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Response of Plains Rough Fescue Seed and Biomass Yields Under Irrigation

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Introduction

Plains rough fescue (*Festuca hallii* (Vasey) Piper) is an important grass species in western Canada. Seed is in high demand by beef producers as the grass provides high-quality forage both in the growing season and after senescence[1].The seed is also in demand in ecological restoration for the reclamation industry. Seed availability is limited by infrequent and inconsistent production by the plant making seed collection difficult[2].

Flower initiation of fescue species occurs in the autumn prior to flowering, with flower development occurring between late May and early June of the subsequent year[3]. Palit[4] reported that irrigation increased seed head density of rough fescue, therefore under moisture-limited rangeland conditions water is a critical factor in controlling reproduction of this species. Seed yield of plains rough fescue was determined by Biligetu[5] to be related to the number of reproductive tillers of individual plants and, in general, the populations with the higher seed yields also produced the greatest amounts of above ground biomass. However, Biligetu[5] also notes that excessive rainfall in 2010 may have limited floral development. We wanted to explore the effects of late season water application on seed yield and biomass production of plains rough fescue as a management strategy to improve performance of seed and biomass yield.

Objective

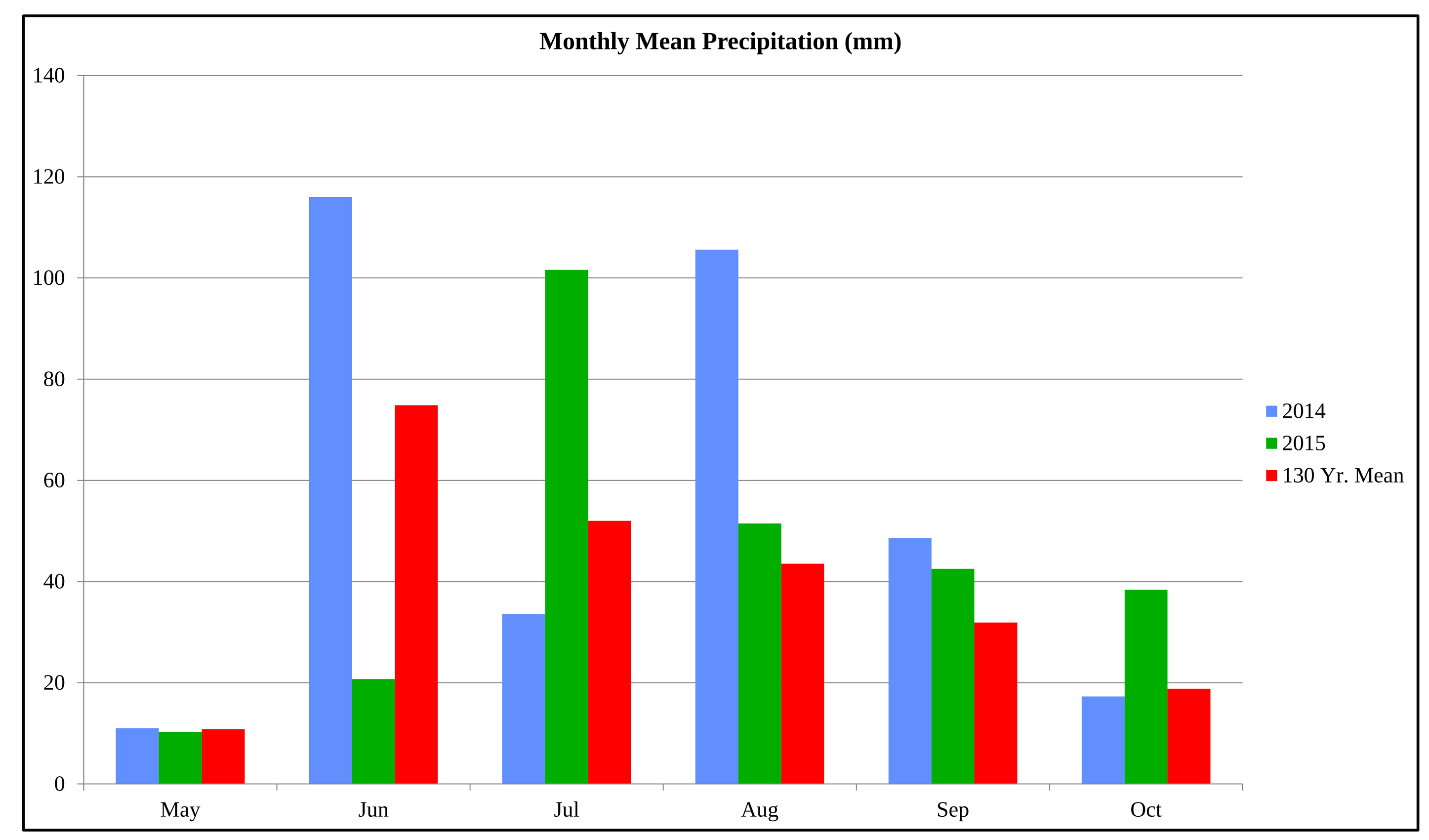
The purpose of our study is to assess seed yield and biomass response of 9 wild populations of plains rough fescue to late season water application and ultimately be able to provide the beef and reclamation industry with a practice that will provide a more dependable seed source of this species.

Materials and Methods

- •Experiment was a split plot design with water treatment as the main plot (water added, ambient precipitation). The sub-plot was rough fescue populations.
- •Nine wild populations were grown out in the greenhouse at Swift Current. The seedlings were transplanted into a common nursery established at the Swift Current Research and Development Centre in 2014. Each subplot consisted of 4 plants in a row with 1m separation between plants and between rows.
- •2.5 cm of water was added to irrigated treatments on August 19, 2015 and again on September 3, 2015.
- •Measurements taken included survivals (spring and fall), plant height, crown diameter, reproductive tiller number/plant, forage yield/plant, and seed yield/plant. Reproductive tiller number, biomass and seed yield are reported here.
- •Statistical analyses done using ANOVA with Tukey for means separation. When α was 0.05 or less the comparison was considered statistically significant.

Results

Figure 1. Monthly mean precipitation (mm) for 2014, 2015 and the 130 year mean.



2014 had precipitation well above the 130 year mean for June and August; September was wetter than average. This late summer/early fall moisture would have been available to the plants at a time when flowers are initiated for the following year. Precipitation was within the seasonal average for May 2015 but well below normal for June when flower development and seed set would be occurring.

Table 1. **Mean number of reproductive tillers, seed yield and biomass per plant. Letters indicate statistically significant differences at α=0.05.**

	Reproductive tillers plant $^{-1}$	Seed yield (g plant $^{-1}$)	Biomass plant $^{-1}$ (g)
Irrigated	7.732	0.402	51.417
Dry	5.879	0.364	45.385
Populations	Tillers counted June 23, 2015	Seed collected June 23, 2015	Biomass collected Sept.. 8, 2015
HAG	12.844 a	0.621 ab	78.020 a
CAN	9.938 ab	0.413 ab	66.700 ab
VNI	8.107 ab	0.810 a	51.550 ab
MONET	7.000 ab	0.240 ab	39.460 ab
TURT	6.871 ab	0.397 ab	27.350 b
PAS	5.750 ab	0.282 ab	50.110 ab
MACKLIN	5.323 ab	0.335 ab	49.510 ab
KERNEN	3.710 b	0.211 b	42.770 ab
RM	3.300 b	0.205 b	30.130 ab
C.V.	143.232	185.86	63.693

Populations HAG, VNI and CAN all rank higher for number of reproductive tillers, seed weight and biomass whereas RM ranks as one of the lowest.

Conclusions

As this was the first year of the imposed fall water treatment, no effect on measured parameters (other than biomass) may be noted until 2016 provided that percent soil moisture was significantly different between main treatments at floral initiation in fall of 2015. We do note significant differences between some populations for all parameters (Table 1) suggesting that these differences are due to genotype, not soil moisture.
Biomass production between irrigated and dry plots, although not significant, trends towards decreased production for the irrigated treatment. This was noted in other rough fescue populations undergoing similar treatment[6] where there may be populations that have a threshold of water application for optimal biomass production. Excess moisture may be detrimental to biomass production for some populations therefore further research is required to determine appropriate amounts.

References

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