


**“Wilman lovegrass Hercules”, *Eragrostis superba* (Peyr) a grass variety  
for arid and semi-arid regions**



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**Abstract:**

The wilman lovegrass (*Eragrostis superba*) is a perennial specie, native to South Africa, from good forage value that adapts well to a wide range of soils and climatic conditions. The Hercules variety of wilman lovegrass comes from collections made in Central and Northern Mexico. It was assessed in arid and semi-arid zones in rainfed and irrigation from 1986 until the record in 2008. The registration granted by the National Service of inspection and certification of seeds (SNICS) is ERA-002-060608. To date, the first variety recorded for this

specie in Mexico. The mean dry matter annual production of this variety performance ranges between 886 y 1,947, mean of 1,416 kg DM ha<sup>-1</sup> under rainfed conditions and between 24.8 y 11.4 t DMha<sup>-1</sup>, mean of 18.1t DMha<sup>-1</sup> under irrigation conditions. This grass is tolerant to drought, easy settlement and rapid growth, is palatable to livestock, grazing-resistant and tolerant to salinity. It is used for the recovery of degraded rangeland and conservation of soil in grassland of arid and semi-arid zones in Mexico.

**Key words:** *Eragrostis superba*, New variety, Arid lands, Semiarid lands.

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## Origin

Originally from South Africa<sup>(1)</sup>, Wilman lovegrass (*Eragrostis superba* Peyr) is an introduced perennial bunch grass currently distributed from the United States of America to Argentina<sup>(2)</sup>, among other regions. Easily established, it is resistant to grazing and provides good forage quality, containing up to 15 % crude protein in the spring<sup>(3)</sup>, and with an *in vitro* dry matter digestibility (IVDMD) of 49.7 %<sup>(4)</sup>. It grows well at altitudes from 300 to 2,000 m asl<sup>(5)</sup>, adapts to arid and semi-arid conditions, will prosper in a wide variety of soils, especially in sandy loam, and recovers well after intense grazing<sup>(3,5)</sup>.

This grass species is mainly used for forage production, but has also been used in revegetation of degraded lands in arid areas in association with bush vegetation and mesquite and huisache forests<sup>(6,7,8)</sup>. It yields from 1,200 to 1,800 kg dry matter (DM) in seasonal cultivation<sup>(3,5)</sup>, and is preferably used fresh to increase acceptance by livestock<sup>(5,6)</sup>. *Eragrostis superba* tolerates arid conditions (annual rainfall of 250 to 350 mm)<sup>(5)</sup>, and salinity (up to 150 meq/l)<sup>(9)</sup>, and protects soils from erosion<sup>(10)</sup>. Due to its good persistence it is recommended for rehabilitation of degraded grasslands<sup>(6)</sup>. It can adapt to a wide range of different soil types at 5 to 8 pH<sup>(11)</sup>, and has a high probability of success in the face of rainfall irregularities<sup>(3)</sup>. This species has good hydrodynamics and presents no serious threat of uncontrolled dispersion<sup>(8)</sup>. Yields of *E. superba* in the Mexican highlands (928 kg/ha) exceed those for *Bouteloua gracilis* (567 kg/ha)<sup>(12)</sup>.

The Garrapata Hercules variety originates in a collection of fourteen *E. superba* accessions from states in northern and central Mexico: Chihuahua, Durango, Zacatecas, Coahuila, Nuevo León and San Luis Potosí<sup>(13)</sup>. In 1986, these accessions were evaluated under seasonal, grazing-free conditions in observation plots at three sites in the highlands of San Luis Potosí,

Mexico: Villa de Arriaga (21°53'00" N, 101°16'00" W; 2,198 m asl); Venado (22°52'16" N, 101°14'51" W; 1,970 m asl); and Soledad de Graciano Sánchez in the INIFAP San Luis Experimental Station (22°14'03" N, 100°53'11" W; 1,835 m asl). These plots were monitored and measured for over four consecutive years (1986-1989). Based on its persistence, forage yield, stability and forage quality, accession 185515 was deemed optimal. This accession was originally collected in Tuitán, Durango (24°02'08" N, 104°15'03" W; 1,882 m asl). Once selected, accession 185515 was evaluated at the same sites as above for a further eight years. Between 1997 and 1999 seed from accession 185515 was harvested from these observation plots with the aim of establishing a seed production lot in 2000. Planted in a 1,500 m<sup>2</sup> area in the INIFAP San Luis Experimental Station, the accession was grown under irrigation conditions to observe its growth potential in the absence of moisture limitations with the objective of producing seed for this new variety of grass for arid and semi-arid conditions in Mexico. As part of the research project "Characterization, description, production and registration of new varieties of pastures", begun in 2001 and with an emphasis on outstanding accessions for altitudes higher than 1,800 m asl, this accession was planted on 5,000 m<sup>2</sup> of irrigated land in the same experimental field in 2002 with the goal of botanically characterizing it and producing basic seed.

In 2004 the forage potential of the Garrapata Hercules variety (accession 185515) was tested by planting it under seasonal conditions in one-hectare parcels with ten farmers at different locations in the arid and semi-arid region of San Luis Potosí (Table 1). Average yield at these ten parcels ranged widely from 1,200 to 2,100 kg DM ha<sup>-1</sup>.

**Table 1:** Test parcel farms and location information

Farm	Location	N	W	Altitude (m asl)
Predio El Chilar	Villa de Zaragoza	21°58'56"	100°45'30"	1950
El Pedregal	Villa de Zaragoza	21°57'54"	100°49'01"	1860
La Sabanilla, Ejido Santa María del Refugio	Real de Catorce	23°44'41"	101°17'19"	2505
Tanque Dolores	Real de Catorce	23°39'35"	101°09'48"	1900
La Mora, Fracción de Triana	Salinas de Hidalgo	22°43'21"	101°39'21"	2050
Ejido San José de la Peña	Villa de Guadalupe	23°15'46"	100°46'05"	1740
La Nopalera, El Leoncito	Villa de Guadalupe	23°22'50"	100°45'18"	1650
San José del Muerto, Ejido Francisco Sarabia	Matehuala	23°22'00"	100°48'33"	1720
La Loma, Ejido Presa Verde	Cedral	23°58'29"	100°41'56"	1910
El Cuarejo	Cedral	23°49'54"	100°34'37"	1770

Formal characterization of the *E. superba* Garrapata Hercules variety (accession 185515) was done at the INIFAP San Luis Experimental Station from 2002 to 2004. According to a pre-established format, seed volume production per hectare, germination quality, purity (%) and viability (%) were quantified. Once characterized, the variety was submitted to the National Seed Inspection and Certification Service (Servicio Nacional de Inspección y Certificación de Semillas - SNICS) for possible registration as a new variety for arid and semi-arid areas. Final SNICS registration was completed in 2008 for *Eragrostis superba* Peyr Garrapata Hercules (ERA-002-060608); to date this is the only registered variety for this species in Mexico.

### **Variety morphological description**

The principal characteristics of the Garrapata Hercules variety are: root with deep ramifications (>50 cm) and fibrous growth; leaves 30.4 cm long and 0.92 wide, dark green, acicular shape; longevity 64 days; erect growth habit; stems dark green, cylindrical 0.24 cm thick and 88.8 cm long; glume, lemma and palea size 5.0 mm; glumes emerald green; plant height to base of inflorescence 69.8 cm; ovoid seed shape, dark brown color, 0.472 mg weight, 1.02 mm long, 0.208 mm wide; imbibition onset 3.0 h (0.13 days), imbibition complete 8.0 h (0.33 d); radicle emergence 13.0 h (0.54 d); coleoptile emergence 21.0 h (0.88 d); germination rate: 3.4 plants/h in one hundred seeds; days to emergence: 7; seedling vigor: strong; very high establishment capacity; regrowth mechanism with basal or root crown buds; degree of bunching: excellent; recovery vigor: excellent; days to flower issue: 78; type of flowering: undetermined; days to anthesis onset: 9; flower density per stem and plant: 62.09 (viable); days to flowering termination: undetermined; predominant flower fertility: 12.8; number of viable seeds per inflorescence: 1,284; resistance to matting: good; resistance to deseeding: good; pest tolerance: good; drought tolerance: good; burn tolerance: good; cold tolerance: regular; salinity tolerance: regular; acidity tolerance: regular; frost tolerance: bad; flood tolerance: good; persistence: good.

### **Agricultural characteristics**

The *Eragrostis superba* (Peyr) Garrapata Hercules variety grows well in arid and semi-arid areas with sandy and sandy loam soils where average annual rainfall ranges from 250 to 350 mm, with good distribution during the summer, and average annual temperature is 16 °C<sup>(5)</sup>. According to the evaluations carried out from 1986 to 1997 in the municipalities of Venado, Villa de Arriaga and Soledad de Graciano Sánchez (370 mm average annual rainfall during

ten-year period), estimated average dry forage yield in seasonal conditions was 1,200 kg ha<sup>-1</sup> and average plant height was 64.8 cm. When grown at the San Luis Experimental Station (1,835 m asl) under seasonal conditions over a three-year period dry matter yield and plant height (respectively) were 886 kg DM ha<sup>-1</sup> and 42 cm (332.2 mm annual rainfall); 1,330 kg DM ha<sup>-1</sup> and 72 cm (364 mm annual rainfall); and 1,075 kg DM ha<sup>-1</sup> and 64 cm (340 mm annual rainfall). When evaluated from 1994 to 1996 in Villa de Arriaga municipality (2,198 m asl) under seasonal conditions, dry matter and plant height (respectively) were 980 kg DM ha<sup>-1</sup> and 72 cm (286 mm annual rainfall); 1,370 kg DM ha<sup>-1</sup> and 64 cm (394 mm annual rainfall); and 1,947 kg DM ha<sup>-1</sup> and 80 cm (406 mm annual rainfall). In forage species potential seed production is a major factor in grassland vegetation communities due to its effect on species dominance, regeneration and survival<sup>(14,15,16)</sup>. A species with high seed production and a good germination percentage is highly probable to have good establishment and persistence<sup>(16)</sup>. At the INIFAP San Luis Experimental Station, under irrigation and fertilization (120-60-00), seed production was 1,651 kg non-scarified seed ha<sup>-1</sup> in a single harvest per year, with 80 germination and 82 purity. These results are similar to previous reports<sup>(15,16)</sup>. Fresh forage yield was 24.8 t ha<sup>-1</sup> and dry forage yield was 11.4 t DM ha<sup>-1</sup> in a single annual harvest, under irrigation. An evaluation of seed count resulted in 1'578,947 seeds kg<sup>-1</sup> from scarified seed.

Bromatological analyses showed this variety to contain 38 % dry matter; 10.2 % crude protein at flowering onset and 4.6 % at maturity; and 8.2 % digestible protein at flowering onset and 3.1 % at maturity. This protein content is high compared to most grasses in arid and semi-arid ecosystems<sup>(17)</sup>. At flowering onset and maturity (respectively) ash content was 11.6 % and 5.4 %, calcium content was 0.39 % and 0.23 %, and phosphorus content was 0.09 % and 0.04 %.

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