Using Summer Annuals as Forages for Livestock Systems

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Pasture is the primary source of forage for grazing dairies. For organic dairies, the National Organic Program livestock production regulations require a minimum of 120 days grazing per animal. In the northern U.S., this requirement is typically met by a May–September grazing season, and profitability depends on pastures providing a uniform, season-long supply of high quality forage. However, in the northern U.S., seasonal variation in temperature and precipitation creates a challenge, as the predominant forage plants, which include perennial grasses such as Kentucky bluegrass and smooth bromegrass, and legumes such as white clover, undergo a "summer slump" in production. To create a more uniform and extended forage supply, research studies recommend diversifying pasture systems to include warm season species in the summer. An approach to increasing diversity in a farm's forage base is to combine annual and perennial crops in separate fields. An example for the northern U.S. would be to use cool season grasses and legumes for forage in spring and early fall, and warm season annuals like teff and Sudangrass for forage in summer. Grazing systems using these approaches to achieve diversity require biological, environmental, and economic analysis.

Table 1. Results for forage quality of BMR sorghum-sudangrass, teff grass, and cool-season grasses during 2013 at the University of Minnesota-WCROC dairy.

Description (% of DM)	Grass Species		
	BMR Sorghum-Sudangrass	Teff Grass	Cool-Season Grasses
Dry Matter	17.0	29.0	27.0
Crude Protein	12.9	13.7	19.9
Acid-Detergent Fiber (ADF)	37.6	40.2	35.5
Neutral-Detergent Fiber (NDF)	58.1	61.8	52.7
TTNDFD	53.9	46.4	52.5
Lignin	5.4	3.6	5.7
Sugar	6.3	5.8	7.3
Non-Fiber Carbohydrates (NFC)	18.8	14.1	18.1
Net Energy for Lactation (Mcal)	0.56	0.53	0.59
Milk Per Ton	2,476	2,028	2,450

Why should summer annuals be considered by livestock producers? They are very drought tolerant and can fill a gap in feed when other species experience the "summer slump." They are great emergency forages during dry weather and are multipurpose, so they can be used for grazing, silage, or baling.

During the summer of 2013, two summer annuals for grazing were planted for the first time at the University of Minnesota dairy in Morris. BMR Sorghum-Sudangrass and Teff grass were planted to extend the forage supply. They were seeded with a drill on May 28, about two weeks later than planned due to the late Spring.

BMR Sorghum-Sudangrass has increased in popularity due to the BMR gene and increased NDF digestibility (5-10% higher than regular Sorghum-Sudangrass). The plants have thick stems and are very leafy. Sorghum-Sudangrass has moderate regrowth potential, but should not be grazed or cut for forage until the plants are at least 18" tall to reduce prussic acid concentration. The ideal height for forage is 18-36" tall. When grazing Sorghum-Sudangrass, animals should be moved so they leave 6-8" of stubble, but they might waste 20-30% of the forage through grazing. Lastly, Sorghums and Sudangrasses are luxury consumers of potassium, so they should not be used for dry cow forages. For seeding rate, fields and pastures were seeded at 20 lbs/ac.

Teff grass is native to Northern Africa. Teff is drought tolerant and can be seeded into many different soil types. This grass will produce high yield with competitive forage quality, and will have rapid growth for 9-12 weeks. The seed is very, very small. Pastures were seeded at 8 lbs/ac. Both of these annuals should be planted at 60°-65°F soil temperature and planted 1-1.5" deep. Perhaps, manure should be added as a fertilizer before planting because they have nitrogen requirements that are similar to corn.

Table 1 has averages for forage quality of BMR Sorghum-Sudangrass, teff grass, and cool-season grasses during 2013. The cool-season species consist of mixtures of smooth bromegrass, orchardgrass, red and white clover, and alfalfa. The dry matter of the Sorghum-Sudangrass was low because cattle grazed the fresh forage in the early vegetative state. The summer annuals were not as high in crude protein as the cool-season grasses. However, with lower crude proteins, nitrogen utilization of the milking herd was probably improved. The ADF values of the grasses were very similar and are within the range of low 30's to mid-50's. All of these grass species were high in digestibility. The NDF levels were higher for the summer annual grasses compared to cool-season species. However, the total tract NDFD (TTNDFD) was lowest for the teff grass. TTNDFD is a measure of how much fiber is digestible, how fast the fiber digests, and how long a cow holds the fiber in the digestive system. The summer annuals were similar to the cool-season grasses for sugar and non-fiber carbohydrates, and they provided similar net energy for lactation and milk per ton as the cool season grasses.

Remember, Sorghum-Sudangrass and teff grass are not replacements for cool-season forages, but should be added to a forage program to complement the cool-season grasses. If there is a drought or dry weather, these two forages may prevent the need to buy expensive hay during a drought.