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Pearl millet cultivation in Colorado

Duane L. Johnson, Robert L. Croissant

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QUICK FACTS

- Early maturing varieties are necessary. Plants must mature in 110 to 120 days. Plants are indeterminate in nature and will continue to tiller until plant senescence.
- Pearl millet is extremely drought-hardy and grows best under dryland conditions in Colorado.
- Does not contain high levels of prussic acid or tannins.
- Hybrids are available as well as open pollinated and synthetic varieties.
- Primarily grown for grain production but may be suitable for forage.

Table 1: Yield comparisons of forages by hybrids and cutting treatments with pearl millet at Walsh, CO. (1972)

Hybrid ¹	Tons of oven-dry forage per acre				Hybrid average
	1 cutting	2 cuttings	3 cuttings	4 cuttings	
Sudax 11	8.73	7.61	5.43	4.35	6.53
Grazer N	11.62	8.30	5.35	4.58	7.46
Trudan 4	6.03	6.77	5.24	3.67	5.43
Millex 22	6.97	5.91	5.68	5.04	5.90
Cutting treatment average	8.34	7.15	5.43	4.41	

¹DeKalb Sudax 11 is a sorghum x sudan hybrid; Asgrow Grazer N is a sorgho x sudan hybrid; NK Trudan 4 is a sudan x sudan hybrid; NK Millex 22 is a pearl millet x pearl millet hybrid.

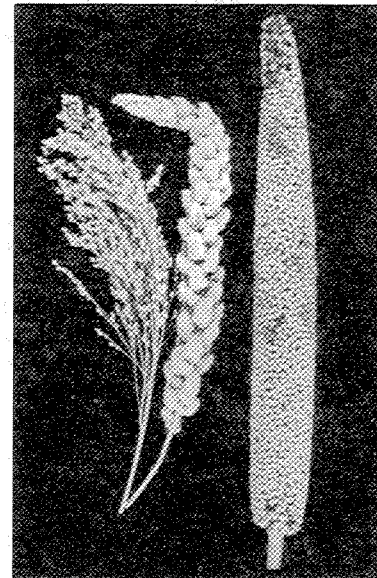


Figure 1: The inflorescence of three types of millet. Left to right: Proso millet—*panicum miliaceum*, foxtail millet—*setaria italica*, and pearl millet—*pennisetum americanum*.

Pearl millet, *pennisetum americanum* is a relative newcomer to Colorado. It is a tropical arid plant and distant relative of grain sorghum. There have been cases reported of crosses between the two species. Pearl millet is a common grain in the semi-arid areas of Africa south of the Sahara. (The inflorescence of pearl millet is compared with proso and foxtail types. See Figure 1.) It is one of the most water efficient cultivated plants with water requirement values expected to fall between the proso and common millet values. It survives well where dryland sorghum may fail. Under irrigation or high precipitation, pearl millet yields are generally not competitive with sorghum. Pearl millet types exist for both forage and grain production. Forage yield comparisons are shown in Table 1 and grain comparisons in Table 2. Normally, forage types produce very little grain.

¹Duane L. Johnson, CSU associate professor of agronomy and Robert L. Croissant, CSU extension associate professor of agronomy (12/85)

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Establishment

Pearl millet is somewhat difficult to establish. Planting rates of 3 lbs/A of seed are acceptable although excellent stands are 5 lbs/A of seed. Pearl millet tillers heavily at low plant density and compensates somewhat for dense or low populations. Generally, look for stands of 60,000 to 80,000 plants/A. Grain types will generally be 3 to 6 feet tall while forage types will be 8 to 10 feet tall. Pearl millet should be planted when soil temperatures reach 60° F at seeding depth. It may be drilled with a grain drill but not planted more than one inch deep and covered with moist soil. Most planting equipment will need modification for planting rates of 5 lbs/acre or less. Planting and harvesting methods and equipment are very similar to those used in sorghum.

Table 2: Dryland pearl millet yields, 1983—Akron.

Exp. Hybrid	Lbs/Bu	Lbs/A
1	54.4	720.6
2	53.9	262.9
3	55.2	1569.3
4	54.6	789.8
5	56.9	1195.4
6	53.7	966.5
7	54.9	1015.2
8	53.7	2049.7
9	53.8	2011.2
10	54.9	2064.5
11	53.4	1883.5
CO Sd Syn*	54.7	2978.6
Sorghum Avg	53.3	2985.0**

*Colorado semidwarf Synthetic

**1983 Sorghum Hybrid Performance Tests

Fertilizing Millet

Very little information is available pertaining to fertilizer requirements and responses of millet. Experiments during 1960-70 in Nebraska and the Central Great Plains Research Stations suggest that proso may respond to fertilization when wheat and barley respond. In other tests, dry matter yields were increased with adequate moisture, but grain yields were not when 30 to 50 lbs. of nitrogen were added. Economic fertilizer responses are expected to occur at an increasing rate as yields improve. It is suggested that 20 to 50 lbs. of nitrogen be added under dryland conditions. With added irrigation, nitrogen application rates of 100 lbs/acre may be acceptable for forage production. Soil testing is a recommended practice to determine the needs of millet on a field by field basis.

Pest Control

Pearl millet is very tolerant to some herbicides, but none are registered for this use. Very few insects or diseases have been observed on pearl millet in Colorado. Some diseases observed elsewhere in the United States include various leaf spots and smuts caused by *helminthosporium* sp., *pseudomonas* and *ustilago*. These diseases do not currently appear in economic outbreaks. Field maturity is generally delayed because of late tillers but is comparable to the mid-maturity sorghums in Colorado. Pearl millet is sensitive to

cold and has not been doing well along the front range or north of Highway 34 in eastern Colorado.

Research

Because of pearl millet's forage potential and disease resistance, most pearl millet varieties are being developed in the higher rainfall areas in southeastern United States. Universities involved in pearl millet in our area are Colorado State University, Kansas State University (KSU-Ft. Hays) and the University of Nebraska. Commercial hybrids are available on a limited basis.

Materials developed and under preliminary evaluation from KSU have not had enough heat tolerance for southeastern Colorado. Newer hybrids should have better tolerance. CSU has a limited amount of an experimental synthetic variety available for trials in 1986.

Markets

Organized markets do not exist for pearl millet and very limited amounts are sold through health food stores for human consumption. Pearl millet is a staple food in many African and Indian countries of which export markets may develop. Animal feed potential for pearl millet is at least equal to or better than most grains. As quality hay or silage, feed value of pearl millet is equal to forage sorghum.

Nutrition

Pearl millet grain lysine content is nearly equal to high lysine corn but still considered deficient when fed to swine. It also does not contain the antinutritional factors of sorghum such as dangerous levels of prussic acid or high levels of tannins. Nutritional comparisons of pearl millet with other grains are shown in Tables 3 and 4.

If pearl millet is grown under drought stress conditions, high levels of nitrate and alkaloids may accumulate in the forage when the plant is in the vegetative state. This characteristic is similar to other types of millet, sudan and sorghum.

Table 3: Chemical composition of several cereal grains.

Grain	Protein %	Oil %	Ash %
Pearl Millet	16.0	4.5	2.2
Spring Wheat	14.0	2.2	1.7
Winter Wheat	12.3	1.8	1.7
Field Corn	8.0	3.9	1.2
Rice	6.7	0.4	0.5
Sorghum	11.0	3.3	1.7

Crop Sci. 12:187-188, 1972

Table 4: Grain yield, protein and amino acid profile of pearl millet and Martin sorghum. Manhattan, KS.

	Grain Yield Bu/A	Lysine Protein %	% of Protein
Pearl Millet	58	14.4	3.5
Sorghum	54	13.3	2.2

Crop Sci. 16:745-746, 1976