Cattle Grazing Preference Among Four Clover Species

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Introduction

- Reliance on forage legumes use in temperate grassland systems declined because of readily available inorganic N fertilizer from the 1950's and lack of persistence of legumes (Laidlaw, 2014).

- Recent research has shown that legume-based systems can be as profitable as grass systems heavily dependent on high rates of fertilizer input (Rochon et al., 2004).

- Benefits of N fixation and greater forage quality of legumes than grasses are well known.

- Further, the energy-saving and emissions-reducing features of legumes confer advantages for their inclusion in sustainable forage-based systems (Laidlaw, 2014).

- With the increasing cost associated with N fertilizer, along with the called for more sustainable approaches to forage-livestock farming, forage legumes incorporation in grassland systems can no longer be overlooked.

- Producers in the southeastern United States, frequently asked the question which clover species should be included in their pastures.

- Apart from agronomic traits used in forage legumes selection, animal preference can provide additional insights into the selection of forage legumes for pasture inclusion.

Objective

- To determine cattle preference of different clover species and its relationship with clover structural and chemical characteristics.

Materials and Methods

- Study site: Iberia Research Station Jeanerette, LA. The soil type is classified as Iberia silty clay loam.

- The four clover species used in this study, were selected based on their popularity (acreage cultivated) by producers in the Gulf Coast Region of Louisiana.

Treatments and Experimental Design
Clover species:
1. White Clover (*Trifolium repens* L.) cv. 'Ladino'
2. Ball Clover (*Trifolium nigrescens* Viv.) cv. 'Grazer's Select'
3. Red Clover (*Trifolium pratense* L.) 'Kenland'
4. Berseem Clover (*Trifolium alexandrium* L.) cv. 'Bigbee'

- The four clover species were arranged in a 4 × 4 Latin Square design experiment.

- Plots were 10 × 10 m in size and separated by 2-m alleyways.

- There were two sets of plots, called 'grazing units' adjacent to each other and separated by 12-m alleyway.

- Each grazing unit was randomized separately and enclosed by an electric fence .

- Seeding rate was: White clover 5 kg PLS ha^{-1}, Ball Clover 5 kg PLS ha^{-1}, Red clover 12 kg PLS ha^{-1}, Berseem clover 20 kg PLS ha^{-1} and all were seeded early October, 2013.

- P and K fertilizers were applied at 60 kg ha^{-1} each at planting based on soil test results.

- Grass and broadleaf weeds were controlled using Poast (Sethoxydim) and Butyrac (2,4-DB) respectively.
Animal Grazing
- Six Angus crossbred yearling steers (initial BW 230±11 kg) grazed each unit for 48-hours duration.

- There were three grazing periods based on herbage mass (March 14, April 28, and May 30, 2014).

Materials and Methods cont'd

- Grazing observation was done twice daily (0700 to 1000 h and 1500 to 1800 h) for 2 d on each grazing unit during each grazing period.

- Time animals spent grazing on each plot in each grazing unit was recorded.

Forage Measurement
- Pre- and postgraze herbage mass on each plot using a rising plate meter was estimated using a double sampling technique (Burns et al., 1989).

- Forage samples were collected for nutritive value and morphological characteristics (leaf, stem, and dead material).
Animal Preference
- Based on:
1. Herbage disappearance (pregraze HM – postgraze HM)
2. Chesson-Manly (CM) Index
3. Grazing time

- **CM Index:** $\propto_i = \dfrac{\ln[1 - (\text{consumed}_i/\text{available}_i)]}{\sum_{j=1}^{m} \ln[1 - (\text{consumed}_j/\text{available}_j)]}, i = 1, \ldots\ldots m$

Statistical Analysis
- Responses were analyzed by fitting mixed models using PROC MIXED in SAS.

- Grazing observation periods were considered as repeated measures.

- Also, treatment means for upright (Red and Berseem clovers) and prostrate (White and Ball growing clovers) were separated using single degree contrast.

- Correlation relationships among response variables were determined.

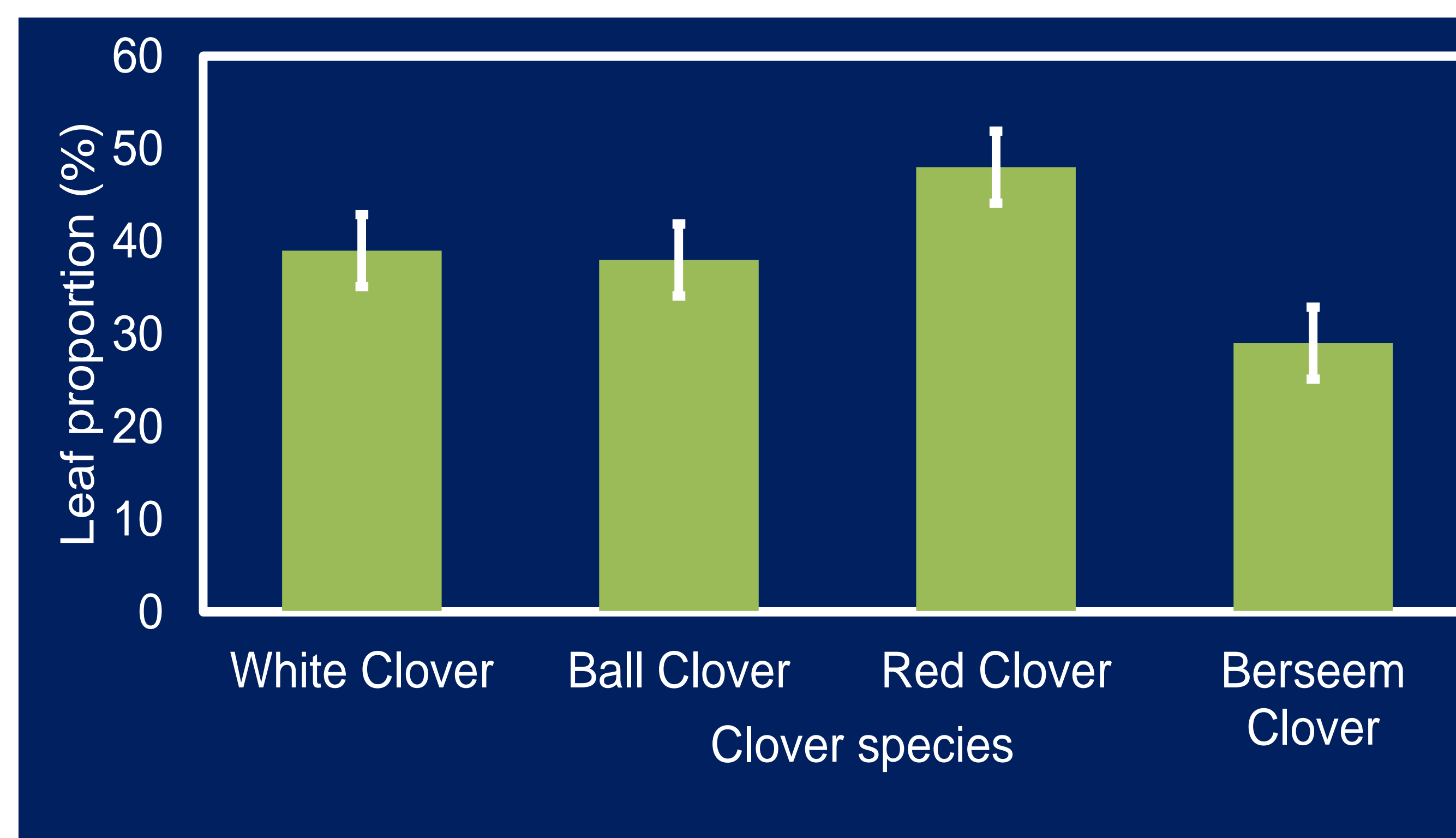- Responses were considered different at $P < 0.05$.

Results

Pre- and postgraze herbage mass of four clover species used for cattle grazing preference determination during the winter-spring season of 2014.

| Grazing Period	White Clover	Ball Clover	Red Clover	Berseem Clover	SEM
		Clover Species			
	--------------------------Pre HM kg DM ha^{-1} ----------------------------				
14-Mar	1900^{Ab†}	1950^{Ab}	1940^{Ac}	2140^{Ab}	50
28-Apr	2360^{Ba}	2380^{Ba}	2940^{Aa}	2550^{ABa}	50
30-May	1940^{BCb}	1860^{Cb}	2420^{Ab}	2320^{ABb}	50
	--------------------------Post HM kg DM ha^{-1} ----------------------------				
14-Mar	1460^{Ab}	1390^{Ac}	1450^{Ac}	1460^{Ab}	50
28-Apr	1750^{Ba}	1760^{Ba}	1950^{Aa}	1940^{Aa}	50
30-May	1530^{Bb}	1600^{Bb}	1820^{ABb}	1860^{Aa}	50

† Within rows, means with same uppercase letter superscripts are not different ($P > 0.05$). Within columns, means with same lowercase letter superscripts are not different ($P > 0.05$).

Leaf proportion of four clover species used for cattle grazing preference determination during the winter-spring season of 2014.


Results cont'd

Herbage disappearance of four clover species used for cattle grazing preference determination during the winter-spring season of 2014.
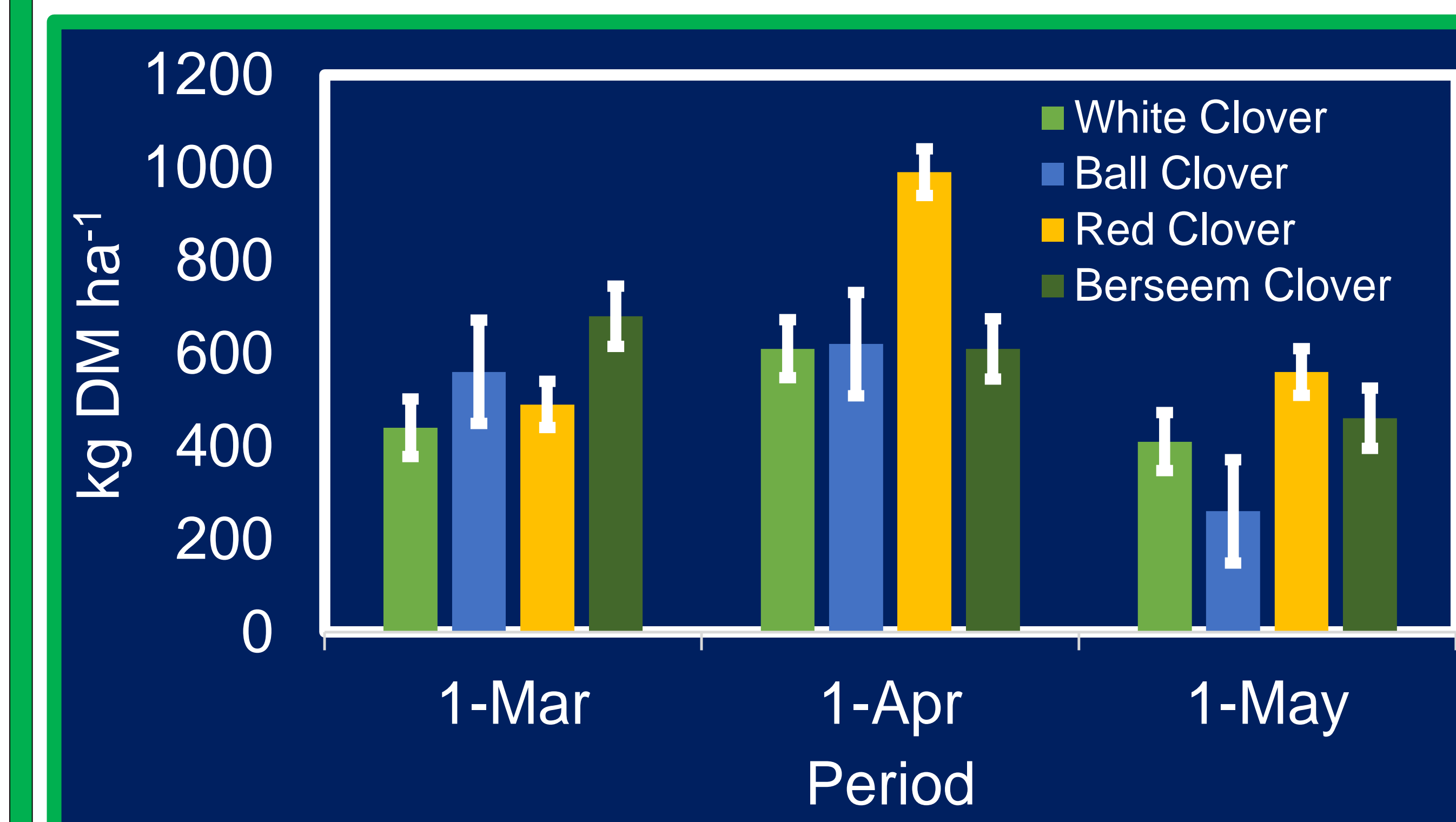
The relationship between pregraze herbage mass and herbage disappearance of four clover species used for cattle grazing preference determination during the winter-spring season of 2014.

$y = 0.5983x - 770.98$
$R^2 = 0.788$
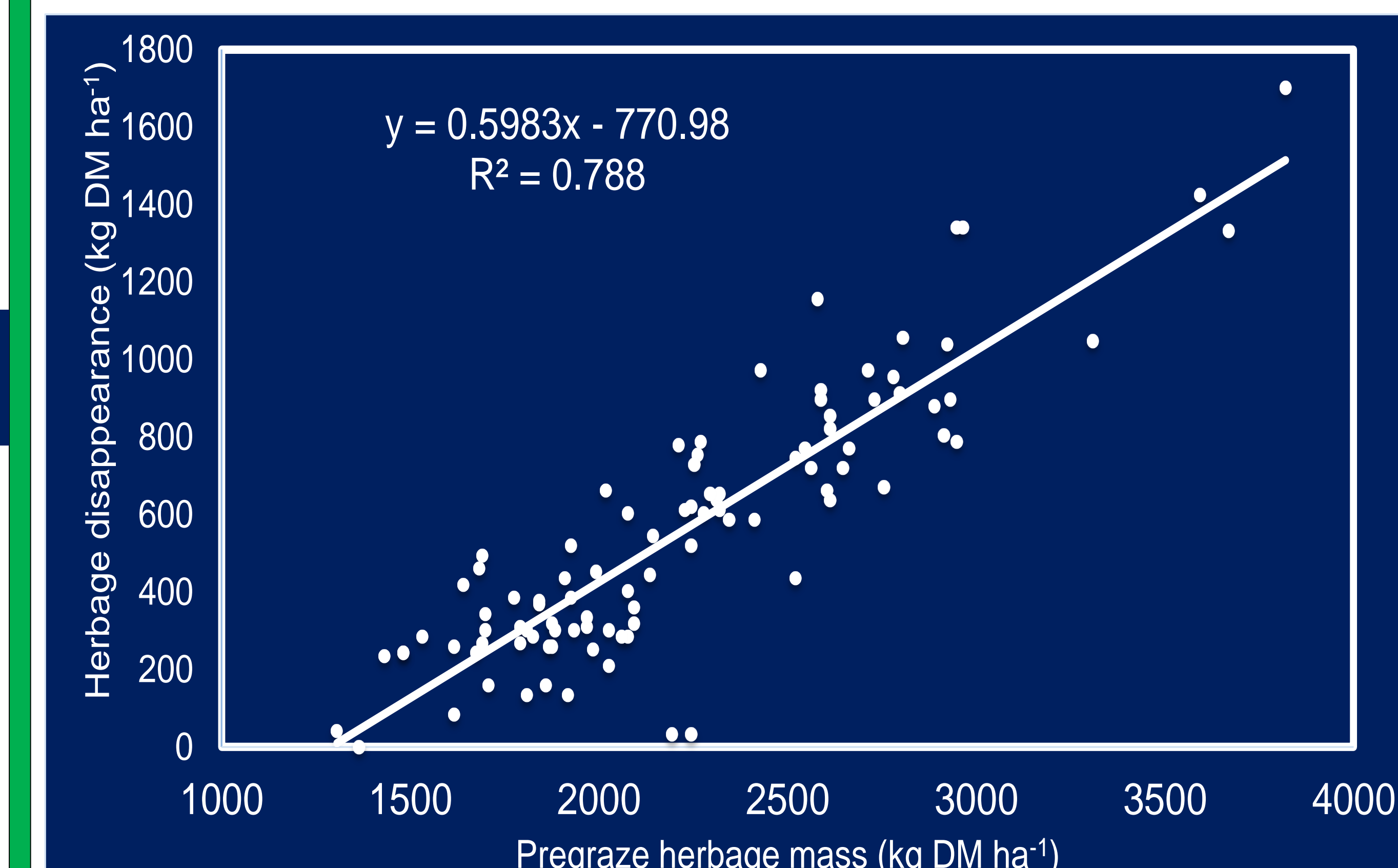
Summary

- Cattle showed no definitive preference among the four clover species.

- Based on the average herbage disappearance across the three grazing periods, cattle showed greater preference for the upright (Red and Berseem clovers) compared to the prostrate growing species (White and Ball clovers).

- The animals spent similar time grazing clover species.

- Pregraze herbage mass during the second and third sampling periods was greater for red clover than white and ball clovers.

- Averaged across the three sampling dates, the proportion of leaf ranked greatest for red clover compared to white, ball, and berseem clovers.

- In this study, pregraze HM was the forage parameter strongly linked to preference.

References

- Burns, J.C., H. Leppke, and D.S. Fisher. 1989. The relationship of herbage mass and characteristics to animal responses in grazing experiments. p. 7–19. *In* G.C. Marten (ed.) Grazing research: Design, methodology, and analysis. CSSA Spec. Publ. No. 16. CSSA, Madison, WI.

- Laidlaw, S. 2014. Forage legumes in grassland systems. Grass Forage Sci. 69:205.

- Rochon, J.J., C.J. Doyle, J.M. Greef, A. Hopkins, G. Molle, M. Sitzia, D. Scholefield, and C.J. Smith. 2004. Grazing legumes in Europe: a review of their status, management, benefits, research needs and future prospects. Grass Forage Sci. 59:197-214.