Use of novel forages on horse farms: Novel turfgrass research update

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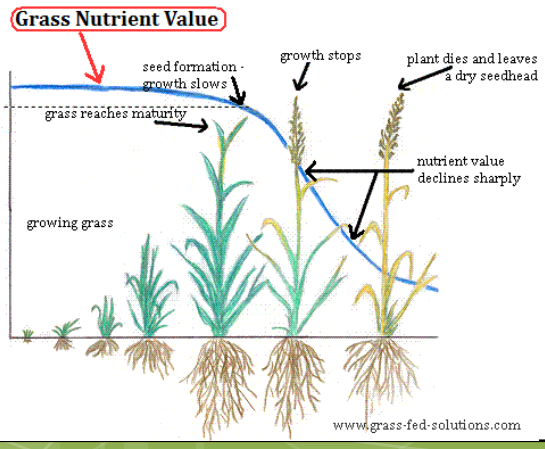
Background

- Horses evolved as grazing animals
- Pasture can meet 100% of dietary needs
  - Dependent on exercise level



Problems with pasture

- High sugar levels = laminitis and obesity
  - Pasture-associated ~ 54% of cases (USDA, 2000)
  - Related to content of NSC (WSC + Starch) in the pasture
- Exposure to toxic weeds and fungus
- Maintenance inputs

https://www.tractorsupply.com/tsc/product/gordons-pasture-pro-herbicide-1-gal


http://www.thehorse.com/articles/36140/slobbers-in-horses


http://www.barefoothooves.net/founder_laminitis.html

Previous Research

Traditional Pasture Grasses

- Positive correlation between NSC and grazing preference
  - (Allen, 2012)
- Horses prefer to graze taller grasses (~12.5 in) than shorter grasses (~4.8 in)
  - Taller grasses had higher NSC%**
  - (Siciliano, 2015)
- Tall fescue is a common pasture grass in Mid-Atlantic region but is ranked low in palatability and may harbor endophytes
  - (Bott et. Al, 2013)

Traditional Pasture Grasses

- Rotational vs. Continuous (UMD and Rutgers collaboration)
  - Similar forage yields
  - Rotational higher height
  - (Kenney, 2017)
- Rotational systems increase vigor and nutritive value of forages
  - (Ghajar, 2017)

Photos courtesy of Dr. Amy Burk

Improved forage cultivars

- Developed over past decades
  - Selective breeding
    - Increased nutritional quality, vigor, growing season, disease resistance, cold tolerance and drought resistance
  - Most forage research fueled by livestock production
    - Optimize pasture for meat and dairy production
  - Improved cultivars = increased NSC
    - Increased photosynthesis

(Watts, 2004)

Variation in NSC

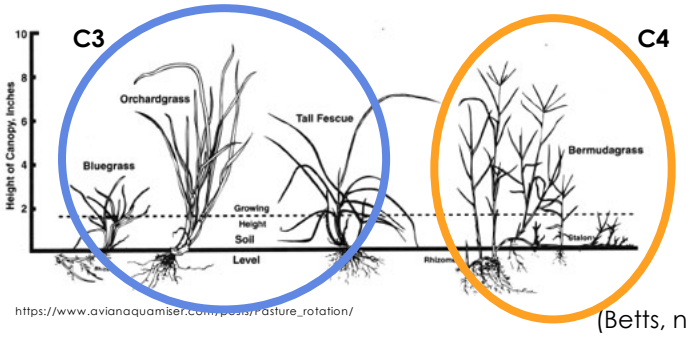
- NSC doesn't always follow standard rules like other nutritional components
  - Environmental factors
    - Time, temperature, sunlight
  - Stress factors
    - Low fertility soil
    - Drought
  - Species
    - Improved forage cultivars, clover, weeds (thistle, chicory, dandelion, quackgrass)

https://www.americanmeadows.com/grass-and-groundcover-seeds/clover-seeds/white-clover-seeds

(Watts, 2004)

C3 vs C4 plants

- C3 (cool season grasses) and C4 (warm season grasses) have different metabolic pathways
  - C4 plants are more efficient
    - Gathering CO_2, utilizing nitrogen, require less water



https://www.avianaquamiser.com/posts/Pasture_rotation/

(Betts, n.d.)

C3 vs C4 plants

- Nutritional composition
  - C3 provide more CP
  - C4 protein more efficiently used by animals but cell walls thicker = more structural fiber and reduced forage quality
  - C4 do not product fructans
- Growing season
  - C4 are tolerant of warm temperature, long photoperiod days, and reduced rainfall
  - Good pasture grasses in the summer months when C3 dormant or stunted

(Betts, n.d.)

Turfgrasses

- Turf and forage not fundamentally different
  - Can be used for both if managed
  - Turf selected for dense horizontal growth, low mowing height and traffic tolerance
  - Forage selected for vertical growth and high yield
    - "Forage or Turfgrasses" Oregon State Univ.

http://www.umterps.com

http://www.unicorngc.com

http://forages.oregonstate.edu/regrowth/how-does-grass-grow/grass-types/forage-or-turf-grasses

Where does turfgrass fit in?

- **Replace dry lots**
  - Soil anchor
  - Safer grass for grazing
    - Return to non growth-optimized cultivars
    - Lower grams sugar per day due to shorter mature height and lower yield
  - Increase turnout space to return horses to natural grazing behavior

Ongoing Research

Overall aims of studies:

Determine potential cultivars for use on equine operations that are…

- Wear tolerant
- Moderate to low in yield
- Low NSC
- Moderate to low palatability
- Require minimal maintenance input

Turfgrass selection

8 cool- and 6 warm-season cultivars selected:

- Cool: Tall fescue, fine fescue, creeping bentgrass, KY bluegrass, perennial ryegrass
- Warm: Bermudagrass, zoysiagrass, crabgrass
- Wear tolerant based on National Turfgrass Evaluation Program
- Must be commercially available
- Seeded varieties

Study 1: Palatability

Objective: To **identify potential turfgrass** cultivars which may be suitable for equine grazing that are…

- Low to moderate in palatability and yield
- <12% NSC, DM

Established four replicated plots via seeding

- 3 m x 6.1 m
- Middleburg Agricultural Research Center in Middleburg, VA (spring/summer 2015)

Fertilizer applied following soil test recommendations

Spring and fall applications of broadleaf herbicides.

Lanes between plots maintained with glyphosate as needed

Horses were grazed 7 am to 4 pm

- Following a 3 day acclimation

Pre-grazing (day before) and post-grazing measures to determine palatability

- Height
- Biomass
- Maturity
- Vegetative Cover
- Nutritional analysis
  - Water soluble carbs + starch
    - Equi-analytical, Ithaca NY
    - Hall, 1999

Study 2: Wear tolerance

Objective: To **identify potential turfgrass** cultivars which may be suitable for equine grazing that are…

- Wear tolerant to horse traffic
- Low to moderate yielding
- <12% NSC, DM

Established four replicated plots via seeding
- 1.5 m x 3.2 m
- Paintbranch Turfgrass Research Center in College Park, MD (spring/summer 2015)

Fertilizer applied following soil test recommendations

Spring and fall applications of broadleaf herbicides

Lanes between plots maintained with glyphosate as needed

Wear applied with Baldree Traffic Simulator

- Similar vertical force as horse at trot (Kowalewski et al, 2013)

Treatments:

1. Control
   - No pass of simulator
2. Low traffic
   - One pass of simulator
3. High traffic
   - Two passes of simulator

Traffic Trials:

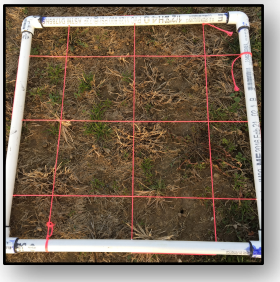
- Treatments applied to plots once weekly for 6 weeks
- Plots rested for 4 weeks
- Trials covered the growing season
  - Cool-season cultivars = 3
    - Spring, summer, and fall
  - Warm-season cultivars = 1
    - Summer

Pre-traffic, post-traffic and post-rest:

- Biomass yield, kg DM/ha
  - 0.25 m^2 quadrats
- Vegetative cover
  - Line-intercept method
    - Herrick et al., 2009

Throughout study:

- Non-structural carbohydrates (NSC)
  - Water soluble carbs + starch
    - Equi-analytical, Ithaca NY
    - Hall, 1999



Results

Relative Traffic Tolerance:

- Tall fescue and zoysia cultivars were most traffic tolerant
- Average NSC less than 12% → creeping bentgrass, zoysia grass and some bermudagrasses
- Creeping bentgrass had poor traffic tolerance

Results

Relative Palatability:

- Ryegrass and crabgrass most preferred
- Some fine fescue cultivars, KY bluegrass and creeping bentgrass least preferred cool season.
- Cold tolerant bermudagrass least prefered warm season
- Zoysia failed to establish therefor no palatability data recorded

Conclusions

- Multiple species show promise but the best option for each facility depends on…
  - Location/environment
  - Management style
  - Specific concerns of horse owners
- Future research focuses:
  - On-farm persistence
  - Stocking rate
  - Animal response to long-term grazing

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Photo by Kristina Davis

Questions?