USDA Agricultural Research Service
U.S. DEPARTMENT OF AGRICULTURE

Animal Performance of Grazing Dairy Heifers and Cows – Assessment of Grasses

U.S. Dairy Forage Research Center

Introduction

Common questions asked by graziers are which cool-season grasses should I grow, and what type of animal performance can I expect? As one might expect, there can be various perspectives on these recurring questions based on a host of factors, including climate, topography, livestock type, and a wide range of producer objectives. The following studies attempt to provide some situational comparisons of different forage types for dairy heifers and cows[1].

Heifers

Most research studies have found that meadow fescue typically exhibits less deposition of structural plant fiber, measured as neutral-detergent fiber (**NDF**), and greater NDF digestibility (**NDFD**, % of NDF) than many other perennial cool-season grasses. While these responses are highly desirable, meadow fescue is often measurably less productive than other erect-growing, perennial cool-season grasses.

In part, these issues have been addressed in a three-year grazing trial conducted at Marshfield, Wisconsin (Hribar, 2019), where pre-bred heifers (~530 lbs) were assigned to either orchardgrass or meadow fescue pastures from May through October. Heifers were grazed within a rotational system that included 10 paddocks within each pasture; therefore, heifers were moved to a new paddock about twice weekly. Water was available continuously, and mineral was available daily, but no supplemental concentrates were offered.

Holstein dairy cattle grazing cool-season pastures (University of Wisconsin Marshfield Agricultural Research Station photo).

Across the 3-year trial, orchardgrass initiated spring growth more quickly, and permitted grazing about eight days earlier each spring than meadow fescue. Contrary to expectations, meadow fescue exhibited greater pre-graze forage availability across the three-year trial than orchardgrass (1349 vs. 1213 lbs DM/acre), but the average annual total forage yield was similar between the two forages. Measures of forage quality and heifer growth performance are shown in Table 1.

Consistent with several other experiments (mostly in Wisconsin), meadow fescue displayed reduced concentrations of NDF, and greater digestibility for both NDF and DM compared to orchardgrass. In each case, these differences were statistically significant. Although one might expect these advantages in forage nutritive value to support improved growth performance by heifers grazing

[1] *For a related discussion on stockpiling various perennial cool-season grass species that includes dairy heifer growth performance, please see 'Stockpiling Perennial Cool-Season Grasses' within this outreach series.*

Table 1. Measures of forage quality and heifer growth performance for pre-bred heifers grazing orchardgrass and meadow fescue pastures across three years at Marshfield, Wisconsin [adapted from Hribar (2019)].

Item[1]	Meadow Fescue	Orchard-grass
NDF, *% of DM*	53.3	56.0
NDFD, *% of NDF*	66.9	64.0
IVDMD, *% of DM*	71.0	68.2
CP, *% of DM*	14.8	14.1
Starting Bodyweight, *lbs*	529	531
Ending Bodyweight, *lbs*	798	780
Gain, *lbs*	269	249
Daily Gain, *lbs/day*	1.72	1.61
Hip Height Change, *inches*	4.9	4.6
BCS Change	+ 0.38	+ 0.25

[1] *Abbreviations: NDF, neutral detergent fiber; NDFD, in-vitro neutral detergent fiber digestibility; IVDMD, in-vitro DM digestibility; CP, crude protein; BCS, body condition score, where 5 = obese and 1 = emaciated.*

meadow fescue pastures, the modestly improved daily and total gains, as well as changes in hip height and body condition score were only numerical in nature, and not statistically significant. Average daily gains (1.62 and 1.71 lbs/day) approached a rate that is commonly targeted across the industry (1.8 lbs/day) for Holstein heifers reared in confinement-based systems. It was concluded that grazed heifers demonstrated acceptable growth performance on both grass types with a high level of pasture management and without supplementation with concentrate feeds. Lactating cows with greater nutrient demands might have demonstrated more definitive differences in production metrics based on the differences in nutritive value observed in this study.

Lactating Cows

For lactating cows, the most appropriate forage to include in pastures is not limited strictly to assessments of forage nutritive value. Without

Table 2. Yield, quality, potential stocking rate, and predicted milk production for 1100-lb cows grazing perennial cool-season grasses during Year 1 [adapted from Brink et al. (2008)].

Forage	Yield	NDF[1]	NDFD[1]	Potential Stocking Rate	Predicted Milk Production[2]
	lbs DM/acre	*%*	*% of NDF*	*cows/acre/day*	*milk/cow/day*
Spring					
Meadow Fescue	1030	46.3	86.5	16	59
Orchardgrass	1010	49.5	84.0	16	52
Quackgrass	1940	50.6	79.6	32	47
Reed Canarygrass	1210	47.8	84.8	20	55
Summer					
Meadow Fescue	1640	45.3	84.0	24	59
Orchardgrass	660	49.1	84.5	11	53
Quackgrass	1180	47.2	78.3	18	53
Reed Canarygrass	1470	49.6	83.4	24	51
Fall					
Meadow Fescue	840	43.5	76.0	12	59
Orchardgrass	820	48.4	77.1	13	50
Quackgrass[3]	---	---	---	---	---
Reed Canarygrass	1000	43.2	76.3	14	59

[1] *Abbreviations: NDF, neutral detergent fiber; NDFD, neutral detergent fiber digestibility.*
[2] *Assumes no supplemental concentrates were offered.*
[3] *Insufficient forage available for harvest.*

Table 3. Yield, quality, potential stocking rate, and predicted milk production for 1100-lb cows grazing perennial cool-season grasses during Year 2 [adapted from Brink et al. (2008)].

Forage	Yield	NDF[1]	NDFD[1]	Potential Stocking Rate	Predicted Milk Production
	lbs DM/acre	*%*	*% of NDF*	*cows/acre/day*	*milk/cow/day*
Spring					
Meadow Fescue	810	43.1	86.4	12	66
Orchardgrass	710	42.2	86.3	10	68
Quackgrass	1210	44.9	79.0	18	58
Reed Canarygrass	880	43.5	84.2	13	64
Summer					
Meadow Fescue	890	46.4	73.7	14	52
Orchardgrass	940	50.1	72.5	16	44
Quackgrass	---	---	---	---	---
Reed Canarygrass	1460	52.4	74.3	26	41
Fall					
Meadow Fescue	740	43.2	72.2	11	58
Orchardgrass	840	47.9	69.8	14	46
Quackgrass[2]	---	---	---	---	---
Reed Canarygrass	---	---	---	---	---

[1] *Abbreviations: NDF, neutral detergent fiber; NDFD, neutral detergent fiber digestibility.*
[2] *Assumes no supplemental concentrates were offered.*
[3] *Insufficient forage available for harvest.*

question, nutritive value affects DM intake and subsequent milk production. However, any grazing system is dependent on the availability of forage; furthermore, the expected seasonal distribution of forage production for specific perennial cool-season grasses is not consistent across all cool-season species. Although this variability may complicate management strategies, it also can be advantageous. For instance, any species that breaks dormancy earlier in the spring and matures rapidly can allow grazing earlier in the spring, while forages known for good fall growth, such as tall fescue, can be especially useful in extending the grazing season. One research attempt to assess these various management factors was conducted over two years at Arlington, Wisconsin (Brink et al., 2008). Meadow fescue, orchardgrass, quackgrass, and reed canarygrass were established in 15 × 20-foot plots and harvested seasonally (spring, summer, and fall) at an approximate 10-inch height, leaving a stubble of about 4 inches to support aggressive regrowth. Using forage yield and nutritive value data for these forages, potential stocking rate and milk yield for 1100-lb cows were predicted. These predictions assumed:

- any grazing would be conducted in single-species pastures (monocultures)
- there would be no supplementation with concentrate feeds.

Years 1 and 2 of the trial differed substantially with respect to amount and timing of precipitation, and are summarized separately in Tables 2 and 3, respectively. An important point not shown in Tables 2 or 3 is the aggressive early-season growth of quackgrass, which would permit grazing 3 to 6 days earlier each spring than the other forages. Although this forage is often considered an undesirable weed in many agronomic crops, its early spring growth within a grazing context can be considered one of its unique attributes. In addition to reaching the target height for sampling sooner, it also produced 44 and 34% more spring forage in Years 1 and 2,

respectively, than the average of the other species tested. This additional spring production would have supported 12 to 16 (Year 1) and 5 to 8 (Year 2) more cows/day than the other forages during those respective years. In contrast, quackgrass did not produce enough forage to evaluate during either fall season, thereby illustrating the discrepancies in seasonal production that can be potentially manipulated to producer advantage, but also present liabilities at other times during the grazing season.

The other major variable in grazing systems is managing the nutritive value of the forages grazed. In this respect, meadow fescue exhibited consistently better characteristics than other forages, which was a function of both less NDF, and greater digestibility of that fiber (NDFD). As a result, predicted milk/cow/day was greatest for meadow fescue in all seasons except for comparisons with reed canarygrass in the fall of Year 1 and orchardgrass in the spring of Year 2; however, these exceptions were minimal in scope and not statistically relevant. In reality, there are other management factors frequently superimposed on the considerations discussed here. Lactating cows grazing cool-season pastures are often supplemented with concentrates, where the daily allocation and formulation can be adjusted to address seasonal variations in nutritive value. Furthermore, most cool-season pastures are not monocultures, and may contain various grass species, as well as legumes. However, translating forage nutritive value into milk production allows producers a better assessment of trade-offs between forage and animal productivity, and can be a useful exercise in evaluating pasture grasses.

References

Brink, G.E., M.B. Hall, D.R. Mertens, and M.D. Casler. 2008. Grass yield and quality affect potential stocking rate and milk production. Online. Forage and Grazinglands doi:10.1094/FG-2008-0313-01-RS.

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U.S. Dairy Forage Research Center, USDA-Agricultural Research Service

1925 Linden Drive, Madison, WI 53706 | Phone: 608-890-0050

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