Effects of Single Irrigation on Yield and WUE of Siberian Wildrye Grass in Agro-Pastoral Transition Zone of China

Hao Wang
China Agricultural University, China

Zizhong Li
China Agricultural University, China

Zhongyan Wang
China Agricultural University, China

Ding Huang
China Agricultural University, China

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Hao Wang , Zizhong Li , Zhongyan Wang , Ding Huang
College of Resources and Environmental Sciences , China Agricultural University , Beijing 100094 , China ,
E-mail : zizhong@cau.edu.cn

Key words : Irrigation ; siberian wildrye grass ; yield ; water use efficiency ; agro-pastoral transition zone of China

Introduction The recent studies showed that deficient irrigation increased water use efficiency (WUE) whereas full irrigation decreased it (Waldron et al., 2002). Recent research on the relationship between forage dry matter yield and total evapotranspiration (ET) showed linear and curvilinear relationships (Nielsen et al.2006). Irrigating in the elongating stage increased the growth of siberian wildrye grass significantly, and forage yield could benefit.

Materials and methods The field experiment was conducted on the Yu'ershan Demonstration Pasture of China Agricultural University in Bashang Plateau in the typical agro-pastoral transition zone of China (116°11′E, 41°45′N, elevation of 1460 m) during 2002-2004. The treatments included: no irrigation (NI), full irrigation (FI) and single irrigation in the key growing stage (KI).

Results Although forage yield of irrigated treatments were much larger than that of NI, differences were not significant between FI and KI (Table 1). WUE could be increased by irrigation and the effect of KI was better than that of FI. It was obvious that water can be used sufficiently in KI. FI with lower WUE would be more costly and waste of water resources. Regression analysis showed that forage yield and WUE were significantly related t ET with quadratic responses (Figure 1), the R^2 was 0.85 and 0.58, respectively.

Conclusions Forage yield of KI reached about 90% of FI with only 30% of the irrigated water. KI was a better irrigation schedule in semiarid areas. The yield response function and the relationship between WUE and total ET were significant and quadratic.

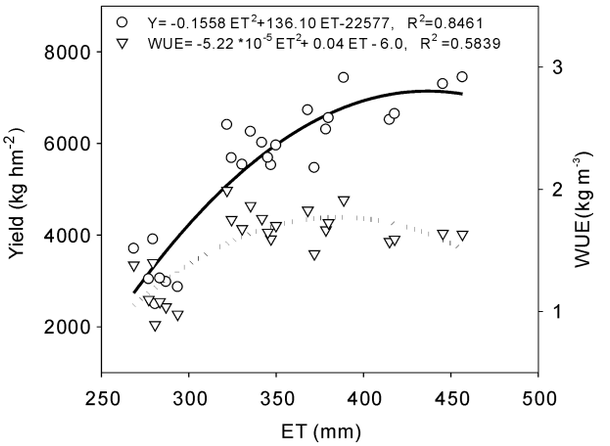

Figure 1 *The yield response function and the relationship between WUE and total ET.*

Table 1 *The evapotranspiration (ET), forage yield and water use efficiency (WUE)* *

Year	T	ET (mm)	Yield (kg ha^{-1})	WUE (kg m^{-3})
2002	NI	288.0±4.2 a	2970.0±77.9 a	1.0±0.0 a
	FI	387.2±20.1 c	6520.0±171.5 c	1.7±0.1 b
	KI	340.5±11.4 b	5725.0±177.8 b	1.7±0.1 b
2003	NI	289.6±6.5 a	2400.0±81.6 a	0.8±0.0 a
	FI	440.0±16.3 c	7133.3±347.2 c	1.6±0.0 b
	KI	333.0±8.3 b	6230.0±160.6 b	1.9±0.1 c
2004	NI	272.8±4.7 a	3553.6±370.3 a	1.3±0.1 a
	FI	380.2±6.9 c	6489.1±803.6 b	1.7±0.2 ab
	KI	343.5±9.9 b	6333.3±775.9 b	1.8±0.2 b

* T : treatment. Values followed by the same letter within a column are not significantly difference at $p=0.05$.

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