



Millet Production

Guide A-414

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The term "millet" is applied to various grass crops whose seeds are harvested for human food or animal feed. Sorghum is called millet in many parts of Asia and Africa, and broomcorn is called broom millet in Australia. Compared to other cereal grains, millets are generally suited to less fertile soils and poorer growing conditions, such as intense heat and low rainfall. In addition, they require shorter growing seasons. The most common millets grown in New Mexico include foxtail and hybrid pearl varieties.

Millets are generally considered minor crops except in parts of Asia, Africa, China, and the Soviet Union. As a group, millets are used for both forage and grain. When used as grain, they are considered a cereal, but in the United States they have lost a great deal of importance in favor of other cereal crops such as wheat or rice. However, millets may once again become important in the United States as rotational or cover crops.

Millets include five genera, *Panicum*, *Setaria*, *Echinochloa*, *Pennisetum*, and *Paspalum*, all of the tribe Paniceae; one genus, *Eleusine*, in the tribe Chlorideae; and one genus, *Eragrostis*, in the tribe Festuceae. The most important cultivated species of millet are foxtail (*Setaria italica*), pearl or cattail millet (*Pennisetum glaucum*), proso (*Panicum miliaceum*), Japanese barnyard millet (*Echinochloa crusgalli*), finger millet (*Eleusine coracana*), browntop millet (*Panicum ramosum*), koda or ditch millet (*Paspalum scrobiculatum*), and teff millet (*Eragrostis tef*).

Millet Types

Foxtail Millet, also called German or Italian Millet (fig.1)

One of the oldest cultivated crops, foxtail millet has generally been displaced by sudan grasses as late-sown hay crops. Foxtail millet requires warm weather and matures quickly in the hot summer months. Generally grown in semi-arid regions, it has a low water requirement, though it does not recover well from drought conditions because it has a shallow root system. Successful production is due almost entirely to its short growing season: millet hay crops will mature in 65-70 days; grain varieties mature in 75-90 days. Foxtail millet can be planted when it is too late to plant most other crops.

An annual grass, foxtail millet forms slender, erect, leafy stems varying in height from 1-5 ft. Seeds are borne in a spike-like, compressed panicle resembling yellow foxtail, green foxtail, or giant foxtail. Its small convex seeds are enclosed in colored hulls, with color depending on variety. Only about 10 or more varieties of foxtail millet are grown in the U.S.

Principal uses of foxtail millet include hay or forage. Although other hay crops are superior in quality, foxtail millet makes good hay for cattle and sheep. Foxtail millet is also used as a grain crop and for birdseed. Some diseases affecting foxtail millet including mildew, bacterial blight, and leaf spots. Kernel smut is also a

problem in some cases; it can be controlled with seed treatments at planting.

Pearl Millet, also called cattail millet, bullrush, millet, candle millet, and penicillaria (fig. 2)

Pearl millet is generally used as a temporary summer pasture crop or in some areas as a food crop. It is a tall, erect, annual bunchgrass growing from 6-15 ft in height. It is particularly well adapted to nutrient-poor, sandy soils in low rainfall areas. Stems are pithy and leaves are long-pointed with finely serrated margins. The plant tillers freely and produces an inflorescence with a dense spike-like panicle 14" long and 1" or less in diameter. The mature panicle is brownish in color, and spiklets are borne in fascicles of two, surrounded by a cluster of bristles. Each spiklet has two florets, one of which is generally staminate. The upper floret is fertile, with the caryopsis (seed) being enclosed by the lemma and palea from which it threshes free during harvest. Pearl millets are generally cross-pollinated. Several varieties and hybrids have been developed. Uses of pearl millet include hay, pasture, silage, seed crops, and food. There appear to be few or no disease problems associated with pearl millet.

Proso Millet, also called broomcorn millet, hog millet, and hershey millet (fig. 3)

Proso millet is grown as a grain crop for human food and is adapted to regions where spring-sown small grains are successful. A short-season crop, it often requires only 60-75 days from seeding to maturity and is generally grown as a late-seeded, short-season summer catch crop. Moderately warm weather is necessary for good plant growth. Proso millet has the lowest water requirement of any grain crop; it is also subject to drought injury because of its shallow root system. It does not grow well on coarse sandy soil.

The inflorescence of proso millet is a large open panicle with coarse, woody stems 12-48" high. The large erect stems and leaves are covered with hair. Seed are enclosed in the inner chaff or hull, and they are larger than those found on foxtail millet. Hulls can vary from white to black, with reds, browns, and grays. Most seeds are self-fertilized, but some cross-pollination does occur. Varieties of proso millet are divided into three groups based on the shape of the panicle: (1) spreading, (2) loose and one-sided, and (3) compact and erect.

Proso millet can be planted following most other crops. It is generally used as a late-seeded, short-season summer catch crop. Diseases are not prevalent on proso millets, but some diseases warrant mention, especially bacterial stripe disease and head smut. Both diseases are considered to be seed-borne: a producer should only buy registered or certified seed for planting to ensure disease-free seed.

Japanese Millet, also called barnyard millet or billion dollar grass (fig. 4)

Japanese millet is grown principally as a forage grass. It resembles barnyard grass (considered a weed in many places) and probably originated from it. Japanese millet is usually grown as a late-season green feed in temperate climates with humid or sub-humid conditions. It makes the most rapid growth of all millets under favorable weather conditions, occasionally producing ripe grain in 45 days after seeding. The growth habit of this annual grass is an erect plant 2-4 ft tall with a panicle inflorescence made up of 5-15 sessile erect branches. Spiklets are brownish to purple and are borne on one side of each branch. Seeds are slightly longer than wide and are larger than those of barnyard grass. Japanese millet makes its best growth on good soils. It is not subject to major fungal diseases; it is susceptible to several species of head smuts.

Another related species of Japanese millet is jungle rice, *E. colonum*, which is considered a weed in most places. The mature Japanese millet plant is difficult to cure for hay because of the thick stems; thus it makes a more palatable hay when cut before heading.

Finger Millet, also known as ragi, nagli, birdsfoot millet, coracana millet, and African millet

Finger millet is generally grown as a food crop in areas where rice is grown, in contrast to other millets grown in arid or semiarid conditions. Finger millet grows best in moist climates in almost any type of soil. It does not do well in areas of heavy rains, but prefers damp conditions. This annual millet generally grows 3-4 ft tall and tillers freely. Helminthosporium diseases can cause leaf spots, seedling blight, and head blight in finger millet. Grain smut has also been reported.

Browntop Millet

Browntop millet is grown for hay and pasture in the southeastern U.S. It provides an excellent source of food for game birds. It is a quick-growing annual 2-4 ft tall with an open panicle 2-6" long. Its forage yields are less than that of pearl millet, but it has a shorter growing season and finer stems that allow easier curing for hay. Grown top millet seed shatters easily and reseeding is natural, making this millet a weedy pest in some places.

Koda or Ditch Millet

These millets resemble certain forage grasses from the genus *Paspalum*. They are closely related to Dallas grass, Vasey grass, and Bahia grass and are primarily grown for forage.

Teff Millet

Teff millet is grown for food in many countries. This millet has a high iron content nearly double that of other food grains and a calcium content almost 20 times more than other grains. These two nutrient levels provide a more favorable nutritional value for teff over other millets.

Millets are generally planted in much the same manner as small grains, using drills with 6-8" row spacing, as wider-spaced drills may allow weed competition. Soil preparation should follow recommendations for producing small grains or sorghum. A fairly level, loose, and mellow seedbed is recommended, and soils should be weed free prior to planting. Millets may be seeded at any time that will allow 60-70 days growing season until frost; yields are reduced if seeding is delayed beyond 60-70 days prior to frost.

Millets do not germinate in cool, wet soil, so it is necessary to delay planting until soils are thoroughly warmed. Regular grain drills set to deliver seed from the small side are generally used for seeding. Seeding depth should not exceed 1/2-1". Generally, when producing millet for seed crops, seeding rates should be reduced by half and millet should be planted in rows to allow cultivation. Higher seeding rates are recommended when forage or hay crops are desired.

Seed millets are generally harvested by windrowing when seeds in the upper half of the head are ripe. This practice prevents shatter and lodging losses. Allow the windrow to dry prior to combine thrashing with a pick-up attachment. Average protein content of most foxtail and proso millet seed ranges from 11 to 12%, compared to around 13% for wheat.

Hay crops should be windrowed when heading begins, especially if used for horse feed. Millet can be dangerous to horses in large quantities, due to a glucoside known as setarian that acts a diuretic. Cutting hay early lessens this danger. Hay for sheep and cattle feed can be cut when heads are in the early milk stage. If hay is cut in later stages of development, quality is lowered but yields are higher.

Cultural Practices For Millets

Millet type	Planting date	Seeding rate lb/A	Soil conditions	Maturity days from planting (for seed production)
Proso	May-July	20-40	almost any soil	60-75
Foxtail	Mid-May- August	10-20 (5 lb for seed production)	all soils (except coarse sand)	75-90
Pearl	April-July	5-15	almost any soil	60-70
Japanese	April-July	20-25	medium to heavy soils	45-60
Finger	April-June	8-10	almost any soil	90-120
Browntop	May-July	10-20	almost any soil	45-60

FERTILITY PRACTICES

Millets are generally grown on less fertile soils. All millets respond to nitrogen and phosphorus fertilizers, but there are only broad guidelines on fertility practices for millets. Generally 40-100 lb of nitrogen and 30-60 lb of phosphorus per acre are adequate to produce hay or seed, but most forage crops for grazing should be fertilized more to enhance forage productivity and volume. The amount of forage needed and the number of livestock to be pastured will be the determining factors in planning nitrogen fertility practices. Nitrogen requirements for heavy forage production and heavy grazing will likely be double those required for hay or seed crops. Phosphorus requirements will also be higher than those for hay or seed crops. A soil test is recommended to evaluate nitrogen and phosphorus fertilizer requirements and to indicate the deficiency of any of the other required nutrient elements that might limit productivity. These nutrient elements include potassium, sulfur, calcium, magnesium, iron, copper, boron, manganese, zinc, molybdenum, and chlorine. One or more of these nutrients may be limiting in the less fertile soils used by millet producers.

WEED CONTROL OPTIONS

Weed control in any crop production practice is limited to five options: preventative, biological, cultural, mechanical, and chemical control. Choice of a particular method or methods depends upon the weed spectrum, crop rotation sequence, and other factors. It is important to employ several options in millet production because chemicals that can be used for weed control are severely limited.

Preventive control options begin with planting clean, weed-free seed. In addition, producers should make sure all equipment used to plant millet is free of weed seeds. Controlling weeds along ditchbanks, roadsides, and field margins will also help prevent weed seed from entering fields.

At the present time there are no known biological controls for weeds in millet. Cultural control options include narrow row spacing, adapted variety selection, and crop rotations, all practices that will provide a competitive edge for the millet crop.

Mechanical controls should be used to prepare the seedbed prior to planting millets and where millets are planted in rows for seed, giving producers a head start on weed control.

Chemical weed control options are limited for millet production. The most troublesome weeds in millet production are summer annual broadleaf weeds and some annual or perennial grasses. In addition, there may be problems with perennial broadleaf weeds if they are present in fields used for millet production. For pearl millet production, producers can use atrazine as a preplant incorporated or preemergence treatment with rates of 0.5-1 lb ai/A. Crop rotation restrictions apply for this herbicide application, and the producer should consult the label. In some areas Banvel (dicamba) is labeled under a special local-need labeling to control annual broadleaf weeds. Producers should contact their local county agent or the New Mexico Department of Agriculture for additional information.

Formula 40[®] (Alkanolamine salt of 2,4-D) is labeled for control of broadleaf weeds in millet. In some areas where 2,4-D-sensitive crops are grown, producers will be required to obtain a permit to use this product. Consult with the local county agent and the New Mexico Department of Agriculture prior to using this product. Application rates vary from .67 to 1.33 pt per acre at early postemergence to 2-3 pt per acre prior to boot stage. The only other agricultural chemicals labeled for weed control in millets are Vapam[®] and Telone[®], both soil fumigants applied prior to planting the crop. They should not be used unless the producer is prepared to follow the label directions completely; otherwise, crop injury is possible.

INSECT AND DISEASE CONTROL

The principal insect problems in millet production are grasshoppers and armyworms. In some cases chinch bugs or false chinch bugs may also cause economic damage. These insect problems can generally be controlled with Sevin[®] XLR Plus, DiPel[®] and Biobit[®] can be used to control armyworms. Follow the label directions for small grains, hay crops, or forage crops depending upon cropping plans, If other insect problems are noted, consult the local county agent or the New Mexico Department of Agriculture for special local-needs labels and chemicals.

Foxtail millet can harbor the wheat curl mite, a vector of wheat streak mosaic virus in wheat. therefore, wheat should not be planted following production of foxtail millet unless sufficient time is allowed to break the curl mite cycle (probably 3-6 weeks).

Diseases in millets are not widespread; however, there may be particular diseases that occur with some millet species. The most important diseases include mildew, bacterial blight, kernel smut, and leaf spots with foxtail millet; bacterial stripe and head smut with proso millet; head smuts with Japanese millets; and helminthosporium with finger millet. The impact of head smuts can be reduced with quality seed purchases and planter box fungicide treatments. Other diseases, especially the bacterial blights, are not easily controlled. Copper fungicides are used to control blight; however, several applications may be necessary from the onset of blights. Consult with the local county agent or New Mexico Department of Agriculture for guidelines on these diseases.

Mildew and seed rots can be controlled with Apron[®] 25 W applied as a seed treatment at planting. consult the label prior to using the product. Leaf spots can be controlled with fungicide applications; however, in New Mexico weather patterns are generally not favorable for spread of the disease.

List of figures:

Figure 1: Foxtail Millet

Figure 2: Pearl Millet

Figure 3: Proso Millet

Figure 4: Japanese Barnyard Millet

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