 6. Effect of NPK fertilization on chlorophyll a, b and carotenoids (mg/g f.w.) of seashore paspalum turfgrass after 4, 7 and 10 months from planting date during 2022/2023 and 2023/2024 seasons.

NPK fertilization	Chlorophyll a			Chlorophyll b			Carotenoids		
	Number of months from planting date								
	4	7	10	4	7	10	4	7	10
				1st season					
0:0:0	1.25	1.25	1.71	0.97	0.82	1.01	1.01	0.87	1.26
10:7.5:7.5	2.17	1.73	2.26	1.42	1.15	1.41	1.65	1.39	1.82
15:10:10	2.52	2.20	2.58	1.66	1.44	1.70	1.87	1.65	2.20
20:12:12	2.82	2.53	2.87	1.80	1.62	1.86	1.95	1.81	2.33
25:15:15	3.03	2.84	3.22	1.96	10.81	1.98	2.20	2.01	2.56
L.S.D 5%	0.08	0.06	0.05	0.04	0.05	0.06	0.05	0.06	0.08
				2nd season					
0:0:0	1.44	1.24	1.68	0.99	0.81	1.02	1.02	0.84	1.23
10:7.5:7.5	2.13	1.72	2.23	1.41	1.11	1.39	1.61	1.38	1.83
15:10:10	2.48	2.19	2.56	1.61	1.42	1.68	1.84	1.64	2.16
20:12:12	2.79	2.50	2.86	1.79	1.64	1.83	1.97	1.80	2.31
25:15:15	3.01	2.71	3.20	1.96	1.82	1.98	2.19	1.99	2.50
L.S.D 5%	0.07	0.05	0.09	0.05	0.07	0.07	0.06	0.04	0.06

Table 7. Effect of planting density on leaves N, P and K % of seashore paspalum turfgrass during 2022/2023 and 2023/2024 seasons.

Number of plants/m^2	N %	P %	K %	N %	P %	K %
		1st season			2nd season	
70	3.26	0.62	3.29	2.04	0.56	2.51
60	3.15	0.54	3.12	1.98	0.48	2.46
50	2.61	0.47	2.58	1.66	0.40	2.14
40	2.45	0.33	2.28	1.50	0.25	1.92
30	1.54	0.26	1.64	1.01	0.20	1.48
L.S.D 5%	0.06	0.04	0.07	0.06	0.04	0.08

planting density could be interpreted by the fact that normal competition existed between the plants which were grown in sandy soil containing about 64% sand. Another explanation for the increase in such chemical constituents according to the increase in dense planting which might be due to increasing the efficiency of utilizing the available environmental and soil conditions surrounding and simulating vegetative growth which reflected in turn on chemical constituents.

Among the four fertilization rates the percent and uptake of N, P and K were gradually increased parallel to the increase in fertilization rate with significant differences being obtained. However, the highest overall values were given by the highest two NPK fertilization rates namely 25:15:15 and 20: 12: 12/m^2 as clearly shown in Table (8). These results were in close agreement with those reported by Overman *et al.* (1991), Overman and Wilkinson (1995) and Manoly (2000) on bermudagrass, Soliman (1997) on *Lolium perenne* and Trenholm and Unruh (2005) on 2 warm season turfgrass.

The obvious increase in the different vegetative growth characters, plant height, clipping fresh and dry weights and covering density were realized in the light of the fact that the application of N, P and K fertilization may stimulate vegetative growth by increasing the availability of nutrients, thereby stimulating plant height and leaves fresh weight which means an increase in the size of photosynthesizing surface of the plant organs that reflects in turn on promoting fresh and dry weight of leaves, stolons and rhizomes (King *et al.*, 1999). Takei *et al.* (2000) postulated that nitrogen availability in the root zone may initiate cytokinins to be transported across the roots to the shoots. Moreover, Bravdo (2000) pointed out that the differences in the mobility of various elements expose the roots to a wide range of mineral availability and rapid branching of small rootlets, thus increasing the absorbing surface area of the root system and producing numerous active root tips, which lead in turn, to producing plant growth regulators mostly gibberellins and cytokinins.

Concerning the role of NPK fertilization in promoting N, P and K % and uptake and chlorophyll a, b and carotenoids (mg/g f.w), it is known that nitrogen is an important constituent of proteins in addition to the positive influence of nitrogen fertilizer on producing more vegetative growth organs which presumably led to greater photosynthetic potential. Moreover, nitrogen is an important constituent of chlorophyll molecule and cytochrome (Bidwell, 1974). The role of increasing growth and chemical constituents of seashore paspalum turfgrass by each increase in the rate of the applied NPK fertilizers could be explained in the light that the plants were grown in a sandy soil containing about 60% sand which means that such soil is in deficiency of such three macronutrients.

Table 8. Effect of NPK fertilization on leaves N, P and K % and uptake of seashore paspalum turfgrass during 2022/2023 and 2023/2024 seasons.

NPK fertilization	Leaves N, P and K %			Leaves N, P and K uptake (mg)		
	N	P	K	N	P	K
			1st season			
0:0:0	2.228	0.173	1.175	1.375	0.107	1.072
10:7.5:7.5	3.117	0.232	1.812	2.813	0.209	1.638
15:10:10	3.438	0.246	2.341	3.418	0.244	2.323
20:12:12	3.555	0.281	2.430	3.706	0.298	2.545
25:15:15	3.632	0.287	2.492	3.964	0.401	2.718
L.S.D 5%	0.091	0.007	0.064	0.026	0.030	0.097
			2nd season			
0:0:0	2.215	0.172	1.175	1.481	0.114	1.075
10:7.5:7.5	3.106	0.231	1.812	2.956	0.220	1.728
15:10:10	3.434	0.239	2.329	3.574	0.248	2.423
20:12:12	3.547	0.280	2.427	3.873	0.305	2.650
25:15:15	3.612	0.289	2.475	4.116	0.419	2.822
L.S.D 5%	0.102	0.005	0.084	0.213	0.028	0.064

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إستجابة مسطح الباسبالم لمعاملات التسميد المختلفة و كثافة الزراعة في أراضي الوادي الجديد تحت نظام الري بالرش

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في تجربة حقلية أجريت بمحطة بحوث شرق العوينات محافظة الوادي الجديد خلال موسمين (٢٠٢٣/٢٠٢٢ و ٢٠٢٤/٢٠٢٣) بهدف دراسة تأثير خمسة معاملات للكثافة النباتية (٣٠، ٤٠، ٥٠، ٦٠، ٧٠ نبات للمتر المربع) و كذلك دراسة أنسب معدل من التسميد النتروجيني: الفوسفاتي: البوتاسي على صفات النمو الخضري والمكونات الكيماوية للمسطح الأخضر سي شور باسبالم تحت الظروف البيئية لمنطقة الوادي الجديد. أظهرت النتائج أن صفات النمو الخضري الأربعة و هي طول النبات والوزن الطازج و الجاف للحشة والنسبة المئوية للتغطية، بغض النظر عن معاملات الكثافة النباتية كانت تتزايد تدريجيا منذ موعد الزراعة في منتصف مايو و حتى منتصف نوفمبر ثم تتناقص خلال شهر ديسمبر و يناير و فبراير ثم تعاود الإرتفاع ثانية خلال شهر مارس. أما فيما يتعلق بتأثير خمسة معاملات للكثافة النباتية (٣٠، ٤٠، ٥٠، ٦٠، ٧٠ نبات للمتر المربع) فإن كل صفات النمو الخضري و كذلك المكونات الكيماوية (صبغات التمثيل الضوئي و نسبة كل من النتروجين و الفوسفور والبوتاسيوم %) كانت تزداد تدريجيا و بإنتظام تبعا للزيادة التدريجية في الكثافة النباتية ولذلك تم الحصول على أعلى القيم من أعلى معاملات الكثافة وهي ٧٠ نبات للمتر المربع و يليها ٦٠ نبات للمتر المربع بينما أعطت أدنى معاملات الكثافة النباتية (٣٠ نبات للمتر المربع) أقل القيم الخضرية. وبالنسبة لمعدلات التسميد المعدني فقد حدثت زيادة تدريجية للصفات الخضرية الأربعة و لمحتوى الصبغات الضوئية الثلاثة و كذلك نسبة و محتوى عناصر النتروجين و الفوسفور و البوتاسيوم تبعا للزيادة التدريجية في معدلات التسميد المعدني حيث نتجت أعلى قيم هذه الصفات جميعا نتيجة للتسميد بالمعدل العالي وعلى ذلك فيمكن التوصية بإمداد مسطح سي شور باسبالم بالمعدل الأعلى من التسميد المعدني (٢٠: ١٢: ١٢ أو ٢٥: ١٥: ١٥) جرام لكل متر مربع من أسمدة نترات الأمونيوم و سوبر فوسفات الكالسيوم و سلفات البوتاسيوم شهريا بعد موعد الزراعة و طوال موسم النمو و ذلك للحصول على أفضل مظهر و أجمل لون للمسطح.