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EFFECT OF HERBICIDES ON GROWTH, ESTABLISHMENT AND WEED CONTROL IN KOREAN GRASS (*ZOYSIA JAPONICA*)

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ABSTRACT

The present investigation was carried out at College of Horticulture, Venkataramannagudem, West Godavari District of Andhra Pradesh during the year 2024-25 in *Rabi* season to evaluate the effect of herbicides on growth, establishment and weed control in Korean grass. The experiment was laid out in RBD replicated three times. Results revealed that, among different herbicides Halosulfuron @ 150 ppm (T_6) recorded the highest stolon length (8.02 cm), leaf length (3.04 cm) and chlorophyll content (5.66 SAPD units). While, the lowest was recorded in hand weeding (T_8) in stolon length (5.58 cm), leaf length (2.33 cm) and chlorophyll content (4.15 SAPD units) at 80 days after planting. In weed parameters hand weeding (T_8) recorded the maximum number of weeds per square meter (61.67 per m^2), fresh weight of weeds (312.69 g m^{-2}) and dry weight of weeds (84.16 g m^{-2}). While, Halosulfuron @ 150 ppm (T_6) recorded the minimum number of weeds per square meter (43.00 per m^2), fresh weight of weeds (218.85 g m^{-2}) and dry weight of weeds (51.87 g m^{-2}) at 80 days after planting.

Key words : Korean grass (*Zoysia japonica*), Herbicides, Growth, Establishment, Weed control.

Introduction

A well-maintained lawn is a key element in ornamental gardens, achieved by densely planting specific Turfgrass species to create a uniform effect. The overall appeal of a garden is greatly influenced by the quality of its lawn. Additionally, lawn grasses help reduce noise pollution, prevent soil erosion and contribute to oxygen production (Randhawa and Mukhopadhyay, 2010). The specialized cultivation and care of lawns is referred to as "Turf". The turf grasses, which belong to the Poaceae family, include over 600 genera and 7,500 species. These grasses are characterized by their ability to form a dense, uniform ground cover that can withstand frequent mowing and foot traffic (Turgeon, 2009).

Turfgrass enhances the appearance of countless residential lawns and offers durable, high-quality surfaces for sports fields supporting over 7,00,000 athletic venues. It also facilitates outdoor leisure activities, including golf, enjoyed by nearly 26 million players across more than 17,000 courses. Additionally, the turfgrass industry generates significant economic benefits, providing livelihoods for numerous seed and sod producers, lawn care professionals and landscapers (Janakiram *et al.*, 2015).

Despite the use of improved cultivars of Bermuda grass and Korean grass, weed infestations remain a persistent problem. Weeds, broadly defined as plants growing where they are not desired, directly compete with turfgrass for sunlight, water, nutrients and space. They also act as hosts for insects and disease-causing organisms, reducing turf quality and making lawns unsuitable for recreational or aesthetic purposes (Busey, 2003).

Ensuring weed-free, lush green turf requires proactive management. Yet, efforts to suppress one weed species through changes in agronomic practices can inadvertently create opportunities for other weeds to establish. Because of this resilience and adaptability, an integrated approach to weed management combining cultural practices with herbicide use is essential for effective and sustainable turf maintenance (Uddin *et al.*, 2012).

Materials and Methods

The field experiment on Turf grass was conducted at PG research block of Department of Floriculture and landscaping, College of Horticulture, Dr. YSRHU. The experimental site is situated at 16°8842'N latitude and 81°4504'E longitude, at an altitude of 34 m above MSL. The location falls under 'Agro-climatic zone 10 of East coastal plain and hills' (Krishna-Godavari zone) with an annual average rainfall of 900 mm. The zone experiences hot humid summer and mild winter. The experiment was laid out in Randomized block design with three replications.

Stolon length (cm)

For each plot, five randomly selected stolons were measured from their base to the growing tip using a graduated scale. The mean stolon length was then determined and recorded in centimeters.

Leaf length (cm)

For each plot, the third fully expanded mature leaf from five randomly selected plants was measured from base to tip using a ruler, with results expressed in centimeters (Basha, 2007).

Total Chlorophyll content (SPAD units)

Leaf chlorophyll concentration was measured using a Soil-Plant Analysis Development (SPAD) chlorophyll meter. For each sampled plant, five physiologically mature leaves of similar developmental stage were selected randomly from each tagged plant for measurement. The mean SPAD value was calculated and reported in SPAD units.

Number of weeds per square meter

This observation was taken by counting the number of weeds in one m^2 area in the beds sprayed with herbicides at 20 days interval and hand weeding is done at 50 DAP.

Fresh weight of weeds

Weed fresh weight was measured at 80 days after planting and expressed in grams per square meter (g m^{-2}). For this purpose, weeds were uprooted from each plot, thoroughly washed under running tap water to remove adhering soil particles and blotted dry with absorbent paper to remove excess surface moisture. The fresh weight of weeds was then recorded.

Dry weight of weeds

For determining the dry weight, the collected weeds were first placed in brown paper bags and dried in a hot air oven at 70°C for 48 hours. After drying, the mean dry weight was calculated and expressed in grams per square meter (g m^{-2}).

Treatment	Details
T_1	2,4-Dimethyl amine @ 1000 ppm
T_2	2,4-Dimethyl amine @ 1500 ppm
T_3	Atrazine @ 2000 ppm
T_4	Atrazine @ 3000 ppm
T_5	Halosulfuron @ 100 ppm
T_6	Halosulfuron @150 ppm
T_7	Neem leaf extract (NLE) @ 3%
T_8	Hand weeding

Results and Discussion

Stolon length (cm)

The data on stolon length (cm) (Table 1) as influenced by herbicides revealed that Halosulfuron @ 150 ppm (T_6) recorded the highest stolon length (8.02 cm) which was followed by Halosulfuron @ 100 ppm (T_5) (7.73 cm). Hand weeding (T_8) (5.58 cm) recorded the shortest stolon length, which was preceded by NLE @ 3% (T_7) (6.21 cm).

A study by Carroll *et al.* (1996) reported increased stolon production and establishment of Meyer zoysia grass from plugs in the presence of severe competition from smooth crabgrass. This indicates that reducing weed competition can enhance stolon development in Zoysia grass.

Leaf length (cm)

As per the data on leaf length (cm) (Table 1) as influenced by herbicides, the highest leaf length was recorded in Halosulfuron @ 150 ppm (T_6) (3.04 cm) followed by Halosulfuron @ 100 ppm (T_5) (2.90 cm). The lowest leaf length was noticed in hand weeding (T_8) (2.33 cm) at 80 DAP.

The present findings suggest that the maintenance of epidermal and mesophyll cell stability is essential for optimal leaf enlargement and laminar development. Quantitative anatomical evaluations revealed minimal deviations in tissue architecture relative to untreated controls, suggesting that the photosynthetically active tissues remained fully operational. The integrity of chlorenchyma layers ensures sustained carbon fixation, while the maintenance of vascular bundle structure promotes effective translocation of assimilates and water toward expanding foliar regions. Collectively, these anatomical and physiological attributes support continuous mitotic activity and cellular elongation within the leaf meristem, thereby contributing to enhanced leaf length, leaf width and overall leaf area index (Marques *et al.*,

Table 1 : Stolon length (cm), leaf length and total chlorophyll content as influenced by herbicides at 80 DAP in Korean grass.

Treatment	Stolon length (cm)	Leaflength (cm)	Total chlorophyll content (SPAD units)
T_1: 2, 4-Dimethyl amine @ 1000 ppm	7.20	2.77	4.59
T_2: 2, 4-Dimethyl amine @ 1500 ppm	7.23	2.88	5.21
T_3: Atrazine @ 2000 ppm	6.46	2.55	4.37
T_4: Atrazine @ 3000 ppm	6.52	2.58	4.56
T_5: Halosulfuron @ 100 ppm	7.73	2.90	5.42
T_6: Halosulfuron @ 150 ppm	8.02	3.04	5.66
T_7: Neem leaf extract (NLE) @ 3%	6.21	2.48	4.36
T_8: Hand weeding	5.58	2.33	4.15
Mean	**6.87**	**2.69**	**4.79**
SEm±	0.09	0.04	0.16
CD at 5%	0.27	0.13	0.49

Table 2 : Number of weeds per square meter, fresh weight (g) and dry weight (g) of weeds as influenced by herbicides at 80 DAP in Korean grass.

Treatment	Number of weeds	Fresh weight of weeds	Dry weight of weeds
T_1: 2, 4-Dimethyl amine @ 1000 ppm	52.67	267.58	59.81
T_2: 2, 4-Dimethyl amine @ 1500 ppm	51.00	258.73	57.17
T_3: Atrazine @ 2000 ppm	55.67	278.70	71.50
T_4: Atrazine @ 3000 ppm	53.33	271.76	68.12
T_5: Halosulfuron @ 100 ppm	45.00	222.60	53.56
T_6: Halosulfuron @ 150 ppm	43.00	218.85	51.87
T_7: Neem leaf extract (NLE) @ 3%	57.00	295.70	75.92
T_8: Hand weeding	61.67	312.69	84.16
Mean	**52.42**	**265.83**	**65.26**
SEm±	1.43	5.22	2.58
CD at 5%	4.35	15.84	7.83

2016).

Total chlorophyll content (SPAD units)

Among the herbicides, the highest chlorophyll content (Table 1) was observed in Halosulfuron @ 150 ppm (T_6) (5.66) which was on par with Halosulfuron @ 100 ppm (T_5) (5.42) and the minimum chlorophyll content was observed in hand weeding (T_8) (4.15).

The biochemical selectivity of halosulfuron minimizes the diversion of metabolic energy toward stress-response pathways, thereby optimizing the allocation of photoassimilates and energy resources to vegetative growth and morphogenesis. The sustained stability of chlorophyll pigments, coupled with preserved stomatal conductance and mesophyll tissue organization, collectively ensures high photosynthetic efficiency and effective gas exchange. These coordinated structural and physiological processes facilitate uninterrupted carbon assimilation and energy transduction, ultimately supporting progressive leaf expansion and contributing to superior turf quality and elasticity (Desai *et al*., 2017).

Number of weeds per square meter

The minimum number of weeds per square meter (Table 2 and Fig. 1) was observed in Halosulfuron @ 150 ppm (T_6) (43.00 per m^2) and it was preceded by Halosulfuron @ 100 ppm (T_5) (45.00 per m^2) at 80 DAP. Hand weeding (T_8) (61.67 per m^2) recorded the maximum number of weeds per square meter.

Weeds death results from events occurring in response to ALS inhibition and low branched chain amino acid production, but the actual sequence of phytotoxic processes is unclear and zoysia grass species has tolerance to ALS inhibitors (Carter, 2007).

Fresh weight of weeds (g)

Fresh weight of weeds (Table 2 and Fig. 1) was at the lowest in Halosulfuron @ 150 ppm (T_6) (218.85 g m^{-2}) which was followed by Halosulfuron @ 100 ppm (T_5) (222.60 g m^{-2}) and highest fresh weight of weeds was found in hand weeding (T_8) (312.69 g m^{-2}) preceded by NLE @ 3% (T_7) (295.70 g m^{-2}).

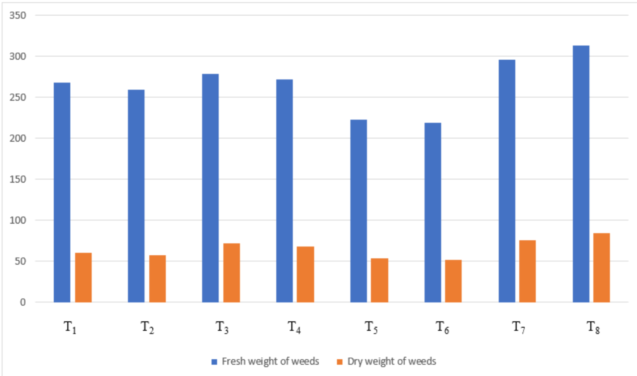

Fig. 1 : Fresh and dry weight of weeds (g) as influenced by herbicidal treatments in Korean grass at 80 DAP.

Dry weight of weeds (g)

At 80 DAP (Table 2 and Fig. 1), the lowest dry weight of weeds was observed in Halosulfuron @ 150 ppm (T_6) (51.87 g m^{-2}) whereas, the highest dry weight of weeds was recorded in hand weeding (T_8) (84.16 g m^{-2}).

The physiological disruptions caused by halosulfuron lead to visible symptoms such as chlorosis, necrosis and stunted growth. These symptoms progress to plant death, significantly reducing weed populations in the treated area. Studies have documented these effects, providing evidence of the herbicide's efficacy in controlling various weed species. That ensures decrease in fresh and dry weight of weeds. The outcomes of the current study are in agreement with those reported by Barker *et al.* (2023), Flores (2024) particularly in relation to weeds per square meter, types of weeds, fresh and dry weight of weeds.

Conclusion

Based on findings of the experiment, it is concluded that under Venkataramannagudem conditions, Halosulfuron @ 150 ppm reported highest stolon length, leaf length, total chlorophyll content and lowest number of weeds per square meter, fresh weight and dry weight of weeds. In contrast hand weeding reported the minimum stolon length, leaf length, total chlorophyll and maximum number of weeds per square meter, fresh weight and dry weight of weeds in Korean grass (*Zoysia japonica*).

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References

Barker, A.L., Pawlak J., Duke S.O., Beffa R., Tranel P.J., Wuerffel J., Young B., Porri A., Liebl R., Aponte R. and Findley D. (2023). Discovery, mode of action, resistance mechanisms and plan of action for sustainable use of Group 14 herbicides. *Weed Science*, **71(3)**, 173-188.

Basha, S.M. (2007). Studies on the growth and performance of turf grasses on different types of soil. *M.Sc (Hort.) thesis*, Tamil Nadu Agricultural Universiy, Coimbatore.

Carroll, M.J, McCarty L.B. and McCarty J.A. (1996). Increased stolon production and establishment of Meyer zoysiagrass from plugs in the presence of severe competition from smooth crabgrass. *Weed Technology*, **10(4)**, 739-744.

Carter, S.K. (2007). Tolerance of seedling turfgrass species to ALS inhibiting herbicides. *Master's Thesis*, University of Kentucky, United States.

Dennese Flores (2024). Halosulfuron methyl 50% and prosulfuron 29% herbicide, Environmental protection agency, 8-11.

Desai, M.Y. (2017). Management of *Cyperus rotundus* L. in turf. *Int. J. Chem. Stud.*, **5(5)**, 696-699.

Janakiram, T., Ritu J. and Namita (2015). *Introduction to turf grasses*. Westville, New Delhi, 12-15.

Marques, R.P., Martins D., Rodella R.A., Almeida Costa S.I. and Vitorino H.D.S. (2016). Leaf anatomy of emerald grass submitted to quantitative application of herbicides. *Semina: Ciencias Agrarias*, **37(4)**, 1767-1777.

Randhawa, G.S. and Mukhopadhyay A. (2010). Floriculture in India. *Allied Publishers*, 560 -74.

Turgeon, A.J. (2009). Urban, Suburban, and Rural Amenities of Grass. In Grassland: Quietness and Strength for a New American Agriculture. Wedin, W.F. and Fales S.L. (Eds). *American Society of Agronomy*: Madison, WI, USA. 137-54.

Uddin M K, Juraimi A S, Ismail M (2012) Weed management in tropical turfgrass areas. *Arch. Biolog. Sci.*, **64(2)**, 597-603.