Sorghum Nitrogen Rate and Time of Harvest Study:

2016 Harvest Protocol

Sarah Lyons, Greg Godwin, Chutao Liu, Quirine Ketterings
Cornell Nutrient Management Spear Program (NMSP)

sel248@cornell.edu
qmk2@cornell.edu – gsg6@cornell.edu
Main phone contact number (Sarah): 828-290-3584
Project Objectives

- To determine the nitrogen (N) rate of sorghum as part of a double cropping rotation with winter cereals.
- To determine the ideal time of harvest to optimize both yield and forage quality.
- Sites with 4 replications of 5 N rates:
  - 0 lbs of N/acre
  - 50 lbs of N/acre
  - 100 lbs of N/acre
  - 150 lbs of N/acre
  - 200 lbs of N/acre
Timeline

- Plant in mid May – mid June.
- Weekly harvests from mid-September through mid-October (5 weeks total).
- Weekly harvests are ONLY 100 and 200 lbs N/acre treatments.
- Nitrogen rate trial harvest will include all treatments and be done when the 100 lbs/acre treatment is at the soft dough stage (all treatments harvested at the same time).
Weekly Harvests
(100 and 200 lb N/acre treatments)

• Stages 5-9
Stage 5: Boot

- Panicle development complete, not yet emerged.
- Maximum leaf area, 60% of total dry matter.
- “Bulge” present underneath flag leaf, enclosed seed head.
Stage 6: Flowering

- Seed head fully emerged, flowers present.
Stage 7: Soft Dough

- Stage just after seeds pass the milk phase (where if you squeeze the seeds a milky liquid comes out).
- When squeezed, little or no liquid comes out, but the kernel is still soft.
Stage 8: Hard Dough

- Grain cannot be compressed with fingers.
- Grain is 75% dry matter.
Stage 9: Physiological Maturity

- Black layer appears just above the point of seed attachment near the base of the seed.
N Rate Trial Harvest

- Stage 7, soft dough stage.
- Stage typically harvested for silage.
- Harvest starts when the plants in the 100 lbs/acre N rate have reached the soft dough stage.
- Harvest ALL N treatment plots.
Harvest Supplies

- Plot map and data sheets
- Large scale and flat surface (or wooden planks)
- Labeled gallon plastic bags
- Cooler with ice packs
- Gloves
- Clippers (hand-held shears)
- 5 ft pole
- Orange frame (38.8 L x 8 W x 4 H in)
- Chipper shredder
- Pens, sharpies
- Safety goggles, ear plugs, face mask
- Drying oven, trays
- Small scale
- GPS (if measurements not already taken)

Harvest method is identical for both weekly and N rate trial harvests
Harvest Supplies
Prior to Harvest

- Give Sarah a call (828-290-3584) to let her know when you will begin harvesting.
- Take pictures of the field, entire site, each replication within a site, and note and take pictures of any significant differences among the plots.
- Take GPS coordinates if not taken at setup time.
Harvest

- Lay the scale on an even surface (or use wooden planks). Ensure it is level.
- Either tare the scale using your weight or record your weight on the data sheet to be subtracted from the sample + your weight measurement.
- Identify plot orientation and the location of treatment plots to be harvested.
Harvest

- ONLY 100 and 200 lb N/acre plots for weeks 1, 2, 4 and 5.
- When the plants in the 100 lbs/acre N rate have reached the soft dough stage (week 3) harvest all 20 treatment plots using the same method as used for the weekly sampling.
Harvest

- The area in each plot to be harvested per sampling day is 5 ft long and 4 rows wide.
- Harvest the middle 4 rows within the plot. The other rows are buffers.
- Place the 5 ft pole at the first stalk to harvest to determine sample area length.
- Place the orange frame next to the rows to determine harvest height.
- Wearing heavy gloves, clip stalks at the frame height (4”) within the sample area and bundle.
Harvest Area

Plot 101, 200 lbs N/acre
Harvest area for week 1

5 ft pole  Harvested Area  Row of sorghum  4” tall frame
Harvest Area

Plot 101, 200 lbs N/acre
Harvest Area for week 2
Harvest Area

Plot 101, 200 lbs N/acre
Harvest Area for week 3

5 ft pole
Harvested Area
Row of sorghum
4” tall frame
Harvest

- As you harvest, lay all of the stalks facing the same direction in the plot area behind you.
- When finished, carry the stalks to the scale. Holding the stalks, step on the scale and record weight (make sure you either tare the scale for your weight or record your weight on the data sheet to be subtracted from your weight + sample weight measurement).
Subsampling for Quality

- Lay stalks from each plot in a bundle on the ground next to the chipper.
- Avoid excessive exposure of stalks to the sun by keeping time between harvest, weighing, and chipping short.
- Randomly take 5 stalks to carefully grind through chipper shredder (be sure to have a bag in place to collect sample!)
- Mix well and place chopped sample into a plastic gallon bag and place in cooler with icepacks to keep it cold.
Stand Counts and Gaps

• Before you leave the field:
  • Record stand count
    • Count the number of stalks harvested in sample area. We count anything that is larger than a pencil.
  • Record gaps
    • Approximate how many ~1 ft large gaps there are in the sample area (so if there are about 2, 1 ft gaps, record “2” on the data sheet).
Forage Dry Matter & Quality

- Once back to the ovens, weigh an empty tray and record ("Tray wt, g").
- Empty the forage sample onto the tray and record the weight ("Tray + wet wt, g").
- Put the plastic bag on the tray with its sample and place in oven at 55°C (131°F).
- After ~ 4 days when sample is fully dry, take out, remove bag from tray and record weight ("Tray + dry wt, g").
- Place samples back into the plastic bags and keep dry until someone from NMSP can come pick up the samples!
Finishing Harvest

- Do not remove flags or posts until final harvest (Week 5).
- Keep samples in a cool, dark and dry place until all samples are collected.
- Call Sarah for pick up and transport of samples and supplies back to our laboratory if we are not out in the field with you.
- If samples cannot be transported back once all harvest is completed please send to:

  Sarah Lyons  
  318 Morrison Hall  
  Dept. of Animal Science, Cornell University  
  Ithaca, NY 14853
Finishing Harvest

• Complete field activity sheets with notes on harvest date, harvest stage, significant differences among plots, abnormalities, and participants.

• After the final week, keep all equipment until someone from NMSP can pick it up or take it back to campus.

• Give Sarah a call once you are done.
After Harvest

- Forage samples will be dried and ground to pass through a 2-mm sieve.
- Forage samples will then be sent to Cumberland Valley Analytical Services for quality analysis through NIR. This includes crude protein, ADF, NDF, lignin, starch, digestibility measurements, etc.
- Once all soil and forage data are analyzed, individualized reports will be generated for each farm that participated in the study.
- Results from entire study will be summarized to develop recommendations for BMR forage sorghum production for New York.
Contacts

• Sarah Lyons
  • 828-290-3584
  • sel248@cornell.edu

• Quirine Ketterings
  • 607-229-0120 (cell)
  • 607-255-3061 (office)
  • qmk2@cornell.edu

• Greg Godwin
  • 607-279-4627 (cell)
  • 607-255-1723 (office)
  • gsg6@cornell.edu
Thank you!
New York On-Farm Research Partnership

http://nmsp.cals.cornell.edu/NYOnFarmResearchPartnership/

There is great power from research information when field data are generated through well designed, repeated and widely implemented trials, with proper data collection and statistically valid analyses.

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