Warm-Season Annual Legumes: Past, Present, and Future
• Introduction
• Aeschynomene
• Cowpea
• Sunnhemp
• Final Remarks
Introduction

• The predominance of warm-season grasses in subtropical and tropical grazing systems created the culture that every forage needs to be perennial and persistent under low-input systems.

• Lack of persistence of the legume is the main factor limiting the adoption of warm-season grass x warm-season legume mixed pastures.
Introduction

• Overseeding cool-season annual legumes every year is acceptable but warm-season legumes need to be perennial?
Introduction

• Are the expectations realistic?
• Do warm-season legumes need to be perennial?
• Warm-season annual legumes may have superior herbage accumulation, nutritive value, and be used in grazing systems as a component of the forage resources

• In addition, some warm-season legumes may reseed and be present in grass-legume mixtures for many years.
Outline

- Introduction
- Aeschynomene
- Cowpea
- Sunnhemp
- Final Remarks
Aeschynomene

- *Aeschynomene americana*
- *Aeschynomene evenia*
Aeschynomene

• Aeschynomene is a self-regenerating annual herbaceous legume adapted to seasonally waterlogged soils

• Early season rainfall is crucial for Aeschynomene development and persistence. Kalmbacher et al. (1993) seeded Aeschynomene in 17 dates and there was no germination in 6 dates due to decreased soil water potential (-15 kPa)
Aeschynomene

- It is known that Aeschynomene has symbiotic relationship with Bradyrhizobium strains and it is detected that some of the relationship is Nod-independent using the similar mechanisms (Chaintreuil et al. 2013)

- Currently, general cowpea inoculant is recommended for the first time that Aeschynomene is seeded in the area
## Nutritive value

<table>
<thead>
<tr>
<th></th>
<th>Stubble height (inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Herbage accumulation (lb/acre)</td>
<td>3100</td>
</tr>
<tr>
<td>CP (%)</td>
<td>17.5</td>
</tr>
<tr>
<td>IVDOM (%)</td>
<td>60</td>
</tr>
</tbody>
</table>

Mislevy et al. (1981)
Aeschynomone

Animal Performance

LA = Limpograss + aeschynomene

LN = Limpograss + N fertilization (160 lb N/ac in 5 applications)

Mean ADG
LA = 1.2 lb/d
LN = 0.6 lb/d

Mean LW
LA = 581 lb/acre
LN = 830 lb/acre

Rusland et al. (1988)
Aeschynomene

• It is recommended to graze Aeschynomene between 3-6 inches and stop grazing before autumn flowering (Chaparro et al., 1991)

• Sollenberger et al. (1992) observed that seed reserve was a major factor in reestablishing Aeschynomene in limpograss pastures. In addition, disking the pasture in the spring favored Aeschynomene reseeding.
• Introduction
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Cowpea

- Cowpea (*Vigna unguiculata*) is an annual, fast-growing legume used as a cover crop, wildlife food plots, and forage for livestock.
• Cowpea usually benefits from inoculation with *Bradrizhobium* spp, commercially known as cowpea commercial inoculant

• Silva Junior et al. (2018) observed that selected strains of *Bradrizhobium* can double cowpea N fixation (from 33 to 60 lb N/acre).
Cowpea

Foster et al. (2009)
Cowpea

Nutritive Value

<table>
<thead>
<tr>
<th></th>
<th>Cowpea</th>
<th>Rhizoma peanut</th>
<th>Bahiagrass</th>
</tr>
</thead>
<tbody>
<tr>
<td>CP (%)</td>
<td>28.2a</td>
<td>20.3b</td>
<td>10.3c</td>
</tr>
<tr>
<td>NDF (%)</td>
<td>25.1b</td>
<td>35.3b</td>
<td>70.0a</td>
</tr>
</tbody>
</table>

Foster et al. (2009)
Cowpea

Animal Performance

1

2

3

4
Cowpea

Animal Performance

Vendramini et al. (2012)
Cowpea

Animal Performance
### Animal Performance

<table>
<thead>
<tr>
<th>Treatment</th>
<th>HA (lb DM/lb LW)</th>
<th>Cow ADG (lb/d)</th>
<th>Calf ADG (lb/d)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cowpea</td>
<td>0.8b</td>
<td>0.30</td>
<td>1.47b</td>
</tr>
<tr>
<td>Creep Grazing</td>
<td>1.3a</td>
<td>0.24</td>
<td>1.47b</td>
</tr>
<tr>
<td>Creep Feeding</td>
<td>1.6a</td>
<td>0.24</td>
<td>1.80a</td>
</tr>
<tr>
<td>Control</td>
<td>1.5a</td>
<td>0.44</td>
<td>1.54b</td>
</tr>
<tr>
<td><strong>SEM</strong></td>
<td><strong>0.2</strong></td>
<td><strong>0.13</strong></td>
<td><strong>0.08</strong></td>
</tr>
</tbody>
</table>

Vendramini et al. (2012)
• Introduction
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Sunnhemp

- Sunnhemp (*Crotalaria juncea*) is a tall herbaceous annual plant widely grown in the tropics, primarily as cover crop.
The genus Crotalaria includes some species known to be toxic to livestock.

The toxic compound pyrrolizidine alkaloid is primarily found in Crotalaria seeds.

According to Mosjidis et al. (2012), sunnhemp is a valuable source of forage without toxic effects to animals.

However, seeds should not be part of the animal diet.
Sunnhemp

- Effects of including sunnhemp seeds in in vitro digestibility of stargrass

<table>
<thead>
<tr>
<th>Treatment (g seed/2 L Rumen Fluid + Buffer)</th>
<th>SE</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>30</td>
</tr>
<tr>
<td>30</td>
<td></td>
</tr>
<tr>
<td>60</td>
<td></td>
</tr>
</tbody>
</table>

IVTD (%)  

- 52a  
- 48a  
- 39b  
- 1.5

Vendramini et al. (unpublished data)
Sunnhemp

- General cowpea inoculant has been recommended for sunnhemp seed inoculation
- Limited information available in the literature

<table>
<thead>
<tr>
<th>Treatment</th>
<th>HA (lb DM/acre)</th>
<th>CP (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inoculated</td>
<td>1820</td>
<td>19.5</td>
</tr>
<tr>
<td>Non-inoculated</td>
<td>1860</td>
<td>19.6</td>
</tr>
<tr>
<td>SE</td>
<td>218</td>
<td>0.6</td>
</tr>
</tbody>
</table>

Dubeux et al. (unpublished data)
### Sunnhemp Cultivars

<table>
<thead>
<tr>
<th>Cultivar</th>
<th>Harvest time</th>
<th>SE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>60 d</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Flowering</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ib DM/acre</td>
<td></td>
</tr>
<tr>
<td>AU Golden</td>
<td>1800b</td>
<td>3500c</td>
</tr>
<tr>
<td>Blue Leaf</td>
<td>1340c</td>
<td>13100a</td>
</tr>
<tr>
<td>Crescent Sun</td>
<td>3000a</td>
<td>13600a</td>
</tr>
<tr>
<td>Ubon</td>
<td>1740b</td>
<td>4470b</td>
</tr>
</tbody>
</table>

Vendramini et al. (unpublished data)
Sunnhemp
## Nutritive Value

<table>
<thead>
<tr>
<th>Weeks after seeding</th>
<th>CP (%)</th>
<th>IVTD (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>31.6a</td>
<td>72a</td>
</tr>
<tr>
<td>5</td>
<td>22.3b</td>
<td>69a</td>
</tr>
<tr>
<td>6</td>
<td>14.3c</td>
<td>61b</td>
</tr>
<tr>
<td>7</td>
<td>12.6d</td>
<td>59c</td>
</tr>
<tr>
<td>SE</td>
<td>1</td>
<td>3</td>
</tr>
</tbody>
</table>

Vendramini et al. (unpublished data)
Sunnhemp
Sunnhemp

- Sunnhemp forage intake and in vivo digestibility

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Forage intake (% BW)</th>
<th>In vivo DMD (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sunnhemp</td>
<td>1.2b</td>
<td>52a</td>
</tr>
<tr>
<td>Sunnhemp + Bermudagrass</td>
<td>1.4b</td>
<td>52a</td>
</tr>
<tr>
<td>Bermudagrass</td>
<td>1.6a</td>
<td>48b</td>
</tr>
<tr>
<td>SE</td>
<td>0.1</td>
<td>1.3</td>
</tr>
</tbody>
</table>

Vendramini et al. (unpublished data)
Sunnhemp

• Forage species mixtures at establishment

Vendramini et al. (unpublished data)
Sunnhemp
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Final Remarks

- Past: Aeschynomene is still the most used warm-season legume in South Florida due to extensive research and extension efforts from the 80’ and 90’

- According to Muir et al. (2010), Aeschynomene is one of the few successful histories of using warm-season legumes in grazing systems in the world.
Final Remarks

• Present: Current focus on warm-season perennial legumes, primarily the genus Arachis.

• Demand for fast growing legumes for cover crops, food plots, and forage may increase the interest for warm-season annual legumes.

• To generate sound and unbiased research data to verify if warm-season annual legumes may be an economic viable alternative to N fertilizer and a reliable source of forage for livestock.
Final Remarks

• Future: If research certifies that warm-season legumes may be viable, a coordinated extension effort will be necessary to change the culture of “perennials” in tropical and subtropical regions.

• By the way, the future starts after this slide.
Thanks!

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