



Bahiagrass

Paspalum notatum Flüggé

Plant Symbol = PANO2

Common Names: bahiagrass, bahia

Description

General: Bahiagrass (*Paspalum notatum*) is a perennial warm-season sod-forming grass. It's a C4 plant that belongs to Poaceae (grass family). It produces coarse light-green colored basal leaves that are arranged in whorl shape by crowding at the base of the plant. Leaves are flat, folded, and in-rolled, tapering to a fine point. Leaf blade is 1/8-1/4-inch wide and 8-20 inches in length (Schiavon et al., 2022). Bahiagrass forms dense sod by growing horizontally through stubby J-shaped scaly rhizomes (underground stems) and stolons (sub-aerial stems) with deep root system (Hoveland, 1961; Schiavon et al., 2022). Stems grow approximately 12 to 25 inches tall (Wallau et al., 2023). It produces distinctive 'Y-shaped' tall seed heads (inflorescence) which consists of 2-3 smooth and shiny spike like racemes with multiple tiny spikelets. Spikes have tiny dark brown to black flowers. Its main mode of reproduction is producing ovoid shaped seeds which are glossy yellowish green in color (Wallau et al., 2023). Rhizomes and roots from nodes also help to vegetatively propagate bahiagrass.



Figure 1. Bahiagrass with 'Y' shaped seed heads

Distribution: Bahiagrass is native to subtropical South America. It was first introduced into the United States as common bahiagrass in 1913 by the Florida Agricultural Experiment Station for forage, and erosion control and has since become naturalized. It is abundantly grown in northern Argentina, Brazil, eastern Bolivia, and Paraguay. It is planted over four million acres in the central and southeastern United States (adapted from east Texas to the Carolinas and Central Arkansas to Central Tennessee). It is well adapted to the humid and subtropical climate of Louisiana, Mississippi, Alabama, southern Georgia, and Florida. The [Plant Profile](#) on PLANTS Web site provides its current distribution in the USA.

Adaptation: Bahiagrass is a warm season C4 grass naturally found in sub-humid to humid subtropical climates. It can adapt to a wide range of edaphic and climatic conditions. It can be used for pastures, forages, roadsides, and low maintenance turfgrass due to its drought tolerance, low fertility requirements, and its ability to adapt to a wide range of soil types (e.g., sandy soils, poorly drained, fine textured soils) (Trenholm et al. 2003; Boeri et al. 2021). Bahiagrass is naturally suited to sandy or light textured soils and grows at soil pH between 4.0 to 6.5. It prefers rainfall between 31 to 79 inches (Jennings, 2017). It grows well under high temperatures and longer-day lengths and produces most of its biomass during the warmest months (April to September). Bahiagrass is the popular forage grass for the cow-calf industry in Florida and grown predominantly on sandy soils (spodosols) due to its ability to tolerate low pH, low soil fertility, and intermittent occurrence of wet conditions (Beatty and Powell, 1978). Pensacola and Argentine are the dominant cultivars available and are widely grown as perennial turfgrass in the Coastal Plain and Gulf Coast regions of southern United States (Beard, 1973; Houck, 2009).

Uses

Pasture/Hay: Bahiagrass can be used for pasture or hay due to its ease of establishment and persistence (Ball et al., 1991). Forage quality of bahiagrass hay is generally lower than bermudagrass (*Cynodon dactylon* L.) or mixed warm-season grass hay. A balanced fertilization program and cutting at immature growth stage (as leafy portion reaches 10 to 12 inches tall) are

critical to produce hay with higher nutritive values (Muchovej and Mullahey. 2000). First cut needs to be done at boot to early heading stage and then cut every 30 to 35 days thereafter for high-quality bahiagrass hay. Forage quality drops as bahiagrass matures and produces seed heads. Higher leaf portion, lesser content of stems, and seed heads are necessary to increase the forage quality of bahiagrass hay. Tifton 9, TifQuik, and UF-Riata cultivars can be used for hay production due to their upright plant growth.

Bahiagrass pasture can be used for grazing under proper management. It can also be overseeded with small grains or annual ryegrass (*Lolium* spp.) to provide winter forage for livestock (Blount and Acuna, 2009). Bahiagrass alone will not meet the nutritional requirements of grazing livestock.

Lawns/sod production/turfgrass: Generally, the acceptance of bahiagrass as a turfgrass is low due to its invasive nature, but it provides useful turf and erosion control for areas where other grass species fail, such as highways or roadsides, heavy traffic areas, less managed open landscapes, and other utility sites.

Erosion control: Bahiagrass can be used for [NRCS conservation practices](#) such as Grassed Waterway (code 412) and Critical Area Planting (342). Bahiagrass can be planted on pond banks, levees, and gullies in agricultural fields to reduce soil erosion and nutrient run-off.

Crop rotation: Bahiagrass sod-based rotations has shown to increase the yields of peanut (*Arachis hypogea*) and cotton (*Gossypium hirsutum*) crops (Katsvairo et al., 2007) and reduces disease infestations such as root-knot nematode (*Meloidogyne* spp.) (Rodriguez-Kabana et al., 1994) and stem rot (*Sclerotinia* spp.) (Brenneman et al., 1995).

Wildlife: Bahiagrass can provide habitat for wildlife when it is planted in a mix with other plant species. Deer, birds, and small mammals feed on seeds of bahiagrass.

Status

Threatened or Endangered: None

Wetland Indicator: None

Weedy or Invasive: Bahiagrass can become an invasive weed in well-maintained turfs, bermudagrass pastures, and vegetable gardens due to its prolific seed production and ability to propagate asexually through rhizomes.

PLANTS Web site (<http://plants.usda.gov/>) and your state's Department of Natural Resources can provide accurate information on the current status (e.g., threatened or endangered species, state noxious status, and wetland indicator values) for hairy vetch.

Planting Guidelines

Bahiagrass can be established from seed or sod. The ideal planting time for bahiagrass is during the spring or early summer months when there is adequate soil moisture. The delay in planting will increase the risk of weed competition such as crabgrass (*Digitaria* spp.) and goosegrass (*Eleusine* spp.) in the southern U.S. As per soil test recommendations, apply lime, phosphorus, and potassium prior to planting. Generally, the application of 20 to 40 pounds of nitrogen per acre is recommended at planting (Hoveland, 1961; Hancock et al., 2007). Bahiagrass seeds are small and need to be planted at a depth of ¼- to ½-inch (Hoveland, 1961; Hancock et al., 2007). Bahiagrass cannot tolerate high-pH soils (> 6.5). Germination rate depends on several factors including, but not limited to, soil temperature, soil moisture, and seed storage. Generally, seed storage duration and scarification influence the germination percentage (Jennings, 2017). Bahiagrass seed is slow to germinate and may take several months to achieve a stand. Seeding rate depends on cultivar and planting method. Seed can be broadcast, or drill planted (e.g., cultipacker-seeder, grain drill) (Jennings, 2017). Higher seeding rates are required when seed is broadcast or no-till planted. For instance, Pensacola requires 18 to 20 pounds pure live seed (PLS) per acre when seed is broadcast or no-till planted compared to 12 to 15 pounds PLS per acre when planted on a conventionally tilled seedbed (e.g., stale-seedbed) (Hoveland, 1961; Hancock et al., 2007; Jennings, 2017). A light disking or cultipacking is necessary to cover the seed when the seed is broadcast planted. For pasture or hay plantings, drill 15 pounds PLS per acre at ¼ inch depth. For turf plantings, seed at 5-10 pounds PLS per 100 square feet. Mowing is an acceptable method to control weed competition. Adjust the cutting height of the rotary mower to prevent mowing the newly established bahiagrass seedlings or plants during the establishment year.

Management

Though bahiagrass is tolerant of low-fertility soils, adequate fertility management is still essential to maximize forage yield and quality and to gain sustainable economic returns for landowners. Use soil test recommendations to determine fertility

requirements for long-term sustainable yields. Apply fertilizer in the spring when plants begin active growth or when the soil temperatures reach 60°F (Jennings, 2017). For better fertilizer use efficiency, apply fertilizers in split applications based on the harvest management. Bahiagrass responds to nitrogen and potassium fertilizer. For new plantings, apply 35 to 50 pounds of nitrogen per acre after the bahiagrass seedlings emerge (Wallau et al., 2023). Apply a second application of 50 to 75 pounds of nitrogen per acre after establishment (early-to-mid summer) (Jennings, 2017; Wallau et al., 2023). Soil potassium level is also critical for satisfactory stand establishment and hay production. Approximately, 30 pounds of potassium is removed from the soil for each ton of hay produced. Use soil test recommendations to manage phosphorus and potassium soil test levels for maximize growth and productivity (Rao et al., 2019).

Bahiagrass is well suited for pastures and provides grazing for livestock during summer. Legumes such as white clover (*Trifolium repens*) (seeding rate: 2-3 lb/acre), crimson clover (*T. incarnatum* L.) (seeding rate: 15-20 lb/acre), and arrowleaf clover (*T. vesiculosum* L.) (seeding rate: 8-10 lb/acre) can be overseeded into edbahiagrass pastures and hay fields (Jennings et al., 2019). Bahiagrass grows from late spring through September and produces yields ranging from 2 to 5 tons/acre. Forage quality is generally good in the early stage of growth (early summer) due to a higher leaf to stem ratio and fewer seedheads (Muhovej and Mullahey, 2000). Forage quality declines with maturity in late summer. Forage productivity depends on grazing management. Less intensive grazing systems such as rotational grazing increases forage productivity and stand longevity than continuous stocking (Stewart et al., 2005). Increase in grazing interval also increases forage productivity (Vendramini et al., 2013). Overseeding bahiagrass pasture with winter annual forages such as small grains, cereal grain or ryegrass in October extends grazing period. However, additional fertilization maybe required for winter annual forages to support grazing in the fall and spring.

Pests and Potential Problems

Broadleaf weeds may hinder bahiagrass growth in the early growth stage. Phenoxy-type herbicides such as 2, 4-D can be sprayed at rates of 0.5 to 0.75 pounds per acre to control broadleaf weeds when bahiagrass seedlings are at least 6 inches in height (Hancock et al., 2007). Apply Hexazinone at a rate of 0.67 to 1.12 pounds per acre to control weedy grasses such as vaseygrass (*Paspalum urvillei*) and smutgrass (*Sporobolus indicus*) (Hancock et al., 2007). Consult with the county extension agents or extension weed specialist for recommendations on herbicide application rates, dates and methods for weed control.

Insects such as fall armyworms (*Sporobolus indicus*) and mole crickets (*Scapteriscus* spp.) cause serious outbreaks in early fall by feeding on above-ground plant parts and lowering the yield and overall grazing potential of bahiagrass-based pastures (Adjei et al., 2003). Tawny mole cricket (*Neoscapteriscus vicinus*) causes serious damage to bahiagrass stands. Biological control using insecticidal-nematode (*Steinernema scapterisci*) and Larra wasp (*Larra bicolor*) are effective against mole crickets (Hancock et al., 2007).

Root diseases and leaf blight or leaf spots are occasionally cited diseases in bahiagrass (Baxter et al., 2023). Dollar spot (*Sclerotinia homoeocarpa*) and ergot (*Claviceps paspali*) diseases infect bahiagrass during hot and humid weather conditions (Hancock et al., 2007; Wallau et al., 2023). Ergot disease can be controlled by mowing seedheads. Dollar spot severely affects Pensacola more than in Argentine (Burton and Lefebvre, 1948; Rios et al., 2015). Grazing on ergot infected plants cause reproductive and behavioral problems in livestock. Burning is effective in removing thatch layers that harbor the inoculum of pathogens.

Environmental Concerns

Bahiagrass plants don't cause any known severe environmental concerns. It can become an invasive weed in unwanted places (e.g., vegetable gardens, turfs, bermudagrass pastures.) due to its prolific production of seedheads and rhizomes. Grazing ergot (a smut disease) infected seedheads can be toxic to livestock.

Control

Bahiagrass is a perennial plant propagated aggressively by rhizomes and seed that can become invasive in places such as highly maintained turfs, vegetable gardens, lawns, and landscape beds. Selective control of bahiagrass in turfs is very difficult. It can be removed from unwanted areas by hand rouging when the soil is moist. Organic mulches (e.g., pine needles, ground leaves, compost, grass clippings, wood chips, old hay etc.) are also effective in suppressing the growth of bahiagrass. Spraying herbicides such as glyphosate (non-selective) and sethoxydim (selective) can kill bahiagrass plants (Rogers et al., 1987; Bunnell et al., 2003). Metsulfuron methyl is recommended to selectively control bahiagrass in lawns and bermudagrass pastures (Rogers et al., 1987). The application of plant growth regulators such as broadcasting of imazapic can suppress the growth of bahiagrass on roadsides and reduce the number of mowing operations (Peacock et al., 1986).

Seeds and Plant Production

Bahiagrass is a long-day plant that requires long day lengths to produce most of its seedheads. For instance, the flowering of Argentine requires more than 13.8 hours of day light (Adjei et al., 2000). Harvest time and seed yield of bahiagrass seed production fields depends on several factors such as cultivar, agronomic practices, grazing management, fertilization,

geographical location, and rainfall (Wallau et al., 2023). Moreover, bahiagrass seed doesn't mature at the same time which makes it hard to determine the optimum harvest time (Adjei et al., 1992). Harvest time can be decided if most mature seeds easily strip from the seedhead when it is pulled through partially closed fingers (Adjei et al., 2000). In the coastal plain of Georgia, bahiagrass is ready for harvest in mid-late June. Seed can be easily harvested with a conventional combine due to presence of extended seedheads above the leaves. Each stem contains approximately 50 seeds. Seed yield varies from 150 to 400 pounds per acre (Gates and Burton, 1998). Seed can be dried using forced air or by spreading the seed on a dry floor and stirring it once or twice a day.

Some of the newer bahiagrass cultivars such as Tifton 9, TifQuik, and UF-Riata are variety protection (PVP) from federal seed laws. They can only be sold by variety name. Buyers need to purchase seed from reputable seed sources. Purchased seed should have a label indicating appropriate information such as state variety, percentage, seed germination percentage, date of testing, and purity.

Cultivars, Improved, and Selected Materials (and area of origin)

'Pensacola' bahiagrass is the widely grown cultivar. It was introduced from South America in the late 1930s (Burton, 1967). This plant is less palatable for cattle and produces long stems, long and narrow leaves, and tall seed stalks. It has excellent tolerance to both hot and cold temperatures (Watson and Burson, 1985). Growth starts in early spring and seedheads mature by mid-summer. Plant growth slows down in late summer and forage quality also decreases (Miller, 1984). Pensacola is resistant to ergot (a smut disease). Pensacola is recommended for roadside plantings and as a lawn grass. Pensacola seeds are produced through sexual reproduction unlike Argentine, which reproduces through apomixis (Blount and Acuna, 2009). Pensacola is the widely available and inexpensive.

'Tifton-9' was released in 1987 by the University of Georgia and USDA-Agricultural Research Service (ARS). It was an improved selection from Pensacola (Burton, 1989). Tifton-9 can be established with lesser seed due to its greater seedling vigor. It doesn't produce dense sod. These plants are highly palatable and digestible to livestock but less tolerant to close grazing (Burton, 1989).

'TifQuik' was developed from selections of Tifton-9. Its yield and growth characteristics are similar to Tifton-9 (Hancock et al., 2007). It was developed by University of Georgia and USDA-ARS for rapid germination and higher initial forage production than Tifton-9. It also has greater seedling vigor and establishes quickly like Tifton-9.

'Tifhi-1' and 'Tifhi-2' were also selections from Pensacola. These cultivars were developed by the Georgia Agricultural Experiment Station. These cultivars produced higher forage yield and more beef gain per acre than Pensacola (Hancock et al., 2007).

'Argentine' is more suitable for lawn use due to production of darker green leaves with wider leaf blades that can form dense sod compared to Pensacola (Killinger et al., 1951; McCarty and Cisar, 1985). It is also more palatable to livestock than Pensacola (Killinger et al., 1951). It was introduced into the United States in 1944 from Argentina. Argentine performs well in poorly drained soils compared to other bahiagrass cultivars. Argentine begins growth in late spring and continues to early fall. Argentine is not cold tolerant, and depending on the severity of the winter, there may be less growth in the spring. It has a shorter growing season and is vulnerable to ergot disease (Killinger et al., 1951). It produces fewer and longer seedheads. Argentine produces seed through an asexual process called apomixis in which the embryo develops from the maternal tissues of the ovule with no fertilization (Watson and Burson, 1985). Apomixis produces offspring genetically identical to the maternal plant.

'Paraguay 22' is a short and upright cultivar. It produces coarse and narrow leaves (Mannetje, 1961). It was introduced from Paraguay in 1937. This cultivar is less productive and not as cold tolerant as Pensacola (Burton, 1946). Leaves are darker and produces dense growth which makes it suitable for lawns (Burton, 1946).

'UF-Riata' was developed for south Florida by the University of Florida. It was developed from Pensacola-derived lines and several other bahiagrass collections from Oklahoma, Alabama, and Georgia (Hancock et al., 2007). It has a long growing season due to lower photoperiod sensitivity as other bahiagrass cultivars. It demonstrates higher cold tolerance and produces more forage during the cool season compared to Argentine and Pensacola. It doesn't tolerate severe overgrazing.

'AU Sand Mountain' is a winter hardy bahiagrass variety released by Auburn University. This cultivar was selected from 'Pensacola' bahiagrass stands which were originally planted in early 1960s at Sand Mountain Research and Extension Center in Crossville, Alabama. AU Sand Mountain is highly persistent bahiagrass cultivar with good forage production potential, well adapted to moist soils, and exhibit higher cold tolerance (Lemus, 2014; Alabama Cooperative Extension System, 2020)

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