Tropical Forages

**Astrebla** spp.

**Scientific name**
*Astrebla elymoides* F. Muell. ex F.M. Bailey
*Astrebla lappacea* (Lindl.) Domin
*Astrebla pectinata* (Lindl.) F. Muell.
*Astrebla squarrosa* C.E. Hubb.

**Subordinate taxon:**
*Astrebla pectinata* (Lindl.) F. Muell. var. curvifolia F.M. Bailey

**Synonyms**
*A. lappacea* ≡ *Astrebla triticoides* (Lindl.) F. Muell.;
*Danthonia lappacea* Lindl.; *Danthonia triticoides* Lindl.
*A. pectinata* ≡ *Danthonia pectinata* Lindl.

**Family/tribe**

**Common names**
*English*: *A. elymoides*: hoop Mitchell grass, slender Mitchell grass, weeping Mitchell grass, wire Mitchell grass
*A. lappacea*: curly Mitchell grass, common Mitchell grass, wheat Mitchell grass, wheat-ear Mitchell grass
*A. pectinata*: barley Mitchell grass
*A. squarrosa*: bull Mitchell grass, wheat-ear Mitchell grass

**Morphological description**
Strongly tufted perennial grasses growing to 1 m tall, culms erect or ascending, arising from scaly bases. Rhizomes short or absent. Ligule a ciliolate membrane or fringe of hairs; leaf blades rolled in bud, narrow. Inflorescence a terminal spike or spike-like raceme, solitary or paired. Roots wiry, dual system comprising shallow roots to utilise surface moisture from lighter rainfall and a deep (>200 cm) system to access subsoil moisture.

Distinguishing features:
*A. elymoides* (hoop Mitchell): tussock to 50 cm. Stems thin, palatable. Leaf blades linear, attenuate, 12-35 cm x 0.3-0.5 cm, glabrous, glaucous, surface ribbed, margins scaberulous, not curling as plant hays off. Spike-like racemes solitary, 12-35 cm long, narrow, straight, or arcuate, hooping (weeping) towards the ground when mature. Spikelet > 4 mm wide, appressed to rachis.

*A. lappacea* (curly Mitchell): tussock to 50 cm. Stems thin, palatable. Leaf blades linear, attenuate, 12-35 cm x 0.3-0.5 cm, glabrous, glaucous, surface ribbed, margins scaberulous, not curling as plant hays off. Spike-like racemes solitary, 12-35 cm long, narrow, straight, or arcuate, hooping (weeping) towards the ground when mature. Spikelet > 4 mm wide, appressed to rachis.

*A. pectinata* (barley Mitchell): tussock to 50 cm. Stems thin, palatable. Leaf blades linear, attenuate, 12-35 cm x 0.3-0.5 cm, glabrous, glaucous, surface ribbed, margins scaberulous, not curling as plant hays off. Spike-like racemes solitary, 12-35 cm long, narrow, straight, or arcuate, hooping (weeping) towards the ground when mature. Spikelet > 4 mm wide, appressed to rachis.

*A. squarrosa* (bull Mitchell): tussock to 50 cm. Stems thin, palatable. Leaf blades linear, attenuate, 12-35 cm x 0.3-0.5 cm, glabrous, glaucous, surface ribbed, margins scaberulous, not curling as plant hays off. Spike-like racemes solitary, 12-35 cm long, narrow, straight, or arcuate, hooping (weeping) towards the ground when mature. Spikelet > 4 mm wide, appressed to rachis.

**Inflorescence**
- **Hoop Head Mitchell grass**
- **Curly Mitchell grass**
- **Barley Mitchell grass**
- **Bull Mitchell grass**
A. *lappacea* (curly Mitchell): tussock to 50 cm, erect, or decumbent. Stems thin, palatable. Leaf blades linear-oblong, acute, 10-20 cm x 0.4-0.5 cm, mostly glabrous, glaucous, curling distinctly as plant hays off. Spike-like racemes single or paired, straight or slightly arcuate; unilateral, 5-30 cm long, usually held within the foliage. Spikelet > 4 mm wide, bristly and loosely arranged along the seed head in an alternate pattern.

A. *pectinata* (barley Mitchell): tussock to 80 cm. Stems coarse, moderately palatable. Leaf blades linear, attenuate, 7.5 - 25 cm x 0.3-0.6 cm, flat, glaucous, often twisted, surface ribbed, sparsely pubescent with tubercular-based hairs; margins scaberulous. Spike-like racemes single, straight, 4-13 cm long, held above foliage on long, erect culm. Spikelet >4 mm wide, tightly packed in 2 distinct rows against straight rachis.

A. *squarrosa* (bull Mitchell) : tussock to 100 cm. Stems coarse, relatively unpalatable. Leaf-blades 15–30 cm x 0.3–0.6 cm, scabrous, rough adaxially, margins scaberulous; distinct, whitish mid-vein on the upper surface. Racemes single, unilateral, straight, 7-18 cm long, Spikelets, > 4 mm wide, long silky hairs at base, prickly by virtue of distinct hooks at end of awn.

**Distribution**

**Native:**

Australasia: Australia – *A. lappacea*, *A. pectinata* (New South Wales, Northern Territory, Queensland, South Australia, Western Australia).

– *A. elymoides*, *A. squarrosa* (New South Wales, Queensland, Western Australia, Northern Territory)

**Ecology**

**Soil requirements**

Native of heavy cracking clay soils in the arid zone of northern, usually with high pH and free limestone. Some tolerance to salinity.

**Moisture**

Best development occurs in areas receiving between 250 and 550 mm annual rainfall. Very drought-tolerant due to their robust root system, although many plants die in extremely dry periods. *A. elymoides* is found on moister depressions; the coarse *A. squarrosa* is dominant in seasonally flooded country usually in northern Australia; *A. pectinata* is susceptible to flooding and is common in more arid areas where soils do not crack as severely; and *A. lappacea* is more common in eastern Mitchell grass downs of Queensland.

**Temperature**

They produce most of their growth in the warm season, requiring temperatures between 25°C and 35°C for optimum germination and growth. They make limited growth following effective winter rainfall, but no growth below 15°C. Their natural environment extends from about 18°-28°30’S and to 1,000 m asl. *A. pectinata* is susceptible to frost. Growth has usually ceased before frosts are experienced because summer soil moisture is usually exhausted.

**Light**

Full sunlight.

**Reproductive development**

Flowering is independent of photoperiod, occurring at almost any time of year in response to rainfall.

**Defoliation**

*Astrebla* spp. respond well to moderate grazing or cutting which tends to stimulate tillering and seed production. As they age, both the number and size of inflorescences are reduced, although cutting and irrigation may help to promote new growth. *Astrebla* spp. are generally tolerant of heavy grazing, although heavy grazing during prolonged drought can result in tussock death. Large scale seedling recruitment is rare.

**Fire**

Mitchell grass is rarely burned, being too valuable as a reserve of feed in an arid climate. However, it will recover well from fire in the absence of grazing following rain.

**Uses/applications**

Forage
Valuable native pasture over large areas on clay soils of arid northern and mid-latitude Australia. Acts as standing hay preserved by the dry atmosphere and absence of rainfall during the cool dry season. Winter rain in southern Astrebla grasslands leads to fungal blackening of the dry leaf and deterioration of nutritive value.

Environment
Seed has been harvested to restore Mitchell grasslands after cropping. Astrebla pectinata seed advertised for sale in India.

Agronomy
Guidelines for the establishment and management of sown pastures.

Establishment
Astrebla spp. are not easy to establish from seed, and sowings must be made on a full profile of soil moisture after a fallow. Seed can be sown into a seedbed or oversown and trampled in by livestock

Fertilizer
While responses to nitrogenous fertilizer have been obtained, the use of any fertilizer on an Astrebla sward would not be economical in the arid environments where it grows.

Compatibility (with other species)
Robust tussocks growing in an arid zone result in strong competition, but the inter tussock spaces may be occupied by other grasses (perennial species Aristida spp., Dichanthium spp. and annual species of Iseilema, Dactyloctenium and Panicum). Some native legumes (e.g. Glycine spp. and Indigofera spp.) co-exist and a large range of C4 dicotyledoneous species. Winter rainfall in more southerly regions results in growth of a wide range of C3 forbs.

Companion species
Desmanthus spp. in lower latitudes, and in the higher latitudes with more winter rainfall, Medicago spp. have naturalised.

Pests and diseases
No information available.

Ability to spread
Large scale seedling recruitment is rare but localised spread does occur when seed is present.

Weed potential
Low.

Feeding value
Nutritive value
Moderate nutritional value, often limited by low available soil nitrogen after a wet year.

Palatability/acceptability
Mitchell grasses are not particularly palatable during the wet season. Livestock preferentially select other accompanying species during the summer growing period. However, the Mitchell grasses retain their leaf during the dry season and are eaten then (there being little other feed). Feeding value varies among the species, with A. elymoides and A. lappacea being more acceptable to livestock in the green state than the other two species. Winter rainfall events sometimes experienced in southern Astrebla grasslands lead to deterioration of nutritive value.

Toxicity
A fungus (Corallocytostroma spp.) sometimes found on the stems of Mitchell grass in the Kimberley Region of northern Western Australia has caused ‘black soil blindness’. Up to 5% of stock grazing affected Mitchell grass may die. The fungus is a hard rough body about 10–20 mm diameter and grows on the grass stem at a node or axillary shoot.

Production potential
Dry matter
Yields of 2 tonnes/ha are common in well grazed pastures during good seasons. Under good conditions, of moisture and N fertility, A. lappacea can produce over 6 tonnes dry matter in a season.

Animal production
Highly variable depending on rainfall.
Genetics/breeding

_Astrebla_ spp. are autogamous, and although hybrids do occur, they are sterile. $2n = 4x = 40$ in _A. lappacea_ and _A. pectinata_.

Seed production

Flowering and seeding is triggered by a minimum of 50 - 75 mm of rainfall in one rainfall event, with seed ripening 5 - 6 weeks after that rainfall. Seed dispersal is rapid and usually complete within 7 weeks. Fresh seed is dormant for 8 months after ripening.

Natural stands of _Astrebla_ produce abundant seed heads that can be harvested with conventional headers or with brush harvesters. Seed yields have varied from 50 to 100 kg/ha (naked caryopses) for wild stands, and spikelet yields of up to 200 kg/ha in curly Mitchell grass (_Astrebla lappacea_) have been measured. Seed production can be improved 3-fold by applications of 100 to 150 kg/ha N through increasing the number of inflorescences per square metre and the number of spikelets per inflorescence.

Herbicide effects

Diuron is registered in Australia for control of selected broadleaf and grass weeds in seed crops of _Astrebla lappacea_, applied as a single pre-emergent or early post emergent treatment to weeds only.

Strengths

- Very drought tolerant
- Tolerant of heavy grazing
- Grow well on heavy cracking clay soils
- Good stand-over feed

Limitations

- Not very palatable
- Generally restricted to alkaline clay soils with summer dominant rainfall

Selected references


Cultivars

‘Yanda’ (_A. lappacea_) Australia (1996) Selected from 289 specimens collected in the wild throughout eastern Australia for high seed yield, improved cool season green leaf growth, dry matter production and a high proportion of warm season leaf production.

‘Turanti’ (_A. pectinata_) Australia (1996) Selected from 166 wild populations for improved cool season green leaf growth, dry matter production and a high proportion of warm season leaf production. It grows about 30 cm high with 67 mm flowerheads.

Promising accessions

None reported.

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