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Determination of cutting date and interval on native grass management of agricultural waterways in South Korea

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Introduction

Agricultural waterways provide a buffer zone between crop fields and adjacent rivers or streams. Waterways are important resource for agriculture water management, water quality and biodiversity conservation. The total linear distance of waterway in Korea is about 180,000 km, and about 40% are concrete and about 60% are grassed waterways. At present, the percentage of concrete waterways is increasing because of their water management efficiency. Some argue that continued expansion of concrete waterways is not sustainable because it leads to potential-degradation of the earth's environment. This concern has led to renewed efforts to use grassed waterways as an alternative to concrete. In addition, grassed waterways enhance the environment-friendly image of agriculture that Korea farmers want to promote. The objective of this experiment was to determine the effect of cutting date and interval of native grasses for water management efficiency of agricultural waterway.

Materials and Methods

The experiment was carried out at rice field waterway in Anseong, South Korea. The experimental design was a randomized complete block in a split arrangement with four replications. Main plots consisted of two positions and subplots consisted of cutting date and interval with a subplot size of 8 m^2 (2×4 m). The fiver treatments of cutting date were May 9, June 13, July 14, August 18 and September 12, 2014, and cutting interval treatment were single cut in May 30, double cut (I) in June 13 and July 7, double cut (II) in June 13 and August 17, and triple cut in June 13, July 7 and August 7, 2014. A sample (800 to 1,000g) was randomly selected from each plot to dry matter (DM) content. The samples were weighed and dried for 72h by forced-air drying oven at 65◦C. Data were analyzed with analysis of variance (ANOVA) procedures using the SAS statistical software package.

Results and Discussion

The fresh and DM yields of native grasses at the slope position were higher than those of the bottom of waterway. The September cutting showed the highest at fresh and DM yields of the slope position, however the July cutting was highest at fresh and DM yield of the bottom position (Table 1). The %DM of native grasses at the slope position decreased with delayed cutting date. However %DM of native grasses at the bottom position didn't show a trend. According to Kim *et al.* (2013; 2014), the grass production of riverbed was related to rainfall. Therefore forage yield didn't show a trend.

Significant main effects (position and cutting interval) were observed for most measured parameters except of DM grass yield (Table 2). Fresh and DM yields of grasses at slope position were also higher than these of the bottom of waterway. Fresh and DM yields of the single cut (June cut) were the highest among the cutting intervals, and triple cut (June, July and August cut) was the lowest.

Table 1. Effect of position and cutting date on the production of native gasses in agricultural waterways.

Position	Cutting date	Plant height (cm)	Fresh yield (kg/ha)	Dry matter (%)	DM yield (kg/ha)
The slope of waterway	May	48	14,039	25.2	3,576
	June	79	24,278	26.4	6,404
	July	78	21,645	26.9	5,907
	August	84	35,795	15.7	5,859
	September	106	46,732	16.7	7,585
	Mean	79	28,498	22.7	5,866
The bottom of waterway	May	103	12,719	21.4	2,730
	June	217	22,769	18.9	4,131
	July	192	35,309	21.9	7,927
	August	202	34,815	17.1	5,704
	September	201	20,931	20.9	3,484
	Mean	183	25,309	20.1	4,795
p-values Position (P)		<0.0001	0.5193	0.1624	0.4211
Cutting date(D)		0.0039	<0.0001	0.0020	0.0048
P * D		1.0000	0.0052	0.0042	0.2168

Table 2. Effect of position and cutting interval on the production of native gasses in agricultural waterways.

Position	Cutting interval	Plant height(cm)	Fresh yield (kg/ha)	Dry matter (DM)(%)	DM yield (kg/ha)
The slope of waterway	Single (June)	95	32,489	22.5	6,986
	Double I (June and July)	38	12,599	21.8	2,430
	Double II (June and Aug.)	68	22,024	17.7	3,954
	Triple (June, July and Aug.)	71	14,881	11.2	1,653
	Mean	68	20,498	18.3	3,756
The bottom of waterway	Single (June)	183	34,141	18.4	6,306
	Double I (June and July)	94	8,730	29.2	2,420
	Double II (June and Aug.)	131	11,054	22.7	2,459
	Triple (June, July and Aug.)	96	2,721	21.1	578
	Mean	126	14,162	22.8	2,941
p-values Position (P)		<0.0001	0.0003	0.8767	0.0003
Cutting interval (I)		<0.0001	<0.0001	<0.0001	<0.0001
P * I		<0.0001	1.0000	0.0496	<0.0001

Conclusion

These results showed difference in grass production on waterways as a result of waterway position, cutting date and cutting intervals. Based on this research, the cutting date of native grasses in Korean waterway is related to rainfall. And triple cut was good for waterway management among cutting interval.

Acknowledgement

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