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Weed suppression ability of plant-based extracts in Bermuda grass (*Cyanodon dactylo*n) and Mexican grass (*Zoysia japonica*)

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Abstract
The present investigation was conducted during *rabi* season of 2020-21 under the supervision of college of Horticulture, Venkataramannagudem at College of Horticulture, Sirsi, (UHS, Bagalkot) Karnataka to study the effect of plant-based extracts on growth and weed suppression in lawn grasses. Eight plant-based extracts (Water, NLE @ 1.5%, NLE @ 3%, TPE @ 1.5%, TPE @ 3%, GTE @1.5%, GTE @ 3%, TLE @ 1.5% and TLE @ 3%) were selected for weed suppression ability and growth in Bermuda grass and Mexican grass. The experiment was laid out in factorial RBD replicated two times. Results revealed that the spraying of neem leaf extract (NLE) at 3% (T_3) has shown significantly minimum number of weeds, weed dry weight and maximum stolon length at 120 days after planting.

Keywords: NLE, weeds, Bermuda grass, Mexican grass

Introduction
Weeds in lawn are considered as undesirable because they disrupt turf uniformity and compete with desirable grass species for moisture, light and nutrients. Some weeds are harmful to people because they attract bees, cause skin irritation or cause poisoning if ingested. Hence, effective weed control measures have to be taken for better performance of turf grasses. The manual removal of weeds is the predominant method of weed management practices in tropics. It is highly laborious, inefficient and often uneconomical. Weed competition during the early stages of crop growth and also competing for light, moisture, nutrients and space which will be ultimate adverse effect on growth of the major plant and yield.

There are several methods to control weed such as non-chemical method, chemical method and biological method. Among different biological methods of weed control, allelopathy could lead to reduced labour costs and increased efficiency, without any adverse effects on the environment. Many of the compounds produced by green plants are observed to function as chemical warfare agents against competing plants and pests. Plant-based extracts contain phenolics and terpenoids, they have the potential to induce a wide array of biological effects and can provide great benefits to weed management. Plant-based extracts are easily available, environment friendly and they have allelopathic effect on some weeds hence they can be used as bio-herbicides in weed management.

Material and Methods
The present investigation was carried out under the guidance of college of Horticulture, Venkataramannagudem at College of Horticulture, Sirsi, (UHS, Bagalkot) during *rabi* season of 220-21 to study the effect of plant-based extracts on growth and weed suppression in lawn grasses. The experimental site is located in the Agro climatic zone-IV (hilly zone) of Karnataka and lies at $14^{0}37$ North latitude and $74^{0}85$ East longitude with an altitude of 616 m above mean sea level. The total rainfall of this area ranges from 2500-3000 mm, distributed over a period of six months, peak during June to July. The experiment was conducted on laterite soil having a pH of 5.67. Planting of lawn grass was done by dibbling at a spacing of 10 cm x 10 cm in Zig-Zag rows in 2.5 m x 2 m beds. Hand weeding was done at 40 days interval.

Fresh leaves of neem, teak, yellow oleander and rhizomes of ginger and turmeric were collected and 300 g of such material was thoroughly cleaned and washed. The leaves and rhizomes were washed with distilled water. The aqueous extracts of different leaf and rhizome

samples were prepared by crushing the leaf and rhizome samples in 2 L of distilled water using mixer grinder and the extracts were filtered through musclin cloth followed by Whatman No. 1 filter paper. The final volume was adjusted to 10 L and used as stock solution (100%). Solutions of desired concentrations *i.e.,* 0.75%, 1.5% were prepared by proper dilution with distilled water. Application of botanicals were done at 0, 20, 40, 60, 80, 100 and 120 days after planting. All the treatments were applied @ 1 litre per bed using hand sprayer.

Eight plant-based extracts *viz*. water (P_1), neem leaf extract (NLE) @ 1.5% (P_2), neem leaf extract (NLE) @ 3% (P_3), *Thevetia peruviana* leaf extract (TPE) @ 1.5% (P_4), *Thevetia peruviana* leaf extract (TPE) @ 3% (P_5), ginger and turmeric extract (GTE) @ 1.5% (P_6), ginger and turmeric extract (GTE) @ 3% (P_7), teak leaf extract (TLE) @ 1.5% (P_8) and teak leaf extract (TLE) @ 3% (P_9) were sprayed on bermuda grass (G_1) and mexican grass (G_2), laid out in a factorial randomized block design replicated two times.

Number of weeds per square meter and dry weight of weeds was recorded at 40, 80 and 120 days after planting. Stolon length of Bermuda grass and Mexican grass were recorded at 20, 40, 60, 80, 100 and 120 days after planting.

Results and Discussion

Number weeds per square meter

Data collected on number of weeds per square meter is presented in table 1. Significant differences were noticed among grass types, plant-based extracts and their interactions with respect to number of weeds per square meter. Among grasses, the plots planted with bermuda grass (G_1) recorded the minimum number of weeds (42.68 per m^2) as compared to those planted with mexican grass (G_2) (52.72 per m^2) at 120 DAP. Among plant-based extracts, the minimum number of weeds per square meter was observed in NLE @ 3% (P_3) (28 per m^2) and it was preceded by TLE @ 3% (P_9) (32.25 per m^2) at 120 DAP. Water spray (P_1) (65.05 per m^2) recorded the maximum number of weeds per square meter. The interaction means revealed that the minimum number of weeds was observed in the treatment combination of G_1P_3 (bermuda grass + NLE @ 3%) (24 per m^2), preceded by G_1P_9 (bermuda grass + TLE @ 3%) (27 per m^2) at 120 DAP. The treatment combination of G_2P_1: mexican grass + water recorded maximum number of weeds per square meter (68.5 per m^2).

Dry weight of weeds

Data collected on dry weight of weeds is presented in table 2. Grass type, plant-based extract and their interaction led to significant difference in the dry weight of weeds. Among grass types, the lowest dry weight of weeds was recorded in bermuda grass (G_1) (35.26 g) and it was at the highest in mexican grass (G_1) (49.79 g) at 120 DAP. As regards to plant-based extracts, the minimum dry weight was observed in NLE @ 3% (P_3) (18.63 g) which was significantly lesser as compared to TLE @ 3% (P_9) (22.73 g) at 120 DAP. The maximum dry weight of weeds was recorded in case of water spray (P_1) (69.33 g) at 120 DAP. Among the interactions, dry weight of weeds was minimum in the combination of G_1P_3 (bermuda grass + NLE @ 3%) (14.15 g), which was preceded by G_1P_9 (bermuda grass + TLE @ 3%) (17.68 g). The dry weight of weeds was at the highest in G_2P_1 combination (mexican grass + water) (78.61 g).

Mexican grass (G_2) was found to possess maximum number of weeds and dry weight when compared to bermuda grass (G_1). Due to slow growth of mexican grass dibbles, competition from weeds might overtook the turf growth thus recording an increased weed population. These findings were in conformity with those of Mathew *et al.* (2020) [8] who also found rapid growth in bermuda grass compared to mexican grass.

Decrease in weed number and weed dry weight can be attributed to be due to the effect of phenolic compounds in the plant extracts as compared to water spray. However, the infestation by weeds was found lessened at 120 DAP which might be due to complementary effect of hand weeding at 40 and 80 DAP coupled with the spray of plant extracts.

The minimum number of weeds per square meter and minimum dry weight of weeds might be due to the fact that the phenolics in the plant extracts lowered the germination of weed seeds by the inhibition of water uptake coupled with an alteration in the synthesis or activity of gibberellic acid, that regulates *de novo* amylase production during seed germination (Asma *et al.*, 2013) [1].

Stolon length

Data collected on stolon length of lawn grasses are presented in the table 3. Stolon length differed significantly at 120 days after planting due to grass type, plant-based extract and their interaction. The stolon length was at the highest in bermuda grass (G_1) (28.84 cm) and the lowest value was found in mexican grass (G_2) (7.16 cm) at 120 DAP.

Among plant-based extracts, the highest stolon length was recorded in NLE @ 3% (P_3) (19.84 cm) which was on par with TLE @ 3% (P_9) (19.27 cm) and the lowest stolon length was observed in case of TPE @ 1.5% (P_4) (16.56 cm) at 120 DAP. Among interactions, the highest values were found in the combination of G_1P_3: bermuda grass + NLE @ 3% (32.05 cm) which was followed by G_1P_9: bermuda grass + TLE @ 3% (30.99 cm) and the lowest stolon length was observed in G_2P_4: mexican grass + TPE @ 1.5% (6.68 cm).

Significant differences were noticed in between two grass types. Bermuda grass recorded maximum stolon length, as compared to mexican grass. These findings are in accordance with Dhanalakshmi, 2015 [2] who found that Bermuda grass recorded superior results with respect to shoot growth parameters.

Table 1: Number of weeds per square meter as influenced by grass types and plant-based extracts at different growth stages

S. No.	Plant-based extracts	40 DAP			80 DAP			120 DAP		
		Grass types								
		Bermuda grass (G_1)	Mexican grass (G_2)	Mean	Bermuda grass (G_1)	Mexican grass (G_2)	Mean	Bermuda grass (G_1)	Mexican grass (G_2)	Mean
1	P_1 – Water	50.00	61.00	55.50	63.10	70.00	66.55	61.60	68.50	65.05
2	P_2 – NLE @ 1.5%	33.50	43.50	38.50	32.50	43.00	37.75	29.00	40.00	34.50
3	P_3 – NLE @ 3%	31.00	40.50	35.75	29.00	38.50	33.75	24.00	32.00	28.00
4	P_4 – TPE @ 1.5%	42.00	54.50	48.25	57.00	67.00	62.00	55.50	65.50	60.50
5	P_5 – TPE @ 3%	37.00	46.50	41.75	53.00	65.50	59.25	51.50	64.00	57.75
6	P_6 – GTE @ 1.5%	41.00	48.00	44.50	54.50	66.00	60.25	53.00	64.50	58.75

7	P_7 – GTE @ 3%	36.00	45.50	40.75	52.50	62.50	57.50	51.00	61.00	56.00
8	P_8 – TLE @ 1.5%	35.00	44.50	39.75	34.00	44.00	39.00	31.50	41.50	36.50
9	P_9 –TLE @ 3%	31.50	41.00	36.25	30.50	40.00	35.25	27.00	37.50	32.25
	Mean	37.44	47.22	*42.33*	45.12	55.17	*50.14*	42.68	52.72	*47.70*
	Factor	SE m±		CD at 5%	SE m±		CD at 5%	SE m±		CD at 5%
	Grass types (G)	0.57		1.71	0.47		1.42	0.34		1.02
	Plant extracts (P)	1.21		3.63	1.00		3.01	0.72		2.16
	G x P	-		NS	-		NS	1.01		3.05

NLE: Neem leaf extract GTE: Ginger and turmeric extract TPE: *Thevetia peruviana* extract TLE: Teak leaf extract

Table 2: Dry weight of weeds as influenced by grass types and plant-based extracts at different growth stages

S. No.	Plant-based extracts	Dry weight of weeds (g)								
		40 DAP			80 DAP			120 DAP		
		Grass types								
		Bermuda grass (G_1)	Mexican grass (G_2)	Mean	Bermuda grass (G_1)	Mexican grass (G_2)	Mean	Bermuda grass (G_1)	Mexican grass (G_2)	Mean
1	P_1 – Water	48.62	61.88	55.25	62.05	80.61	71.33	60.05	78.61	69.33
2	P_2 – NLE @ 1.5%	26.11	36.22	31.16	25.00	36.02	30.51	20.78	30.89	25.83
3	P_3 – NLE @ 3%	21.87	31.67	26.77	17.80	29.69	23.74	14.15	23.10	18.63
4	P_4 – TPE @ 1.5%	37.97	52.26	45.11	48.70	68.21	58.45	46.70	66.21	56.45
5	P_5 – TPE @ 3%	32.10	42.44	37.27	46.40	64.53	55.47	44.40	62.53	53.47
6	P_6 – GTE @ 1.5%	37.02	45.36	41.19	47.98	67.14	57.56	45.98	65.14	55.56
7	P_7 – GTE @ 3%	31.16	41.28	36.22	46.05	61.06	53.55	44.05	59.06	51.55
8	P_8 – TLE @ 1.5%	27.77	37.00	32.39	26.67	36.88	31.78	23.56	34.78	29.17
9	P_9 –TLE @ 3%	22.77	32.98	27.87	21.70	31.91	26.80	17.68	27.79	22.73
	Mean	31.71	42.34	*37.03*	38.04	52.89	*45.47*	35.26	49.79	*42.52*
	Factor	SE m±		CD at 5%	SE m±		CD at 5%	SE m±		CD at 5%
	Grass types (G)	0.18		0.54	0.13		0.38	0.07		0.20
	Plant extracts (P)	0.38		1.14	0.27		0.80	0.14		0.41
	G x P	0.54		1.61	0.38		1.13	0.19		0.59

NLE: Neem leaf extract GTE: Ginger and turmeric extract TPE: *Thevetia peruviana* extract TLE: Teak leaf extract

Roshini *et al*. (2017) [9] reported that bermuda grass var. "Tif Dwarf' recorded maximum values in respect of shoot growth parameters. Such superiority of bermuda grass can be attributed to its inherent genetic makeup and suitability to the local conditions.

Application of plant-based extracts resulted in a growth retarding effect in turf grass as evident from a significant decrease in shoot growth relative to water sprayed plots, up to 80 DAP. The lower values in the stolon length might be due to the inhibitory effect of bio active inhibitory phytochemicals in the plant extracts. The inhibitory effect of NLE @ 3% was found significantly superior followed by TLE @ 3%. A concentration of 3% in either of these aqueous extracts was found to be more effective in inhibition as compared to 1.5% in respect of shoot growth parameters.

Phenolics in the leaf extracts of neem, teak etc were found to increase cell membrane permeability, leading to spill over of cell contents resulting in an increased lipid peroxidation, ultimately, the death of plant tissue. Besides, they were also reported to have inhibited nutrient absorption, adversely affecting their normal growth (Jacob *et al.*, 2012) [6].

The inhibitory effect of plant extracts on lawn grass was noticed at a reduced scale at 100 days after planting as compared to earlier stages. Such an increase in stolon length due to plant extract sprays can be attributed to less competition from weeds due to periodic hand weeding at 40 days interval coupled with spraying of inhibitory plant extracts. Hence, it is interesting to note that the growth of lawn grass in NLE @ 3%, TLE @ 3%, NLE @ 1.5% and TLE @ 1.5% overtook the water sprayed plots at 100 DAP. Many workers reported that controlling weeds associated with plant extract sprays reduced competition, consequently increasing plant growth parameters (Fayed *et al*., 1998; Kumar *et al*., 2005; El-Metwally and El-Rokiek, 2007) [5, 7, 3].

Table 3: Stolon length as influenced by grass types and plant-based extracts at different growth stages

S. No.	Plant-based extracts	Stolon length (cm)								
		20 DAP			40 DAP			60 DAP		
		Grass types								
		Bermuda grass (G_1)	Mexican grass (G_2)	Mean	Bermuda grass (G_1)	Mexican grass (G_2)	Mean	Bermuda grass (G_1)	Mexican grass (G_2)	Mean
1	P_1 – Water	5.92	1.23	3.58	12.04	2.02	7.03	20.44	3.22	11.83
2	P_2 – NLE @ 1.5%	5.15	1.16	3.16	8.45	1.64	5.05	14.56	2.56	8.56
3	P_3 – NLE @ 3%	5.01	1.12	3.07	7.98	1.48	4.73	13.89	2.38	8.14
4	P_4 – TPE @ 1.5%	5.84	1.22	3.53	11.18	2.00	6.59	19.37	3.04	11.21
5	P_5 – TPE @ 3%	5.51	1.21	3.36	9.95	1.94	5.95	17.12	2.92	10.02
6	P_6 – GTE @ 1.5%	5.62	1.22	3.42	10.56	1.98	6.27	18.48	2.98	10.73
7	P_7 – GTE @ 3%	5.45	1.20	3.33	9.01	1.86	5.44	16.01	2.82	9.42
8	P_8 – TLE @ 1.5%	5.22	1.18	3.20	8.64	1.78	5.21	15.09	2.74	8.92
9	P_9 –TLE @ 3%	5.09	1.14	3.12	8.08	1.56	4.82	14.02	2.46	8.24
	Mean	5.42	1.19	*3.31*	9.54	1.81	*5.68*	16.55	2.79	*9.67*

	Factor	SE m±	CD at 5%	SE m±	CD at 5%	SE m±	CD at 5%
	Grass types (G)	0.02	0.05	0.06	0.19	0.11	0.32
	Plant extracts (P)	0.03	0.09	0.13	0.39	0.22	0.65
	G x P	0.04	0.13	0.19	0.56	0.31	0.94

NLE: Neem leaf extract GTE: Ginger and turmeric extract TPE: *Thevetia peruviana* extract TLE: Teak leaf extract

Table 3: Continued…

S. No.	Plant-based extracts	Stolon length (cm)								
		80 DAP			100 DAP			120 DAP		
		Grass types								
		Bermuda grass (G_1)	Mexican grass (G_2)	Mean	Bermuda grass (G_1)	Mexican grass (G_2)	Mean	Bermuda grass (G_1)	Mexican grass (G_2)	Mean
1	P_1 – Water	26.89	5.20	16.05	27.19	5.98	16.59	28.56	7.20	17.88
2	P_2 – NLE @ 1.5%	20.02	4.24	12.13	27.54	6.10	16.82	29.89	7.38	18.64
3	P_3 – NLE @ 3%	18.04	4.02	11.03	27.80	6.20	17.00	32.05	7.62	19.84
4	P_4 – TPE @ 1.5%	25.74	5.00	15.37	25.95	5.58	15.77	26.44	6.68	16.56
5	P_5 – TPE @ 3%	23.22	4.78	14.00	26.41	5.75	16.08	27.64	6.90	17.27
6	P_6 – GTE @ 1.5%	24.66	4.92	14.79	26.15	5.66	15.91	26.96	6.82	16.89
7	P_7 – GTE @ 3%	22.05	4.66	13.36	26.74	5.86	16.30	27.98	7.06	17.52
8	P_8 – TLE @ 1.5%	20.92	4.46	12.69	27.26	6.03	16.65	29.02	7.27	18.15
9	P_9 –TLE @ 3%	19.02	4.14	11.58	27.74	6.14	16.94	30.99	7.54	19.27
	Mean	22.28	4.60	*13.44*	26.98	5.92	*16.45*	28.84	7.16	*18.00*
	Factor	SE m±		CD at 5%	SE m±		CD at 5%	SE m±		CD at 5%
	Grass types (G)	0.14		0.43	0.05		0.14	0.11		0.32
	Plant extracts (P)	0.29		0.86	0.09		0.27	0.22		0.65
	G x P	0.42		1.25	0.13		0.39	0.32		0.94

NLE: Neem leaf extract GTE: Ginger and turmeric extract TPE: *Thevetia peruviana* extract TLE: Teak leaf extract

Conclusion

From the present investigation it is concluded that the bermuda grass recorded the maximum stolon length and minimum weed parameters when compared to the mexican grass. Among the plant-based extracts tested, neem leaf extract at 3%, teak leaf extract at 3% recorded the maximum weed inhibition and maximum stolon length in lawn grass at 100 and 120 days after planting when compared with other plant extracts and water spray. Hence, these plant-based extracts can be used as pre-emergent herbicides in the lawn with no detrimental effects to the environment.

References

1. Asma EA, Jannet HB, Skhiri FH. Effects of *Acacia cyanophylla* Lindl. extracts on seed germination and seedling growth of four crop and weed plants. Turkish Journal of Biology 2013;37:305-314.
2. Dhanalakshmi R. Studies on evaluation of different turf grass species with different methods of establishment. M.Sc. (Hort) Thesis, Dr. Y.S.R Horticultural University, Venkataramannagudem, West Godavari (India) 2015.
3. El-Metwally IM, El-Rokiek KG. Response of wheat plants and accompanied weeds to some new herbicides alone or combined in sequence. Journal Agricultural Sciences 2007;15(2):513-525.
4. El-Rokiek KG. Evaluating the physiological influence of benzoic and cinnamic acids, alone or in combination on wheat and some infested weeds comparing with the herbicide isoproturon. Annals of Agricultural Sciences 2007;52(1):45-58.
5. Fayed TB, Sabry SRS, Aboul-ela SH. Effect of wild oat (*Avena fatua*), herbicides on weed density, wheat grain yields, and yield components. Annals of Agricultural Science 1998;4(1):173-188.
6. Jacob J, Sarada S. Role of phenolics in allelopathic interactions. Allelopathy Journal 2012;29(2):215-230.
7. Kumar D. Influence of integrated weed management practices on weed competition for nutrients in wheat. Indian Journal of Agricultural Research 2005;39(2):110-115.
8. Mathew S, Seetharamu GK, Satish D, Dileepkumar M, Mukund S. Effect of weed management and methods of planting on weed population and establishment of turf grasses 2020;55(5&6):250-261.
9. Roshini A, Chawla SL, Sudha P. Evaluation of warm season turf grasses for various qualitative and quantitative traits under Gujarat agro-climatic conditions. Indian Journal of Agricultural Sciences 2017;87(7):83-91.