The Pharma Innovation Journal 2022; 11(5): 2238-2241

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2022; 11(5): 2238-2241

www.thepharmajournal.com
Received: 01-02-2022
Accepted: 08-03-2022

Sachin Patel
Research Scholar, Department of Floriculture and Landscape Architecture, Pt. Kishori Lal Shukla College of Horticulture and Research Station, Rajnandgaon IGKV, Raipur Chhattisgarh, India

Dr. Toran Lal Sahu
Assistant Professor, Department of Floriculture and Landscape Architecture, College of Horticulture and Research Station, Sankara, Patan, Durg, IGKV, Raipur, Chhattisgarh, India

Neelima Netam
Assistant Professor, Department of Floriculture and Landscape Architecture, Pt. Kishori Lal Shukla College of Horticulture and Research Station, Rajnandgaon IGKV, Raipur Chhattisgarh, India

Dr. MS Paikra
Associate Professor, Department of Fruit Science, Pt. Kishori Lal Shukla College of Horticulture and Research Station, Rajnandgaon IGKV, Raipur Chhattisgarh, India

Dr. Dikeshwar Nishad
Assistant Professor, Department of Agriculture Statistics and Social Science Language, Pt. Shiv Kumar Shastri College of Agriculture and Research Station, Rajnandgaon IGKV, Raipur Chhattisgarh, India

Corresponding Author:
Sachin Patel
Research Scholar, Department of Floriculture and Landscape Architecture, Pt. Kishori Lal Shukla College of Horticulture and Research Station, Rajnandgaon IGKV, Raipur Chhattisgarh, India

Effect of macronutrients on establishment of Korean lawn grass (*Zoysia japonica* Steud.)

Sachin Patel, Dr. Toran Lal Sahu, Neelima Netam, Dr. MS Paikra and Dr. Dikeshwar Nishad

Abstract
An investigation was carried out to know the “Effect of macronutrients on establishment of Korean lawn grass (*Zoysia japonica* Steud.)” at horticultural research cum institutional farm, Pt. KLS College of Horticulture and Research Station, Pendri Rajnandgaon, Chhattisgarh during the year 2020-2021 In Randomized Block Design (RBD), with three replications and 12 treatments. The treatments includes, T_1: Control (Without any fertilizers), T_2: 50g N_2 + 20g P_2O_5 + 30 g K_2O per m^2, T_3: 45g N_2 + 15g P_2O_5 + 25g K_2O per m^2, T_4: 45g N_2 + 10g P_2O_5 + 20g K_2O per m^2 T_5: 40g N_2 + 20g P_2O_5 + 30g K_2O per m^2, T_6: 40g N_2 + 10g P_2O_5 + 20g K_2O per m^2, T_7: 40g N_2 + 05g P_2O_5 + 15g K_2O per m^2, T_8: 30g N_2 + 10g P_2O_5 + 20g K_2O per m^2, T_9: 30g N_2 + 05g P_2O_5 + 10g K_2O per m^2, T_{10}: 30g N_2 + 05g P_2O_5 + 05g K_2O per m^2, T_{11}: 20g N_2 + 10g P_2O_5 + 10g K_2O per m^2, T_{12}: 20g N_2 + 05g P_2O_5 + 05g K_2O per m^2. The experimental results revealed that the T_2 (50g N_2 + 20g P_2O_5 + 30g K_2O per m^2) performed best in growth character namely, shoot length of turf, leaf length of turf, root length of turf, shoot fresh weight of turf.

Keywords: Korean lawn grass (*Zoysia japonica* Steud.), macronutrient and growth parameters

Introduction
Zoysia is one of the earliest grass species to be used as turf, it is native to Korea, China, Japan, Australia, Philippines and New Zealand (Samples and Sorochan 2007) [11]. In Zoysia genus, out of 10 species, 3 species are used as turf. They include mascarene grass (*Zoysia tenuifolia*) manila grass (*Zoysia matrella*) and Korean (Japanese) lawn grass (*Zoysia japonica* Steud) (Christians and Engelke 1994) [2].

Zoysia japonica (Korean lawngrass, Zoysiagrass or Japanese lawngrass) is a species of mat-forming, creeping, short perennial grass. It is native to the coastal grasslands of Southeast Asia and Indonesia. The United States first introduced *Zoysia Japonica* in 1895. It is import from Chinese region of Manchuria. *Zoysia Japonica* has become one of the most widely used species of turfgrass in the United States, China, Brazile, Japan and Korea. It has smooth, stiff, vertical leaf blades that roll in the bud. It grows to around 0.5 mm in width and hairy near on base and exhibits short inflorescences. The pedicles grow to about 1.75 mm and the ascending culm internodes measure roughly 14 mm long. *Zoysia japonica* has a very coarse texture, compared to others of its genus. It is high tolerance to freezing temperature, drought, salt and shade make for a favorable lawn grass. It does lose its bright green color, turning brown after frost. *Zoysia japonica* needs a humid climate to survive. It does well in transition zones and warm temperate or marine zones.

Zoysia japonica is only one of the *Zoysia* species that can be seeded. It has a lengthy germination rate of at least a month. That’s why vegetative propagation is the primary form of propagation through both rhizomes and stolons. *Zoysia japonica* seeds require a moist environment and a temperature of at least 70 °F to germinate. There-fore sod, sprigs and plugs are less prohibitive methods of planting. It can be planted at almost any time of year however, late summer planting is discouraged. On average, it requires 1.0-1.5 inches of irrigation per week. It is mowed to a height of 0.5-2.5 inches every 5–10 days. *Zoysia japonica* is nearly resistant to disease, yet is subject to insect attack from white grubs. *Zoysia japonica* is often used on golf course. It is also used for home lawns, parks, schoolyards and athletic fields. Landscapers use *Zoysia japonica* as a buffer around flower beds and sand pits to keep invasive species out.

Nitrogen plays very important role in growth and development of turf grass. Nitrogen is perhaps the most important nutrient as it helps the grass to produce green, healthy leaves. Since leaves are the energy-making factories of the plant, it is important that enough nitrogen be provided to maximize their energy making capabilities without causing an over production of leaves. The optimum dose of nitrogen is responsible for vegetative growth, green colour, heat, cold, drought resistance and composition of turf grass community. Nitrogen deficiency appears on older leaves as a pale green colour that changes to a yellow as the deficiency symptoms progress. Its deficiency will result in stunting of shoot growth, decreased tillering and leaf length. On the other hand, over doses of nitrogen causes excessive stimulation of shoot growth, which result in death of the root system due to lack of carbohydrates. Johnson (1973) [7] reported that nitrogen fertilizer improve the appearance of turf. Bermuda grass is most productive during the summer months and is highly responsive to nitrogen fertilization (Wilkinson and Langdale, 1974; Johnson, 2001) [14]. High rate of nitrogen are needed to ensure top quality turf and nitrate is usually the principal source of nitrogen in fertilizers (Epstein and Bloom, 2005) [4].

Phosphorus is involved in active root growth and helps in uptake of other nutrients (Marshner, 1986) [8]. Application of phosphorus also improves rooting and cell division. Shoot growth is dependent on root growth and vice versa. Hence, higher rates of phosphorus is also a contributing factor for higher shoot density next to nitrogen. On the other hand turf grass response to phosphorus fertilizer is expressed as improved root growth (Stewart, 2008) [12] and shoot growth is dependent on root growth. Hence, higher clipping shoot growth was observed due to higher phosphorus rates.

Potassium plays vital role in photosynthesis and carbohydrate production. Potassium deficient plants are known to be less resistant to plant diseases (Goss and Gould 1967, Salisbury and Ross, 1992 and Tisdale and Nelson, 1975) [5, 10, 13]. Potassium is also involved with the opening and closing of plant stomata. The stomata play a vital role in stress management and plants deficient in potassium are less tolerant of environmental stresses. The tolerance of creeping bentgrass to heat in midsummer winter hardiness of bermudagrass (Gilbert and Davis 1971) [6], wear tolerance, and other related stress functions are all affected by Potassium, which increases cell turgidity and reduces tissue succulence, provides shoot tissue with greater mechanical strength to with stand the pressure and abrasion resulting from wear injury. Potassium deficiency symptoms on plants can be very subtle and difficult to recognize. It is mobile within the plant and is easily redistributed from mature plant parts to younger tissue, so deficiency symptoms first appear on older leaves (Salisbury and Ross, 1992) [10]. On turf, potassium deficiency symptoms are more difficult to identify. Likewise the application of potassium to deficient turf will not generally show a visible response. The subtle responses of carbohydrate production, stress survival and disease resistance are very difficult to discern visually. Root development requires sufficient potassium levels (Christians *et al.*, 1979, DePaola J. M. and J. B. Beard 1977).

Materials and methods

The research was conducted at the Horticultural Research cum Institutional Farm, Pt. K.L.S. College of Horticulture and Research Station Pendri, Rajnandgaon. I.G.K.V. Raipur, Chhattisgarh, during the year 2020-21. The field is geographically located at about 21.10^0 N latitude and 81.03^0 E longitudes with an average altitude of 307 m above the mean sea level.

The soil property of experimental site was 7.1 pH, Electrical conductivity ($0.38 dSm^{-1}$), Available nitrogen (205.04 kg/ha.), Phosphorus (13.42 kg/ha.), Potassium (271.52 kg/ha.).

The experiment was conducted in Randomized Block Design having thirteen treatments including three replication. Turf was transplant on November 27. thirteen treatment comprising of T_1: Control (Without any fertilizers), T_2: 50g N_2 + 20g P_2O_5 + 30 g K_2O per m^2, T_3: 45g N_2 + 15g P_2O_5 + 25g K_2O per m^2, T_4: 45g N_2 + 10g P_2O_5 + 20g K_2O per m^2 T_5: 40g N_2 + 20g P_2O_5 + 30g K_2O per m^2, T_6: 40g N_2 + 10g P_2O_5 + 20g K_2O per m^2, T_7: 40g N_2 + 05g P_2O_5 + 15g K_2O per m^2, T_8: 30g N_2 + 10g P_2O_5 + 20g K_2O per m^2, T_9: 30g N_2 + 05g P_2O_5 + 10g K_2O per m^2, T_{10}: 30g N_2 + 05g P_2O_5 + 05g K_2O per m^2, T_{11}: 20g N_2 + 10g P_2O_5 + 10g K_2O per m^2, T_{12}: 20g N_2 + 05g P_2O_5 + 05g K_2O per m^2.

Observation were taken for growth parameters *viz.* shoot length of turf (cm), leaf length of turf (cm), number of leaves per shoot, root length of turf (cm), shoot fresh weight of turf (g), shoot dry weight of turf (g), root fresh weight of turf (g), root dry weight of turf (g).

Results and Discussion

1. **Shoot length of turf (cm):-** Shoot length of turf varied significantly due to different level of macronutriant, presented in Table (1). Maximum shoot length was observed in T_2 (50g N_2 + 20g P_2 O_5 + 30g K_2O per m^2) and minimum in T_1 (Control) at 120 days at transplanting. Further, it is clear from data that fertilized plots exhibited maximum shoot length as compared control plots. The present investigations were in agreement with the results of Bowman *et al.* (2002) [1]. It was suggested that the higher N application improve the vegetative growth rate and quality of the turf grass. Epstein and Bloom, (2005) [4] also reported the similar results.
2. **Leaf length of turf (cm):-** Leaf length of turf varied significantly due to different level of macronutriant, presented in Table (1). Maximum leaf length was observed in T_2 (50g N_2 + 20g P_2 O_5 + 30g K_2O per m^2) and minimum in T_1 (Control) at 120 days at transplanting. Further, it is clear from data that fertilized plots exhibited longer leaf length as compared control plots. The present investigations were in agreement with the results of Bowman *et al.* (2002) [1]. It was suggested that the higher N application improve the vegetative growth rate and quality of the turf grass. Epstein and Bloom, 2005 [4] also reported the similar results.
3. **Root length of turf (cm):-** Root length of turf varied significantly due to different level of macronutriant, presented in Table (1). Maximum root length was observed in T_2 (50g N_2 + 20g P_2 O_5 + 30g K_2O per m^2) and minimum in T_1 (Control) at 120 days at transplanting. Further, it is clear from data that fertilized plots exhibited longer root length as compared control plots. The present investigations were in agreement with the results of Bowman *et al.* (2002) [1]. It was suggested that the higher N application improve the vegetative growth rate and quality of the turf grass. Epstein and Bloom, (2005) [4] also reported the similar results. Role of phosphorus may be attributed to the fact that, it is involved in active root growth and helps in uptake of other nutrients (Marshner, 1986) [8].
4. **Shoot fresh weight of turf:-** Fresh weight of turf varied

significantly due to different level of macronutriant, presented in Table (2). Maximum fresh weight was observed in T_2 (50g N_2 + 20g P_2O_5 + 30g K_2O per m^2) and minimum in T_1 (Control) at 120 days at transplanting. Further, it is clear from data that fertilized plots exhibited maximum fresh weight as compared control plots. The present investigations were in agreement with the results of McMahon and Hunter (2012). It was suggested that the, fertilizer rate (kg/ ha) of one third (37.73 N: 8.41 P: 40.34 K), two third (75.47 N:16.84 P: 80.66 K) and full rate (113.20 N: 25.25 P: 121 K) were applied on *Agrostis stolonifera*. clipping yield and leaf moisture were affected by fertilizer rate. Increase in fertilizer rate led to increased clipping yield.

Table 1: Effect of macronutrients on establishment of Korean lawn grass (*Zoyesia japonica* Steud.) on Shoot length of turf (cm), leaf length (cm), Number of leaf per shoot, root length (cm) at 120 DAT

Notation	Treatment/N+P+K g/m^2	Shoot length of turf (cm)	Leaf length of turf (cm)	Number of leaf per shoot	Root length of turf (cm)
T_1	Control	7.10	4.12	9.26	7.50
T_2	50g N_2 + 20g P_2O_5 + 30g K_2O per m^2	9.50	5.34	10.00	9.56
T_3	45g N_2 + 15g P_2O_5 + 25g K_2O per m^2	9.32	5.30	9.93	9.20
T_4	45g N_2 + 10g P_2O_5 + 20g K_2O per m^2	9.26	5.23	9.80	9.10
T_5	40g N_2 + 20g P_2O_5 + 30g K_2O per m^2	9.31	5.24	11.13	9.06
T_{6s}	40g N_2 + 10g P_2O_5 + 20g K_2O per m^2	9.23	5.12	9.93	8.83
T_7	40g N_2 + 05g P_2O_5 + 15g K_2O per m^2	9.12	5.01	10.60	8.73
T_8	30g N_2 + 10g P_2O_5 + 20g K_2O per m^2	8.98	4.91	11.33	8.40
T_9	30g N_2 + 05g P_2O_5 + 10g K_2O per m^2	8.83	4.80	10.06	8.20
T_{10}	30g N_2 + 05g P_2O_5 + 05g K_2O per m^2	8.60	4.66	10.66	8.00
T_{11}	20g N_2 + 10g P_2O_5 + 10g K_2O per m^2	8.32	4.42	10.20	7.93
T_{12}	20g N_2 + 05g P_2O_5 + 05g K_2O per m^2	8.10	4.40	9.73	7.83
C.D. at 5%		0.84	0.52	N/A	0.60
SE(m) ±		0.28	0.17	0.46	0.20
C.V. (%)		5.60	6.26	7.87	4.15

Table 2: Effect of macronutrients on establishment of Korean lawn grass (*Zoyesia japonica* Steud.) on fresh weight of turf, Dry weight of turf, fresh root weight of turf, Dry root weight of turf at 120 DAT

Notation	Treatments	Fresh weight of turf	Dry weight of turf	Fresh root weight of turf	Dry root weight of turf
T_1	Control	11.03	2.23	6.17	2.40
T_2	50g N_2 + 20g P_2O_5 + 30g K_2O per m^2	14.30	3.16	7.00	2.90
T_3	45g N_2 + 15g P_2O_5 + 25g K_2O per m^2	14.20	3.10	7.23	3.47
T_4	45g N_2 + 10g P_2O_5 + 20g K_2O per m^2	14.13	3.03	6.37	2.80
T_5	40g N_2 + 20g P_2O_5 + 30g K_2O per m^2	14.16	3.06	7.07	3.00
T_{6s}	40g N_2 + 10g P_2O_5 + 20g K_2O per m^2	13.83	2.96	7.03	2.70
T_7	40g N_2 + 05g P_2O_5 + 15g K_2O per m^2	13.80	2.90	7.13	3.13
T_8	30g N_2 + 10g P_2O_5 + 20g K_2O per m^2	13.76	2.80	7.40	2.23
T_9	30g N_2 + 05g P_2O_5 + 10g K_2O per m^2	13.66	2.73	7.57	1.93
T_{10}	30g N_2 + 05g P_2O_5 + 05g K_2O per m^2	13.53	2.63	6.83	2.43
T_{11}	20g N_2 + 10g P_2O_5 + 10g K_2O per m^2	12.93	2.56	6.43	2.13
T_{12}	20g N_2 + 05g P_2O_5 + 05g K_2O per m^2	12.63	2.33	7.40	2.73
C.D. at 5%		1.09	N/A	N/A	N/A
SE(m) ±		0.37	0.26	0.58	0.35
C.V. (%)		4.77	16.39	14.43	14.43

Conclusion

Based on the results of present study on the effect of macronutrients on establishment of Korean lawn grass (*Zoyesia japonica* Steud.) it is concluded that Korean lawn grass performed well at (50gN_2+20gP_2O_5+30g K_2O per m^2) with respect to shoot length of turf, leaf length of turf, root length of turf, shoot fresh weight of turf. Therefore (50gN_2+20gP_2O_5+30gK_2O per m^2) treatment was best for turf growth.

Reference

1. Bowman DC, Cherney CT, Rufty TW. Jr. Fate and transport of nitrogen applied to six warm-season turfgrasses. Crop Science. 2002;42:833-841.
2. Christians NE. The interrelationships of nutrient elements and their effects on the growth and quality of turfgrasses. Ph.D. Dissertation. Ohio State University, 1994, 93-95.
3. DiPaola JM, Beard JB. The root growth of St. Augustinegrass (*Stenotaphrum secudndatu*) during establishment from sod and subsequent drought as influenced by potassium. Agronomy Abstract. 1977, 110.
4. Epstein E, Bloom AJ. Mineral nutrition of plants: Principles and perspectives. 2nd ed. Somaier Associates Inc. Sunderland, Massachusetts. 2005, 30.
5. Goss RL, Gould CJ. The Effect of Potassium on Turfgrass and Its Relationship to Turfgrass Diseases. In Agronomy Abstract. ASA, Madison, WI. 1967, 52.
6. Gilbert WB, Davis DL. Influence of fertility ratios on winter hardiness of bermudagrass. Agronony Journal. 1971;63:591-593.
7. Johnson BJ. Herbicides, sprigging rates, and nitrogen treatments for establishment of Tifway bermudagrass. Agronomy Journal. 1973;65:969-972
8. Marshner H. Mineral nutrition of higher plants.

Academic Press Inc. London, U.K, 1986.
9. McMahon G, Hunter A. Turf quality and growth suppression of *Agrostis stolonifera* “Penn A4” with plant growth regulators and various fertilizer rates. Acta Hort 2012;938:129-36.
10. Salisbury FB, Ross CW. Plant Physiology. Wadsworth Publishing Co., Belmont, 1992.
11. Samples T, Sorochan J. Zoysia. University of Tennessee Cooperative Extension Bulletin W159-H.[online], 2007. Available: http://utextension.tennessee.Edu/ publications/wfiles/W159-H.pdf [May 12th, 2012].
12. Stewart M. Best management practices for turf and lawn fertilization. A publication of International Plant Nutrition Institute (IPNI), Georgia, USA, 2008, 1-8.
13. Tisdale SL, Nelson JWL. Soil fertility and fertilizer, 3rd ed. Macmilan, New York, 1975.
14. Wilkinson SR, Langdale GW. Fertility needs of the warm-season grasses. In Forage fertilization, ed. D.A. Mays, 1974.