The performance of different warm season turf grasses under Saline condition

Abstract

The present investigation on **the performance of different warm season turf grasses under Saline condition** was conducted at Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology And Sciences, Prayagraj. The experiment was conducted in Completely Randomized Design (CRD) with Five different turf grasses replicated thrice under different level of salinity. The different turf grasses were procured from Division of Floriculture and Landscaping, IARI, Pusa, New Delhi. Different Turf grasses were *Cynodon dactylon* (Bermuda Hybrid Selection-1), *Cynodon dactylon* (Bermuda grass Tif-419) *Zoysia matrella* (Manilla grass), *Zoysia japonica* (Zoysia Grass) and *Paspalum notatum* (Bahia grass) were investigated during the study at Department of Horticulture Sam Higginbottom University of Agriculture Technology and Science, Prayagraj. Turf grasses were planted in plastic pots filled with sand: cocopeat: vermiculite (2:1:1) and irrigated with different concentration of salinity levels (0.6, 5.0, 10.0, 15 ds m^{-1}). The day taken establishment of different turf grass, Manila grass (21) shown fastest establishment rate, taken completely coverage of turf grass, Bahia grass covers earlier (45), clipping yield is best in Zoysia grass (3.06), Mowing intervals is determinate on the basis of day interval mowing frequency of Zoysia grass is less (19.88), The result of Visual appeal (Leaf colour chart) is recorded before and after treatment, before treatment Manila grass and Bahia grasses shown same RGB value (137B), Tif- Dwarf and selection – 1 shown same colour chart (137A) and Zoysia grasses shown different (134C). After the application of treatment all turf grasses shown different colour chart. Manila grass shown (N144A) Tif dwarf shown (N144B), Bahia grass shown (N144D) Selection -1 shown (144 D) and Zoysia Shown (145 D). proline content shown the effect of stress on turf grasses, in turf grasses the value of highest of proline is shown the stress level. In which Bahia grasses shown highest stress (7.61)

Keywords: Cynodon dactylon, *Paspalum notatum*, Turfgrass, *Zoysia matrella*, *Zoysia japonica* ds m^{-1}. Visual appeal RGB value,

Introduction

Floriculture and Landscaping are related industries, in the past landscaping was commonly regarded as luxury for the wreathing or as cosmetic for masking indictors and average architecture. Turf grass servers' decorative function as it is called as Heart of the garden as it enhances the beauty of the landscaping, it provides a soft cushion to playground in many games mostly Cricket ground, Golf, Football, Soccer, Baseball and Athletic Field. Lawn is an integral part of any landscape whose quality is determined by the management of the turf. Today the species have been defined and used as per the requirements e.g., turf species in golf courses may differ from cricket grounds or the species used only for ornamental purposes. Today, turf grass industry encompasses the development, production, and management of specialized grasses for utility, beautification, and recreational facilities. It involves science, development, and the creation and sale of turf grass products and services. Turf grass is an important element of the landscape; they provide beautiful green area in urban and sub urban landscape. Turf grasses are widely used in enhancing and maintaining the function and beauty of lawns, aesthetic fields, *etc.* all over the world. Turf grass provides at least three major benefits to human activities: functional, recreational, and ornamental (*Janaki ram et al.* 2015). Turf grass are among the most important industries in many countries, turf grass as an important element to the landscape, sever the function as beatification and its attractiveness are suitable for mental health more specifically. Turf grass enhances the appearance and utility of sport field lawn park golf courses and other green belt area in and around urban area. Members of the family Poaceae, grasses number 600 genera and 9000 species (**Rademacher.** 2003), Lawn grasses are usually categorized as cool-season grasses and warm-season grasses. As par Population growth plane gather pressure on potable water supplies, non-potable recycled irrigation water is becoming widely used on Turf-grass area including sports field, cricket field, golf course, lawn tennis, gardens, and lawns. Non-potable recycled water often has elemental salinity levels therefore turf-grasses must increase have good salinity tolerance to persists in these environments. Water quality and quantity are major issue of concern around the world particularly in arid and semiarid areas where water storage have resulted from rapid urbanization agriculture and industry (**Houng** *et. al.* 2014)

Material and methods

The present study entitled the performance of different warm season turf grasses under Saline condition was carried out at Department of Horticulture, Naini agriculture Institute, Sam Higginbottom university of Agriculture Technology and Science Naini Prayagraj U.P. during July to December 2022. The objective was finding the most salt tolerant turf grass species and most suitable turf grasses in Prayagraj agro climatic condition. The detail of various material used and the method employed in carrying out the experiment and described in the detailed in this chapter under appropriate heading.

Table 1 Turfgrass species used in this study

Sl No.	**Variety**
1	Manila grass (*Zoysia. Matrella)*
2	Bermuda grass Tift-Dwarf-419
3	Bahia Grass (*Paspalum notatum)*
4	Bermuda grass Selection-1 (*Cynodon dactylon)*
5	Zoysia /Japanese lawn grass (*Zoysia. japonica*)

Day Taken establishment (Days): - Numbers of days was counted from planting till new growth papered on the plants.

Day taken complete coverage: - Number of days was counted from establishment till the complete coverage of pot by the different method.

Mowing Intervals:- Mowing is an important operation for the maintenance of turf grasses. Mowing was done with mechanical lawn mower at particular intervals. Mowing was done for individual grass depending upon its growth rates.

Clipping Yield/Pot: - The clipping from each pot were harvested and clipping yield/pot was worked out.

Visual Appeal of Turf: - The colour of individual green leaves recorder with RHS colour chart and corresponding colour was recorded for visual appeal of turf.

Determination of Proline content: - Proline was estimated by following method of (Bates et al.1973). Fresh leaf tissue (0.5 g) was homogenized in 10ml of 3% sulfosalicylic acid, and the homogenate was filtered through Whatman no. 2 filter paper. Two milliliters of the filtrate were brought to reaction with 2ml acid ninhydrin solution (1.25 g ninhydrin in 30ml glacial acetic acid), 20mL ortho-phosphoric acid (6 M), and 2ml of glacial acetic acid for 1 h at 100◦C. The reaction was terminated in an ice bath. The reaction mixture was extracted with 4mL toluene, mixed vigorously by passing a continuous stream of air for 1-2 min. The chromophore containing toluene was aspirated from the aqueous phase, warmed at room temperature, and the absorbance was recorded spectrophotometrically at 520 nm. The proline concentration was determined from a standard curve and calculated on fresh weight basis as follows:

$$\mu\text{mol proline/g fresh weight} = \frac{\mu\text{g proline/ml} \times \text{ml of toluene}}{115.5 \times 100}$$

Result and Discussion

Days taken for establishment (days)

The data and figures presented in Table 2 revealed significant difference in days taken for establishment by different turf grasses. The minimum number of days (20 days) taken for establishment of turf grasses was observed in Manila grass followed by Bermuda grass var. Tif-419 (21 days) whereas the maximum days taken for establishment was observed in Zoysia grass (35 days). Significant difference in number of days taken for establishment of different turf grasses could be due to varietal characteristics and difference in the inherent makeup.

Days taken for complete coverage (days)

The data and figures presented in Table 3 and Fig 1 revealed significant difference in days taken for complete coverage by different turf grasses. The minimum number of days (45 days) taken for complete coverage was observed in Bahia grass followed by Tif Dwarf-419 (47 days). Whereas significantly maximum number of days taken for complete coverage was observed in Zoysia Grass (60 days). All different turf grasses differed significantly with respect to number of days taken for complete coverage which could be due to their different rate of vegetative growth which is the result of different genetic makeup of turf grasses.

Mowing interval (days)

The data presented in Table 4 reveals the number of mowing required which depends upon increase in the height of culms. Among all turf grasses, maximum in first mowing interval (23 days) was observed in Manila grass followed by Zoysia grass (21.66 days) whereas minimum mowing interval was observed in Tif-dwarf grass (18.66 days). In second mowing maximum day interval (25 day) was observed in Tif – dwarf grass followed by Manila grass (23 days) whereas minimum mowing interval (18 days) was observed in zoysia grass. In third mowing maximum day interval (30 days) was observed in Tif – Dwarf grass followed by Bahia grass (29.33 days). Whereas minimum mowing intervals (20 days) was observed in Zoysia grass. Significant difference in the mowing interval of different turf grasses can be attributed to their different growth rate and photosynthetic activity due to their different genetic make-up.

Clipping yield (g/pot)

The data presented in Table 5 revealed significant difference in clipping yield with decides the functional utility of the grass and its maintenance at different mowing heights and intervals under varied traffic situations. The greenness retention after mowing also depends on these traits. Among the different mowing intervals in different turf grasses, significantly highest Clipping yield (3.06 g/pot) was observed in Zoysia grass fallowed by Selection- 1 (2.92 g/pot) and lowest Clipping yield was observed in Manila grass (2.3 g/pot).

Significant difference in clipping yield of different turf grasses is related to variation in growth rate of the different turf grasses which depend on the genetic makeup of each grass.

Visual appeal of Turf Grass (RGB Content before and after Treatment)

The data presented in Table 6 in relation to leaf colour of different turf grasses recorded different colour according to RHS colour chart before or after treatment. The different turf grasses exhibited colours before treatment which ranged from dark green colour group 137-A in Bermuda Hybrid selection-1, and Bermuda grass Var. Tif-419 137-A, Green colour group 137-B in Bahia grass and Manila Grass, green group 134 -C was found in Zoysia Grass of the RHS colour chart during the month of September 2022. After the Nacl treatment the different turf grasses exhibited colour which ranged from green group N 144 A in Manila grass, N144 B was found in Bermuda grass Var. Tif- Dwarf N144 D was found in Hybrid Bermuda grass Var. Selection- 1 and 145 D was found in Zoysia grass. During the month of December. Significant variation in leaf colour among different turf grasses could be attributed to their genetic makeup resulting in different pigments and their proportion leading to different colour in turf grasses.

Proline Content (*µ*mole/gfw)

The data for proline content was analyzed and presented in Table 7 It is clear from data that the shoot proline content of all grasses increased with increasing salinity. Regardless of salt concentration maximum proline content was recorded among the species in Bahia Grass (7.61µmole/gfw) while minimum was found in manila grass (13.52 µmole/gfw). Among the treatments of salt concentration (NaCl mM) it was observed that maximum proline content recorded (7.5 µmole/gfw) in 15 ds m^{-1} salt level and minimum was recorded (2.83 µmole/gfw) in control. The interaction data shows that the proline concentration of all the species significantly increasing in respect to the increasing salt concentration. All the grasses exhibited lower proline content at control condition but it increased as salinity level increased from control to 15 ds m^{-1} salt concentration. The maximum proline content observed in Bahia grass (10.2 µmole/gfw) followed by Zoysia grass (8.4 µmole/gfw) at 15 ds m^{-1} salt concentration while minimum was recorded in Mania grass (25.47 µmole/gfw). Some compatible solutes that show an increase in concentration under salinity stress may also play significant role in osmotic adjustment, and these include proline, glycine betaine, and sugars (Storey and Jones 1979). Glycine betaine and proline protect enzymes (proteins) from damages caused by salinity or dehydration stress (Paleg et al. 1984, Smirnoff and Cumbes 1989) interestingly, significant proline accumulation generally occurs only after exceeding a threshold of drought or salt stress (Cavalieri and Huang 1979). In the current study, salinity triggered proline synthesis in response to salinity to turgor maintenance (Table 7).

Table: - 2 Days taken for establishment (days) of different turf grasses

Sl. No.	Species	MEAN
1	Manila Grass	20
2	Tif-Dwarf	21
3	Bahia Grass	23
4	Selection-1	31
5	Zoysia Grass	35
	F-test	S
	S.Ed. (±)	2.129
	CD% (0.05)	4.744
	C.V	10.03

Table :- 3 Day taken complete coverage (Day): -

Sl. No	Species Name	Mean
1	Manila Grass	48

2	Tif-Dwarf	47
3	Bahia Grass	45
4	Selection-1	54
5	Zoysia Grass	60
	F-test	S
	CD% (0.05)	3.902
	C. V	4.239

Table:- 4 Determination of Mowing Interval

Sl. No	Species Name	1st mowing	2nd mowing	3rd mowing
1	Manila Grass	23	23	20.66
2	Tif-Dwarf	18.66	25	30
3	Bahia Grass	21	22	29.33
4	Selection-1	20.66	20	22.33
5	Zoysia Grass	21.66	18	20
	F-test	S	S	S
	S. Ed. (±)	1.8	1.26	2.8
	CD% (0.05)	2.44	2.04	3.04
	CV	6.38	5.19	6.83

Table: - 5 Determination of clipping Yield (g/pot)

Before Treatment	After Treatment

Sl. No	Species	MEAN
1	Manila Grass	2.3
2	Tif-Dwarf	2.4
3	Bahia Grass	2.7
4	Selection-1	2.9
5	Zoysia Grass	3.06
	F-test	S
	CD% (0.05)	0.26
	CV	5.43

Table :- 6 Determination of visual appeal of Turf Grass (RGB Content before and after Treatment)

Sl. No	Varieties	Leaf colour of turf grass	Varieties	Leaf colour of turf grass
1	Manila Grass	137 B	Manila Grass	N144A
3	Bahia Grass	137 B	Bahia Grass	N144D
4	Selection-1	137 A	Selection 1	144D
5	Zoysia Grass	134 C	Zoysia Grass	145 D

Table: - 7 Determination of Leaf Firing (%)

Treatment / **Species**	T0 (Control)	T1 (0.6 ds m^{-1})	T2 (5.0 ds m^{-1})	T3 (10 ds m^{-1})	T4 (15 ds m^{-1})	MEAN

Manila Grass	0	13.96	18.16	22.8	32.13	17.41
Tif-Dwarf	0	13.63	18.3	28.3	39.4	19.92
Bahia Grass	0	17.1	22.1	32.06	44.26	23.1
Selection-1	0	22.6	27.33	35	43.73	25.73
Zoysia Grass	0	20.33	26.53	35.36	43	25.04
MEAN	0	17.52	22.48	30.7	40.5	
CD% (0.05)						
Species (S)	1.68					
Treatment (T)	1.68					
Interaction (A*B)	3.77					

Conclusion

On the present experiment, it is concluded that the development of turf grass industry in the salt affected is challenging due to scarcity of fresh water for irrigation. Bahia grasses is shown best result with respect of Day taken establishment, & Proline content. . Highest clipping yield & mowing frequency shown in Zoysia grass. Earlier establishment of turf grasses is shown in Manila grass. conclusion is based on response of five turf grass species.

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