PEARL MILLET

Pennisetum glaucum (L.) R. Br.

Plant Symbol = PEGL2

Photograph of pearl millet variety 'TifGrain 102'. Photo by University of Georgia, hosted by the USDA-NRCS PLANTS Database.

Alternate Names

Common Names: bulrush millet; dukn; bajra; babala
Scientific Names: *Pennisetum americanum* (L.) Leeke; *Panicum americanum* L.; *Cenchrus americanus* (L.) Morrone; *Pennisetum typhoides* auct. non (Burm.) Stapf & C.E. Hubbard; *Setaria glauca* (L.) Beauv.; *Setaria lutescens* (Weigel) F.T. Hubbard

Description

General: Pearl millet (*Pennisetum glaucum*) is an introduced, annual, warm-season crop widely grown throughout the United States for grazing, hay, cover crop, and wildlife. There are approximately 1.5 million acres in production in the US (Myers, 2002). It is a bunch grass growing 4–8 ft tall, on smooth ½–1 inch diameter stems, with upright side shoots (tillers). Compared to sorghum, it will produce more tillers and has a woodier stem (Kajuna, 2001). The inflorescence (4–20 in) is a terminal spike, resembling that of cattail. Seeds are cylindrical, typically white, or yellow, but there are varieties with colors ranging from brown to purple. Leaf blades are long and pointed.

Pearl millet's deep root system grows relatively fast (Hannaway and Larson, 2004), and can scavenge residual nutrients. It is a good choice for low-input sustainable agricultural systems.

Distribution: Pearl millet can be grown throughout the continental United States and Puerto Rico. It is widely distributed across Africa, India, and Asia. For current distribution, please consult the Plant Profile page for this species on the PLANTS Web site.

Habitat: Pearl millet is thought to have originated from the Sahel region in Africa (Hannaway and Larson, 2004). It is an obligate upland or facultative upland plant, depending on the region where it is grown. It almost never occurs in wetlands in the arid West, but may occasionally occur in a wetland in the Atlantic and Gulf Coastal Plain, Eastern Mountains and Piedmont, and Great Plains. It grows well on sandy and acidic soils.

Adaptation

In the Southeast Coastal Plains of the United States, pearl millet is grown mainly in well-drained sandy or light loams, and can survive low pH and fertility. Generally, it grows best in regions where sorghum is grown. It is one of the most drought resistant grains (Lee et al., 2012), but cannot survive standing water. It can grow with annual precipitation as low as 16–26 in, but it will not grow well above 6,500–9,000 ft (2,000– 2,700 m) (Hannaway and Larson, 2004).

Uses

Forage/Feed: Pearl millet is used by livestock producers for grazing, silage, hay, and green chop (Newman et al., 2010). It is the preferred choice for forage when compared to similar warm-season millets such as browntop, Japanese, and proso millet. Pearl millet production for grain is mainly used for poultry feed (Myers, 2002). It is considered equal to or better than typical corn-soybean broiler chicken feed (Gulia et al., 2007). Unlike sorghum, pearl millet does not produce prussic acid or have tannins, so is safe to feed to horses (Newman et al., 2010). Swine have been shown to reach slaughter weight earlier on pearl millet than on a corn diet (Gulia et al., 2007). Terrill et al. (1998) found pearl millet could be effectively used as a substitute for corn feed in goat diets.

Pearl millet has a high potential for accumulating toxic levels of nitrate, especially on the lower 6 in (15 cm) of the stalks (Strickland et al., 2007). It is best to avoid grazing younger plants and to avoid overgrazing. Droughty or cold weather can stress plants and increase nitrate levels. Pearl millet may contain higher levels of nitrate than sorghum-sudangrass after hot weather, however nitrate returns to safe levels 7–14 days after a drought-ending rain (Strickland et al., 2007). Pearl millet feed can be diluted by mixing with low nitrate feeds. Newman et al. (2010) observe that haying material does not reduce nitrate concentrations, but ensiling the forage can decrease nitrate levels 40–60%.

Pearl millet can have a crude protein (CP) level of 12–14% (Lee et al., 20012), higher than that of corn silage (Banks and Stewart, 1998), with relatively low fiber and lignin concentration (Newman et al., 2010). Davis et al. (2003) noted that the protein content of pearl millet is greater than corn and found that broiler chicken diets with 50% pearl millet performed better than corn-soybean diets. Pearl millet will have higher CP levels if it fertilized with N. Stems left standing in the field after grain harvest are low in digestibility and nutrients (Newman et al., 2010).

Due to pearl millet's large stems, hay production is difficult without a hay or mower conditioner, and extra time will be needed for drying. Rotational grazing is recommended, as it requires less management (Newman et al., 2010). It can be grazed/cut when it reaches 3 ft (Hannaway and Larson, 2004) approximately 60–65 DAP.

Cover crop/green manure: When used as a cover crop, pearl millet may suppress soil-borne diseases and increase soil organic matter. Pearl millet has a C:N ratio greater than 50, which is not as favorable as a legume cover crop for releasing scavenged N to a following crop (Wang and Nolte, 2010). Nevertheless, Rosolem et al. (2004) found that pearl millet used as a cover crop enhanced N use efficiency by a following maize crop.

Pearl millet is tall and produces 3-5 ton/ac of dry matter biomass, similar to sorghum-sudangrass (Schonbeck and Morse, 2006), and so can be used as a good surface mulch. It can be killed by mowing, rolling, and exposure to freezing temperatures. Decaying pearl millet plants left on the soil surface retained 60–80% of potassium in the straw for the following crop (Rosolem et al., 2005).

Pearl millet has high root density, root dry matter, and vegetative vigor, and is especially well suited to break up compacted soil (Rosolem et al., 2001). Like other grass cover crops (sorghum for example), it develops rapidly, covers the soil surface, and has an extensive, fibrous root system. Pearl millet is compatible in mixes with forage legumes like cowpea (*Vigna unguiculata*), lab lab (*Lablab purpureus*), or sunn hemp (*Crotalaria juncea*) (Cook et al., 2005).

Used as a rotation crop, pearl millet has been shown to control root-lesion nematodes in potatoes (Ball-Coelho et al., 2003) and tobacco (Belair, et al., 2002). When rotated with triticale, pearl millet was able to increase soybean yields in compacted soils compared to treatments terminated with chiseling (Calonego and Rosolem, 2010).

Wildlife: Pearl millet seed is used as a food source for birds and is used in wild birdseed mixes. Goldfinches, juncos, quail, turkey, doves, and ducks use pearl millet seed as a food source (Gulia et al., 2007). It has been included in wildlife mixes that reduce erosion in critical area plantings, like mineland reclamation (KYDFWR, 1995).

Ethnobotany

Pearl millet has been used as a food crop for thousands of years in a variety of food products, and continues to be used as a staple grain by approximately 90 million people in Africa and India (Gulia et al., 2007). It contains more nutrients than rice or wheat, but is considered a subsistence crop for poorer countries (Kajuna, 2001). Pearl millet grain contains higher gross energy than corn, higher concentrations of amino acids, and 27–32% more protein (Gulia et al., 2007). As a gluten-free food product, pearl millet is becoming popular in the growing health-food market (Gulia et al., 2007).

Status

Weedy or Invasive: Pearl millet has an extremely low potential for weediness, especially in grazing management systems (Cook et al., 2005). Please consult with your local NRCS Field Office, Cooperative Extension Service office, state natural resource, or state agriculture department regarding its status and use.

Please consult the PLANTS Web site (http://plants.usda.gov/) and your State Department of Natural Resources for this plant's current status (e.g., threatened or endangered species, state noxious status, and wetland indicator values).

Planting Guidelines

Germination occurs at or above 54˚F (12˚C) (Hannaway and Larson, 2004) and if conditions are optimal, seedlings will emerge in 2–4 days. The optimal temperature for growth ranges from 77–86˚F (25–30˚C) (Hannaway and Larson, 2004) to 91–95˚F (32–35˚C) (Newman et al., 2010). Within 14 DAP, the plant will begin to grow rapidly. Growing guidelines and planting windows for pearl millet are similar to sorghum. Plant 12–15 lb/ac drilled, and 30–40 lb/ac broadcast. Rows should be drilled at 36 inches if there is a need to cultivate for weed control.

Pearl millet is a low-input crop with low nutrient demands, requiring few additional nutrients. Its nutrient needs can be met through the use of animal manure or rotations with a leguminous cover crop (Myers, 2002).

Management

Pearl millet is commonly planted after a spring small grain or vegetable crop. It will re-grow after cutting to 6–8 in and may be cut up to twice during a growing season (Banks and Stewart, 1998). After grazing to 6–8 in, pearl millet should be allowed to regrow to 14–24 in before being grazed again. Mowing off seedheads may encourage more vegetative growth (Hancock Seed, 2014). Some defoliation will help maintain the quality of the stand and irrigation or rainfall is beneficial and important for seed development (Hannaway and Larson, 2004).

Pests and Potential Problems
Pearl millet is affected by fall armyworm and rust, or leafspot (Newman et al., 2014). In parts of the United States, grain production is limited by rust disease (Davis, et al., 2003).

Environmental Concerns
There is very little threat of pearl millet spreading naturally. Please contact your local agricultural extension specialist or county weed specialist to determine if this plant is considered a weed in your area.

Seeds and Plant Production
Pearl millet is cross-pollinated, with flowers opening on the inflorescent spike from the top down. It can produce 225–700 lb/ac to 3,500 lb/ac of seed (Lee et al., 2012), with approximately 40,000–60,000 seeds/lb (Newman et al., 2010) to 90,900 seeds/lb (Hannaway and Larson, 2004).

Cultivars, Improved, and Selected Materials (and area of origin)
Newman et al. (2010) describes two types of pearl millet: dwarf and tall. The former is leafier and is used for grazing, while the latter produces higher seed yield. The higher yielding variety can produce 9,300–9,900 lb/ac dry matter (Newman et al., 2010). Short and tall varieties have approximately the same number of leaves (Hancock Seed, 2014). Varieties HGM 486 and HGM 686 are hybrids, so will only yield the same type of plant as the intentional hybrid if new seed is purchased every year. Pearl millet cv. TifGrain 102 has been shown to be a successful alternative poultry feed, in the Southeast Coastal Plain (Davis et al., 2003). Cultivars should be selected based on the local climate, resistance to local pests, and intended use. Consult with your local land grant university, local extension, or local USDA NRCS office for recommendations on adapted cultivars for use in your area**.**

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For more information about this and other plants, please contact your local NRCS field office or Conservation District at http://www.nrcs.usda.gov/ and visit the PLANTS Web site at http://plants.usda.gov/ or the Plant Materials Program Web site: http://plant-materials.nrcs.usda.gov.