

***In vitro* ruminal fermentation and digestibility of  
*Eragrostis* hay supplement with forages of selected  
accessions of *Stylosanthes scabra***

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# Introduction

- Grasses are important and cost-effective feed resources.
- Lignocellulosic content and declined of nitrogen and sugar content.
- Palatability and intake influenced by protein, metabolizable energy and fibre level.
- Supplementation is essential to improve palatability and intake.

# Objective

- To determine the effect of supplementing poor quality grass hay with *Stylosanthes scabra* accessions on *in vitro* ruminal fermentation and digestibility of the forage based diet.

# Materials and methods

- Five accessions (9281, 11252, 11255, 11595 & 11604).
- *Eragrostis trichophora* grass was used.
- Two South Africa merino sheep were used as rumen fluid donor.
- Three levels of *S. scabra* were used as supplements.
- Substrate were incubated for 72 hours

# Data collection

- Chemical composition.
- Gas was recorded for 2, 4, 8, 12, 24, 30, 48 & 72 h
- Neutral detergent fibre degradability was determined after 30h.
- ME, SCFA and OMD were calculated.

# Results

## Chemical composition of grass grass and *Stylosanthes scabra*

Species	DM (%)	CP	NDF	ADF	ADL	Ash	TT
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g kg <sup>-1</sup> DM							
Grass hay	93.7	34.3	813.4	475.8	65.4	33.1	nd
9281	92.9	184.1	330.8	282.9	42.4	96.9	1.22
11252	92.2	177.5	349.7	300.6	42.6	93.6	1.02
11255	92.3	182.8	349.7	292.9	43.5	80.1	1.14
11595	92.4	185.4	300.3	273.9	63.4	94.4	1.64
11604	92.5	181.7	347.1	316.4	41.3	102.7	0.87

## *In vitro* gas production of grass hay and *Stylosanthes scabra*

Treatments	Incubation period (in hours)							
	2	4	8	12	24	30	48	72
Grass hay	5.5 <sup>d</sup>	11.3 <sup>c</sup>	18.0 <sup>b</sup>	26.5 <sup>b</sup>	44.1 <sup>b</sup>	56.4 <sup>b</sup>	75.2 <sup>b</sup>	86.5 <sup>b</sup>
9281	19.8 <sup>a</sup>	34.9 <sup>a</sup>	49.5 <sup>a</sup>	60.5 <sup>a</sup>	74.2 <sup>a</sup>	83.6 <sup>a</sup>	94.4 <sup>a</sup>	100.5 <sup>a</sup>
11252	17.0 <sup>bc</sup>	32.7 <sup>b</sup>	47.8 <sup>a</sup>	59.0 <sup>a</sup>	72.3 <sup>a</sup>	81.7 <sup>a</sup>	92.5 <sup>a</sup>	99.3 <sup>a</sup>
11255	17.3 <sup>bc</sup>	33.7 <sup>ab</sup>	48.2 <sup>a</sup>	59.2 <sup>a</sup>	72.5 <sup>a</sup>	81.6 <sup>a</sup>	92.1 <sup>a</sup>	98.5 <sup>a</sup>
11595	17.8 <sup>b</sup>	33.6 <sup>ab</sup>	49.6 <sup>a</sup>	60.6 <sup>a</sup>	73.5 <sup>a</sup>	82.7 <sup>a</sup>	93.5 <sup>a</sup>	100.3 <sup>a</sup>
11604	16.9 <sup>c</sup>	32.2 <sup>b</sup>	48.3 <sup>a</sup>	59.7 <sup>a</sup>	73.3 <sup>a</sup>	82.1 <sup>a</sup>	92.3 <sup>a</sup>	98.4 <sup>a</sup>
SEM	0.28	0.49	0.76	0.87	0.82	0.97	1.04	1.22



## Effect of 15% of *S. scabra* supplementation to poor-quality grass hay

Treatments	Incubation period (in hours)							
	2	4	8	12	24	30	48	72
<b>Grass hay</b>	<b>5.5<sup>d</sup></b>	<b>11.3<sup>d</sup></b>	<b>18.0<sup>c</sup></b>	<b>26.5<sup>c</sup></b>	<b>44.1<sup>c</sup></b>	<b>56.4<sup>b</sup></b>	<b>75.2<sup>b</sup></b>	<b>86.5<sup>a</sup></b>
<b>Grass hay+15% 9281</b>	<b>7.3<sup>bc</sup></b>	<b>14.6<sup>ab</sup></b>	<b>21.8<sup>a</sup></b>	<b>30.5<sup>a</sup></b>	<b>47.4<sup>ab</sup></b>	<b>59.0<sup>a</sup></b>	<b>76.7<sup>ab</sup></b>	<b>86.9<sup>a</sup></b>
<b>Grass hay+15%11252</b>	<b>7.8<sup>ab</sup></b>	<b>14.8<sup>ab</sup></b>	<b>22.2<sup>a</sup></b>	<b>30.9<sup>a</sup></b>	<b>47.3<sup>ab</sup></b>	<b>58.9<sup>a</sup></b>	<b>76.9<sup>ab</sup></b>	<b>87.3<sup>a</sup></b>
<b>Grass hay+15%11255</b>	<b>7.9<sup>a</sup></b>	<b>15.2<sup>a</sup></b>	<b>22.6<sup>a</sup></b>	<b>31.3<sup>a</sup></b>	<b>48.4<sup>a</sup></b>	<b>60.1<sup>a</sup></b>	<b>78.0<sup>a</sup></b>	<b>88.6<sup>a</sup></b>
<b>Grass hay+15%11595</b>	<b>7.2<sup>c</sup></b>	<b>14.4<sup>b</sup></b>	<b>21.9<sup>a</sup></b>	<b>30.0<sup>a</sup></b>	<b>46.6<sup>b</sup></b>	<b>58.4<sup>a</sup></b>	<b>76.8<sup>ab</sup></b>	<b>87.5<sup>a</sup></b>
<b>Grass hay+15%11604</b>	<b>5.5<sup>d</sup></b>	<b>12.8<sup>c</sup></b>	<b>19.9<sup>b</sup></b>	<b>28.1<sup>b</sup></b>	<b>44.6<sup>c</sup></b>	<b>56.4<sup>b</sup></b>	<b>74.8<sup>b</sup></b>	<b>85.6<sup>a</sup></b>
<b>SEM</b>	<b>0.17</b>	<b>0.20</b>	<b>0.34</b>	<b>0.53</b>	<b>0.41</b>	<b>0.56</b>	<b>0.77</b>	<b>1.01</b>

## Effect of 30% of *S. scabra* supplementation to poor-quality grass hay

Treatments	Incubation period (in hours)							
	2	4	8	12	24	30	48	72
<b>Grass hay</b>	<b>5.5<sup>e</sup></b>	<b>11.3<sup>d</sup></b>	<b>18.0<sup>d</sup></b>	<b>26.5<sup>d</sup></b>	<b>44.1<sup>d</sup></b>	<b>56.4<sup>d</sup></b>	<b>75.2<sup>cd</sup></b>	<b>86.5<sup>b</sup></b>
<b>Grass hay+30% 9281</b>	<b>9.9<sup>c</sup></b>	<b>18.2<sup>b</sup></b>	<b>26.4<sup>b</sup></b>	<b>34.9<sup>b</sup></b>	<b>50.8<sup>b</sup></b>	<b>61.9<sup>b</sup></b>	<b>77.5<sup>b</sup></b>	<b>87.1<sup>b</sup></b>
<b>Grass hay+30%11252</b>	<b>8.8<sup>d</sup></b>	<b>16.2<sup>c</sup></b>	<b>23.7<sup>c</sup></b>	<b>31.9<sup>c</sup></b>	<b>48.5<sup>c</sup></b>	<b>58.7<sup>c</sup></b>	<b>73.7<sup>d</sup></b>	<b>83.5<sup>c</sup></b>
<b>Grass hay+30%11255</b>	<b>9.3<sup>d</sup></b>	<b>16.8<sup>c</sup></b>	<b>24.3<sup>c</sup></b>	<b>32.6<sup>c</sup></b>	<b>48.7<sup>c</sup></b>	<b>58.9<sup>c</sup></b>	<b>75.3<sup>cd</sup></b>	<b>84.9<sup>bc</sup></b>
<b>Grass hay+30%11595</b>	<b>10.7<sup>b</sup></b>	<b>18.3<sup>b</sup></b>	<b>25.6<sup>b</sup></b>	<b>34.2<sup>b</sup></b>	<b>51.1<sup>b</sup></b>	<b>61.3<sup>b</sup></b>	<b>77.2<sup>bc</sup></b>	<b>86.6<sup>b</sup></b>
<b>Grass hay+30%11604</b>	<b>14.4<sup>a</sup></b>	<b>22.6<sup>a</sup></b>	<b>31.3<sup>a</sup></b>	<b>40.0<sup>a</sup></b>	<b>57.4<sup>a</sup></b>	<b>67.8<sup>a</sup></b>	<b>83.0<sup>a</sup></b>	<b>92.1<sup>a</sup></b>
<b>SEM</b>	<b>0.18</b>	<b>0.20</b>	<b>0.33</b>	<b>0.44</b>	<b>0.52</b>	<b>0.53</b>	<b>0.70</b>	<b>0.92</b>

## *In vitro* gas production kinetics of grass hay, *S. scabra* and supplemented grass hay

Treatments	b (ml)	c (h <sup>-1</sup> )	EGP(ml 400 mg <sup>-1</sup> )
Grass hay	106.4 <sup>a</sup>	0.024 <sup>g</sup>	34.4 <sup>b</sup>
9281	84.9 <sup>b</sup>	0.058 <sup>b</sup>	45.7 <sup>a</sup>
11252	85.8 <sup>b</sup>	0.059 <sup>b</sup>	46.5 <sup>a</sup>
11255	84.4 <sup>b</sup>	0.061 <sup>b</sup>	46.3 <sup>a</sup>
11595	85.7 <sup>b</sup>	0.061 <sup>b</sup>	47.1 <sup>a</sup>
11604	85.8 <sup>b</sup>	0.064 <sup>a</sup>	48.1 <sup>a</sup>
Grass hay+15% 9281	99.4 <sup>a</sup>	0.027 <sup>ef</sup>	34.7 <sup>b</sup>
Grass hay+15%11252	99.9 <sup>a</sup>	0.026 <sup>efg</sup>	34.3 <sup>b</sup>
Grass hay+15%11255	100.9 <sup>a</sup>	0.027 <sup>ef</sup>	35.1 <sup>b</sup>
Grass hay+15%11595	101.7 <sup>a</sup>	0.025 <sup>fg</sup>	34.3 <sup>b</sup>
Grass hay+15%11604	101.9 <sup>a</sup>	0.025 <sup>fg</sup>	34.0 <sup>b</sup>
Grass hay+30% 9281	91.8 <sup>b</sup>	0.030 <sup>cd</sup>	34.6 <sup>b</sup>
Grass hay+30%11252	89.8 <sup>b</sup>	0.029 <sup>d</sup>	33.5 <sup>b</sup>
Grass hay+30%11255	91.8 <sup>b</sup>	0.028 <sup>de</sup>	33.4 <sup>b</sup>
Grass hay+30%11595	91.5 <sup>b</sup>	0.029 <sup>d</sup>	34.0 <sup>b</sup>
Grass hay+30%11604	91.2 <sup>b</sup>	0.033 <sup>c</sup>	36.0 <sup>b</sup>
SEM	2.19	0.0008	1.02

## Effect *Stylosanthes scabra* supplementation on feeding value of poor-quality grass hay

Treatments	OMD (% DM)	ME(MJ kg <sup>-1</sup> DM)	SCFA (μmol g <sup>-1</sup> DM)
Grass hay	38.2 <sup>h</sup>	5.4 <sup>i</sup>	0.46 <sup>f</sup>
9281	62.5 <sup>a</sup>	9.3 <sup>a</sup>	0.83 <sup>a</sup>
11252	61.1 <sup>b</sup>	9.0 <sup>c</sup>	0.80 <sup>a</sup>
11255	60.5 <sup>b</sup>	9.1 <sup>bc</sup>	0.81 <sup>a</sup>
11595	62.0 <sup>a</sup>	9.2 <sup>ab</sup>	0.82 <sup>a</sup>
11604	62.3 <sup>a</sup>	9.2 <sup>ab</sup>	0.82 <sup>a</sup>
Grass hay+15% 9281	41.3 <sup>f</sup>	5.8 <sup>g</sup>	0.51 <sup>de</sup>
Grass hay+15%11252	41.2 <sup>f</sup>	5.8 <sup>g</sup>	0.50 <sup>de</sup>
Grass hay+15%11255	41.6 <sup>f</sup>	5.9 <sup>g</sup>	0.51 <sup>de</sup>
Grass hay+15%11595	40.9 <sup>f</sup>	5.8 <sup>g</sup>	0.49 <sup>e</sup>
Grass hay+15%11604	40.1 <sup>g</sup>	5.6 <sup>h</sup>	0.47 <sup>f</sup>
Grass hay+30% 9281	44.4 <sup>d</sup>	6.3 <sup>e</sup>	0.54 <sup>c</sup>
Grass hay+30%11252	43.3 <sup>e</sup>	6.1 <sup>f</sup>	0.51 <sup>de</sup>
Grass hay+30%11255	43.2 <sup>e</sup>	6.1 <sup>f</sup>	0.52 <sup>d</sup>
Grass hay+30%11595	44.5 <sup>d</sup>	6.3 <sup>e</sup>	0.55 <sup>c</sup>
Grass hay+30%11604	47.5 <sup>c</sup>	6.7 <sup>d</sup>	0.63 <sup>b</sup>
SEM	0.28	0.04	0.007

## *In vitro* NDF degradability and ratios of cell wall components

Treatments	<i>iv</i> NDFd(%DM)	(ADF/NDF)x100	(ADL/NDF)x100
Grass hay	19.3 <sup>e</sup>	58.5 <sup>f</sup>	8.0 <sup>i</sup>
9281	39.0 <sup>b</sup>	85.6 <sup>b</sup>	12.8 <sup>b</sup>
11252	42.9 <sup>a</sup>	87.6 <sup>ab</sup>	12.4 <sup>bc</sup>
11255	36.0 <sup>c</sup>	83.8 <sup>b</sup>	12.4 <sup>bc</sup>
11595	35.4 <sup>c</sup>	91.2 <sup>a</sup>	21.1 <sup>a</sup>
11604	35.6 <sup>c</sup>	91.2 <sup>a</sup>	11.9 <sup>cd</sup>
Grass hay+15% 9281	19.3 <sup>e</sup>	62.0 <sup>def</sup>	9.4 <sup>gh</sup>
Grass hay+15%11252	19.5 <sup>e</sup>	61.0 <sup>ef</sup>	8.8 <sup>h</sup>
Grass hay+15%11255	19.2 <sup>e</sup>	62.1 <sup>def</sup>	9.5 <sup>fgh</sup>
Grass hay+15%11595	20.8 <sup>de</sup>	61.7 <sup>def</sup>	11.2 <sup>e</sup>
Grass hay+15%11604	20.1 <sup>de</sup>	60.0 <sup>ef</sup>	11.5 <sup>de</sup>
Grass hay+30% 9281	19.1 <sup>e</sup>	65.8 <sup>cd</sup>	9.6 <sup>fg</sup>
Grass hay+30%11252	19.1 <sup>e</sup>	66.0 <sup>cd</sup>	7.6 <sup>i</sup>
Grass hay+30%11255	20.6 <sup>de</sup>	63.5 <sup>cde</sup>	9.1 <sup>gh</sup>
Grass hay+30%11595	20.0 <sup>de</sup>	66.8 <sup>c</sup>	10.1 <sup>f</sup>
Grass hay+30%11604	22.2 <sup>d</sup>	63.7 <sup>cde</sup>	7.6 <sup>i</sup>
SEM	0.76	1.34	0.23

# Conclusion

- *Stylosanthes scabra* improved fermentation of poor quality grass hay.
- Supplementation of accession 11604 at 30% significantly improved fermentation.
- Moreover this accessions improved NDF digestibility.
- Supplementation of accession 11604 at 30% may reduce the retention period.

# Recommendations

- The results of this study need to be extrapolated with caution.
- There is a need of the following studies:
  - Strategic use of the forage material in the animals diet.
  - The benefit of using the promising accession on animal product.
  - To assess the effect of the forage on poor quality forage digestibility and intake.

# Acknowledgements

- GDARD
- NRF
- ILRI



# Thank you

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