

Millets

Forage Management

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Introduction

Millets are major grain crops world wide, but in Iowa their use is mainly as annual summer forage production as hay, silage, green-chop, and pasture. The sudan/sorghum forages are often the first choice for summer annual forage production, but millets have been gaining in popularity.

Millets grown in Iowa include:

- Pearl Millet -- also called Cattail Millet.
- Japanese Millet -- also called Barnyard Millet. Seed shatter may lead to Barnyardgrass weed problems.
- Foxtail Millet -- German and Siberian varieties seem to be the most popular for forage use.
- Proso Millet -- also called hog, hershey, and broomcorn millet.

Forage Selection for Livestock

All millet forages are good feed for beef and sheep. The choice of millet is largely dependent on seasonal needs and intended harvest management @ silage, pasture, green-chop, hay, etc.

Dairy -- There is some evidence¹ that Pearl Millet may cause butterfat depression in milk. Therefore, recommendations for use of Pearl Millet with lactating dairy are either to:

- limit feed the millet and monitor butterfat levels
- or simply avoid its use for lactating dairy

Horses -- Do not feed Foxtail Millet as a major component of their diet. Foxtail Millet acts as a laxative² and contains a glucoside called setarian that may damage the kidneys, liver, and bones³.

Table 1. Establishment and Harvest Information for Millet Forages.

Forage millet	Seeding rate	Typical dry matter yield & cutting schedule	Days from planting to 36-inch height or boot stage	Harvest at boot stage or 36-inch height down to...	Height when to graze, Height to graze to, Grazing interval
	lbs./ac.	tons/ac.			
Pearl	25-30	4 to 6 tons 2 to 3 cuts	45 to 50 days to 36-inch height	6 to 10 inches of stubble to allow for optimum regrowth	18 to 30 inches, 6 to 8 inches, 3 to 4 weeks
Japanese	25-30	3 to 5 tons 2 cuts	45 to 55 days to 36-inch height	6 to 10 inches of stubble to allow for optimum growth	Lack of information on grazing potential
Foxtail	15-25	2 to 3 tons 1 cut	50 to 60 days to boot stage	2 inches, little regrowth	Graze aftermath growth after 1 st cut
Proso	15-25	2 tons 1 cut	40 to 50 days to boot stage	2 inches, little regrowth	Graze aftermath growth after 1 st cut

Establishment Tips for Millets

- Date of planting: June 1 to July 15.
- Soil temperatures at planting: 65°F and increasing. The minimum soil temperature is more critical than planting date.
- Seeding depth: ½ to 1 inch deep.
- Seeding method: Most common method is to use a grain drill. Achieve good seed-to-soil contact (press wheels or cultipacker) for best results.
- Seeding rate: Typical seeding rates are listed in Table 1. Use lower rates for grazing management and production on lighter soils, and higher rates for hay management.

Soil pH and Fertility

Millet forages grow well in soil pH levels between 5.5 and 7.5. Typical nitrogen (N) recommendations under multiple harvest management (Pearl Millet and Japanese Millet) would be 50 to 80 lbs./ac. N preplant, and 40 to 50 lbs./ac. N after each harvest. For Foxtail and Proso Millet, just use the preplant recommendation. Remember to use N credits from manure, forage legumes, and soybeans if applicable.

Weed Management

Delay planting until soil temperatures are warm enough for the first flush of weeds to be controlled by tillage. This coincides with recommended soil temperatures for planting millet. These warm soil temperatures allow for relatively quick emergence and growth of millets such that herbicides are rarely needed.

Some 2,4-D labels allow postemergence application for broadleaf control. Follow label directions. These labels usually restrict harvesting or grazing of forage for 14 days after application.

Harvest Management

Grazing-- Best choice for grazing tends to be Pearl Millet, or more specifically, the newer developed hybrid Pearl Millets. Best utilization for grazing is to subdivide pastures and graze in a rotation. Stagger plantings to help spread out plant growth and development for best grazing potential. Stocking rates of 4 to 6 animal units

per acre should provide for uniform and efficient utilization of forage. Leave 6 to 8 inches of stubble for rapid regrowth and tiller development. If forage height gets too tall for efficient grazing, consider ensiling or green chop.

Hay -- The easiest millet to hay is Foxtail and Proso Millet. Pearl Millet stems are too coarse to allow for a good hay option. Japanese Millet stems are coarser than Foxtail and Proso Millets but thinner than Pearl Millet. Because of the stem thickness, Japanese Millet is still challenging to hay, but with proper management it can be accomplished. For all millets, hay harvest should be done prior to heading stage.

Foxtail and Proso Millet -- These millets rarely provide sufficient regrowth to economically justify another hay harvest. Utilize regrowth by grazing. Awns of mature Foxtail Millet heads have caused feeding problems.

Japanese Millet -- Leave 6 to 10 inches of stubble for best regrowth. Use the higher recommended seeding rates for hay production to reduce stem thickness and provide a dense stubble to help hold the cut forage off the soil surface and aerate the cut forage swaths. Condition using more roller pressure than for conventional hays. Create as wide and fluffy a windrow as possible. Do not turn the windrow until all of the plants on top of the windrow are dry enough for baling.

Silage -- Harvest is recommended anytime from boot to soft dough stage. Wilt forage to appropriate moisture depending on storage structure (upright, bagged, bunker, etc.).

Green-chop -- Requires more timely labor than for other harvest systems, but it avoids trampling from grazing and potential dry-down problems from haying.

Forage Quality

Millets provide good quality feed. However, quality will vary with harvest management, soil fertility, weather conditions, and the choice of millet forage. Table 2 provides forage quality data from a single research trial conducted in 1990 at the University of Minnesota Research Farm at Rosemount. Use the table only as a rough guideline of forage yield and quality of millets.

Table 2. Comparisons of Forage Yield & Quality of Millets & Sorghum-Sudan Forages, U of MN, 1990.

Forage	Harvest schedule	Dry matter yield	Crude protein	RFV
		tons/ac.	%	
Pearl millet	1-cut	5.4	11.5	77
	multiple cuts	5.7	17.2	92
Japanese millet	1-cut	3.5	14.1	82
	multiple cuts	5.0	16.6	87
Foxtail millet	1-cut	3.5	12.3	77
Proso millet	1-cut	3.0	12.8	88
Sudangrass	1-cut	6.2	16.0	76
	multiple cuts	6.2	17.2	88
Sorghum-sudan	1-cut	7.3	9.7	75
	multiple cuts	5.8	18.2	95

Nitrates

Millets may accumulate nitrates under conditions of heavy N fertilization and limited soil moisture. Plant growth reduces nitrate levels by dilution and metabolism of nitrate into protein. Nitrate concentrations are greater in stems and highest in the lower 6 inches. Since harvest management of Pearl and Japanese Millet recommends leaving at least 6 inches of stubble, nitrates rarely pose a problem.

If harvesting a drought-stressed crop, leave a high stubble height. Nitrate is stable in hay. The hay curing process will not reduce nitrate levels. However, proper ensiling will reduce nitrate concentrations by 40 to 60%. Forages suspected of high nitrate levels should be tested by a laboratory. See Table 3 for guideline on concentrations of nitrates in feedstuffs.

Table 6. Guidelines for Nitrate in Feedstuffs⁵

Nitrate (NO ₃) concentration ¹		Comments
(%)	ppm	
0.00 - 0.44	0 - 4,400	This level is considered safe to feed under all conditions.
0.44 - 0.66	4,400 - 6,600	This level should be safe to feed to non-pregnant animals under all conditions. It may be best to limit its use for pregnant animals to 50% of the total ration on a dry basis.
0.66 - 0.88	6,600 - 8,800	Feeds safely if limited to 50% of the total dry matter in the ration.
0.88 - 1.54	8,800 - 15,400	Feeds should be limited to about 35 to 40% of the total dry matter in the ration. Feeds containing over 0.88% nitrate should not be used for pregnant animals.
1.54 - 1.76	15,400 - 17,600	Feeds should be limited to 25% of total dry matter in ration. Do not use for pregnant animals.
over 1.76	over 17,600	Feeds are potentially toxic. Do not feed.

¹NO₃ concentration, ppm ÷ 4.4 = NO₃-N concentration, ppm

References

1. Wheaton, N.H. *Sudangrasses and Other Crops for Temporary Forage*. University of Missouri.
2. National Research Council, *Nutrient Requirements of Dairy Cattle*, Sixth Addition, 1989.
3. Boyd et al. 1938. *Agronomy Journal*.
4. Burns and Wedin. 1964. *Agronomy Journal*.
5. Faulkner, D.B. and M.F. Hutjens. 1989. *Nitrates in Livestock Feed* from the American Society of Animal Science symposium.