Plantain (*Plantago lanceolata*) Outperforms Chicory (*Cichorium intybus*) under Moisture Stress in Glasshouse

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The 22nd International Grassland Congress (Revitalising Grasslands to Sustain Our Communities) took place in Sydney, Australia from September 15 through September 19, 2013.

Proceedings Editors: David L. Michalk, Geoffrey D. Millar, Warwick B. Badgery, and Kim M. Broadfoot

Publisher: New South Wales Department of Primary Industry, Kite St., Orange New South Wales, Australia

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Keywords: *Plantago lanceolata*, *Cichorium intybus*

Introduction

Forage chicory (*Cichorium intybus*) and plantain (*Plantago lanceolata*) are now widely used throughout the world as high feed quality perennial herbage (Sanderson *et al.* 2003; Labreveux *et al.* 2006; Li *et al.* 2010; Golding *et al.* 2011; Hutton *et al.* 2011). Both are taprooted plants and are thus likely to confer a degree of drought tolerance through accessing water deeper in the soil profile (Kemp *et al.* 2010). Nie *et al.* (2008) reported chicory can tolerate moisture stress to a greater degree than plantain. However, overall little is known about the effect of moisture stress on plantain and chicory persistence under defoliated conditions.

The objective was to compare plantain and chicory under moisture stress and defoliation under glasshouse conditions.

Methods

Plantain cv. "Ceres Tonic" and chicory cv. "Grasslands Puna Π" seeds were established in separate pots under optimum conditions and thinned to four plants per 10L pot. Plants were then grown under two water treatments (Optimal (100% field capacity) and Stressed (maintained between 36-55% field capacity)) and three defoliation frequencies (1, 2, 3 weeks) for 12 weeks, followed by optimum water levels for a further two week recovery period. Plants were defoliated to 5 cm above the soil.

Results and discussion

There were no interactions (P>0.05) between species, water treatment or defoliation treatment. Plantain yielded 13% more (P<0.05) than chicory during the treatment period and 20% more (P<0.05) during the recovery period (Table 1).

Plant yields were reduced by 29% under the Stressed treatment (P<0.05) compared to the Optimal treatment during the treatment period, however the opposite effect was observed during the recovery period, with the Stressed treatment yielding 45% more (P<0.05). Both species yielded greater (P<0.05) during the treatment period under the 3 week defoliation treatment than the more frequent defoliation treatments. Defoliation treatment had no effect on yield during the recovery period (P>0.05).

Plantain yielded more than chicory under both optimal and moisture stress conditions. In field conditions the taproot of chicory is likely to provide access to water deeper in the soil profile, explaining its perceived superior drought tolerance to plantain (Nie *et al.* 2008).

Conclusion

Both plantain and chicory displayed compensatory recovery growth following severe moisture stress and thus have the potential to survive and yield adequately in drought prone regions provided that defoliation frequency is lenient.

Acknowledgements

The authors thank Steve Ray, Lindsay Sylva and Lesley Taylor at the Plant Growth Unit and Kay Sinclair from INR for their technical assistance.

Table 1. Leaf yield (g) of plantain and chicory during the water treatment period and the recovery period.

		Leaf yield during treatment period (g)	Leaf yield during recovery period (g)
Species	plantain	14.8b	4.2b
	chicory	13.1a	3.5a
	significance	*	*
Water	control	15.7b	3.2a
	very dry	12.2a	4.6b
	significance	***	***
Defoliation	1	12.4a	3.5a
frequency	2	13.3a	3.9a
	3	16.2b	4.2a
	significance	**	NS

NS, not significant ; * P<0.05 ; ** P<0.01 ; *** P<0.001

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