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SEDGE WEEDS CONTROL IN TROPICAL TURF USING SEA WATER

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Abstract

Research was designed to reduce herbicide use by replacing post emergence herbicides with readily available sea water to control tropical weeds. Results showed that 5 species *viz.*, *Cyperus compressus* L., *Cyperus iria* L., *Fimbristylis miliaceae* Vahl., *Fimbristylis ovata* J. Kern. and *Scirpus juncoides* Roxb. were very susceptible and effectively controlled (100%) with 72 dS/m salinity treatment, but. 2 species *viz. Cyperus aromaticus* Ridley. and *Cyperus rotundus* L. were extremely tolerant to the salinity level of 72 dS/m.

Turfs are important in human activities from functional, recreational, and ornamental standpoint (Beard 1973). The presence of weeds in a turfgrass community disrupts the uniformity due to the variability in leaf width, color, and growth habit. Weeds also compete with the desirable turfgrass species for light, soil moisture, soil nutrients, and carbon dioxide. Chemical herbicides such as 2, 4-D, dicamba, DSMA, MSMA and bentazone have been used to control weeds in turfgrass (Emmons 2008).

Physiological growth responses of turfgrass species to salinity stress have been investigated. Among the salt-tolerant warm-season turfgrass species, *Paspalum vaginatum* (seashore paspalum) and *Zoysia japonica* (Japanese lawn grass) were the most salt-tolerant species (Uddin *et al.* 2011). As a result application of salt water as a substitute for post emergence herbicides in salt tolerant turfgrass species could control weeds as well as reduce the amount of herbicide use, but the information on response of weed and turfgrass species to salt water (post emergence) is limited in Malaysia. Therefore, the present study was designed to evaluate the efficacy of salt water for the control of weed species in the turf.

This experiment was conducted under glasshouse conditions at Faculty of Agriculture, Universiti Putra Malaysia (UPM) in 2007/08. Eighteen field-grown sedge weed species (Table 2) were selected in this study, and seashore paspalum (*Paspalum vaginatum* Swartz.) was used as a control. The young weeds were planted in pots (14 cm diameter by 15 cm depth), filled with a mixture of sand and peat (9 : 1).

All species of weeds and turfgrass (seashore paspalum) were treated in four different saline water (seawater) concentrations namely EC 0, 24, 48, and 72 dS/m. The treatments were applied using hand sprayer with 1 liter capacity to wet the whole plants parts including leaf, inflorescence, stem, node, internodes, as well as the planting medium. The volume of spray was 450 l/ha and applied once. Visual assessments of plant injury were made 3, 7, 14 and 21 days after initial saltwater exposure using a scale of European System of Weed Control and Crop Injury Evaluation

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(Burrill *et al.* 1976). The data have been presented in (Table 1). Data were analyzed using Analysis of variance (ANOVA) and LSD test was performed at the 5% probability level (SAS 2004).

Table 1. Injury rating scale of weed and turf.

Scale	Injury (%)	Effects on turf
1	0	No effect (all foliage green and alive)
2	1 - 10	Very light symptoms (very minor chlorosis and/or leaf curling)
3	11 - 30	Light symptoms
4	31 - 49	Symptoms not reflected in yield
5	50	Medium (moderate chlorosis and/ or leaf curling)
6	51 - 70	Fairly heavy damage
7	71 - 90	Heavy damage
8	91 - 99	Very heavy damage (severe chlorosis and/or dead leaves)
9	100	Complete kill (dead)

Source: Burrill *et al.* 1976.

Table 2. Effect of different salt water concentration on weed injury at three days after treatment in Malaysia.

Weed species	Plant injury level (%)				LSD (0.05)
	Salt concentration (dS/m)				
	0	24	48	72	
Paspalum vaginatum Sw.	0 a	0 a	0 a	5 b	0
Cyperus aromaticus Ridley.	0 a	0 a	0 a	9 b	1
C. compressus L.	0 a	28 b	45 c	53 d	4
C. distans Steud.	0 a	7 b	10 b	13 bc	5
C. eragrostis Lam.	0 a	13 b	21 c	36 d	3
C. iria L.	0 a	27 b	45 c	57 d	4
C. kyllinga Larridon.	0 a	15 b	32 c	39 d	5
C. pilosus Vahl.	0 a	5 b	8 c	31 d	3
C. rotundus L.	0 a	0 a	9 b	15 c	3
C. sphacelatus Rottb.	0 a	16 b	29 c	45 d	6
Fimbristylis dichotoma Vahl.	0 a	4 a	15 b	32 c	4
F. diphylla Vahl.	0 a	0 a	10 b	31 c	3
F. globulosa Retz.	0 a	4 b	10 c	23 d	3
F. miliacea Vahl.	0 a	15 b	39 c	55 d	7
F. ovate J.Kern.	0 a	50 b	60 c	69 d	5
F. pauciflora R.Br.	0 a	26 b	35 c	48 d	4
Scirpus juncoides Roxb.	0 a	31 b	37 c	50 d	4
S. latariflorus J.F.Gmel.	0 a	4 b	14 c	29 d	3

Means within rows followed by the same letter are not significantly different at p = 0.05 (LSD test).

After 3 days, a significant difference in injury was observed among the weed species at 24 dS/m salinity level irrespective of weed types (Table 2). Three weed species *Cyperus aromaticus*, *C. rotundus*, and *Fimbristylis diphylla*; and the control turfgrass species *Paspalum vaginatum* were unaffected, expressing by no injury.

After 21 days, weed species *Cyperus aromaticus* and *C. rotundus* including control species *Paspalum vaginatum* were unaffected at 24 dS/m salinity, while low injury level (1 - 10%) was observed in *Cyperus distans* species (Table 3). Meanwhile, high level of injury was observed in *Fimbristylis ovata* (95%), and *Scirpus juncoides* (96%), indicating high susceptibility to salinity in these weed species. *Paspalum vaginatum* was found to be the most tolerant species. Meanwhile, 5 weed species *viz.*, *Cyperus compressus, C. iria, Fimbristylis miliaceae, F. ovate* and *S. juncoides* were completely killed. High level of injury between 91 - 98% was observed in *Fimbristylis dichotoma, Cyperus sphaceolatus* and *Fimbristylis pauciflora*. Two sedges *Cyperus aromaticus* (37%) and *C. rotundus* (45%) appeared to be most salt tolerant with injury level less than 50%. The result suggested that the species has the capacity to recover salt injury after a certain time. Being halophyte, 72 dS/m salinity was applied at a time which might be imposed a sudden osmotic shock to the turfgrass species (*Paspalum vaginatum)*. With the passing of exposure time, it may overcome the osmotic shock and recover salt injury. Wiecko (2003) also reported that *Paspalum vaginatum* was injured by 10% by 10 days after treatment of 55 dS/m salinity. Sequential application of sodium chloride at 488 kg/ha provided 90% control of grassy weeds in

Table 3. Effect of different salt water concentration on weed injury at 21 days after treatment in Malaysia, 2007.

Weed species	Plant injury level (%) Salt concentration (dS/m)				LSD (0.05)
	0	24	48	72	
Paspalum vaginatum Sw.	0 a	0 a	0 a	0 a	0
Cyperus aromaticus Ridley.	0 a	0 a	22 b	37 c	4
C. compressus L.	0 a	50 b	92 c	100 d	6
C. distans Steud.	0 a	4 a	10 c	65 d	5
C. eragrostis Lam.	0 a	43 b	56 c	79 d	4
C. iria L.	0 a	55 b	92 c	100 d	5
C. kyllinga Larridon.	0 a	37 b	53 c	89 d	6
C. pilosus Vahl.	0 a	14 b	44 c	83 d	5
C. rotundus L.	0 a	0 a	35 b	45 c	5
C. sphacelatus Rottb.	0 a	46 b	87 c	98 d	5
Fimbristylis dichotoma Vahl.	0 a	28 b	73 c	91 d	5
F. diphylla Vahl.	0 a	19 b	45 c	67 d	5
F. globulosa Retz.	0 a	26 b	47 c	67 d	5
F. miliacea Vahl.	0 a	53 b	92 c	100 d	5
F. ovata J.Kern.	0 a	95 b	98 c	100 c	2
F. pauciflora R.Br.	0 a	62 b	75 c	91 d	6
Scirpus juncoides Roxb.	0 a	96 b	98 b	100 bc	3
S. latariflorus J.F.Gmel.	0 a	25 b	52 c	63 d	6

Means within rows followed by the same letter are not significantly different at $p = 0.05$ (LSD test).

seashore paspalum (Brosnan *et al.* 2009). The exceptionally high salt tolerance of seashore paspalum has been reported in previous studies (Azwa *et al.* 2011, Uddin *et al.* 2011, Uddin and Juraimi 2012).

Based on the present study, weeds can be categorized as highly susceptible, moderately susceptible and highly tolerant to salinity. Highly susceptible species were *Cyperus eragrostis, C. iria, C. compressus, C. sphaceolatus, Fimbristylis miliaceae, F. ovate and Scirpus juncoides*. The fairly tolerant species were *Cyperus aromaticus* and *C. rotundus*. *Paspalum vaginatum* was highly tolerant to salt water treatments (72 dS/m). Hence, it can be concluded that sea water could be used as an alternative to herbicides for sedge weed control in turfgrass species *Paspalum vaginatum.*

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