Grazing Horses on Annual Warm-Season Grasses

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Midwest pastures mainly consist of cool-season grasses which go through a summer slump, resulting in reduced productivity and forage quality in July and August. Annual warm-season grasses can provide forage during the slump and be used as emergency forage should cool-season grasses suffer winter injury. However, annual warm-season grasses have higher fiber concentrations and lower crude protein (CP) and nonstructural carbohydrates (NSC) when compared to cool-season grasses. Additionally, most warm-season grasses are more prone to accumulating nitrates, which can be toxic to most grazing livestock at high concentrations.

Four adult horses grazed "Summer Lovegrass" teff, "PCS 3010" sudangrass, "PCS 2020" sorghum sudan BMR, Japanese millet, "Red" Siberian millet, and "Jumbo" annual ryegrass, planted in May of 2014 and 2015. Annual ryegrass served as a cool-season grass control. Horses rotationally grazed these forages June to September at a vegetative stage of maturity; yield and nutritive values were evaluated prior to grazing. Manure was removed, and remaining forage mowed to 4" and allowed to regrow. Horse preference was determined by visually assessing percentage of available forage removed on a scale of 0 (no grazing activity) to 100 (100% of existing vegetation grazed down to 4").

Preference. Annual ryegrass, teff, and sudangrass were consistently the most preferred forages while sorghum-sudangrass, and Japanese and Siberian millets were the least preferred.

Yield. Sudangrass was consistently among the highest yielding grasses (>6.0 tons/ac) while Siberian and Japanese millets and annual ryegrass were among the lowest yielding (<2.8 tons/ac). Neither Siberian nor Japanese millet survived the entire growing season, which may have resulted in their lower overall yields. All other annual grasses resulted in three or more grazings during the summer and fall months. Results indicate annual warm-season grasses, with the exception of Siberian and Japanese millets, have potential for high yields when grazed by horses. However, warm-season forages should not be grazed lower than 4-6" for optimal regrowth in a grazing system.

Forage Nutritive Value. Annual ryegrass consistently had higher CP and NSC levels, as well as lower neutral detergent fiber (NDF) concentrations when compared to warm-season grasses (Table 1). While warm-season grasses had a lower nutritive value, they met or exceeded the nutrient requirement for adult horses at maintenance. Lower NSC values (≤10%) in warm-season grasses suggest they have potential for horses diagnosed with metabolic conditions. However, it is important to note that an inverted calcium to phosphorus ratio (Ca:P) was observed in most forage species (ideal Ca:P ratio is 1:1-3:1). If a Ca:P is <1:1, calcium supplementation will be required to increase mineral availability.

Table 1. Nutritive values of annual forages grazed by horses in 2014 and 2015.

Forage Species	2014				2015			
	CP	NDF	NSC	Ca:P	CP	NDF	NSC	Ca:P
	% DM							
Annual Ryegrass	26	47	14	1.0:1	30	45	9	1.0:1
Teff	22	60	6	0.7:1	28	53	7	0.8:1
Sudangrass	20	60	9	1.0:1	21	55	7	1.2:1
Sorghum Sudangrass	22	59	9	0.6:1	24	56	5	0.8:1
Japanese Millet	23	56	10	1.2:1	26	53	6	1.2:1
Siberian Millet	24	57	7	0.8:1	28	53	3	0.7:1

Nitrates. Some forages are capable of accumulating high concentrations of nitrates (NO3-N) as a result of over fertilization or environmental stress. Nitrate toxicity is considered rare in horses and toxic levels have yet to be determined. Previous research indicates horses can consume forage with a NO3-N as high as 4,600 ppm before nitrate toxicosis will be observed. While all forages, except annual ryegrass, were at acceptable levels in 2014, they all exceeded 6,430 ppm in 2015 (Table 2). While excessive drought and heat were not observed, soil nitrogen mineralization from past manure applications may have contributed to the high nitrate values. However, nitrate toxicity was not observed, likely because horses grazed these forages for short periods of time and in rotation with other forages. Nitrate concentrations should be determined prior to grazing warm-season grasses.

Table 2. Nitrate-nitrogen values of horses grazing annual grasses in 2014 and 2015.

Forage Species	2014	2015
	NO3-N (ppm)	
Annual Ryegrass	6,821	9,202
Teff	2,547	6,430
Sudangrass	2,793	8,412
Sorghum Sudangrass	1,049	7,693
Japanese Millet	2,347	7,493
Siberian Millet	4,094	9,073

Based on maximizing yield, nutritive values, and preference, teff and sudangrass show potential as annual warm-season pasture forages. However, sudangrass can lead to prussic acid poisoning, cystitis syndrome, and abortions in horses. These are more commonly observed under stressful environmental conditions, including high temperatures, drought, and frost. Teff may be utilized in Midwest horse pastures as an emergency forage or to maximize grazing during the summer slump. Also, warm-season annual's low NSC content shows potential for these forages to be grazed by horses diagnosed with metabolic conditions. However, due to the inverted Ca:P levels and higher nitrate concentrations, teff should be tested prior to grazing.