Zagazig J. Agric. Res., Vol. 51 No. (2) 2024 171-179

Plant Production Science

Available online at http://zjar.journals.ekb.eg
http:/www.journals.zu.edu.eg/journalDisplay.aspx?Journalld=1&queryType=Master

USING OF BIOLOGICAL AND NANO-MICRONUTRIENTS FERTILIZERS FOR ENHANCING GROWTH, COVERING DENSITY AND GREENING OF SEASHORE PASPALUM (*Paspalum vaginatum*, SWARTZ) GRASS

Yousra A.E. Elsayed*, A.S.H. Gendy, M.A.I. Abdelkader

Hort. Dept., Fac. Agric., Zagazig Univ., Egypt

Received: 10/03/2024; Accepted: 21/03/2024

ABETRACT: In order to enhance seashore paspalum grass growth and quality, bed (28 × 40 cm) experiment was done at Horticulture Department roof of Zagazig University, Egypt during 2021/2022 and 2022/2023 seasons. The main factors of this experiment were, firstly bio-fertilizers type (control, nitrobein, phosphorein and nitrobein + phosphorein), secondly nano-micronutrients named Magro NanoMix (0.0, 0.25, 0.50 and 1.00 g/l) beside their interaction treatments. The experimental design was split-plot design which had 16 treatments in three replicates. The results pointed out that fertilization seashore paspalum with 0.5 g/m^2 of nitrobein + 0.5 g/m^2 of phosphorein significantly enhanced plant height, herb fresh and dry weight per area, roots fresh and dry weights per area, covering density (%) and total chlorophyll content (mg/100 g as fresh weight) compared to the other bio- fertilizer types. Nano-micronutrients fertilizer at any tested concentration significantly increased growth traits and leaf greening compared to control. The highest values of all above mentioned traits were obtained by fertilization with 1000 ppm of nano-micronutrients. Generally, to enhance growth of seashore paspalum grasses and increase covering density and their greening it is recommended to fertilize plants with nitrobein + phosphorein each at 0.5 g/ m^2 and spraying them with nano-micronutrients at 1000 ppm three times during winter season.

Key words: Seashore paspalum, bio fertilization, nano micronutrients, growth, covering and greening.

INTRODUCTION

Paspalum seashore the prostrate, perennial seashore paspalum, or *Paspalum vaginatum*, is a native of tropical and coastal regions all over the world. It can withstand a great deal of stress from the environment (**Huxley *et al*., 1992**). Seashore paspalum, as opposed to bermudagrass (*Cynodon* spp.), can produce a higher-quality turf at lower light levels, in soils with a pH range of 3.6 to 10.2, in wet soils, and with less nitrogen fertilizer applications. Most horticultural crops cannot survive at soil salt levels as high as 54 dSm^{-1}, while this plant can withstand (**Brosnan and Deputy, 2008**). Furthermore, one of the most popular grasses in Egypt for creating lawns is seashore paspalum. It spreads quickly and readily from sodding to lateral growth stems known as stolons (**El-Sayed *et al*., 2016**).

Many microorganisms, including azotobacter, rhizobium, azolla, *Azospirillum* and blue green algae, have been utilized to prepare biofertilizers. The inclusion of *Azotobacter* increases the yield by 10 to 15 percent. Plant vegetative development is enhanced by *Azospirillum* (**Mohammed, 2012**). According to **Ahmed *et al*. (2013)**, the application of biofertilizer in combination with two thirds of the authorized dose of nitrogen fertilizer resulted in the maximum value of chlorophyll content in guar plants. Also, **Mir *et al*. (2015)** found that the application of chelated nano fertilizers (Fe + K) in combination with bio-fertilizers produced the maximum levels of chlorophyll a and chlorophyll b. In addition, the application of bio-fertilizer to clipped gazon grass resulted in a highly significant reaction concerning plant height, covering density and fresh and dry weights (**Abdou *et al*., 2020**).

*** Corresponding author: Tel. :**+201008002904
E-mail address: Mohammedahmed1980@yahoo.com

According to **Wang *et al*. (2010)**, one practical way to address a plant's nutritional requirements is through foliar administration of micronutrients, or leaf feeding. Nanotechnology-based plant nutrient delivery is emerging as a successful plant nutrition management strategy (**Solanki *et al*., 2015; Ghorbanpour *et al*., 2017**).Making fertilizer components into minuscule particles ranging from 1 to 100 nm is the process of creating nano-fertilizers. In this regard, the highest values of plant height, fresh and dry weights and covering density of (*Paspalum vaginatum*, Swartz) were achieved by nano-micronutrients at 0.50 and 1.00 g/l rates compared to unsprayed plants (**Abdelsadek, 2020**).

The main goal of the current study was to investigate the effect of utilizing different bio-fertilizer types, nano-micronutrient rates and their combination treatments on growth, covering density and greening of seashore paspalum plant.

MATERIALS AND METHODS

Experiment Place and Aim

In order to enhance seashore paspalum plants growth and covering density, an experiment was done during 2021/2022 and 2022/2023 winter seasons at roof garden of Horticulture Department, Zagazig University, Egypt. This study was carried out to enhance growth, covering density % and total chlorophyll content of seashore paspalum plants by utilizing different bio fertilizer types (nitrobein, phosphorein and nitrobein + phosphorein and without bio-fertilization as control,), nano-micronutrient rates [control (sprayed with tap water), 0.25, 0.50 and 1.00 g/l] as well as and their combinations.

Sodding Cultivation and Soil Analysis

The sodding pieces of seashore paspalum were cultured in beds (wide 28 cm × length 40 cm × depth 25 cm) each bed was covered with one piece and filled with 14 kg of sand: clay (1: 1 *V/V*) combination. Furthermore, the mechanical and chemical characteristics of soil mixture were determined according to **Chapman and Pratt (1978)** and presented in Table 1. Sodding of paspalum was covered after planting with a thin layer (1 cm) of the same soil mixture. These sodding had been carefully compressed by hand to better integrate with the soil mixture. Beds were irrigated with 1500 ml of tap water every day for two weeks.

Bio-fertilizers Rates

During preparation of soil mixture, phosphorein (*Bacillus megatherium*) and nitrobein (*Azospirillum lipofrum*) were administered in accordance with the manufacturer's recommendations. The control group had no bio fertilizer application; the other treatments were nitrobein at 0.5 g/m^2, phosphorein at 0.5 g/m^2, and nitrobein at 0.5 g/m^2 plus phosphorein at 0.5 g/m^2.

Nano-micronutrients Source and Application

Seashore paspalum plants were foliar sprayed three times with different nano-micronutrient concentrations at 30, 45 and 60 days after planting as well as after each cutting these doses were repeated. Nano-micronutrients fertilizer (Magro NanoMix) used in this experiment was supplied by the Modern Agricide Company (MAC). It was contained; Fe (6%), B (2%), Zn (6%), Cu (1%), Mn (5%), Mo (0.1%) and 4 % citric acid. Recommended agricultural practices were followed in the production of the seashore paspalum plants.

Experimental Design

Experimental treatments were implemented in three replicates using a split-plot randomized complete blocks design. Bio-fertilizer types were occupied in the main plots while nano-micronutrients treatments were distributed in the subplots.

Recorded Data

A fully sharp stainless steel cutter was used to make the first cut on 18th of December after 75 days of planting, leaving behind 3 cm long stubbles. Following that, on 18th of February and 18th of April, two more cuts were made in a span of sixty days. After that, the subsequent data were noted; plant height (cm), herb fresh and dry weight/0.112 m^2, roots fresh and dry weights/45.48 cm^2 as well as covering density (%), measured as number of tillers/area × 100, as reported by **Mahdi (1953)**. An average of two cuts made during the first and second seasons

Table 1. Experimental soil mixture mechanical and chemical properties (average of 2021/2022 and 2022/2023 seasons)

Mechanical analysis			Soil texture
Clay (%)	Silt (%)	Sand (%)	Sandy
19.75	7.79	72.34	

Chemical analysis												
pH	E.C. (dsm^{-1})	Soluble cations (m.mol/l)					Soluble anions (m.mol/l)			Available (ppm)		
		Ca^{++}	Mg^{++}	Na^{+}	Zn^{++}	Mo^{++}	Cl^{-}	HCO_3^{-}	SO_4^{--}	N	P	K
7.83	0.64	1.78	0.89	0.6	1.04	1.42	2.99	1.09	0.81	108	46	51

was used to determine the growth characteristics and covering density of seashore paspalum grass. According to **Wettstein (1957)**, the total chlorophyll content (a+ b) in seashore paspalum leaves was measured after the first cut during both seasons (mg/100g as fresh weight).

Statistical Analysis

All collected data were analyzed with analysis of variance (ANOVA) procedure using the Statistix version 9 (**Analytical Software, 2008**). Differences between means were compared by using least significant difference (LSD) test according to **Gomez and Gomez (1984)**, data were evaluated at a 5% level of LSD.

RESULTS AND DISCUSSION

Effect of Bio-Fertilizers

Using any bio-fertilizer type (nitrobein, phosphorein and nitrobein + phosphorein) gave a significant enhance in seashore paspalum average plant height compared to control (without bio-fertilization) in both seasons (Table 2). Likewise, the heaviest fresh and dry weights of herb were achieved with nitrobein + phosphorein compared to the other types under study (Table 2). In addition, root fresh and dry weights per 45.48 cm^2 significantly enhanced by utilizing mixture of nitrobein and phosphorein compared to control in both seasons (Table 3). Additionally, when compared to the control, the covering density percentage increased significantly for all bio fertilization types (Table 4). Generally, the highest values of total chlorophyll (a +b) content in leaves were noticed when utilizing the mixture of bio fertilizers (nitrobein + phosphorein) compared to control and the individually bio-fertilizer under study (Table 4). The good impacts of microorganisms may be attributed to a multitude of factors, including changes in soil health, microbial activity, and nutrient availability through a variety of techniques (**Kammann *et al.*, 2012**). The celery plant's growth metrics peaked, according to **Khalil *et al.* (2019)**, when seeds were inoculated with a mixture of mycorrhizal and mycrobein. Also, **Ali *et al.* (2018)** reported that effective microorganisms (EM) caused significant enhances photosynthetic pigments contents (chlorophyll a, b and a+ b) of bermuda turfgrass. Moreover, **Elsayed *et al.* (2020)** demonstrated that for the chemical contents (pigment content) of two genotypes of dill, 100% chemical fertilizer and bio-fertilizer were the favorable treatment.

Effect of Nano-micronutrients

As compared to the control in the two seasons, results tabulated in Tables 2, 3 and 4 show a significant increase in plant height, herb fresh and dry weight/area, roots fresh and dry weights/ area, covering density (%), and total chlorophyll content when seashore paspalum was sprayed with nano-micronutrients three times per cut. Additionally, the highest concentration of nano-

Table 2. Impact of bio-fertilizer type, nano-micronutrients rate, and their combinations (A×B) on plant height, herb fresh and dry weights /0.112 m^2 (g) of *Paspalum vaginatum* during 2021/2022 and 2022/2023 seasons

Treatments		Plant height (cm)		Herb fresh weight /0.112 m^2 (g)		Herb dry weight /0.112 m^2 (g)	
		1st season	2nd season	1st season	2nd season	1st season	2nd season
Effect of bio-fertilizers type (0.5 g/m^2)							
Control		23.33	20.83	184.00	177.88	43.73	42.00
Nitrobein		25.42	23.25	223.69	201.54	53.29	49.55
Phosphorein		27.33	24.58	218.71	187.40	54.23	49.36
Nitrobein + Phosphorein		30.67	28.91	273.13	255.85	59.17	60.74
L.S.D. at 5 %		**0.55**	**0.55**	**2.24**	**3.67**	**0.64**	**0.62**
Effect of nano-micronutrients rate (g/l)							
0.00		24.08	20.83	197.68	179.55	42.45	41.72
0.25		25.83	23.33	219.61	200.25	50.44	47.32
0.50		27.42	25.75	234.35	213.33	56.78	53.00
1.00		29.42	27.67	247.88	229.53	60.75	59.62
L.S.D. at 5 %		**0.85**	**0.62**	**1.74**	**3.46**	**0.77**	**0.55**
Effect of combination between bio-fertilizer type and nano-micronutrients rate							
Control	**0.00**	21.00	17.67	141.36	154.59	34.83	35.18
	0.25	23.00	20.00	174.51	167.48	39.73	39.54
	0.50	24.00	22.00	206.12	186.03	49.73	45.33
	1.00	25.33	23.67	213.99	203.41	50.63	47.96
Nitrobein	**0.00**	23.67	19.67	199.21	163.53	45.70	41.30
	0.25	24.67	22.33	216.01	195.71	52.13	45.87
	0.50	25.67	24.67	225.21	211.91	55.33	52.57
	1.00	27.67	26.33	254.34	235.01	60.00	58.48
Phosphorein	**0.00**	24.67	21.33	187.43	154.42	43.83	42.00
	0.25	26.00	23.33	217.20	184.80	53.77	45.61
	0.50	28.33	26.00	230.47	194.63	57.30	48.51
	1.00	30.33	27.67	239.73	215.73	62.00	61.29
Nitrobein + Phosphorein	**0.00**	27.00	24.67	262.73	245.67	45.45	48.39
	0.25	29.67	27.67	270.72	253.00	56.12	58.25
	0.50	31.67	30.33	275.61	260.75	64.74	65.58
	1.00	34.33	33.00	283.45	263.99	70.37	70.75
L.S.D. at 5 %		**1.57**	**1.21**	**3.75**	**7.01**	**1.47**	**1.13**

Table 3. Impact of bio-fertilizer type, nano-micronutrients rate, and their combinations (A×B) on fresh and dry weights of roots/ 45.48 cm^2 (g) of *Paspalum vaginatum* during 2021/2022 and 2022/2023 seasons

Treatments		Fresh weight of roots/ 45.48 cm^2 (g)		Dry weight of roots/ 45.48 cm^2 (g)	
		1st season	2nd season	1st season	2nd season
Effect of bio-fertilizers type (0.5 g/m^2)					
Control		1.37	1.35	0.36	0.34
Nitrobein		2.58	2.50	0.70	0.66
Phosphorein		3.19	3.23	0.80	0.84
Nitrobein + Phosphorein		5.64	5.04	1.71	1.57
L.S.D. at 5 %		**0.14**	**0.07**	**0.05**	**0.03**
Effect of nano-micronutrients rate (g/l)					
0.00		2.54	2.37	0.66	0.61
0.25		2.96	2.85	0.87	0.84
0.50		3.50	3.30	0.96	0.94
1.00		3.77	3.61	1.08	1.01
L.S.D. at 5 %		**0.09**	**0.10**	**0.02**	**0.01**
Effect of combination between bio- fertilizer type and nano-micronutrients rate					
Control	**0.00**	1.29	1.25	0.34	0.28
	0.25	1.31	1.34	0.35	0.32
	0.50	1.42	1.39	0.38	0.36
	1.00	1.45	1.43	0.39	0.39
Nitrobein	**0.00**	2.31	2.28	0.65	0.56
	0.25	2.43	2.45	0.67	0.64
	0.50	2.72	2.54	0.70	0.67
	1.00	2.83	2.75	0.76	0.74
Phosphorein	**0.00**	2.75	2.70	0.70	0.72
	0.25	2.90	2.98	0.73	0.81
	0.50	3.46	3.50	0.80	0.87
	1.00	3.64	3.74	0.95	0.94
Nitrobein + Phosphorein	**0.00**	3.80	3.26	0.94	0.89
	0.25	5.19	4.63	1.71	1.59
	0.50	6.41	5.77	1.95	1.86
	1.00	7.15	6.52	2.22	1.97
L.S.D. at 5 %		**0.20**	**0.18**	**0.06**	**0.04**

Table 4. Impact of bio-fertilizer type, nano-micronutrients rate, and their combinations (A×B) on covering density (%) and total chlorophyll content a + b (mg/100 g as fresh weight) of *Paspalum vaginatum* during 2021/2022 and 2022/2023 seasons

Treatments		Covering density (%)		Total chlorophyll content (a + b)	
		1st season	2nd season	1st season	2nd season
Effect of bio-fertilizers type (0.5 g/m^2)					
Control		130.33	132.17	2.91	2.94
Nitrobein		134.42	135.36	2.99	3.13
Phosphorein		136.83	138.08	3.09	3.24
Nitrobein + Phosphorein		141.50	144.08	3.25	3.40
L.S.D. at 5 %		**1.44**	**1.10**	**0.04**	**0.03**
Effect of nano-micronutrients rate (g/l)					
0.00		127.25	130.50	2.86	2.95
0.25		134.75	135.83	3.05	3.15
0.50		138.75	139.17	3.15	3.27
1.00		142.33	144.19	3.17	3.35
L.S.D. at 5 %		**1.09**	**0.79**	**0.03**	**0.03**
Effect of combination between bio- fertilizer type and nano-micronutrients rate					
Control	**0.00**	122.00	126.00	2.85	2.78
	0.25	129.33	130.67	2.91	2.96
	0.50	133.67	134.67	2.96	3.00
	1.00	136.33	137.33	2.90	3.03
Nitrobein	**0.00**	127.00	129.33	2.81	2.96
	0.25	134.67	134.00	2.94	3.06
	0.50	137.00	137.67	3.03	3.18
	1.00	139.00	140.43	3.17	3.31
Phosphorein	**0.00**	127.33	131.00	2.86	3.00
	0.25	136.00	137.00	3.13	3.24
	0.50	140.33	138.33	3.21	3.30
	1.00	143.67	146.00	3.18	3.40
Nitrobein + Phosphorein	**0.00**	132.67	135.67	2.92	3.03
	0.25	139.00	141.67	3.23	3.34
	0.50	144.00	146.00	3.41	3.59
	1.00	150.33	153.00	3.44	3.66
L.S.D. at 5 %		**2.36**	**1.74**	**0.06**	**0.06**

micronutrients (1000 ppm) provided the highest values of the previously indicated measures when comparing to the control. In this regard, **Hediat (2012)**, findings suggest that nano-fertilizers facilitate nutrient uptake by plants, accelerating photosynthesis and the production of dry matter while enhancing vegetative growth. Furthermore, in comparison with the control, *Paspalum vaginatum*, Swartz's plant height and covering density were highest in response to nano-micronutrients administered at 0.50 and 1.00 g/l rates (**Abdelsadek, 2020**).

Effect of Bio-fertilizers × Nano-micronutrients

Regarding the influence of the combination between bio-fertilizers and nano-micronutrients, all combination between bio-fertilizer and nano-micronutrients treatments significantly enhanced plant height, herb fresh and dry weight/ area (Table 2), roots fresh and dry weights/area (Table 3) and covering density as well as total chlorophyll content (Table 4) of seashore paspalum in both seasons. The mixture of bio fertilizers (nitrobein+ phosphorein) and spraying with nano-micronutrients at 1000 ppm concentration resulted in the highest values of plant growth, covering density and leaves chlorophyll content of seashore paspalum compared to the other combinations under study in 1st and 2nd seasons. One of the main growth factors thought to affect how plants develop is their micronutrient content (**Reffaat and Balbaa, 2001**). Moreover, micronutrients and bio-fertilizers are widely acknowledged as essential nutrients that support plant growth and the overall chlorophyll content of plant leaves (**Noreen *et al*., 2018; Ali *et al*., 2018**).

Conclusion

Bio-fertilization with nitrobein+ phosphorein at 0.5 g /m^2 combined with 1000 ppm of nano-micronutrients was the most favorable treatment for enhancing plant growth, covering density and total chlorophyll content of *Paspalum vaginatum* plant.

REFERENCES

Abdelsadek, O.A. (2020). Improving growth and quality of seashore paspalum by nano-micronutrients under soil salinity stress. J. Plant Prod., Mansoura Univ., 11 (10): 991-996.

Abdou, M.A., A.A. El-Sayed, Ragaa A. Taha and M.E. Tolba (2020). Response of gazon grass plants to compost, humic acid and bio-fertilizer. Minia J. Agric. Res. and Develop., 40 (2): 243-255.

Ahmed, S.H., A.H. Gendy, A.A.M. Hussein, M. Said-Al Ahl and F.Y. Hanaa (2013). Effect of some nitrogen sources, bio-fertilizers and their interaction on the growth, seed yield and chemical composition of guar plants. Life Sci. J., 10 (3): 389-402.

Ali, A.F., M.A.H. Abdou, E.H. Amer and H.A.E.I. Ammar (2018). Influence of compost, mineral and effective microorganisms application on sandy soil-grown bermuda turfgrass. Scientific J. Flowers and Ornamental Plants, 5 (2): 127-140.

Analytical Software (2008). Statistix Version 9, Analytical Software, Tallahassee, Florida, USA.

Brosnan, J.T. and J. Deputy (2008). Seashore Paspalum. Turf Management J., TM-1: 1-8.

Chapman, D.H. and R.F. Pratt (1978). Methods of Analysis for Soils, Plants and Waters. Div. Agric. Sci. Univ. Calif. USA,16-38.

El-Sayed, B.A., S.M. Shahin, T.M. Noor El-Deen and M.A. El-Ashwah (2016). Response of seashore paspalum turfgrass to irrigation periods and humic acid. Scient. J. Flowers and Ornamental Plants, 3 (1): 71-78.

Elsayed, S.I.M., A. A. Glala, A. M. Abdalla, A. A. El-Sayed and M.A. Darwish (2020). Effect of biofertilizer and organic fertilization on growth, nutrient contents and fresh yield of dill (*Anethum graveolens*). Bulletin of the Nat. Res. Cent., 44:1-10.

Ghorbanpour, M., K. Manika and A. Varma (2017). Nanoscience and plant-soil system. Springer, Intl. Pub.

Gomez, N.K. and A.A. Gomez. (1984). Statical Procedures for Agricultural Research. 2nd Ed., John wiley and sons, New York. USA, 680.

Hediat, M.H.S. (2012). Effects of silver nanoparticles in some crop plants, common bean (*Phaseolus vulgaris* L.) and corn (*Zea mays* L.). Int. Res. J. Biotechnol., 3: 190-197.

Huxley, A., M. Griffiths and M. Levy (1992). The New Royal Hort. Society Dictionary of Gardening. The Stockton Press, 257 Park Avenue South, New York, N.Y. 10010, USA, 3: 790.

Kammann, C., S. Ratering, C. Eckhard and C. Müller (2012). Biochar and hydrochar effects on greenhouse gas (carbon dioxide, nitrous oxide, methane) fluxes from soils. J. Environ. Quality, 41: 1052- 1066.

Khalil, M.K., K.F. Taha, M.A. Nesem and S.S. Sallam (2019). Effect of chemical fertilization, biofertilizer and thidiazuron on growth and yield of celery (*Apium graveolens* L.) plant. Az. J. Pharm Sci., 59 (3): 27-53.

Mahdi, M.Z. (1953). The influence of management on botanical composition and quality of turf. Ph.D. Thesis, Fac. Agric., California Univ., Los Angeles, USA.

Mir, S., A. Sirousmehr and E. Shirmohammadi (2015). Effect of nano and biological fertilizers on carbohydrate and chlorophyll content of forage sorghum (*Speedfeed hybrid*). Int. J. Biosci., 6 (4): 157-164.

Mohammed, A.A. (2012). Effect of Bio-Fertilizer on physiology of growth and development of maize *(Zea mays* L.) in Sulaimani region. Mesopotamia J. Agric., 40 (1): 9-20.

Noreen, S., Z. Fatima, S. Ahmad, H. Athar and M. Ashraf (2018). Foliar application of micronutrients in mitigating abiotic stress in crop plants. Plant Nutr. and Abiotic Stress Tolerance, 6 (2): 95-117.

Reffaat, A.M. and L.K. Balbaa (2001). Yield and quality of lemongrass plants (*Cymbopogon flexusus* Stapf) in relation to foliar application of some vitamins and microelements . Egypt. J. Hort., 28 (1): 41-57.

Solanki, P., A. Bhargava, H. Chhipa, N. Jain and J. Panwar (2015). Nano-fertilizers and their smart delivery system. In: Rai, M., Ribeiro, C., Mattoso, L. and Duran N. (eds) Nanotechnologies in food and agriculture. Springer, Cham, NY, USA.

Wang, Y.G., Y. S. Li, H. Kim, S.L. Walker, L. M. Abriola and K.D. Pennell (2010). Transport and retention of influence nanoparticles in natural soils. J. Environ. Qua., 39 (1): 1925-1933.

Wettstein, D.V. (1957). Chlorophyll lethal under sub mikroskoshrel der plastieden. Ex. PF Celi. Res., (12): 427-433.

استخدام التسميد الحيوي والمغذيات الدقيقة النانوية لتحسين النمو وكثافة التغطية واللون الأخضر لنباتات نجيل باسبيلم جزر البحر

يسرا علي السيد السيد – أحمد شاكرحسين جندي – محمد أحمد إبراهيم عبدالقادر

قسم البساتين- كلية الزراعة- جامعة الزقازيق - مصر

أجريت تجربة على سطح قسم البساتين، جامعة الزقازيق بمصر في أحواض أبعادها (28 × 40 سم) خلال موسمي 2022/2021 و2023/2022 وذلك لتحسين نمو نبات نجيل باسبيلم جزر البحر. كانت عوامل الدراسة الرئيسية لهذه التجربة هي أولا نوع السماد الحيوي (الكنترول، النتروبين، الفوسفورين والنيتروبين + الفوسفورين)، ثانيا المغذيات الدقيقة النانوية (ماجرو نانو ميكس) بمعدل (صفر، 250، 500 و 1000 جزء في المليون) بالإضافة إلى تأثير التداخل بينهما. كان التصميم التجريبي هو تصميم القطع المنشقة مرة واحدة والذي يحتوي على 16 معاملة في ثلاث مكررات. أشارت النتائج إلى أن تسميد نجيل جزر البحر بمعدل 0,5 جرام/م^2 نيتروبين + 0,5 جرام/ م^2 فوسفورين/فدان أدى إلى زيادة معنوية في ارتفاع النبات ووزن العشب الطازج والجاف لوحدة المساحة ووزن الجذور الطازج والجافة لوحدة المساحة والنسبة المئوية لكثافة التغطية والمحتوى من الكلوروفيل الكلي (ملجم/100جم كوزن طازج) مقارنة بأنواع الأسمدة الحيوية قيد الدراسة. أدى استخدام أي تركيز من المغذيات الدقيقة النانوية إلى زيادة معنوية في صفات النمو واخضرار الأوراق مقارنة بالكنترول. تم الحصول علي أعلى القيم في الصفات المذكورة أعلاه عند الرش بتركيز 1000 جزء في المليون من العناصر الصغرى النانوية. بشكل عام، لتحسين نمو نجيل باسبيلم جزر البحر وزيادة كثافة التغطية واللون الأخضر يوصي بتسميد النباتات بالنتروبين + الفوسفورين بمعدل 0,5 جرام/م^2، مع الرش بالمغذيات الدقيقة النانوية بمعدل 1000 جزء في المليون ثلاث مرات خلال فصل الشتاء.

المحكمـــون:

1- أ.د. السيد حماد عامر حماد أستاذ نباتات الزينة والطبية والعطرية- قسم البساتين- كلية الزراعة-جامعة الأزهر بأسيوط.

2- أ.د. هشام عبد العال الشامي أستاذ نباتات الزينة والطبية والعطرية- قسم البساتين- كلية الزراعة-جامعة الزقازيق.