



Supplemental nutrients increase the consumption of chemically defended shrubs by free-ranging herbivores

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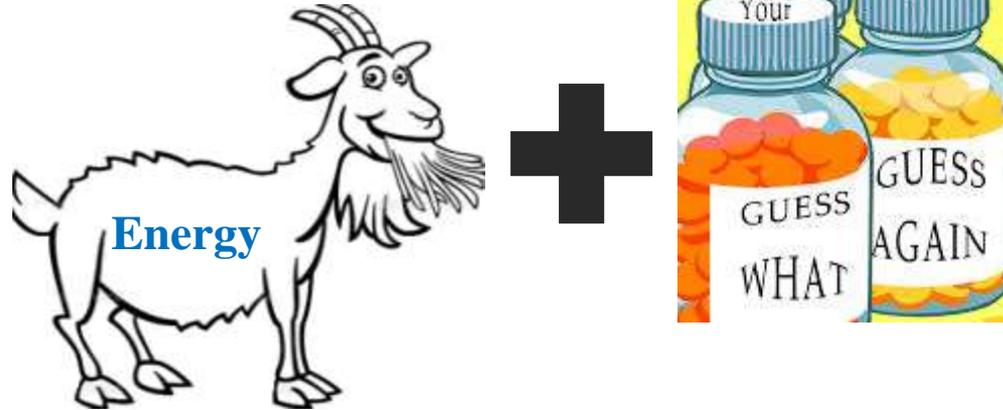
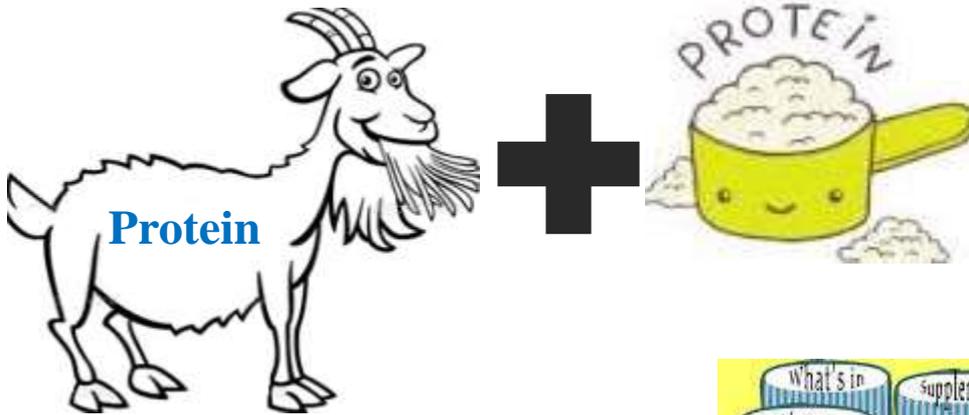
How herbivore contend with PSM

Herbivores are predicted to increase the intake of chemically defended plants as long as their **capacity** to neutralize and excrete chemical defences is not exceeded.

Capacity = liver enzymes, energy and amino acid precursors

Thus, nutrient deficiencies reduce animal's capacity

Evidence for this detoxification limitation hypothesis



increased intake of
sagebrush,
unpalatable shrubs in
the **Mediterranean**
systems

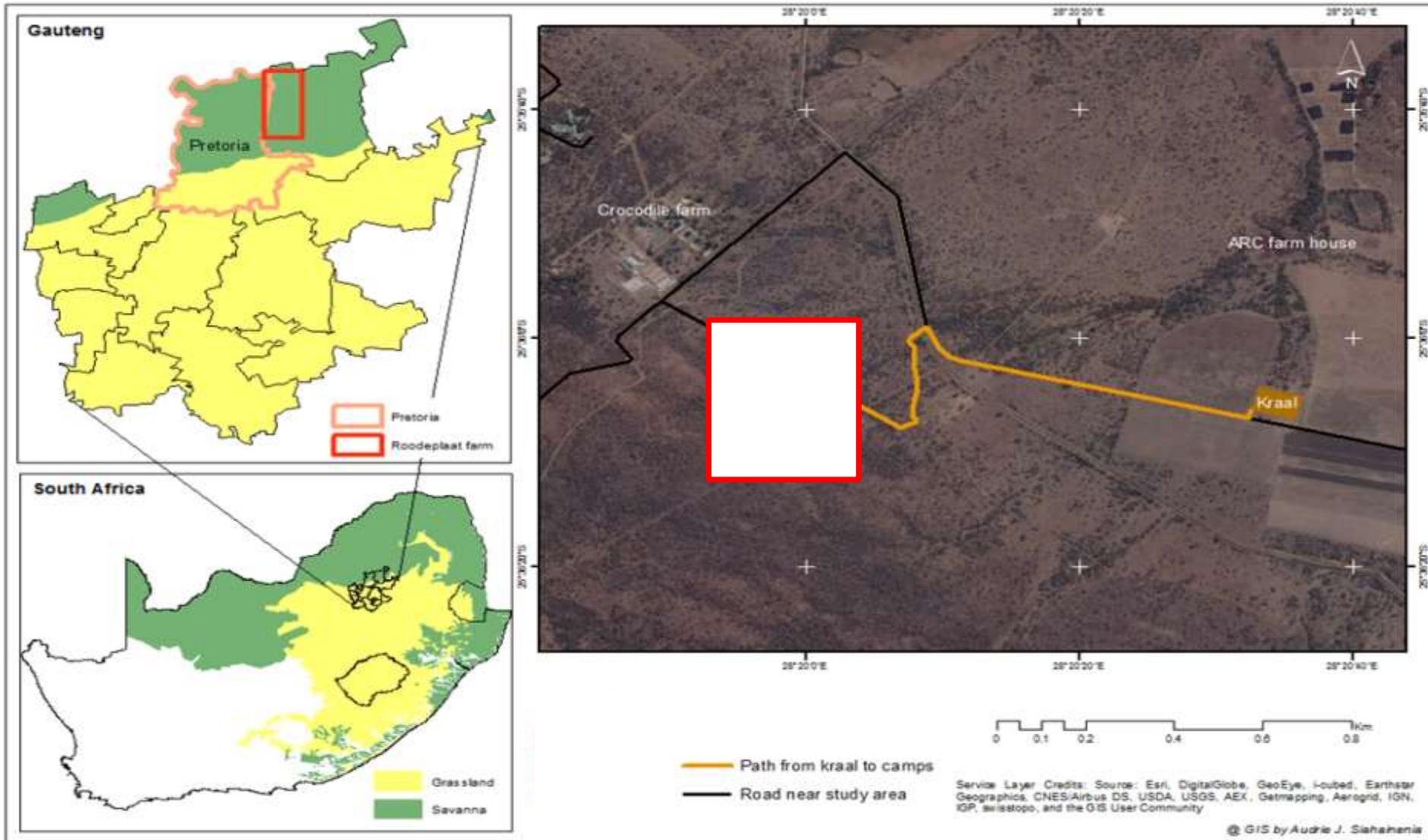
Tannins are unique to toxins

But this hypothesis has not been tested in the African savannas which are predominantly defended by **condensed tannins** and other CBSMs

Objective

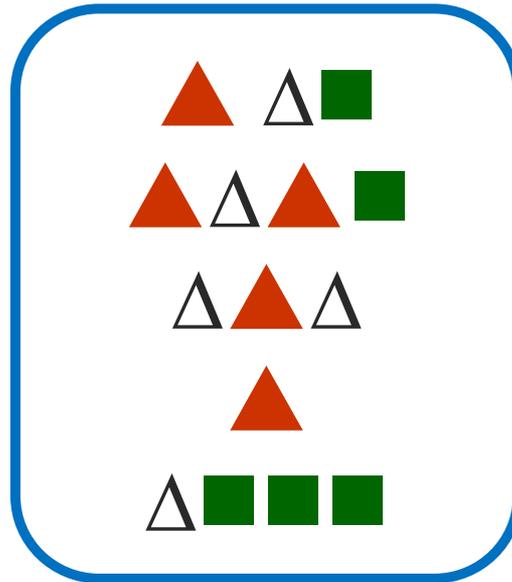
Investigate the effects of high-protein and high-energy supplementation on woody plant use by free-ranging goats in a semi-arid savanna.

Roodeplaat Farm (in July 2013)



Experimental Design

Each paddock was stocked with 15 indigenous female goats (± 1 year old)

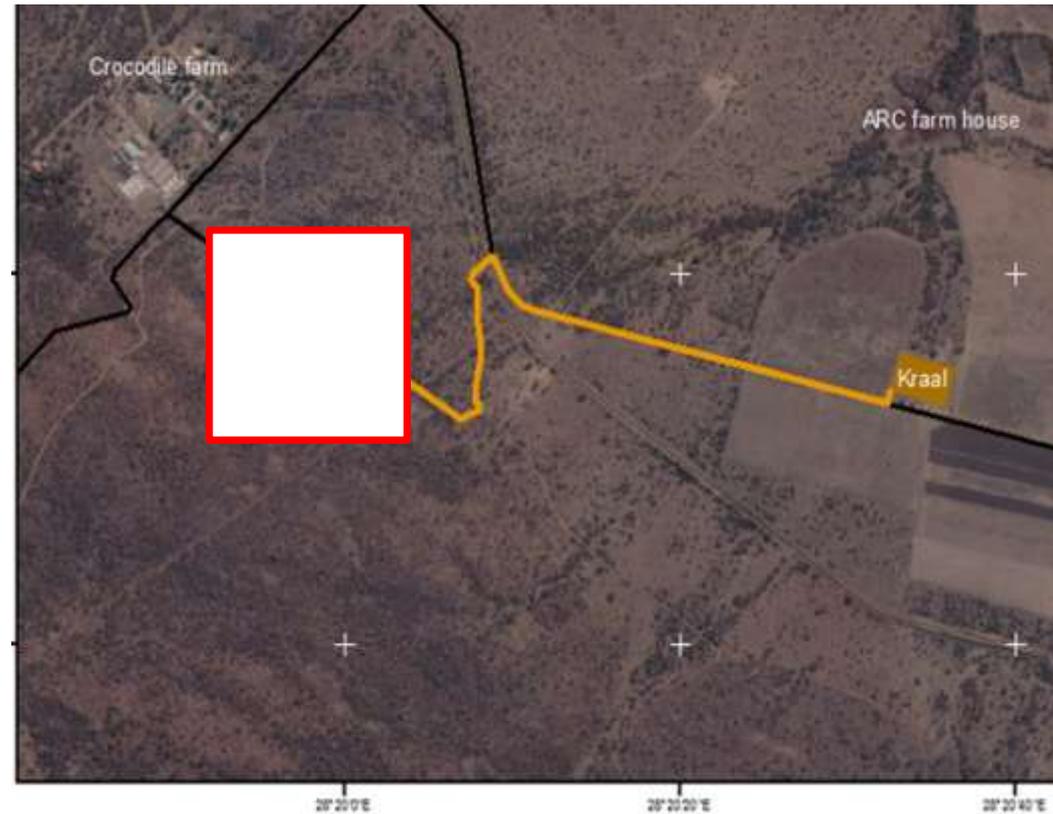


Every morning for 15 days, 15 goats were individually offered supplements then released into the field.

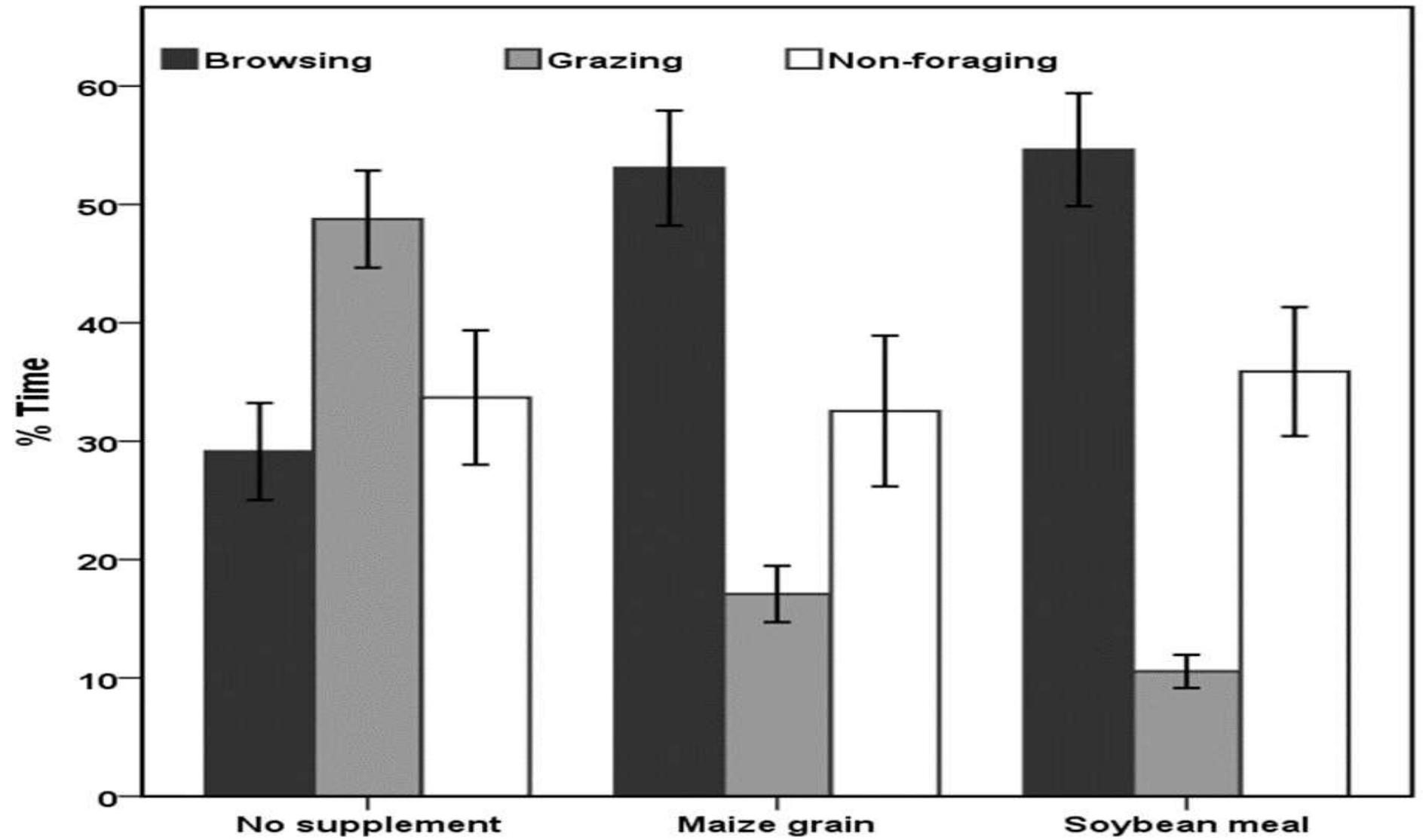
- 5 goats (▲) = supplemented with 100g yellow maize gain (high-energy)
- 5 goats (△) = not supplemented (control group)
- 5 goats (■) = supplemented with 100g soybean meal (High-protein)

Data collection

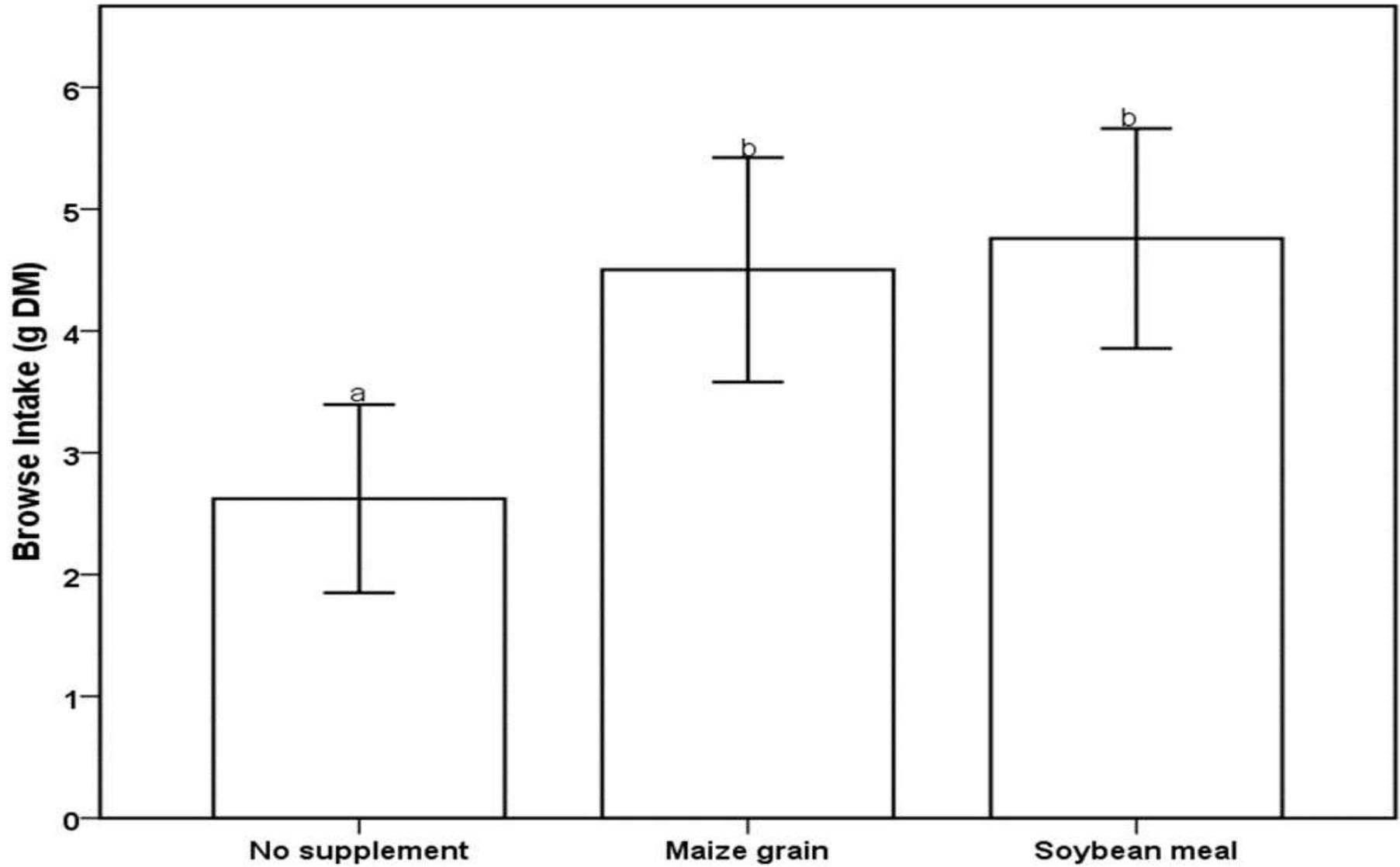
- **Number of bites**
- **Time spent on different activities** (grazing, browsing, no-feeding)
- **Dietary [CT]s**
- **% inclusion of each forage in diet**



Results

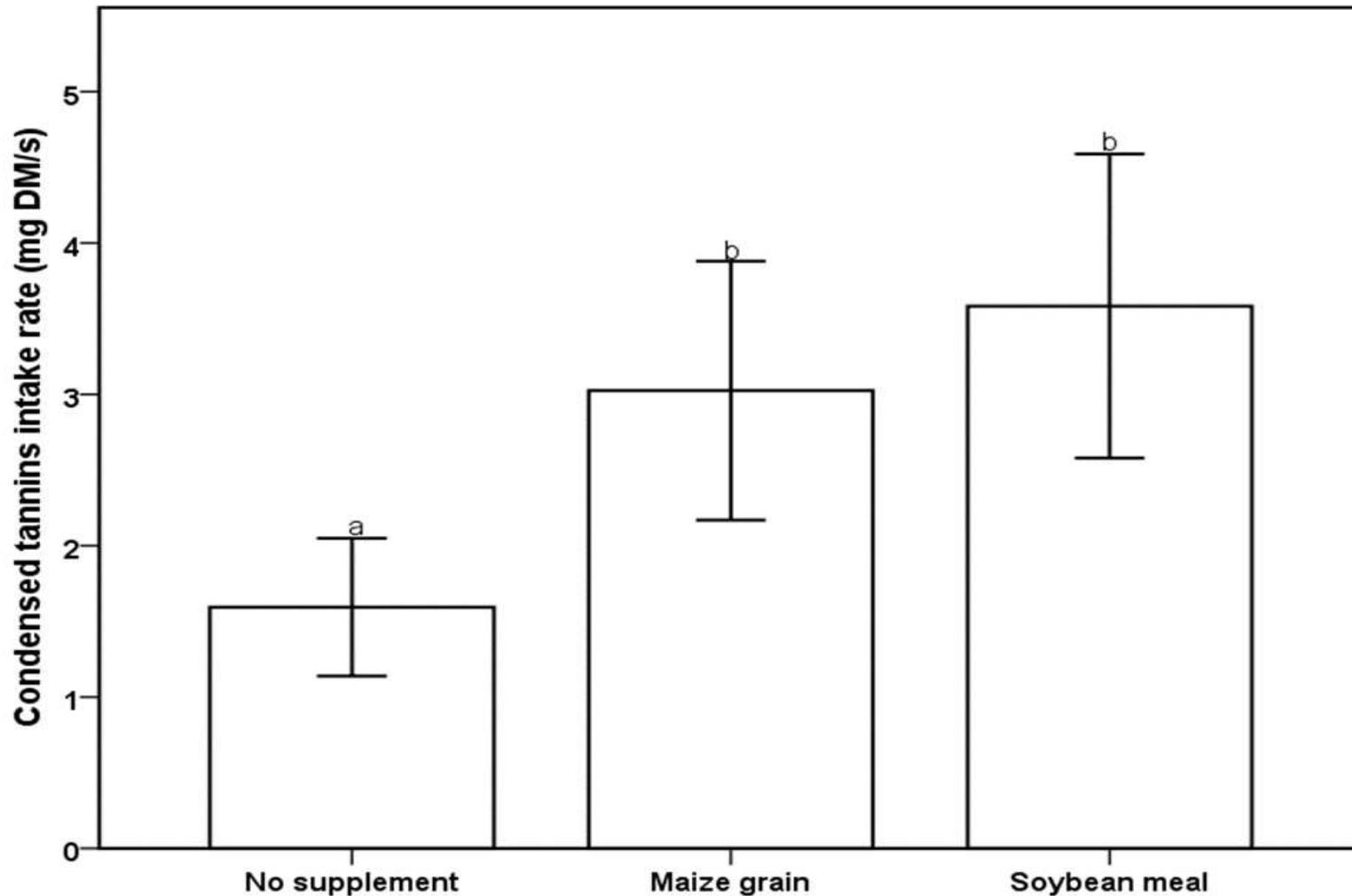


Results



Results

How nutrient supplementation affects CT intake rates



Results

Forage Species	CT (mg/g)	Treatment (% inclusion in diet)		
		Control	High Protein	High Energy
<i>Carissa bispinosa</i>	95.6	0.1^a	3.1^b	1.2^b
<i>Scolopia zeyheri</i>	72.8	0.4 ^a	0.0 ^a	0.2 ^a
<i>Euclea crispa</i>	69.0	2.4^a	29.9^b	16.3^b
<i>Gymnosporia buxifolia</i>	68.9	1.1^a	4.7^b	3.9^b
<i>Grewia flava</i>	48.6	0.5 ^a	0.8 ^a	0.8 ^a
<i>Pappea capensis</i>	48.5	1.4 ^a	1.5 ^a	0.8 ^a
<i>Ziziphus mucronata</i>	40.5	8.8^a	18.6^b	28.6^b
<i>Barchemia zeyheri</i>	28.2	0.4 ^a	1.8 ^a	0.9 ^a
<i>Acacia robusta</i>	16.3	1.3 ^a	4.1 ^a	2.4 ^a
Herbs	7.1	6.1 ^a	9.4 ^a	8.2 ^a
<i>Acacia nilotica</i>	4.9	0.4 ^a	0.6 ^a	0.5 ^a
Grass	2.2	73.7^a	20.3^b	29.5^b
<i>Ehretia rigida</i>	1.4	1.0 ^a	1.0 ^a	1.7 ^a
<i>Aloe greatheadii</i>	0.7	2.4 ^a	4.3 ^a	5.0 ^a

Conclusions

- Protein and energy supplementation improved the use of high condensed tannin containing savanna shrubs by goats.
- Results indicate that post-ingestive feedback is an important basis for palatability.
- Responses of goats to nutrient supplementation highlight opportunities for management of savannas.

Implications for Savannas

Future will favour animals that can better eat woody plants than grasses

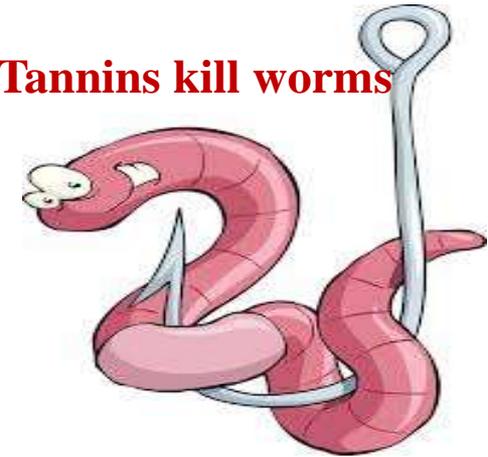
carbon-based defences
and less nutrients in
plants = projected



Possibility to use mixed-feeders and browsers to control bush encroachment

Implications

Tannins kill worms



Less reliance on anthelmintic drugs

Health implications



Dietary tannins reduce methane emissions in ruminants



Climate change implications



Thank you!

