

Tropical Forages

Paspalum plicatulum

Scientific name



Paspalum plicatulum Michx.

Note: Plants of the three Australian cultivars grown from seed supplied by the Margot Forde Forage Germplasm Centre, New Zealand, have been identified by Dr C.L. Quarín, Facultad de Ciencias Agrarias at Universidad Nacional del Nordeste, Corrientes, Argentina, as *Paspalum lenticulare* Kunth.

Synonyms

Paspalum plicatulum Michx. var. *glabrum* Arechav.;
Paspalum plicatulum Michx. var. *villosissimum* Pilg.

Family/tribe

Family: *Poaceae* (alt. *Gramineae*) subfamily:

Panicoideae tribe: *Paspaleae* subtribe:

Paspalinae group: *Plicatula*.

Morphological description

Tufted, upright (sometimes decumbent) perennial, short rhizomes. Foliage to about 60 cm, fertile culms erect to geniculately ascending to 1.3 m tall; shoots often purplish colour at base. Leaf sheaths glabrous or with few hairs towards the summit; ligule eciliate membrane 1–3 mm long; leaf blades linear, (10–)15–30 (–50) cm long, and 3–10 (–15) mm wide, glabrous to pilose, scabrid on and near the margins, apex acuminate. Inflorescence a panicle comprising (3–) 10–13 (–26) ascending racemes, 2–6 (–10) cm long, 1.5–2 mm wide. Spikelets in pairs, obovoid-ellipsoidal, dorsally compressed, plano-convex, 2–3 mm long, 1.5–2 mm wide; dark brown, shiny, falling entire. 530,000–660,000 "seeds" (spikelets) per kg, 780,000–1 million caryopses per kg.

Similar species

P. plicatulum Michx.: Culms leafy, paucinode, usually rounded in transversal section, unbranched. Leaf sheath rounded on the back or rare slightly compressed. Inflorescences with 3–12 racemes (commonly 4–8). Spikelets broadly elliptic or obovate, 2.5–3 mm long, approximately 1.8 mm wide. On very variable type of soils and habitats.

P. lenticulare Kunth: Culms somewhat compressed, multinoded, branched in the distal nodes, each branch ending in an inflorescence. Leaf sheath laterally compressed, keeled on the back particularly in the basal leaves. Inflorescences multi-racemose, 6–25 racemes. Spikelets elliptic, 1.8–2.5 mm long, 0.8–1.7 mm wide. Open savanna wetlands, usually on seasonally inundated or humid clay soils.

C.L. Quarín, pers. comm. (2019).

Common names

Asia: □□□□ zhou fu que bai, zong zi que bai (China); ■■■■■■■■■■ ■■■■■■■■■■ (Hindi, India); ya-phlikhathium (Thailand); kahverengi yalanci dari (Turkey)

English: plicatulum (Australia); brownseed crowngrass, brownseed paspale, brown-seed paspalum, brown top paspalum, plaited paspalum (USA)

Latin America: capim coquerinho, felpudo, pasto-negro (Brazil); caguazo, camalote, conejito, cortadera dulce, cortadora, gamalotillo, gamelotillo, gamalote, gramalote, gramalotillo, grama negra, hierba de caballo, hierba de cepa, manga larga, pajillo, paspalum de semilla



Tussock growth habit



Pasture in SE Sulawesi, Indonesia



Inflorescence a panicle comprising few to many racemes



Plano-convex seeds



Paspalum plicatulum Michx.: 1, habit flowering plant; 2, ligule; 3, inflorescence; 4, two views of a spikelet.

Line illustration



With *Calopogonium mucunoides* in pasture, South-East Sulawesi, Indonesia



North Queensland Australia (cv. Rodds Bay)

parda, rocpasto cadena, pasto cadenero, pasto rosario, rocío de miel, yábuna, yáguna, yerba de cepa (Spanish); wak'apí lekálk (Mocoví)

French: herbe à cheval

Distribution

Native:

Northern America: USA (Alabama (s.), Florida, Georgia, Louisiana, Mississippi (s.), Texas); Mexico (Aguascalientes, Chiapas, Colima, Guerrero, Jalisco, Michoacán, Morelos, Nayarit, Nuevo León, Oaxaca, San Luis Potosi, Sinaloa, Tabasco, Tamaulipas, Veracruz)

Caribbean: Antigua and Barbuda; Barbados; Cuba; Dominica; Grenada; Guadeloupe; Jamaica; Martinique; Montserrat; Puerto Rico; St. Kitts and Nevis; St. Lucia, St. Vincent and Grenadines

Central America: Belize; Costa Rica; El Salvador; Guatemala; Honduras; Nicaragua, Panama

South America: Argentina; Bolivia; Brazil; Colombia; French Guiana; Guyana; Paraguay; Peru; Suriname; Uruguay; Venezuela

Naturalized:

Widely naturalized across the world tropics and subtropics.

Uses/applications

Forage

Used primarily as a permanent pasture in seasonally poorly drained, low fertility soils. It can be used for hay and silage if harvested when nutritive value is high. It can be used in ley pastures following a rice crop.

Environment

It has been used as an understorey in the open shade of coconut plantations, but is not suitable for use in the more intense shade of oil palm.

Ecology

Soil requirements

Grows on a wide range of soils from poor to well-drained sands to clays, usually of low fertility and acid reaction: pH (4–) 4.5–5.5 (–7). Although less fertility-demanding than *Paspalum dilatatum*, it is responsive to up to 200 kg/ha of fertilizer nitrogen. It is fairly tolerant of high soil aluminium; rarely mentioned in lists of grasses for saline conditions.

Moisture

While it has been collected in areas with up to 3,500 mm annual rainfall, it is mostly found in areas with rainfall between about 1,200 and 1,500 mm and is mostly used in cultivation within this same rainfall range, although some success has resulted down to about 750 mm and up to about 2,000 mm. It is moderately drought-hardy, tolerating short dry periods with little adverse effect, and surviving dry seasons of 5–6 months. It is often found in permanently moist situations, and is very tolerant of short-term flooding and waterlogging.

Temperature

The distribution of *P. plicatum* gives little insight into species temperature adaptation. It extends from about 31° N in southern USA to 32° S in Argentina, and from near sea level to about 1,500 m asl. This is equivalent to a range in average annual temperatures from 17 to 27 °C. Geographically, the cultivars appear to largely originate from the warmer part of this distribution. Optimum temperature for growth of lines tested lies in the range 9–23 °C. Tops are burnt off by frost, but crowns survive, and regrow the following season.

Light

P. plicatum is generally considered to be intolerant of shade, although it can be useful in open shade such as under coconut plantations.

Reproductive development

The cultivars have a short-day flowering response, with floral initiation occurring at a day length of 13 hours, and flowers appearing in March in the southern hemisphere. Genotypes from Bolivia and Argentina flower from as early as January at similar latitudes. Flowering terminates with the onset of winter and does not resume until the following summer.

Defoliation

P. plicatum is not as grazing-tolerant as some other members of the *Plicatula* group such as *P. atratum* and *P. leptum*, and decreases in a pasture under continuous grazing. It responds to periodic 30 day rests, but care should be taken not to allow it to become rank and unpalatable. It is best grazed when it is leafy in spring and summer rather than saved for autumn grazing or haymaking.

Fire

It survives burning.

Agronomy

Guidelines for establishment and management of sown forages.

Establishment

It is normally planted from seed, but is readily established from plant "splints" if seed is not available. There is little or no post-harvest dormancy, and any dormancy can be broken by chilling seed at 7 °C for 30 days if necessary. While dried seeds re-imbibe if stored in humid conditions and rapidly lose viability, seed stored in a dry situation can last for two years. Seed germinates at 20–35 °C. Seedling vigour is low, so it is best sown into a well-prepared, weed-free seedbed. It should be sown at 2–3 kg/ha, no more than 10–15 mm deep, then rolled to provide close contact with the soil.

Fertilizer

It is mostly sown into low fertility soils, where it benefits from low applications of fertilizer, usually about 250 kg/ha of superphosphate, and other nutrients as required. Occasional dressings of 50–100 kg/ha N stimulate extra growth during the warm season. Although it responds to nitrogen, it will produce better than other grasses under low soil nitrogen supply. Calcium deficiency, which shows as tip death in young leaves has been noted but is rarely a problem if superphosphate is used.

Compatibility (with other species)

It combines well with a range of legumes to maintain a stable pasture. It should not be planted with more palatable grasses such as *Setaria sphacelata* since these will be selectively grazed leading to dominance of the least palatable species.

Companion species

Grasses: Best planted as the only grass since animals tend to select alternative grasses, leading to *P. plicatum* dominance.

Legumes: *Desmodium intortum*, *D. uncinatum*, *Listia bainesii*, *Lotus uliginosus*, *Macroptilium atropurpureum*, *Stylosanthes guianensis*, *Trifolium repens*, *Vigna parkeri*.

Pests and diseases

It is not subject to ergot (*Claviceps paspali*) attack, and has no other disease problem. It has no specific pests.

Ability to spread

It can spread quickly by seed.

Weed potential

Although *P. plicatum* was planted extensively in some areas during the 1970s, there is little indication of its becoming a weed.

Feeding value

Nutritive value

Nutritive value of *P. plicatum* tends to be lower than that of many other sown tropical grasses, particularly once mature. CP levels range from 5 to 12%, and IVDMD from 39 to 50% for whole plant tops, and 50–70% for leaf. In one study on 'Rodd's Bay' cut at 12-weekly intervals, the average P level in the DM was 0.15%, K 1.2%, Ca 1.2%, Mg 0.4%, and Na 0.1%.

Palatability/acceptability

Most other commonly sown warm season grasses are more readily eaten at a similar stage of growth. Mature growth is poorly accepted by cattle, but can provide useful low-quality roughage to supplement with urea-molasses mixtures. The more pubescent genotypes are considered to provide the best forage of any native grass in Bolivian cerrado communities.

Toxicity

No toxicity has been reported. Oxalate levels are very low, 0.02% of the DM, compared with over 5% in *Setaria sphacelata*. There is a suggestion of allelopathy caused by roots of *P. plicatum* on subsequent lettuce crop.

Production potential

Dry matter

Annual DM yields are mostly of the order of 8–12 t/ha, and up to 24 t/ha. Early spring growth is slower than that of *P. dilatatum* and *P. malacophyllum*.

Animal production

Grass legume pasture based on 'Rodd's Bay' stocked at 1.7–2.5 beasts/ha produced annual liveweight gain of 232 kg/ha, compared with 272 kg/ha from *P. dilatatum* and 290 kg/ha from *Digitaria eriantha* over an 8-year period. 'Bryan' fertilized with 440 kg/ha N and stocked at 5 steers/ha averaged 740 kg/ha liveweight gain.

Genetics/breeding

Mostly segmental allotetraploids ($2n = 4x = 40$) reproducing by aposporous apomixis, as well as occasional self-incompatible, sexual diploids ($2n = 2x = 20$). One hexaploid ($2n = 6x = 60$) has been identified. Sexual colchicine-induced autotetraploids have provided the possibility of creating intra-specific hybrids with apomictic tetraploids within *P. plicatum*, as well as interspecific with apomictic tetraploids in other members of the Plicatula group including *P. guenoarum*, *P. leptum*, and *P. oteroi*.

Seed production

In the southern hemisphere, crops are usually started in mid-January for 'Bryan' and 'Rodd's Bay', and early February for 'Hartley'. Stands flower earlier, yield better and the seed viability is higher if nitrogen is applied at about 100 kg/ha. Crops mature in late April/early May, and timing of harvest is critical within a 4–10 day "window of opportunity", if peak yields are to be obtained. The seed turns brown at maturity, about 18–22 days after peak flowering. Although presentation seed yields approaching 1.4 t/ha seed are quoted, commercial yields are of the order of 250 kg/ha for 'Bryan', 150 kg/ha for 'Rodd's Bay', and 130 kg/ha for 'Hartley'.

Combine-harvested and/or rapidly dried seed of *Paspalum plicatum* has a relatively short shelf life under normal storage. While similarly structured, related seeds are prone to both some threshing damage and some fast-drying damage, plicatum is particularly sensitive. Hand-cut, slow-dried seed shows normal rates of deterioration.

Herbicide effects

Susceptible to atrazine.

Strengths

- Tolerates waterlogging and flooding.
- Produces fairly well on poor soils.
- Does not become sod-bound.
- Combines well with legumes.
- Moderate drought tolerance.

Limitations

- Low nutritive value compared with many other tropical sown grasses.
- Becomes unpalatable with maturity.

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Cultivars

'Bryan' (CPI 21378) Released in Queensland, Australia (1975). Institutional collection from Puerto Rico, origin Venezuelan lowlands. A tetraploid aposporous apomict ($2n = 40$) similar to 'Rodd's Bay', but distinguished by having a larger seedhead and a distinct collar of hairs at the junction of the leaf blade and sheath on the abaxial surface; and a zone of hairs c. 1.0 mm long extending for at least 2 cm down the sheath, and tapering towards the midrib. Flowering time is similar to that of 'Rodd's Bay' but earlier than in 'Hartley'. Reputedly the most palatable of the three cultivars, although none is as palatable as most other sown grasses in similar situations; also less competitive than 'Rodd's Bay' which is very competitive with legumes.

'Hartley' (CPI 11826, PI 299067, PI 292191, PI 339896) Released in Queensland, Australia (1963). Origin Cuiabá, Brazil (15°32' S, 190 m asl, rainfall 1,350 mm). A tetraploid aposporous apomict ($2n = 40$). Differs from 'Rodd's Bay' and 'Bryan' in having broader leaves and no hairs on the leaf blades or sheaths of more mature plants. Tends to give slightly lower yields than 'Rodd's Bay', but is of higher nutritive value. Flowers 2–3 weeks later than 'Rodd's Bay', and produces less seed. Has high nutritive value and high intake, even after frosting, and combines well with legumes.

'Rodd's Bay' (PI 339897) Released in Queensland, Australia (1963). Institutional collection from Guatemala. A tetraploid aposporous apomict ($2n = 40$). Differs from 'Hartley' in having slightly narrower leaves, and hairs on the leaf-blade of more mature plants. Higher DM production but lower nutritive value than 'Hartley'. Persists with legume under intermittent, rotational, and continuous grazing. Flowers 2–3 weeks earlier than 'Hartley', over a short period in late summer. Grows faster than naturalized *Paspalum dilatatum* in summer and autumn.

Promising accessions

None reported.

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