Yield and mineral contents of native pastures in six semi-arid communal grazing lands located in three soil types: Effect of protection and season

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1. BACKGROUND

- Within communal areas in SA, grazed rangeland are virtually the sole source of feed for both domestic and wild ruminants
- Low forage production and deteriorating conditions of rangelands have been widely reported under continuous grazing practised in many extensive of these communal lands

2. PROBLEM STATEMENT

- In the EC province, there is a lack of adequate data on the protected and unprotected distribution of forage biomass and nutrients, and the response of these variables to distance gradient

3. JUSTIFICATION

- Understanding the yield potential and nutrient contents of protected and unprotected will aid determination of the adequacy of nutrients intake, and
- formulation of fodder flow plan to ensure adequate nutrients supply throughout the year

4. OBJECTIVES

- The objectives of the current study were therefore to determine the yield potential and mineral (P, K, Ca, Mg, Fe, Cu, Zn and Mn) content of grasses
- i) along a distance gradient from the fence-line, and
- ii) between protected and unprotected grazing lands under three soil types

5. MATERIALS AND METHODS

Communal rangeland	**Soil type**
Calderwood & Phumlani	Shallow-yellow-red stony ground (SYRSG)
Cwarhu, Ngwenya & Sakhi	Deep-pale brown alluvium sands (DPBS)
Madubela	Deep dark loamy (DDL)

6. Site selection and lay out

- In each communal area, six transects radiating out from the fencing line along the main road were established (length 1-2km).
- Each transect was divided to form sub–transects with initial points at
- near within 100 m, middle (> 100 - ≤ 300 m) and
- far sites (>- 300 m) away from the fence depending on the vegetation change.

7. Data collection

- In each communal area, two 1 m x 1m enclosures were erected in the near, middle and far site (2015),
- Grass species were harvested within the enclosure & outside enclosure for biomass yield determination and mineral analysis.
- Plants were harvested at a stubble height of 2-4 cm from the ground (2016).

8. Statistical analysis

- GLM procedure of SAS (2001) to test differences between protected & unprotected,

  seasons (wet & dry) and

  distance gradients (near, middle & far)

Table 1. Mean biomass yield (kg ha-1) of protected and unprotected grass layer along distance gradient in three soil types

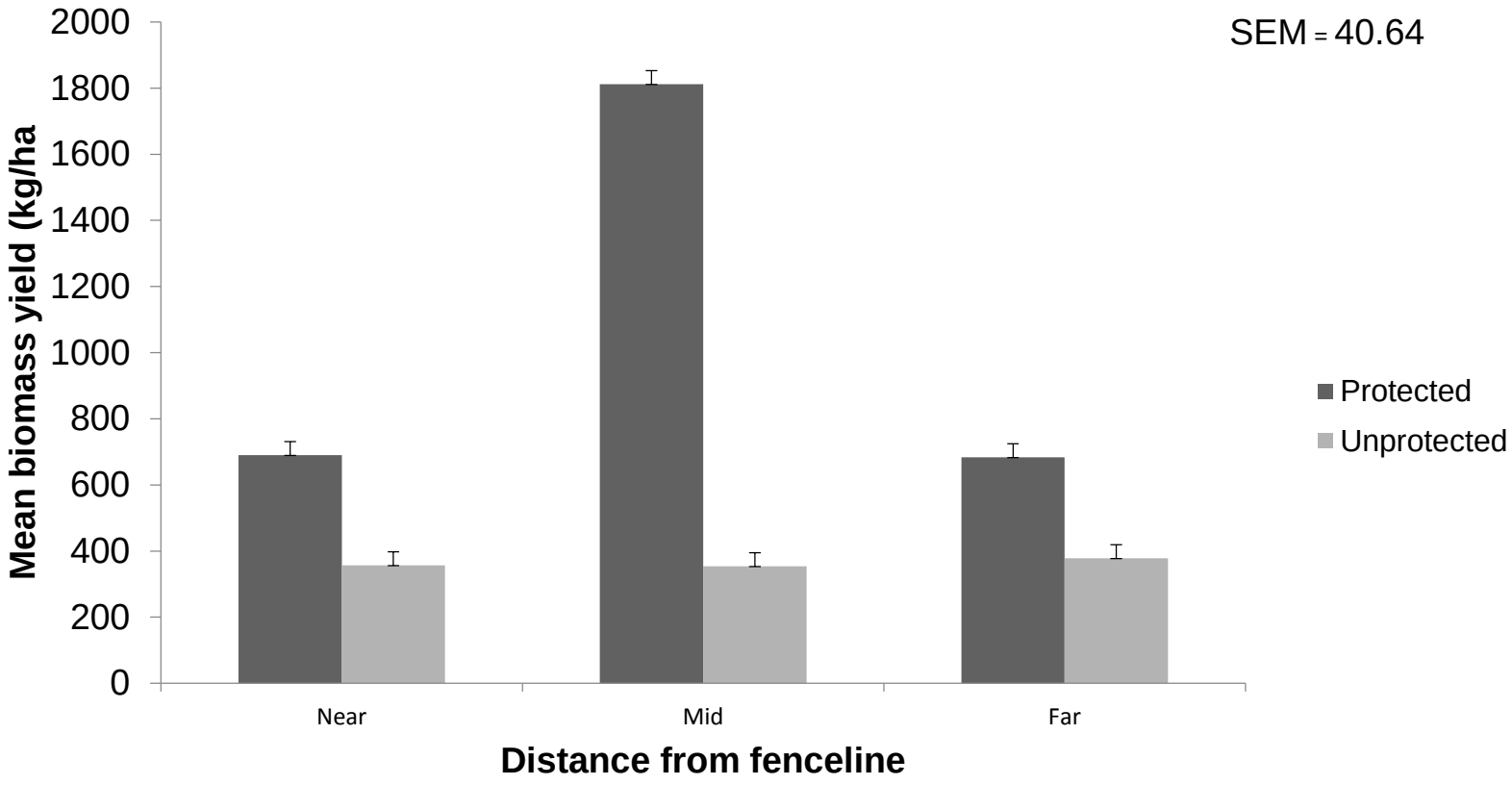

Table 2. Mean biomass yield (kg ha^{-1}) of the protected and unprotected grass layer in two different season in three soil types

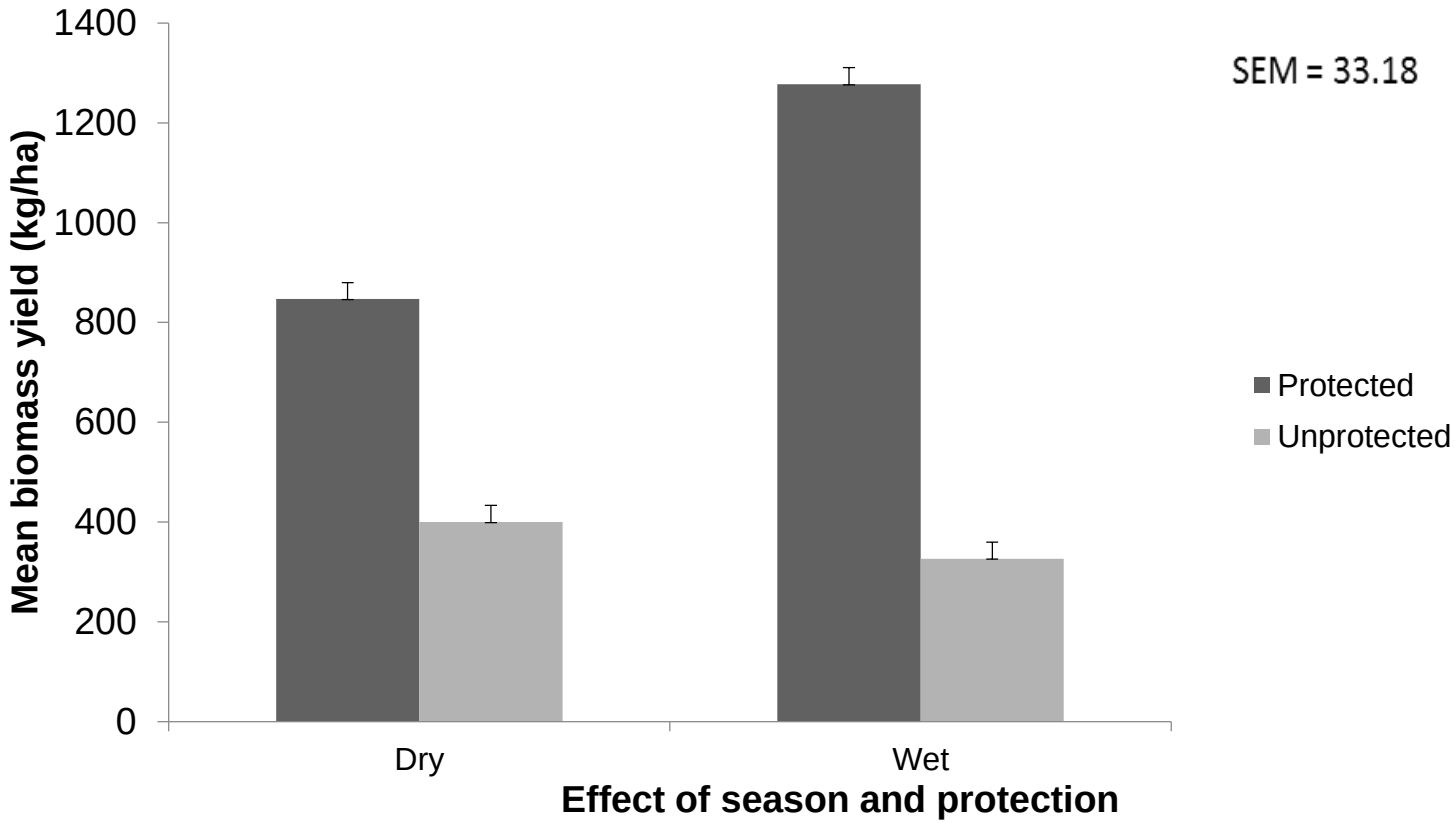

Table 3. Mineral concentration of bulked grasses between protected and unprotected in two different seasons in three soil types

	Season				
	Wet		Dry		
Minerals	Protected	Unprotected	Protected	Unprotected	SEM
P (gkg^{-1})	1.48[a]	1.47[a]	1.01[b]	0.87[b]	0.11
K (gkg^{-1})	15.97[a]	15.76[a]	8.69[b]	7.47[b]	0.91
Ca (gkg^{-1})	3.51[a]	3.43[a]	3.58[a]	3.57[a]	0.16
Mg (gkg^{-1})	1.35[a]	1.31[a]	1.14[b]	1.12[b]	0.06
Fe ($mgkg^{-1}$)	278.84[a]	260.03[a]	528.49[a]	415.63[b]	37.64
Cu ($mgkg^{-1}$)	4.59[a]	4.06[a]	3.32b[b]	2.86[b]	0.33
Zn ($mgkg^{-1}$)	22.83[a]	21.49[a]	24.13[b]	25.96[b]	1.76
Mn ($mgkg^{-1}$)	102.98[a]	87.39[a]	88.773[a]	65.89[b]	9.63

[a, b, c] Means in the same row with different superscripts are significantly different ($p<0{\cdot}05$). SEM, standard error of means.

Table 4. Mineral concentration of bulked grasses along distance gradient in three soil types

	Distance gradient from fenceline (m)			
Minerals	Near	Middle	Far	SEM
P (gkg^{-1})	1.36^{a}	1.14^{b}	1.30^{ab}	0.07
K (gkg^{-1})	15.97^{a}	13.50^{b}	14.96^{ab}	0.74
Ca (gkg^{-1})	4.20^{a}	4.10^{a}	4.15^{a}	0.10
Mg (gkg^{-1})	1.33^{ab}	1.36^{a}	1.23^{b}	0.05
Fe ($mgkg^{-1}$)	334.75^{a}	349.28^{a}	324.44^{a}	36.68
Cu ($mgkg^{-1}$)	3.55^{a}	3.08^{a}	3.13^{a}	0.20
Zn ($mgkg^{-1}$)	24.25^{a}	20.56^{a}	18.87^{a}	2.86
Mn ($mgkg^{-1}$)	73.79^{a}	69.06^{a}	53.84^{b}	4.68

Means in the same row with different superscripts are significantly different ($p<0{\cdot}05$)

SEM, standard error of means

Table 5. Mineral concentration of bulked grasses in two different seasons along the distance gradient

Mineral	Season	Near	Middle	Far	SEM
P (gkg^{-1})	Dry	1.26^{Aa}	0.87^{Bb}	0.97^{Bb}	0.10
	Wet	1.47^{Aa}	1.41^{Aa}	1.63^{Aa}	0.10
K (gkg^{-1})	Dry	12.15^{Ba}	7.87^{Bb}	10.05^{Bab}	1.05
	Wet	19.80^{Aa}	19.12^{Aa}	19.88^{Aa}	1.05
Ca (gkg^{-1})	Dry	4.16^{Aa}	3.73^{Bb}	3.70^{Bb}	0.14
	Wet	4.23^{Aa}	4.47^{Aa}	4.60^{Aa}	0.14
Mg (gkg^{-1})	Dry	1.23^{Ba}	1.22^{Ba}	1.08^{Ba}	0.07
	Wet	1.43^{Aab}	1.51^{Aa}	1.38^{Ab}	0.07
Fe ($mgkg^{-1}$)	Dry	439^{Aa}	491.50^{Aa}	410.11^{Aa}	51.87
	Wet	230.45^{Ba}	207.07^{Ba}	238.77^{Ba}	51.87
Cu ($mgkg^{-1}$)	Dry	3.22^{Aa}	2.57^{Bab}	2.38^{Bb}	0.29
	Wet	3.89^{Aa}	3.60^{Aa}	3.87^{Aa}	0.29
Zn ($mgkg^{-1}$)	Dry	20.28^{Aa}	16.15^{Aa}	19.22^{Aa}	4.04
	Wet	28.22^{Aa}	24.98^{Aa}	18.53^{Aa}	4.04
Mn ($mgkg^{-1}$)	Dry	76.43^{Aa}	79.44^{Aa}	64.79^{Aa}	6.63
	Wet	71.15^{Aa}	58.68^{Bab}	42.90^{Bb}	6.63

^{A,B} In a column, means with the same uppercase superscripts do not differ ($P > 0.05$); ^{a,b,c} In a row, means with the same lowercase superscripts do not differ ($P > 0.05$)

- SEM: standard error of means

9. Conclusion and recommendation

- The study indicated that forage availability, and the resultant low nutrient intake, may limit animal production in the communal areas investigated and subsequently, most periods of the year.
- Therefore, resting these rangelands for at least two years may improve the forage production and nutrient intake.

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