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EFFECT OF THE IRRIGATION AND FERTILIZATION IN THE GROWTH PERFORMANCE OF TURF GRASS SEEDS MIXTURE IN SPRING SEASON

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ABSTRACT

This research was conducted in the field of Malta nursery/Dohuk governorate- Iraq, for the period 12/15/2021 to 5/15/2022. It aims to study the effect of irrigation numbers and urea fertilizer levels on the growth and performance of the evergreen thyme fodder turf grass seeds mixture consist of (21% *Poa Pratensis*, 39% *Festuca rubra* and 40% *Lolium perenne*). This research focused on two main factors, the first is irrigation includes (once time in week, twice times in week and three times in weeks) and the second is urea fertilizer in four levels (0, 5, 10 and 15 g.m^2). The experiment was performed by using a Factorial Experiment in Randomized Complete Block Design (RCBD) with two factors and three replications. The outcomes revealed that the irrigation of turf grass seeds mixture at once time in week led to a significant increase in most studied characters like coverage percentage (75.37%), mowing number (2.56), cumulative length of vegetative growth (11.51 cm), cumulative dry weight of turf grass clipping yield (12.05 g). cumulative dry weight (2.63 g), root depth (11.67 cm) and root dry weight (2.58 g) and was superior to those irrigated twice and three times in week. The both levels 5 and 10 g.m^{-2} of urea fertilizer had a significant effect on coverage percentage (73.96 and 70.07%), root depth (11.23 and 11.51 cm), respectively, where levels of 5 g.m.$^{-2}$ caused significant increase in cumulative length of turf grass (11.43 cm) and root dry weight (2.56g), and 10 g.m^{-2} significantly increase in mowing number (2.26), cumulative fresh weight of vegetative growth (11.56 g) and cumulative dry weight of vegetative growth (2.60 g). As for interactions between two factors, the highest significant values for most characteristics were found when turf grass irrigated once times in week and fertilized with 10 g.m^{-2} of urea fertilizer as compared with other interactions.

KEYWORD: turf grass mixture, irrigation, urea fertilizer

INTRODUCTION

The grass has been used a permanent vegetation covering on soil surfaces for a variety of agricultural applications, including landscape, recreational, sporting, ornamental, and environmental lawns. **(Souza *et al.*, 2016; Oliveira *et al.*, 2018).** In comparison to monoculture, mixtures of turf grass species ensure genetic variety, improved ability for adaptation, and increased tolerance to pests and other environmental pressures. **(Beard, 1973)**.The cultivation of a variety of seeds rather than just one type and the mixtures frequently produce satisfactory results because the cultivation of a single species cannot be sustained all year to produce the desired color, and the selection of species for use in mixture is based on a number of different criteria, including tolerance to environmental conditions like light or shade, high or low temperatures, excessive irrigation or drought, etc., the selection is based on the species growth characteristics, such as the development of rhizomes or stalks, growth in the shape of bundles, upright growth, or creeping, or the life cycle **(Day, 2006; Lane *et al.*, 2019 and Yilmaz, 2019). Misiha (1991)** when studying different mixtures of seeds of cool-season turf grass concluded that the mixture consisting of 50% *Festuca rubra* var. Harld and 50% *Lolium perenne* cv. Citadel gave the highest yield, plant height after 120 days of sowing seeds, largest plant density, and highest dry weight of cut crop after 150 days, also this mixture gave the best rate of coverage (spreading) and the longest growth period.

The first thing that must be taken care of in order to preserve the turf grass is irrigation, and regular irrigation is preferred at all times. The distribution, growth, and productivity of both

cool-season and warm-season turf grass species are significantly impacted by the availability of water. **(Nilsen & Orcutt, 1996).** It's critical to understand the water needs of different grass species in order to spot grasses that can survive with less water and to create effective irrigation management techniques. **(Fu *et al.*, 2004)**. **Adamipour *et al.* (2017)** demonstrated that the reduction in intense irrigation resulted in a decrease in chlorophyll contents, enzyme activities, and fresh and dry weight of root and shoot in their study on the effect of photoperiod and irrigation regime on growth and physiological indices of tall fescue (*Festuca arundinacea* Schreb.).

In order to stimulate growth, aid in damage repair, and enhance the color, uniformity, and density of the grass for the pitch presentation, fertilizers used for keeping turf grass provide a range of crucial nutrients. The turf attributes of color, vitality, root growth, and disease resistance must be supported and maintained through nitrogen (N) fertilization. In comparison to a nitrogen-deficient turf, properly fertilized turf grass can withstand moisture stress better, is more disease resistant, and grows more rapidly (roots and leaves) (**Candogan *et al.* 2015)**.

Currently, there is very little published literature available on the quantity of nitrogen or irrigation needed to produce acceptable turf grass quality **(Busey, 2003)**. Therefore, research must be conducted to provide accurate fertilizer and irrigation recommendations so acceptable turf grass quality can be maintained with a minimum impact on the environment. Thus, the objective of this research is to determine the effects of irrigation time number and nitrogen fertilizer levels on growth of turf grass mixture.

MATERIALS AND METHODS

This research was carried out in the nursery of Malta, Dohuk governorate – Iraq, from the period December 15, 2021 to May 15, 2022. The purpose of the study was to ascertain the impact of irrigation numbers per week and urea fertilizer levels on the growth performance of seed mixture turf grass. This research focused on two main factors, the first is irrigation number per week include (once a week, twice times a week and three a weeks) and the second is urea fertilizer (46% N) in four levels (0, 5, 10 and 15 $g.m^{-2}$) which is added twice a week. The first fertilization was on 15/2/2022 and the second fertilization was on 15/3/2022. The seeds of an evergreen thyme mixture (Shadow Yellow Jacket or Bio stimulator (EU) consist of some cold season turf grass (21% *Poa Pratensis*, 39% *Festuca rubra* and 40% *Lolium perenne*), was sown in wooden boxes with size (length 1 m × width 1 m × 40 cm) in 15/11/2021 after being filled with media consisting of (loam: peat moss 1:1 as volume) which was treated with fungicides before sowing of seeds. The experiment was applied using factorial randomized complete block design (RCBD) with two factors (3×4) treatments in three replications. Each replicate included 12 boxes (36 boxes). The data were analyzed by using the computer through the SAS program, and mean comparison was done by Duncan's Multiple Range Test under 5% **(SAS, 2013)**. The studied measurements included coverage percentage (%), mowing numbers, cumulative Length of turf grass (cm), cumulative fresh weight (g), cumulative dry weight of turf grass (g), root depth (cm) and dry weight of roots (g)

RESULTS AND DISCUSSIONS

1- Coverage percentage (%)

Results in Table (1) indicated that the irrigation of this turf grass mixture once time in week led to significant increase in cover percent (75.37%) as compared with increasing number of times to twice and three (63.84 and 63.76%), respectively. As for urea fertilizer the addition of 5 and 10 $g.m^{-2}$ caused significant increases in coverage percentage (70.07 and 73.96%) as compared with control and 10 $g.m^{-2}$. The interaction between irrigation times and fertilizer levels had significant effect in this trait, the highest percent of coverage (91.83%) was obtained when turf grass irrigated once a week and fertilized with 10 $g.m^{-2}$, while the minimum percent of coverage (60.00 %) was obtained when turf grass irrigated twice a week and fertilized with 5 $g.m^{-2}$.

Table(1): -Effect of irrigation numbers and urea fertilizer levels on coverage percentage (%) of turf grass mixture.

Irrigation. week^{-1}	Urea fertilizer g.m^{-2}				Irrigation effect
	0	5	10	15	
Once time	63.87 c	81.87 b	91.83 a	63.90 d-f	75.37 a
Twice time	63.33 d-f	60.00 f	68.37 c	63.67 d-f	63.84 b
Three time	63.37 d-f	68.33 c	61.67 ef	61.67 ef	63.76 b
Urea effect	63.52 b	70.07 a	73.96 a	63.08 b	

Means with same letter for each factor and interaction are not significantly different at 5% level based on Duncan's Multiple Range test.

2- Mowing numbers.

The results in Table (2) indicated that the irrigation of turf grass mixture had a considerable impact on the mowing number where once irrigation in a week led significantly to affect obtain higher mowing number to (2.56) as compared with twice and three times (1.07 and 0.71), respectively. As for urea fertilizer the addition of 10 g.m^{-2} caused significant increasing in mowing number to (2.26) as compared with control and other levels. The interaction between irrigation times and fertilizer levels significantly affect in this trait, the highest number of mowing (5.13) was for between once time of irrigation in week and fertilized with 10 g.m^{-2}, while the minimum number (0.47) was for interaction between one time of irrigation in a week and 10 g.m^{-2} of urea fertilizer.

Table(2): -Effect of irrigation numbers and urea fertilizer levels on mowing numbers of turf grass mixture.

Irrigation. week^{-1}	Urea fertilizer g.m^{-2}				Irrigation effect
	0	5	10	15	
Once time	1.07 c	2.87 b	5.13 a	1.17 c	2.56 a
Twice time	1.50 c	0.87 c	0.63 c	1.27 c	1.07 b
Three time	0.47 c	0.83 c	1.00 c	0.53 c	0.71 b
Urea effect	1.01 b	1.52 b	2.26 a	0.99 b	

3- Cumulative length of turf grass (cm)

Table (3) showed that there are significant differences between times of irrigation number per week in its effect on the cumulative length of vegetative growth of turf mixture when turf grass irrigated once a week gave the highest length (11.51 cm). The results of fertilizer showed that fertilizing with 5 g.m^{-2} gave the largest length (11.43 cm) in comparison to other levels and created significant positive changes in root length. The interaction between once irrigation in a week and 5 and 10 g.m^{-2} of fertilizer gave the longest lengths (12.73 and 12.57 cm) respectively, which differ significantly from other interactions.

Table (3)-:Effect of irrigation numbers and urea fertilizer levels on cumulative length of turf grass (cm) of turf grass mixture**.**

Irrigation. week^{-1}	Urea fertilizer g.m^{-2}				Irrigation effect
	0	5	10	15	
Once time	10.37 c	12.73 a	12.57 a	10.37 c	11.51 a
Twice time	10.20 c	10.17 c	10.07 c	10.20 c	10.54 b
Three time	10.27 c	11.40 b	10.27 c	10.23 c	10.16 b
Urea effect	10.28 c	11.43 a	10.97 b	10.27 c	

4- Cumulative fresh weight of vegetative growth (g)

The data in Table (4) clarified that the different variations in irrigation number per week had a significant effect on cumulative fresh weight of turf grass growth, the highest fresh weight (12.05 g) was obtained from one irrigation per week but the two and three irrigations in a week gave the lowest values (4.55 and 3.93 g) respectively. In addition, urea fertilizer showed significant increase in vegetative fresh weight, the highest value (11.56 g) was for turf grass fertilized with 10 g.m^{-2}. The values of the interaction of irrigating times and fertilizer levels had a significant effect where the once irrigation in week and 10 g.m^{-2} of urea fertilizer significantly gave the highest value of vegetative growth fresh weight (23.50 g) which differed significantly with the other interactions.

Table (4):- Effect of irrigation numbers and urea fertilizer levels on cumulative fresh weight (g) of turf grass mixture.

Irrigation. week^{-1}	Urea fertilizer g.m^{-2}				Irrigation effect
	0	5	10	15	
Once time	4.07 d-f	13.37 b	23.50 a	7.27 c-e	12.05 a
Twice time	3.93 d-f	2.60 d-f	7.57 cd	1.63 f	4.55 b
Three time	3.00 d-f	9.50 bc	3.60 d-f	2.10 ef	3.93 b
Urea effect	3.67 c	8.49 b	11.56 a	3.67 c	

5- Cumulative dry weight of vegetative growth (g)

According to Table (5) findings, the once-weekly irrigation produced the maximum dry weight (2.63 g), which was significantly higher than the results from other irrigation schedules. We found a sizable difference in fertilizer levels in the dry weight of vegetative growth. The highest weight (2.60 g) was for 10 g.m^{-2} whereas the lowest weight (0.83 g) was for non-fertilize turf grass. In addition, the dual interaction between irrigation and fertilizer showed a significant effect on this character and the fertilized turf that was irrigated once a week with 10 g.m^{-2} gave the greatest weight (5.07 g) compared to the least values (0.10 g) for three times irrigation and fertilized with 15 g.m^{-2}.

Table (5)-: Effect of irrigation numbers and urea fertilizer levels on cumulative dry weight of vegetative growth (g) of turf grass mixture

Irrigation. week^{-1}	Urea fertilizer g.m^{-2}				Irrigation effect
	0	5	10	15	
Once time	1.17 c-e	2.63 b	5.07 a	1.65 b-d	2.63 a
Twice time	0.93 c-e	1.03 c-e	1.93 bc	1.17 c-e	1.27 b
Three time	0.40 de	1.17 c-e	0.80 c-e	0.10 e	0.62 c
Urea effect	0.83 c	1.61 b	2.60 a	0.97 bc	

6- Root depth (cm)

The data regarding root depths are presented in Table (6). The depth of roots was significantly affected by the number of irrigation per week, the highest value (11.67 cm) of root depth was recorded for one irrigation, followed by two and three irrigation (10.58 and 10.41 cm) respectively. The highest mean of root depth (11.51 and 11.23 cm) was for 5 and 10 $g.m^{-2}$ of urea fertilizer respectively. As for dual interaction noted that the highest depth (13.27 cm) was for turf grass irrigated once time in week and fertilized with 10 $g.m^{-2}$.

Table(6): -Effect of irrigation numbers and urea fertilizer levels on root depth (cm) of turf grass **mixture.**

Irrigation. $week^{-1}$	Urea fertilizer $g.m^{-2}$				Irrigation effect
	0	5	10	15	
Once time	2.00 a-c	3.00 ab	3.33 a	2.00 a-c	2.58 a
Twice time	2.00 a-c	2.67 a-c	1.33 c	1.67 bc	1.91 b
Three time	2.00 a-c	2.00 a-c	1.33 c	1.67 bc	1.75 b
Urea effect	2.00 ab	2.56 a	2.00 ab	1.78 b	

7- Dry weight of roots (g)

Results in Table 7 showed that once irrigation per week lead to obtain the highest dry weight of roots (2.58 g) which differed significantly when compared with other numbers of irrigation per week. The

varied urea fertilizer dosages showed a substantial difference in the dry weight of roots, the highest weight (2.56 g) was for 5 $g.m^{-2}$ which did not differ significantly with 0 and 10 $g.m^{-2}$ while the lowest weight (1.78 g) was for 15 $g.m^{-2}$. The dual interaction between irrigation number and fertilizer levels showed significant effect on this character, and fertilized turf grass that was irrigated once a week and fertilized with 10 $g.m^{-2}$ gave the highest weight (3.33 g) compared to the other interactions.

It can be shown in the final results of this research that the three levels of irrigation significantly affected on all studied trait, the irrigation of turf grass seeds mixture at once a week as in tables (1 to 7) showed a significant increase in most studied characters like coverage percentage, mowing number, cumulative length of vegetative growth, cumulative fresh and dry weight of turf grass clipping yield, root depth and root dry weight and was superior to those irrigated twice and three times in week, this results agree with what **Mc Groary *et al.* (2009)** determined in their examination of the impact of irrigation and nitrogen on the colour, growth, and quality of St. Augustine that the low irrigation regime may be a more appropriate regime out of the low and high regimes for conserving water while maintaining acceptable turf grass quality and color. *Festuca* L., *Poa* L., *Agrostis* L. and *Lolium* L. are examples of common cool-season turf grasses found on lawns, sports fields, parks, grounds, golf courses, and along roadways. The species of cool-season turf grasses vary in their water consumers, tall fescue (*Festuca arundinacea* Schreb.), creeping bentgrass (*Agrostis stolonifera* L.), and annual bluegrass (*Poa annua* L.) are considered to be the highest water users, whereas hard fescue (*Festuca longifolia* Thuill.), Chewing's fescue (*Festuca rubra* L. ssp. commutata Gaud.), and creeping red fescue (*Festuca rubra* L. ssp. rubra) are the lowest water users **(Beard, 1989)**. **Da Costa and Huang (2006)** in New Jersey compared water use among three bent grass species and found that velvet bentgrass (*Agrostis canina* L.) used less water than creeping bent grass and colonial bentgrass (*Agrostis capillaries* L.). Water loss through shoot transpiration and soil evaporation, as well as water intake from the soil via the root system, all have an impact on how much water is used by the turf grass canopy. Therefore, changes in shoot and root features, such as canopy design or leaf orientation, tiller or shoot density, growth habit, rooting depth, and root density, among turfgrass species, are related to variations in water-use rates **(Beard 1973; Huang and Fry 1999)**. Turf grass canopy when compared to grasses with an upright growth pattern, those with a prostrate shoot development style often consume less water **(Kim and Beard 1988)**. Due to the

increased leaf area from which transpiration occurs, turf grass with a quick vertical shoot extension rate typically has higher water use rates than slower growing or dwarf-type grasses. **(Shearman and Beard 1973; Kim and Beard 1988)**. Spatial changes in water supply have a significant impact on how roots are distributed. In a soil profile, roots typically grow or spread out in confined wet zones. For instance, plants establish large, shallow root systems when the soil surface is consistently kept moist due to regular irrigation or rainfall. Periodically allowing a soil surface to dry out improves the amount of roots that can grow in the lower, water-rich layers. The ability of roots to follow moisture into deeper levels of the soil profile influences a plant's ability to survive or escape short and long periods of drought. This root response has been documented in several turf grass species. Faster root elongation under drying conditions may be related to the development of a deep root system. Faster root development into deeper soil profiles, however, may be harmful to plants due to rapid water depletion when limited soil water is held there. **(Huang *et al.*, 1997 and Huang 1999)**.

Urea fertilizer levels (nitrogen fertilizer) had a considerable impact on the majority of characteristics. as shown in Tables (1to 7) indicated that fertilizer of turf grass mixture plants with both levels 5 and 10 $g.m^{-2}$ of urea fertilizer had a significant effect in coverage percentage, root depth, where 5 $g.m.^{-2}$ level caused significant increase in cumulative Length of turf grass and root dry weight and 10 $g.m^{-2}$ level of urea fertilizer significantly increase in mowing number, cumulative fresh and dry weight of vegetative growth were significantly superior to non-fertilized and this fertilized with high level 15 $g.m^{-2}$. These findings are consistent with those reported by Anderson **(2005)** who mentioned that nitrogen at a concentration of 12.5 -15% the dry weight of the vegetative and root system in five types of turf grasses as to compared with less concentrations. And **Raslan (1974)** demonstrated that the presence of nitrogen fertilizer causes the plant to create auxin, which promotes cell division and elongation. **Turner (2003)** revealed that turf grass of outstanding quality may be produced without the issue of leaching using fertilizers containing ready-made or soluble nitrogen in the form of (NH4), such as urea, sulphate, or ammonium chloride nitrate. The results can be generally attributed to nitrogen fertilization's significant contribution to turf grass development and response, as well as its significance in producing a robust and dense turf grass by promoting and increasing vegetative growth. In order to stimulate growth, aid in damage repair, and enhance the color, consistency, and density of the grass for the pitch presentation, fertilizers are utilized to maintain turf grass. Supporting and sustaining grass attributes including color, vigor, root growth, and disease resistance depend on nitrogen (N) fertilizer during the growing season, a balanced fertilization regimen based on regular, light applications of nitrogen **(Głąb *et al.* 2020)**.

As for interactions between two factors as in tables (1-7), the highest significant values for most characteristics were found when turf grass irrigated once times in week and fertilized with 10 $g.m^{-2}$ of urea fertilizer as compared with other interactions. Irrigation and N are essential components of producing quality turf grass **(Beard, 1973)**. At the appropriate rates, N and irrigation have shown to improve turf grass color, quality, vegetative and root growth along with many additional benefits. However, excess N and irrigation rates to turf grass can potentially increase NO3-N leaching and degrade water quality **(Snyder *et al.*, 1984; Hull and Liu, 2005)**.

CONCLUSIONS

This research concluded that the once irrigation number in week had a significant effect on all studied traits like coverage percentage, mowing number, cumulative length of vegetative growth, total fresh and dry weight of clipping turf grass, root depth, root dry weight, and was superior to those irrigated twice and three times in week. The fertilizer of turf grass mixture plants with both levels 10 and 5 $g.m^{-2}$ of urea fertilizer had a significant effect in coverage percentage, root depth, where the 5 $g.m.^{-2}$ level caused significant increase in cumulative length of turf grass and root dry weight and 10 $g.m^{-2}$ level of urea fertilizer significantly increased mowing number, cumulative weight of both fresh and dry vegetative growth which was significantly superior to non-fertilized and this fertilized with high level 15 $g.m^{-2}$. As for interaction the highest significant values for most characteristics were found when turf grass irrigated once times in week and fertilized with 10 $g.m^{-2}$ of urea fertilizer as compared with other interactions.

REFERENCES

Adamipour, N., Salehi, H. and Khosh-Khui, M. (2017). Effect of photoperiod and irrigation regime on growth and physiological indices of Tall Fescue (*Festuca arundinacea Schreb*.). *South Western Journal of Horticulture, Biology and Environment* Vol.8, No.1, pp.41-54.

Anderton, A. (2005). Effect of nitrogen concentration on six grass species. *Journal of plant nutrition.* 36:1045-1052.

Beard, J. B. (1973). Turf grass: Science and Culture. Prentice-Hall, Inc., Englewood Cliffs, New Jersey.

Beard, J. B. (1989). Turf grass water stress: Drought resistance components, physiological mechanisms, and species-genotype diversity. Proc. Intl. Turfs Res. Conf., Tokyo, Japan. 6:23–28.

Busey, P. (2003). St. Augustinegrass. pp. 309- 330. In Casler, M. D., and Duncan, R. R. (eds.) Biology, breeding, and genetics of turfgrasses. John Wiley & Sons, Inc, Hoboken, NJ.

Candogan, B. N., Bilgili, U., Yazgan, S. and Acikgoz, E. (2015): Irrigation level and nitrogen rate affect evapotranspiration and quality of perennial ryegrass (*Lolium perenne*). *International Journal of Agriculture & Biology*, 17: 431−439.

Da Costa, M. and Huang, B. (2006). Minimum water requirements for creeping, colonial, and velvet bent grass under fairway conditions. *Crop Sci*., 46:81–89.

Day, T. R. (2006). Intermountain west native and adapted grass species and their management for turf grass applications. A thesis submitted in partial fulfillment of the requirements for the degree of Master of Science in plant Sci., Montana state university, Bozeman, Montana.

Fu, J., Fry, J., and Huang. B. (2004). Minimum water requirements of four turfgrasses in the transition zone. *Hort. Sci.,* 39:1740–1744.

Głąb, T., Szewczyk, W., Gondek, K., Mierzwa-Hersztek, M., Palmowska, J. and Nęcka, K. (2020): Optimization of turf grass fertigation rate and frequency. Agricultural Water Management: 234. Availabe at https://doi.org/10.1016/j.agwat.2020.106107 .

Huang, B. (1999). Water relations and root activities of *Buchloe dactyloides* and *Zoysia japonica* in response to localized soil drying. *Plant Soil*, 208:179–186.

Huang, B. and Fry, J. (1999). Turf grass evapotranspiration. Pp. 317–334. In M. B. Kirkham (ed.). Water Use in Crop Production. Food Products Press, New York.

Huang, B., Duncan, R. and Carrow. R. (1997). Root spatial distribution and activity for seven turfgrasses in response to localized drought stress. *Int. Turf Res. J.*, 7:681–690.

Hull, R. J. and Liu, H. (2005). Turf grass nitrogen: physiology and environmental impacts. *International Turf grass Society Research Journal*, 10:962-975.

Kim, K. S. and Beard, J. B. (1988). Comparative turf grass evapotranspiration rates and associated plant morphological characteristics. *Crop Sci.*, 28:328–331.

Lane, I., Watkins, E. and Spivak, M. (2019). Turf grass species affect the establishment and bloom of kura clover (*Trifolium ambiguum*) in lawns. *Hort. Science.*, 54(5), 824-828.

Mc Groary, P. C., Daroub, S.H., Wright, A. L., Cisar, J. L., Snyder, G. H. and Williams, K. E. (2009). The effect of irrigation and nitrogen on St. Augustine grass color, quality and growth. *International Turf grass Society Research Journal*, Volume 11: 55-60.

Misiha, A. (1991). Effect of cool season turfgrasses seed mixtures on lawn characteristics. Bulletin of Faculty of Agriculture. University of Cairo, 42, 401-414.

Nilsen, E. T., Orcutt, D. M. (1996): Physiology of plants under stress. Abiotic factors. pp. 689. C. F. Pessarakli, M., Kopec, D.M. (2008): Comparing growth responses of selected cool-season turf grasses under salinity and drought stresses. *Acta Horticulturae,* 783: 169-174.

Oliveira, N. B., De Oliveira, J. F. V., Dos Santos, P. L. F., Gazola, R. P. D. and De Castilho, R. M. M. (2018). Avaliação do estado nutricional de três gramados ornamentais em Ilha Solteira–SP: um estudo de caso. *Revista LABVERDE*, 9(1), 96-119.

Raslan, A. (1974). Theoretical chair in soil fertility and fertilization. Ministry of Higher Education and Scientific Research Institute of Technical Institutes, Agricultural Technical Cradle, Abu Ghraib, Iraq.

SAS (2013). Statistical Analysis System. SAS Institute Inc. Cary, NC. USA.

Shearman, R. C. and Beard, J. B. (1973). Environmental and cultural preconditioning effects on the water use rate of *Agrostis palustris* Huds., Cultivar Penncross. *Crop Sci*., 13:424–427.

Snyder, G. H., Augustin, B. J. and Davidson, J. M. (1984). Moisture sensor controlled irrigation for reducing nitrogen leaching in bermudagrass turf. *Agron. J.*, 76:964-969.

Souza, F. H. D. D., Gusmão, M. R., Cavallari, M. M. and Barioni, W. (2020). Characterization of the potential of native grasses for use as lawns. *Ornamental Horticulture*, 26, 109-120.

Turner, T. R. (2003). Nutrient management guidelines for state property and commercially managed turf grass. University of Maryland, turf grass technical update, T. T.-115: P. 1-5.

Yilmaz, M. (2019). The effects of different combinations of combined fertilizer doses on some turf grass performances of turf mixture. *Pak. J. Bot*., 51(4), 1357-1364.

كارتێكرنا ئاڤدانى و پەيْنكرنى يوريا لسەرشێنبوونا توڤى فرێزى تێكەل

پوختە

ئەف ڤەكولينە هاتە ئەنجامدان ل كێلگەيين نەمامگەها مالتا /پارێزگەها دهوك دماوێ 2021/12/15 تا 2022/5/15. ئارمانج ژڤى ڤەكولێنى دياركرنا كارتێكرنا ژمارا ئاڤدانا و ئاستێن پەيْنكرنا يوريا بو لسەر شێنبون وگەشەكرنا فرێزى هەردەم كەسك وتێكەل ، و ڤەكولينى تەكەزى لسەر دوو فاكتەرێن سەرەكى كر ، يى ئێكى ئاڤدان (جارەكى د هەفتيى دا ، دوو جارا د هەفتيى دا و سى جارا دهەفتيى دا) و يى دووى چوار ئاستێن پەيْنكرنا يوريا بو (0 ، 5، 10 و15 گم.م-2. ڤەكولين هاتە جيبَەجيگرن بكارئێنانا ديزانێ (RCBD) بكارئێنانا دوو فاكتەرا و سێبارەكرنا هەر معامەلەكى. ئەنجاما دياربون كو ئاڤدانا جارەكى د هەفتيەى دا بو ئەگەرى زێدەكرنەكا بەرجاڤ دساخلەتێن هاتين وەرگرتن وەك رێژا سەدەيى يا رائێخستنا فرێزى (73.37%) ، ژمارا تراشينا فرێزى (2.56) ، دريژيا فرێزى يا لسەر ئيك (11.51 سم) ، كێشا كوم كرى يافرێزى تەر (12.05 گم) ، كێشا كوم كرى يافرێزى هشك (2.63 گم) ، كێراتيا رها (11.67 سم) ، كێشا هشك يارها (2.58 گم) بەراورد دگەل دوو و سى جاران ئاڤدان د هەفتيى دا. هەردوو ئاستێن پەيْنكرنا يوريا 5 و 10 گم. م-2 كارتێكرنەكا بەرجاڤ هەبو د رێژا سەدەيْى يا رائێخستنا فرَيزى (73.96 و 70.07%) ، كێراتيا رها (11.23 و 11.51سم) لدويف ئێك، و ئاستێ 5 گم.م-2 بو ئەگەرى زێدەكرنا بەرجاڤ د دريژيا فرێزى يا لسەر ئێك (11.43 سم) ، كێشا هشك يارها (2.58 گم) وئاستى 10 گم.م-2 زيدەكرنەكا بەرجاڤ د ژمارا برينا فرێزى (2.56) ، كێشا كوم كرى يافرێزى تەر (11.56 گم) ، كَيشا كوم كرى يافرێزى هشك (2.60 گم) كر. و سەبارەت تێكەليا فاكتەرين ئاڤدانى و پەيْنكرنا يوريا باشترين ئەنجام بدەستڤەهاتن د ساخلەتين فرێزەى دا ئەوين هاتينە وەرگرتن دناف بەرا جارەكى ئاڤدان د هەفييەك و پەينكرنا يوريا ب ئاستى 10 گم.م-2 بەراوورد دگەل تێكەليين دى.

كيلێكا پەيڤا: **فريزى تيكەل، ئاڤدان ، پەينكرنى يوريا**