

Effect of elevated temperatures on growth and defense of *Vachellia sieberiana* grown with or without grass

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Background

- Mean global temperature; 1.8 - 4°C by 2099
- Following an increase of 0.4°C over last century (1906 - 2005)
- In Africa, longer growing periods, higher fecundity, higher biomass allocation towards roots.
- Grassland to savanna

Background

- Neighbour removal experiments
- Woody legumes
- If the expected climate change increases the growth rate
- does that increase in growth rate make woody legumes better competitors against grasses?
- Trade-offs in plant defence and growth
 - Fast growth - low defence



Problem statement

- What are the effects of elevated temperatures on growth and defence of seedlings of woody legume species that grow with or without grasses?

Justification

- Availability of knowledge on the performance of woody plants in savanna when exposed to warming



Hypothesis

Elevated temperatures under no competition will increase growth and defence of *Vachellia sieberiana*



Aim and Objective

- To determine the effect of elevated temperature on growth and defence of *Vachellia sieberiana* seedlings grown with or without grasses
- To determine the growth performance and defence response of *Vachellia sieberiana* seedlings under warming

Methods and Materials

- **Study site**

- Ukulinga Research Farm of the University of KwaZulu-Natal Longitude 29°40'E , Latitude , 30 24'S
- Altitude 715m; rainfall 694 mm per annum
- Vegetation: grassland

- **Experimental set up**

- fully crossed randomised design
- design with 5 replicates, 4 treatments and 20 plots
- trial ran from Oct 2017 to Jan 2018

Experimental design

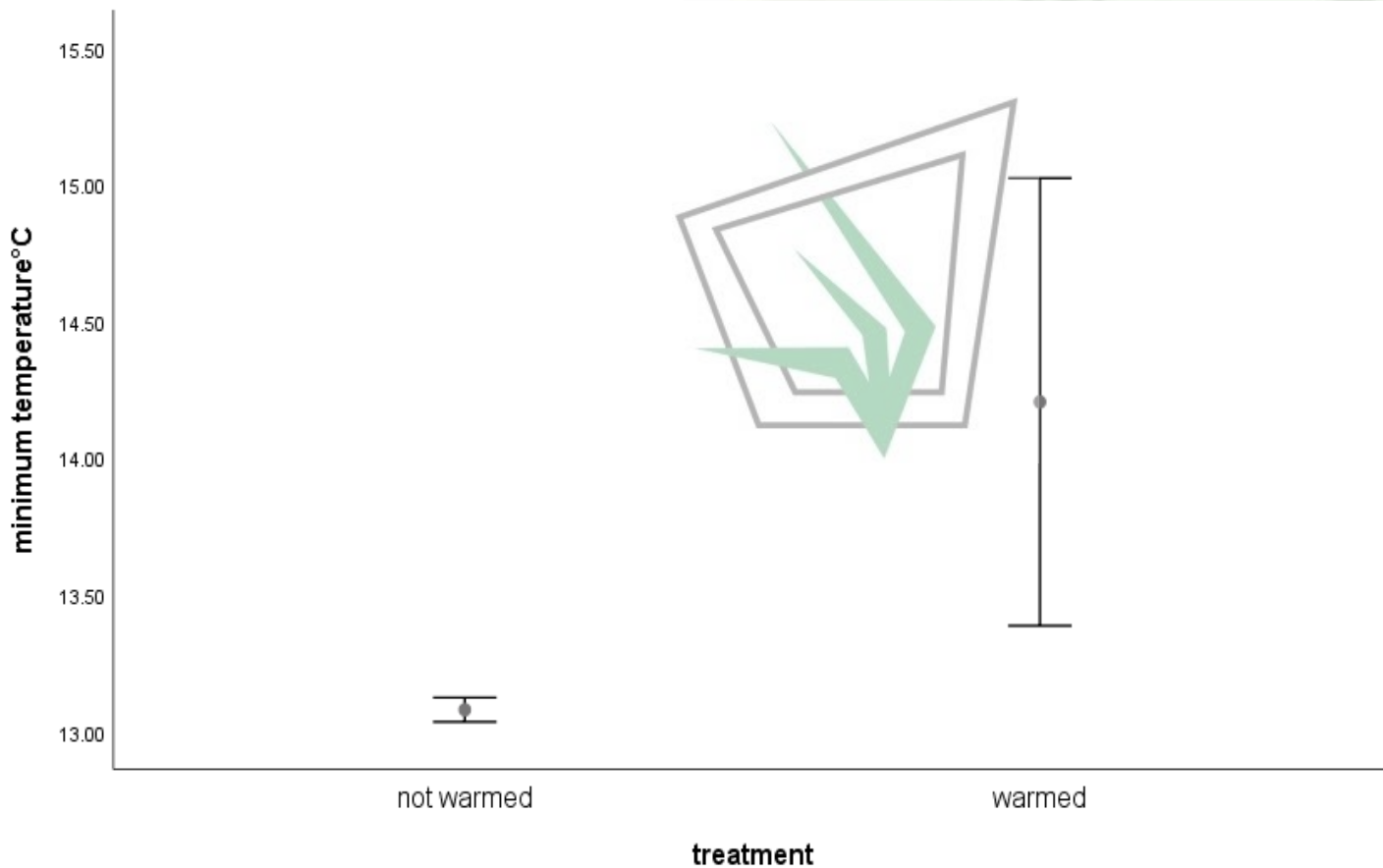


Experimental design

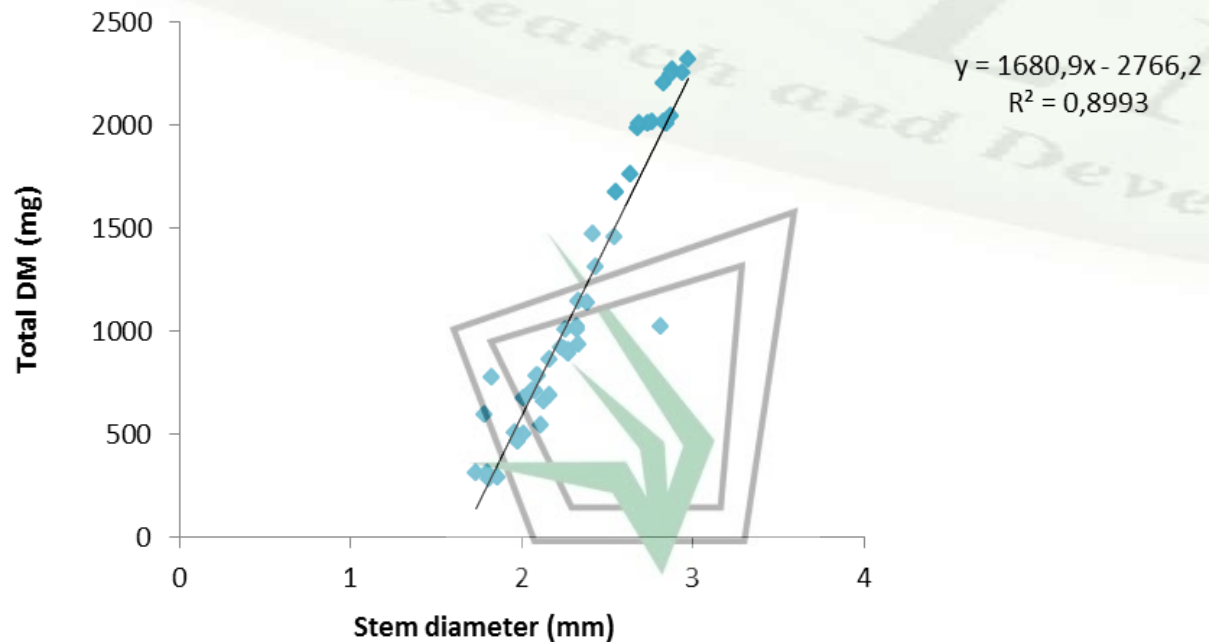


Experimental design cont.....

	t	df	p-value
Temperature	4.373	6	0.048



Experimental design cont.....



$$y = 1680.9 (2.16) - 2766. 2$$

$$= 864.54$$

estimated initial biomass was 864.54 mg

Sampling

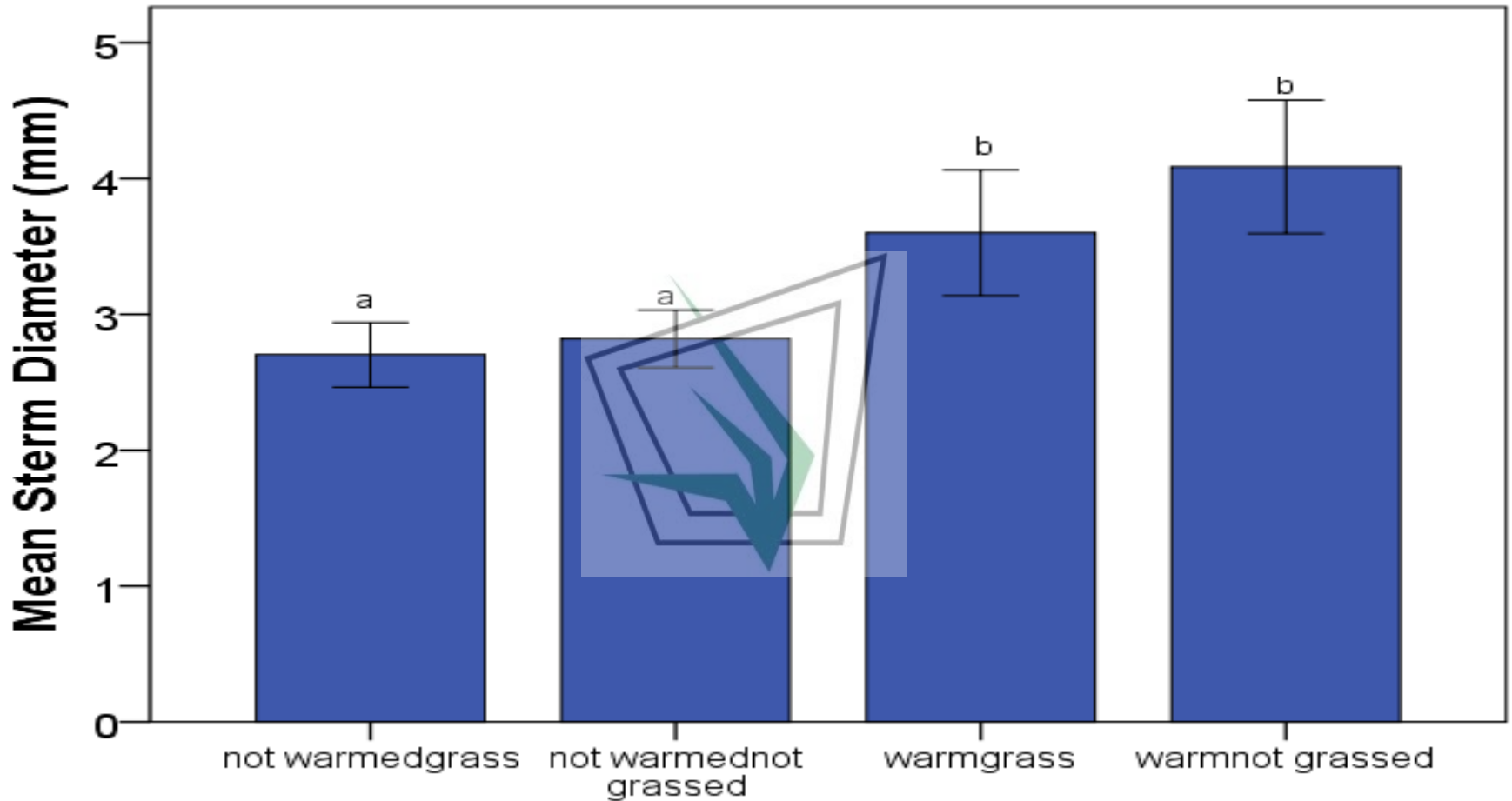
- The initial heights and stem diameter were taken
- Plant height, stem length, stem diameter and thorn length
- Woody seedlings were harvested and dried at 60°C
- Shoots, roots, leaves and total dry matter (DM)



Statistical analysis

- One way ANOVA
 - effect of warming and grass on
 - plant height, stem length, stem diameter, thorn length, roots, leaves, shoots and total dry matter (DM)
 - Means were compared with Bonferroni *post hoc* test to evaluate the interaction of warming and grass

Results and discussion

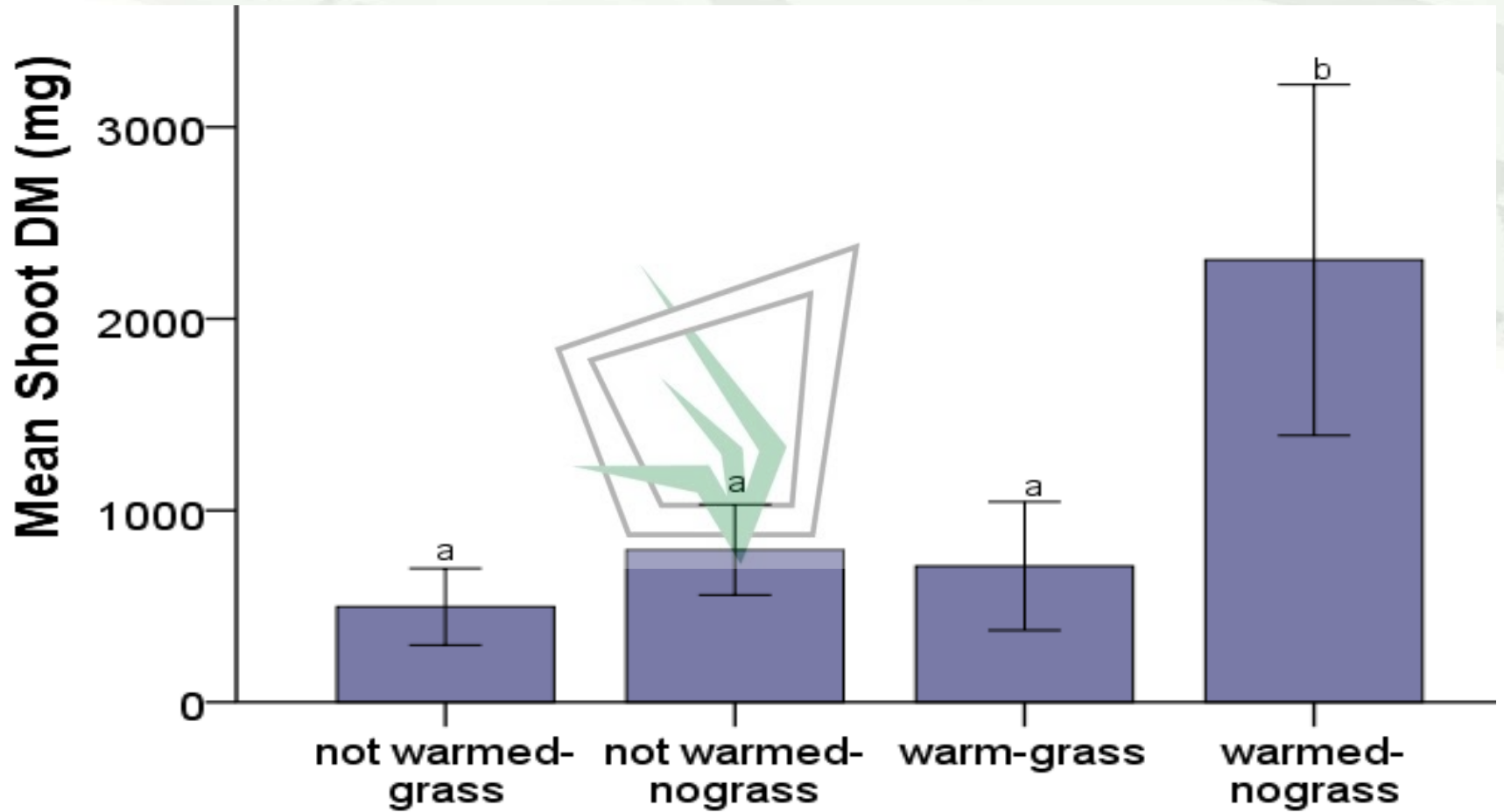


Results and discussion

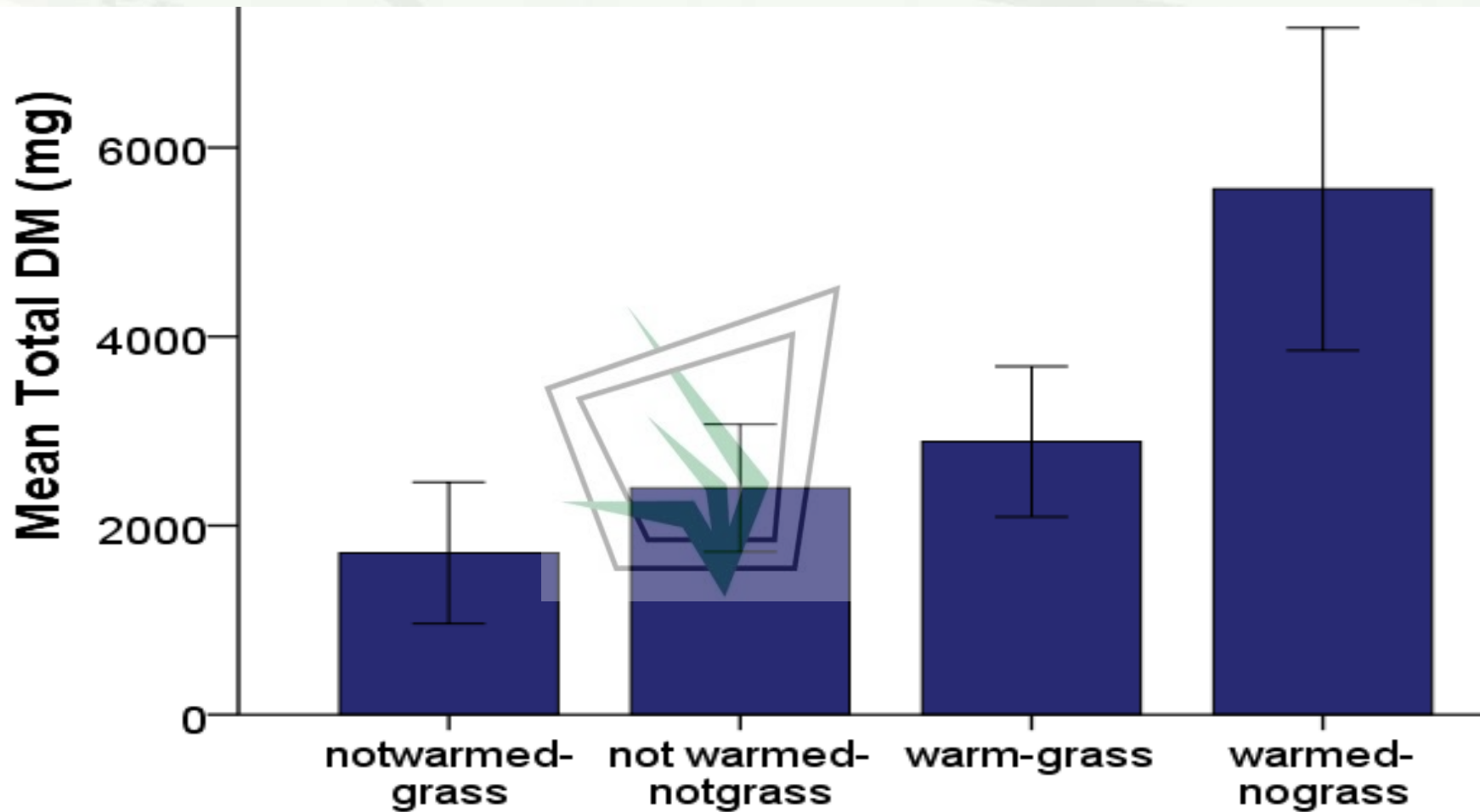
Response variables	Mean \pm Std. error		Warming index
	Warmed	Not Warmed	
Stem length	345.72 \pm 3.21*	256.09 \pm 3.65	1.35
Plant height	377.98 \pm 3.59*	286.81 \pm 3.74	1.32
Leaf DM	833.89 \pm 89*	469.25 \pm 9.68	1.78
Roots DM	1942.3 \pm 15.41*	960.70 \pm 12.99	2.02

* $p < 0.05$

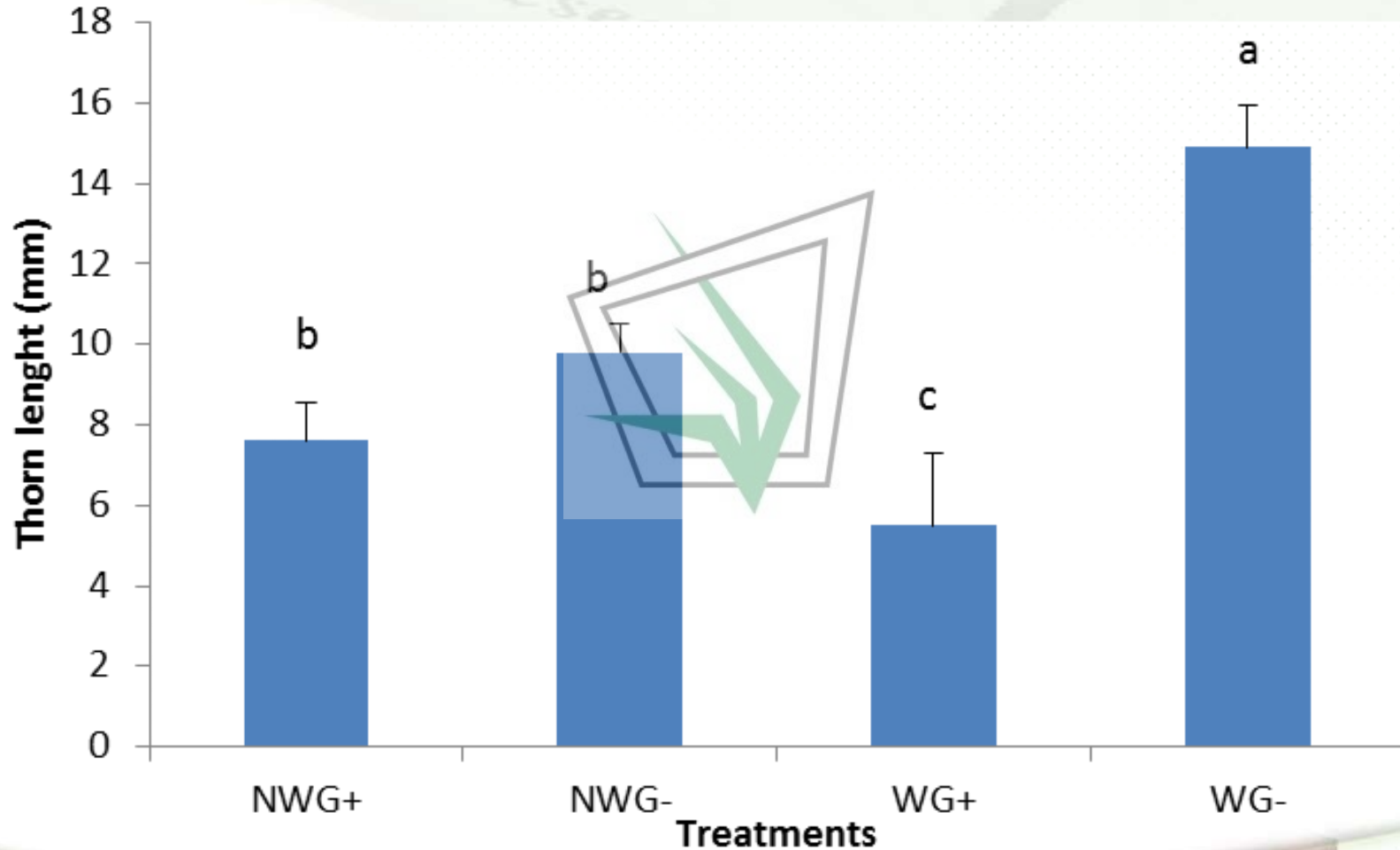
Results and discussion



Results and discussion



Results and discussion continued..



Conclusion

- Warming was more beneficial than grass cover removal for growth
- Regardless of grass cover, the rate of woody encroachment will increase as temperature rises
- *V. sieberiana* at $\sim 1^{\circ}\text{C}$ showed to have high growth and high defence in terms of thorn length



Acknowledgements

- Dr A. Clulow
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- Dr M. Tedder



Thank you



Thank you

Hey *Capra hircus*, this global warming worries me. We might be out of food soon. How do you feel?

Not sure *Bos taurus*...I might have a lot to eat, just worried about thorn length

