Rhodes Grass: a New Forage Crop for the Low Desert

Oli Bachie
UCCE Agronomy Advisor, Imperial, Riverside and San Diego Counties
Director, UCCE Imperial County

- Backgrounds
- Research @ DREC
- Yield & nutrition
- Other desirable features
- Summary

The 7th Annual New Technologies Workshop for Field Crops.
Wednesday, June 3rd, 2020. The UA CE (via zoom)
THE RHODES GRASS & AGRONOMIC FEATURES

- **Is Chloris gayana Kunth, C. abyssinica** (synonym)
- Is a C4 perennial grass native to Africa, but, widespread in tropical & subtropical countries.
- Very closely related to Bermuda grass *(C. dactylon)*
Morphology

➢ RG stems are tender, very leafy & spreads through stolons (Stoloniferous) & highly productive nature

➢ RG is valued for its (1) ability to set seed, (2) relative ease of establishment & ability to cover ground, (3) tolerance for drought, light frost, & soil salinity

Keftasa 2006.

➢ In the Arabian Peninsula, RG varieties produced significantly higher dry mass than alfalfa cultivars

Nadaf et al., 2014
Salt tolerance of RG

- Possession of salt glands is the mechanism by which RG tolerates salinity problems (can secrete both Na+ & K+) through its leaves
  
  Kobayashi et al., 2007

- the ability to secrete Na+ is greater than that of K+ secretion

Growth on a saline soil in Pakistan
Probably the first of its kind in CA on RG

We tested 2 varieties;

✓ Gulfcut (GF) & Recliner (RL)
✓ Selected Seeds of Australia states that the previous RG were wild selections & inconsistent in feed bunks.

✓ The varieties were latter hybridized & optimized as fine stemmed leafy plant of aggressive stoloniferous growth habits, salt tolerance & high dry matter yields.
Objectives of the trial

- Evaluate adaptability under the dry hot irrigated conditions of the low desert, &

- test forage yield and nutrition value of the two varieties
Plot layouts & Planting

- Plots laid out in RCBD with 4 replications
- 18 lbs of seeds/ac (broadcasting)
- sprinkler irrigation, then shifted to flood irrigation

Fertilization;

- ✓ 120 lb/ac N (pre-plant) & 50 lbs/ac N (subsequent cuttings)
- ✓ Pre-plant PK at 40-50 kg/ac

Harvested/cut when crop develops 5-10% flower heads
First year biomass (t/ac) – 6 cuttings

<table>
<thead>
<tr>
<th>Variety</th>
<th>5-May</th>
<th>21-Jun</th>
<th>28-Jul</th>
<th>29-Aug</th>
<th>10-Oct</th>
<th>12-Dec</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>GF</td>
<td>5.4a</td>
<td>4.5a</td>
<td>3.6a</td>
<td>2.0a</td>
<td>2.0a</td>
<td>0.9a</td>
<td>18.4</td>
</tr>
<tr>
<td>RL</td>
<td>6.2a</td>
<td>4.26a</td>
<td>3.61a</td>
<td>2.0a</td>
<td>2.0a</td>
<td>0.8b</td>
<td>19.1</td>
</tr>
<tr>
<td>Pr&gt;F</td>
<td>0.34</td>
<td>0.73</td>
<td>0.94</td>
<td>0.95</td>
<td>0.46</td>
<td>0.05</td>
<td></td>
</tr>
</tbody>
</table>

- no significant differences between the varieties in hay production at any of the cuttings
- Biomass yield declined throughout the cutting cycles
- Annual yield ranged from 18 to 19 t/ac (see table)
Second year biomass (t/ac) – 5 cuttings

<table>
<thead>
<tr>
<th>Variety</th>
<th>24-May</th>
<th>12-Jul</th>
<th>31-Aug</th>
<th>1-Nov</th>
<th>12-Dec</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>GF</td>
<td>3.4a</td>
<td>3.7a</td>
<td>0.9b</td>
<td>2.3a</td>
<td>1.0a</td>
<td>11.2</td>
</tr>
<tr>
<td>RL</td>
<td>2.2a</td>
<td>3.9a</td>
<td>1.9a</td>
<td>2.4a</td>
<td>1.0a</td>
<td>11.4</td>
</tr>
<tr>
<td>Pr&gt;F</td>
<td>0.43</td>
<td>0.66</td>
<td>0.01</td>
<td>0.94</td>
<td>0.96</td>
<td></td>
</tr>
</tbody>
</table>

✓ Slightly variable biomass yielding patterns for the 2nd year trial
✓ Similar trend of yield decline over cutting cycles
✓ No significant differences between the varieties in biomass production
✓ Total annual yield was ~ 11t/ac (5 cuttings)
# Forage Crop hay yield comparison

<table>
<thead>
<tr>
<th>Crop</th>
<th>2016 yield (t/ac)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alfalfa hay</td>
<td>7.19</td>
</tr>
<tr>
<td>Bermuda grass hay</td>
<td>7.89</td>
</tr>
<tr>
<td>Klein grass hay</td>
<td>10.0</td>
</tr>
<tr>
<td>Sudan grass hay</td>
<td>5.66</td>
</tr>
<tr>
<td>Rhodes grass</td>
<td>11-19</td>
</tr>
</tbody>
</table>

*Source: 2016 IV Ag Crops & LS Report*
Nutritional values from three samplings

<table>
<thead>
<tr>
<th>Variety</th>
<th>CP%</th>
<th>AFD</th>
<th>dNDF</th>
<th>Ash</th>
<th>dNDF48</th>
<th>dNDF30</th>
<th>TDN</th>
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<tbody>
<tr>
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<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>First cutting</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RL</td>
<td>14.1&lt;sup&gt;a&lt;/sup&gt;</td>
<td>37.5&lt;sup&gt;a&lt;/sup&gt;</td>
<td>65.4&lt;sup&gt;a&lt;/sup&gt;</td>
<td>9.9&lt;sup&gt;a&lt;/sup&gt;</td>
<td>38.1&lt;sup&gt;a&lt;/sup&gt;</td>
<td>23.5&lt;sup&gt;a&lt;/sup&gt;</td>
<td>59.8&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>GF</td>
<td>14.2&lt;sup&gt;a&lt;/sup&gt;</td>
<td>37.8&lt;sup&gt;a&lt;/sup&gt;</td>
<td>65.0&lt;sup&gt;a&lt;/sup&gt;</td>
<td>9.7&lt;sup&gt;a&lt;/sup&gt;</td>
<td>37.5&lt;sup&gt;a&lt;/sup&gt;</td>
<td>22.4&lt;sup&gt;a&lt;/sup&gt;</td>
<td>59.5&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>Pr&gt;F</td>
<td>0.94</td>
<td>0.62</td>
<td>0.74</td>
<td>0.63</td>
<td>0.57</td>
<td>0.24</td>
<td>0.64</td>
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<tr>
<td>Second cutting</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RL</td>
<td>12.2&lt;sup&gt;a&lt;/sup&gt;</td>
<td>39.73&lt;sup&gt;a&lt;/sup&gt;</td>
<td>67.2&lt;sup&gt;a&lt;/sup&gt;</td>
<td>10.1&lt;sup&gt;a&lt;/sup&gt;</td>
<td>40.8&lt;sup&gt;a&lt;/sup&gt;</td>
<td>28.7&lt;sup&gt;a&lt;/sup&gt;</td>
<td>63.2&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>GF</td>
<td>12.1&lt;sup&gt;a&lt;/sup&gt;</td>
<td>41.2&lt;sup&gt;a&lt;/sup&gt;</td>
<td>68.8&lt;sup&gt;a&lt;/sup&gt;</td>
<td>10.0&lt;sup&gt;a&lt;/sup&gt;</td>
<td>41.6&lt;sup&gt;a&lt;/sup&gt;</td>
<td>28.9&lt;sup&gt;a&lt;/sup&gt;</td>
<td>61.8&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>Pr&gt;F</td>
<td>0.94</td>
<td>0.41</td>
<td>0.4</td>
<td>0.74</td>
<td>0.25</td>
<td>0.71</td>
<td>0.26</td>
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<tr>
<td>Third cutting</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td>62.1&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>Pr&gt;F</td>
<td>0.24</td>
<td>0.69</td>
<td>0.32</td>
<td>0.93</td>
<td>0.68</td>
<td>0.62</td>
<td>0.16</td>
</tr>
</tbody>
</table>

Means in each column followed by the same letter under each cutting is not significantly different from each other.
# Forage nutrient component comparisons

<table>
<thead>
<tr>
<th>Crop</th>
<th>CP</th>
<th>TDN</th>
<th>ADF</th>
<th>NDF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alfalfa</td>
<td>17-29</td>
<td>50-56</td>
<td>26-35</td>
<td>40-50</td>
</tr>
<tr>
<td>Bermuda grass</td>
<td>8-12</td>
<td>43</td>
<td>32-43</td>
<td>70-78</td>
</tr>
<tr>
<td>Sorghum / Sudan grass</td>
<td>8-15</td>
<td>-</td>
<td>29-40</td>
<td>55-65</td>
</tr>
<tr>
<td>Corn Silage</td>
<td>6-9</td>
<td>70</td>
<td>28-43</td>
<td>51-68</td>
</tr>
<tr>
<td>Wheat straw</td>
<td>4</td>
<td>-</td>
<td>54</td>
<td>85</td>
</tr>
<tr>
<td>Rhodes grass</td>
<td>12-14</td>
<td>59-63</td>
<td>37-41</td>
<td>65-69</td>
</tr>
</tbody>
</table>

*Source: Compared to nutrition information, Putnam (ag practices for forage quality)*
ongoing trial

Forage Crop Yield by Cutting

- Rhododendron
- Bermuda
- Kleingrass
- Moringa
- Teff

Yield lbs/Acre

Cutting

0 1 2 3
Other desirable Characteristics

- Tolerates mechanical damages
- Crop after recovery from damage (bottom)
Suitability for Pasture (not tested here)

- Suitable for rainfed & irrigated systems
- Highly desirable for direct pasturing, palatable
- Suitable for all animals (Dairy, Beef, Horses, Goats & Sheep)
Pest Management

➢ No incidences of insect pest or pathogens detected at our research field

➢ Weeds were not a problem.
  ✓ It was strong competent crop
  ✓ But, may need BL weed control at establishment
Summary (strengths)

- Easy to establish, high salt & stress tolerant
- Rare pests or diseases
- Well adapts to the low desert conditions & produces high biomass of good nutritive quality
- RG can be an alternative forage crop for the low desert & even beyond
- Is already adopted by some growers for commercial production and export
- Future work will focus on resource use & estimation of production costs & prepare RH production guideline
Acknowledgments

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Contact: obachie@ucanr.edu

More information IN Proceedings, 2019 Western Alfalfa & Forage Symposium. Pages 123-131