Eragrostis curvula

Scientific name

Eragrostis curvula (Schrad.) Nees

Synonyms

Eragrostis chloromelas Steud.
Eragrostis curvula (Schrad.) Nees var. ampli ned.
Eragrostis curvula (Schrad.) Nees var. conferta Nees
Eragrostis curvula (Schrad.) Nees var. valida Stapf
Eragrostis jeffreysii Hack.
Eragrostis robusta Stent
Eragrostis subulata Nees

Poa curvula Schrad.

Note: The taxonomy of this species is complex. Gibbs Russell et al. (1991) recognise E. robusta as the only synonym of E. curvula, and treat E. chloromelas and E. jeffreysii as separate species. They further comment that "this is a very variable grass, with several ploidy levels, which appears to grade into other species such as E. chloromelas, E. barbinodis, E. caesia, E. lehmanniana, E. planiculmis and E. rigidior."

For general purposes, 4 types are recognised:

1) Curvula (Weeping lovegrass)
2) Conferta (Boer lovegrass)
3) Robusta (sometimes further divided into Blue, Green and Intermediate)
4) Cold-hardy (CH) type (sometimes considered to have an affinity with E. lehmanniana, and E trichophora - not supported by isozyme typing).

Note: Chloromelas (Short and Tall) are sometimes included in the complex.

Family/tribe


Common names

boer love grass; weeping love grass (South Africa, USA); african lovegrass (Australia); oulandsgras (Afrikaans); pasto llorón (Spanish); gekrümmtes liebesgras, kosmatka africka, eragrostide curvula, shinadare suzume gaya, wiipin gurabu gurasu, capim-chorão, afrikanskt kärleksgräs, salkim yalaf.

Morphological description

A tufted, perennial with drooping leaves mostly concentrated at the base of the plant to 30 or 50 cm. Culms erect, mostly to 1.2 (-1.8) m tall, with fine, fibrous unbranched, stems, and glabrous nodes. Leaf blades variable in colour from bluish to green, curling at the tip when dry, minutely hispid (rough on both surfaces), long, narrow and tapering, to 500 mm long and 1-5 mm wide, rolled or flat; basal leaf sheaths strongly striate, densely to sparsely hispid below. Panicle much branched, sometimes narrow and contracted, with branches appressed to the main axis but mostly loose and spreading, 60-400 mm long, 50-100 mm broad, the lower branches pilose in axils. Spikelets greyish-green, flattened, linear-oblong to linear elliptic, 3-10 mm long and 1-1.5 mm wide, comprising 4-13 florets; caryopsis ellipsoid, 0.7 mm long. About 3.5-5 million caryopses or 110,000 spikelets per kilogram.

The conferta type is smaller than the other types.

Distribution

Native to:

Naturalised in:
Northern Africa and the Canary Islands, Asia, Australia, New Zealand, British Isles, USA, tropical and subtropical South America.

Grows in grasslands and clearings in woodlands. Considered an important pioneer grass in its native habitat; not common in natural grasslands, but can be in dense populations in disturbed land e.g. trampled, heavily grazed or cultivation fallow.

Uses/applications

Used for pasture and hay. Also for stabilisation of road verges and terraces, water discharge areas, and banks of earth tanks, and sown in strips for control of wind erosion.

Ecology

Soil requirements

Grows on well-drained, acid soils of sandy to loam texture, and with pH from 4.5-7.0. Susceptible to iron deficiency chlorosis on calcareous soils. Optimum pH varies with genotype. Although it can be established on heavy clays, it is less persistent. The extensive root system can exploit depths to 5 m, but it is also adapted to relatively shallow soils (c. 20-50 cm deep). Tolerant of moderate levels of
salinity.

**Moisture**

Normally grows in areas of low to moderate rainfall, 500-1,000 mm (1,200 mm), extending to as low as 300 mm if sown in basins or contour furrows and mulched. It is very drought tolerant (*conferta* and *robusta* types generally > *curvula* types). The horizontal roots can spread to at least 1 metre, filling the surface soil between plants, making it very effective in using light rain and in preventing other plants from establishing. *E. curvula* does not grow in poorly drained soils and does not tolerate flooding.

**Temperature**

The distribution of *E. curvula* extends from near the equator to about 34ºS and from sea level to 3,500 m asl, representing a range in average annual temperature from <14º to about 23ºC. Optimum temperature for growth is between 17 and 32ºC, although it still makes significant growth at 7ºC, and in some genotypes, down to -10ºC. Frost tolerance varies widely, some genotypes going dormant at the first frost (most CH types), while other (e.g., *curvula* types) remain green and potentially active through the first frosts, but with little active growth. Still other accessions, frequently *robusta* types, remain active and continue to grow through the first frosts. Winter survival (winter-hardiness) in severely frosted areas varies among genotypes. Those with intermediate growth strategy are usually the most winter-hardy, while those that grow the longest are rarely very winter-hardy. *E. curvula* has persisted in areas with mean minimum winter temperatures down to -5ºC. Minimum temperature for reliable stand survival of the most winter-hardy cultivars is between -15 and -20ºC (assuming appropriate management).

**Light**

Has moderate shade tolerance.

**Reproductive development**

Flowering patterns vary with type. *Curvula* and *conferta* types normally flower in late spring and to a lesser extent, late summer, but rarely in mid summer. If a *curvula* type is mowed following flowering in late spring, it produces few or no additional heads until late summer. By contrast, the CH type, commences flowering in spring, and continues to produce large numbers of inflorescences throughout the summer, with a much higher percentage of fertile tillers than in the *curvula* type.

**Defoliation**

Starts growth early in the season and continues until quite late. As foliage becomes fibrous rapidly, and seedheads emerge as described above, it is important to mow or graze regularly. Periodic mowing is beneficial if cattle are not able to maintain sufficient grazing pressure.

Rotational grazing is not necessary to maintain stands of the *curvula* type, although in some circumstances it can be helpful. Defoliation can increase persistence when more heavily fertilised ‘A-67’ is subjected to summer drought. In this situation, failure to remove forage results in depletion of available soil water and tiller/plant death. Defoliation can slow water use and improve chances of survival. In higher latitude extremes of adaptation, late-season defoliation can decrease persistence. Close late-season defoliation results in depletion of energy reserves in producing new growth at a time when they are needed for winter survival.

**Fire**

Prescribed burning is a practical and efficient management tool for maintaining stands. Herbage production and quality, density and uniformity of stand, and pasture utilisation are generally improved by burning.

**Agronomy**

Guidelines for the establishment and management of sown pastures.

**Establishment**

A clean fine seedbed is essential for successful establishment. Seed can be broadcast or drilled, and covered to less than 1 cm. Rates of 1-5 kg/ha seed give good stands with broadcast sowings, although this can be reduced to as low as 0.25 kg/ha for row planting. An inter-row cultivation of row-planted *E. curvula* during the first year helps it compete with weeds, although this is not necessary in subsequent years. Row spacing can be from 0.6-1.2 m. Good seedling vigour and rapid early growth contribute to ease of establishment.

**Fertiliser**

Survives on poor soils, but needs extra nitrogen for high production. In hay crops, potassium may also become necessary. Phosphorus does not seem to be as important as it might be with some of the panicoid grasses. If needed, fertiliser should be added prior to planting, with recommended rates of P and K. Nitrogen may be applied at this time at rate of 10-20 kg/ha, with additional nitrogen applied as top-dressing once seedlings are well established. At the northern extreme of its range in the USA, limited N fertilisation can increase winter survival of *curvula* types.

**Compatibility (with other species)**

Competes aggressively, particularly in disturbed situations, and in sandy soils.

**Companion species**
Grasses: Bothriochloa ischaemum, Chloris gayana, Cynodon dactylon, Digitaria eriantha, Paspalum nicorae.


**Pests and diseases**

None known.

**Ability to spread**

Spreads readily into disturbed areas. Often spread by roadside slashing, earthworks and motor vehicles.

**Weed potential**

*E. curvula* has become a serious weed of pasture, on road verges, and in cultivation, although the culpable type is rarely cited. Less palatable, prolifically seeding types develop large, viable soil seed banks, making them difficult to eradicate and very competitive with other pasture species.

**Feeding value**

**Nutritive value**

Crude protein levels and IVDMD vary largely with age of material and nitrogen fertility of the soil. IVDMD values of 65% and 18% CP have been measured in young growth, compared with 50% and 6% in older material. Values as low as 40% and 4% for standover material have been measured. Hay harvested about 10 days after seed head emergence, has values of the order of 60% and 11%.

**Palatability/acceptability**

Acceptability to stock declines rapidly with age of regrowth, some genotypes becoming fibrous and unpalatable sooner than others. Of the groupings mentioned under "Synonyms", the 'conferta' types are the most palatable, followed by 'robusta', 'chloromelas' then 'curvula', with 'CH' the least palatable. However, the palatability of robusta germplasm is especially variable and important palatability differences exist within all types. Palatability is improved by fertilising with N. Leaves become very fibrous and difficult for stock to break off or digest. Unless slashed or burnt periodically, stems and leaves are not utilised by stock except under heavy grazing pressure or where there is no pasture choice.

**Toxicity**

Not toxic.

**Production potential**

**Dry matter**

Growing mostly in infertile soils under low rainfall, dry matter yields are generally low at 3-10 t/ha/year. However, in more favourable environments and with adequate nitrogen and sometimes, irrigation, yields of 20-30 t/ha DM are achievable. Yields can be doubled by increasing cutting frequency from 4-8 weeks, and more than doubled through applications of 100-200 kg/ha N.

**Animal production**

Heifers stocked at about 12/ha have produced a liveweight gain of 550 kg/ha over summer, and sheep 53/ha over 130 days produced a liveweight gain of 160 kg/ha. At lower stocking rates (1.5 steers/ha), animals can gain 0.7-1 kg/day during the growing season. Use of more palatable selections can produce 13% more liveweight gain than on less palatable types. However, where they have been tested, robusta cultivars have not been more productive of animal product than the curvula types, 'Morpa' or 'Ermelo'.

**Genetics/breeding**

Basic chromosome number is \( x = 10 \). Diploid \((2n = 20)\), polyploids, and aneuploid \((2n = 63)\) types have been found. The diploids reproduce sexually while the polyploids are mostly pseudogamous, diplosporously apomicts. Apomixis is mostly obligate, sometimes facultative. Sexual and apomorphic types have been found in the tetraploids.

The following chromosome complements have been identified:

1. 'conferta': \( 2n = 20 \) (sexual), or 40 (apomorphic);
2. 'curvula': \( 2n = 40 \);
3. 'robusta': \( 2n = 50-80 \);
4. aff. 'robusta': \( 2n = 20 \) (PI 299920);
5. CH (cold-hardy) type: \( 2n = 40 \);
6. 'chloromelas': \( 2n = 40, 80 \).

**Seed production**

Seed crops are generally planted in rows to achieve larger seeds. It is possible to produce two crops per season, one started in April in the northern hemisphere (October in the southern hemisphere), and the other in August (February). Crops are started with 50 to 100 kg/ha N, along with other nutrients as required. It can be harvested with a header-harvester or a hand sickle when one-third of the head has turned brown. Seed yields of 30-225 (to >500) kg/ha have been reported.
Herbicide effects

Broadleaf weeds can be controlled in *E. curvula* with 2,4-D. Mature plants are killed with glyphosate, which can be mixed with sulfometuron methyl where residues will not affect subsequent crops. Fluroxypyr, and oxyfluorfen are also effective. Several of the triazine herbicides, including atrazine, can be used for control of weeds (including weedy cool-season grasses). *E. curvula* seedlings are susceptible to these herbicides.

Strengths

- Grows on low-fertility soils.
- Establishes easily.
- Good cold tolerance.
- Valuable in erosion control.
- Drought-hardy.
- Long growing season.

Limitations

- Not adapted to heavy clays.
- Nutritive value declines rapidly.
- Can become a weed.
- Intolerant of waterlogging.

Other comments

C4 photosynthetic pathway.

Germination of maize and wheat suppressed by root exudates from *E. curvula* but stimulated in sunflower and cowpea.

‘Ermelo’ has been used in rotations to reduce populations of root-knot (*Meloidogyne* spp.) and root-lesion (*Pratylenchus* spp.) nematodes in tea and tobacco areas. Nematode control appears associated with high concentrations of pyrocatechol in root exudates, but the ability to produce this chemical varies among genotypes.

Selected references


Internet links

http://www.hort.purdue.edu/newcrop/duke_energy/Eragrostis_curvula.html
http://www.noble.org/Ag/Forage/LovegrassSymposium.pdf
http://plants.usda.gov/factsheet/pdf/fs_ecru2.pdf

<table>
<thead>
<tr>
<th>Cultivars</th>
<th>Country/date released</th>
<th>Details</th>
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<tbody>
<tr>
<td>'A-67' (PI 477012)</td>
<td>Arizona, USA</td>
<td>From north central Tanzania. Culvtype. Leafy, densely tufted, long-lived, with extensive root system and long, lax leaves. Greater forage and seed production and more cold-tolerant than the 'Agpal' type or <em>E. lehmanniana</em>. Used for range, pasture, and soil protection on a wide variety of soil textures where annual precipitation exceeds 350 mm. Probably the most widely naturalised type in the USA.</td>
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<tr>
<td>'A-84 Boer' (PI 469322)</td>
<td>Arizona, USA (1950).</td>
<td>From South Africa. Confera type. Palatable, drought-resistant, but less winter-hardy than A-67, and most other genotypes. Longer lived than <em>E. lehmanniana</em>.</td>
</tr>
<tr>
<td>'Agpal'</td>
<td>South Africa (2000).</td>
<td>From Kokstad, KwaZulu-Natal, South Africa (30.55ºS, 29.42ºE, 2100 m asl, rainfall 700 mm) Selected from the old Witbank type for superior palatability, fine stem and leaf, and early seeding ability. Dark green foliage, and finer-leaved than ‘Ermelo’. Cold tolerant type, with culms to 1.8 m.</td>
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<tr>
<td>'Catalina' (PI 203347, used to develop PI 674519)</td>
<td>Arizona, USA (1969).</td>
<td>From Craddock, South Africa (32.1ºS, 25.6ºE, 930 m asl, rainfall 312 mm). Confera type. Selected for seedling drought tolerance. Adapted in semiarid and arid areas with a minimum annual rainfall of 300 mm. Superior to ‘A-84’ for ease of establishment, producing 30% higher yield of bale-quality than ‘Lehmann’. Long-term survival similar to that of ‘A-84’.</td>
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<tr>
<td>'Cochise'</td>
<td>Arizona, USA</td>
<td>A cold-hardy (CH) type, frequently listed as <em>E. lehmanniana</em> × <em>E. trichophora</em> or <em>E. trichophora</em>. Heads far more profusely than the curvula type, and is less palatable than the curvula type, except for a short time during spring prior to initial heading.</td>
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</table>
'Consul' (South Africa: B/53/52, Register No. 119; NSW S.C.S. 4663) NSW, Australia. Institutional collection from South Africa. A tetraploid $(2n = 40)$, conferta type. Morphologically similar to 'A-84', 'Catalina' and 'Don Walter'. Selected primarily on the basis of palatability to sheep. More palatable than 'Morpha' and 'Catalina' which are in turn more acceptable to stock than 'Ermelo'. Basal leaf sheaths purple, striate, nerves somewhat indistinct, yellowish. Culms up to 60cm tall, robust (to 3mm diameter at the base), erect, nodes long, exserted, purple to olive green. Leaves glaucous, blue-green, 15-25 cm long, up to 7 mm wide. Panicle olive-green, up to 15 cm long, narrow, contracted, with stiff lateral branches, usually less than 5 cm long, lowest branches not hairy in the axis. Seed orange to dark brown, approximately twice as long as broad, acute. Morphologically distinguishable from naturalised types, as well as being more palatable. Agronomically similar to 'Catalina'. Superior drought tolerance, persistence, frost hardness and herbage production to most other warm season perennial grasses in adapted environment. Most active growth in spring and autumn. Tolerant of relatively high exchangeable soil aluminium ($>30\%$ saturation).

'Don Juan' Argentina. Robusta type - adapted to drier areas.

'Don Pablo' Argentina. Robusta type - adapted to drier areas.

'Don Walter' Argentina. Conferta type.

'Don Arturo' Argentina. Similar to 'Ermelo'. No longer in production.

'Don Carlos' Argentina. Robusta type. No longer in production.


'Ermelo' (PI 164917, 190312, 196355, 199060, 232986, 298985) South Africa. From Ermelo district, Mpumalanga, South Africa (26.5°S, 1700 m asl, rainfall 500 mm). Curvula type. Leafier and more palatable than naturalised types, staying green longer under moisture and temperature stress, and re-growing more quickly after grazing.

'Morpa' (PI 208994) Oklahoma, USA (1970). From South Africa. Curvula type. Selected for winter survival and acceptability to livestock. Taller than naturalised ecotypes, with darker panicles, and slightly wider leaves. Used for pasture and hay. DM yields equal to or higher than those of other cultivars; contains less lignin and produces higher liveweight gains than naturalised types with both winter and summer grazing.

'OTA-S' Oklahoma & Texas, USA. Conferta type from South Africa. Bred from 4 clones, three sexual clones from PI 299929 $(2n = 40)$ and one a tetraploid from the cross PI 299928 $(2n = 20) \times$ PI 299929 (apparently derived from fertilisation of an unreduced egg by pollen from the tetraploid PI 299929).

'Renner' (PI 591633) Texas, USA. Leaves blue-green and broad (up to 6 mm wide). Seed reddish-brown with a black hilum; much smaller than those of common types. Seed prone to shattering. Selected for higher palatability than 'Ermelo'. Remains green during drought and heat, autumn and winter and into maturity. Relatively winter hardy compared to other robusta germplasm. Less winter-hardy than 'Ermelo' or other curvula type cultivars. No longer available.

'Tanganyika' Argentina See 'A-67'. Curvula type. Adapted to moister areas. Probably the most widely naturalised type in Argentina. Other cultivars include 'American Leafy', 'Kromarrai', 'Umgeni' (South Africa, 1995), and 'Witbank'.

### Promising accessions

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<thead>
<tr>
<th>Promising accessions</th>
<th>Country</th>
<th>Details</th>
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<tbody>
<tr>
<td>PUK E238, PUK E422, PUK E427, PUK E916</td>
<td>South Africa.</td>
<td>Potchefstroom University in the Bethlehem area.</td>
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<tr>
<td>CPI 30380</td>
<td>Queensland, Australia.</td>
<td>Robusta type, highest yielder.</td>
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</tbody>
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