Conservation and Nutritive Value of Legume Forages

Bob Myer
University of Florida
NFREC Marianna

Legumes for forage are scarce in the lower S. E. USA

Alfalfa does not do well in the deep SE USA

Cool-Season Legumes:

- White clover
- Crimson clover
- Red clover
- Arrowleaf clover
- Sweet clover

Warm-Season Legumes:

- Perennial peanut
- Forage soybean
- Annual peanut
- Cow pea
- Pigeon pea
- Aeschynomene
- Alycelover
- Capon Desmodium
- Hairy indigo
- Stylo

Forage Legumes:

- **Alfalfa** **(‘Florida 77’ and ‘Florida 99’)**

Forage Legumes:

- Grazing
- Green chop
- Silage
- Haylage
- Hay

Legume Silage/Haylage:

- Harvest at optimal maturity
- Wilt to 60% moisture for silage and 50% for haylage
- Use wide swaths and conditioners to facilitate wilting
- Legumes are difficult to ensile due to low sugar and high buffering capacity – may need to add molasses or ground corn and/or use a bacterial inoculant
- Store properly

Factors affecting legume silage nutritional quality:

- Legume species
- Variety within species
- Maturity at harvest
- Weed/grass contamination
- Harvest conditions/procedures
- Proper moisture
- Storage method
- Feed out procedure
- Afternoon vs morning harvest

Effect of maturity on nutritional composition of alfalfa hay (%, moisture basis):

	Crude Protein	NDF	ADF	TDN
Pre bloom	**23**	**39**	**33**	**62**
Early bloom	**20**	**43**	**33**	**60**
Mid bloom	**19**	**46**	**37**	**59**
Full bloom	**17**	**47**	**39**	**58**
Mature	**16**	**56**	**44**	**53**

Ensminger et al., 1990

Legume silage vs. corn silage (% moisture free basis):

	Legume silage	Corn silage
Crude protein	**21** (18-24)	**8** (7-9)
ADF	**35** (30-39)	**26** (22-30)
NDF	**44** (38-50)	**44** (38-50)
TDN	**60** (55-64)	**70** (66-74)
Starch	**2** (1-4)	**31** (24-39)
Ca	**1.4** (1.2-1.7	**0.25** (0.2-.03)
P	**0.3** (0.3-0.4)	**0.25** (0.2-0.3)
(Dry matter)	**40** (28-52)	**34** (24-44)

Dairy One forage library, 2010.

Nutritional composition of legume hays (% moisture free basis):

	Crude Protein	TDN
Crimson clover	**17**	**59**
Red clover	**15**	**61**
White clover	**18**	**64**
Sweet clover	**15**	**56**
Alyceclover	**12**	**52**
Hairy indigo	**12**	**62**
Cow pea	**19**	**62**
Forage soybean	**16**	**57**
Alfalfa	**17-21**	**56-60**
Legume hay (Dairy One)	**21**	**60**

Ensminger et al., 1990

Perennial Peanut (rhizoma peanut)

Perennial Peanut:

- Main warm-season for. legume in the lower SE USA
- Slow to establish
- Very persistent once established
- Yield: 2 to 5 ton/ac
- 2 to 3 cuttings per year
- Good for hay, haylage and silage; okay for grazing
- Excellent nutritional value

Perennial Peanut:

- Expensive to establish
- Grown on approximately 30,000 ac in FL and GA
- Perennial peanut growers association
- Field day: 5 June, 2010 at Moultrie, GA
- Valuable as a hay for horses

Nutritional composition of perennial peanut hay (%, moisture free basis):

	Perennial peanut	Alfalfa
Crude protein	**11-20**	**17-24**
NDF	**36-56**	**34-44**
ADF	**24-38**	**26-34**
TDN	**52-68**	**54-68**

Myer et al, 2010

Nutritional value of perennial peanut silage for dairy cows:

"Rhizoma peanut silage can replace 70% of corn silage in diets containing 50% concentrate without affecting dairy cow performance"

Staples et al., JDS 80:541-549, 1997

Forage Soybean

Forage Soybean:

- Annual – easy to establish
- Use full season varieties
- Long-juvenile varieties available
- Good for hay, haylage, and silage
- One cutting
- Can harvest from pre-pod to bean fill, before leaf drop
- Yield : 2 to 4 ton/ac
- Good nutritional value

Effect of maturity on yield and nutritional composition of forage soybean (moisture free basis):

Growth stage	DM Yield, lb/ac	Crude protein. %	Crude fat, %	NDF, %	IVOMD, %
50% bloom	**3660**	**18**	**2**	**54**	**59**
75% bloom	**4000**	**17**	**2**	**54**	**58**
95% bloom	**4500**	**17**	**2**	**56**	**60**
Pods .5 full	**5220**	**18**	**3**	**51**	**60**
Pods .6 full	**5060**	**19**	**4**	**50**	**61**
Pods .8 full	**5520**	**21**	**5**	**49**	**60**
Pods .9 full	**7100**	**21**	**6**	**47**	**61**

Blount et al., 2009

Nutritional composition of forage soybean silage:

	%, moisture free basis
Crude protein	**14-22**
NDF	**48-60**
TDN	**54-64**

Dairy One forage library, 2010

Nutritional value of forage soybean for dairy cows:

"We conclude that forage soybean silage, when compared with alfalfa silage, had a negative impact on feed intake and milk yield, whereas energy corrected milk, milk efficiency, and total tract nutrient digestion were similar"

Vargas-Bello-Perez, JDS 91:229-235, 2008

Cowpea (clay peas)

Cowpea:

- Annual – easy to establish
- Leafy, viney , low growing plant
- High leaf to stem ratio
- Good for grazing, hay, haylage, and silage
- Potential long grazing season
- Yield: 1 to 3 ton/ac
- Good nutritional quality

Pigeonpea

Pigeonpea:

- Annual – easy to establish
- Tree like plant
- Woody main stems
- Best for hay, haylege, and silage
- Best to harvest at relatively high stubble height
- Poor to good nutritional value
- Yield: 2 to 6 ton/ac
- High tannin in some varieties
- Good for browse

Annual Peanut (self seeded annually)

Annual cultivated peanut for forage:

- Well adopted to SE USA
- Annual – easy to establish
- Disease resistant varieties available
- Excellent nutritional value
- One, maybe two cuttings
- Harvest of forage reduces pod yield
- Yield: 2 to 3 ton/ac
- High production costs
- Can re-seed
- Residue vines are often baled after pod harvest, but hay is of low to fair quality and may not be legal to feed

Nutritional composition of annual peanut forage (% moisture free basis):

	Crude protein	NDF	ADF	IVOMD
Fresh	**15-22**	**32-38**	**26-30**	**70-80**
Hay	**12-18**	**44-50**	**32-40**	**64-72**
Residue hay	**8-14**	**44-60**	**36-48**	**50-60**

Myer et al., 2010

In vitro true digestibility of forage legumes (% moisture free basis):

	Hay	Haylage
Perennial peanut	**77**	**77**
Annual peanut	**71**	**74**
Cowpea	**58**	**69**
Forage soybean	**57**	**ND**
Pigeonpea	**35**	**38**
Bahiagrass	**51**	**60**

Foster, 2008

Further information (edis.ifas.ufl.edu):

- SS-ARG-48 “Warm Season (Summer) Forage Legume Guide”
- SS-ARG-69 “Silage Crops for Dairy and Beef Cattle”
- SS-ARG-79 “Minor Use Summer Forage Legumes”
- SS-ARG-177 “Silage Harvesting, Storing, and Feeding”
- SS-ARG-180 “Forage Soybeans for Grazing, Hay and Silage”
- AN-234 “Perennial Peanut: Forage Nutritional Composition and Feeding value”

Thank You

UF UNIVERSITY of FLORIDA
IFAS