

## 435. LYGEUM SPARTUM

*Gramineae*

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**Summary.** The taxonomy, distribution and uses of the Mediterranean grass, *Lygeum spartum* (*Gramineae*), are discussed; an illustration is provided, together with a full description of the species

*Lygeum* contains a single species, *L. spartum*, which is known as ESPARTO GRASS, and is the only representative of tribe *Lygeae*. Structurally it is one of the most extraordinary members of the grass family and its taxonomic affinities are still not fully understood. It has a *Pooid* embryo (the details of which are: mesocotyl absent, epiblast present, scutellum cleft absent and first leaf folded) and slender microhairs similar to those of *Nardus* (the only representative of its own tribe, *Nardeae*, whose affinities are also in doubt) but otherwise there is no clue to its origins. It has abandoned its glumes as a means of protection for the developing florets and no trace of them can be found. Protection of the florets is still important and the role has been assumed by the inflated sheath of the subtending spatheole. The two (or very rarely three) florets comprising the spikelet are amalgamated in a way quite unique among grasses. The lemmas are leathery and densely hairy below and are fused along their opposing lower margins to form a tube; they are membranous and glabrous above and their upper halves are divergent at maturity. The lemma-tube is divided across the middle by a septum formed of the two paleas which are fused back to back and extend well beyond the tips of the lemmas. The spikelet protrudes from the side of the persistent spatheole but drops very readily at maturity (especially when it begins to dry out after gathering) and the rhizomes are often wedged very tightly in cracks in limestone rocks making the plant one of the hardest of the grasses to collect for the herbarium in good condition.

Esparto grass occurs around much of the Mediterranean basin but is absent from Greece, Turkey and most of the Middle East. It has been collected from Spain, Italy (including Sicily and Sardinia), Malta and Crete in the north and from Morocco, Algeria, Tunisia, Libya and Egypt in the south. Surprisingly, it has also been found in Kashmir but it has almost certainly been introduced there as an

ornamental since no part of the region has a Mediterranean climate to which the species could have migrated naturally. It grows in rocky and sandy places, often but not exclusively calcareous, in grassy plains and in salt-marshes.

**USES.** *Lygeum spartum* is used for its leaf fibres. It is commonly marketed, like the commercially more important *Stipa tenacissima* L., under the name of ESPARTO GRASS. Both species have similar narrow leaves and are difficult to distinguish, except at flowering time when the former cannot be confused with any other grass, as already mentioned above.

Esparto is a major economic resource in the arid zones of Morocco, Algeria and Tunisia, and was formerly also important in Spain. Although a wild resource, grassland has traditionally been managed so as to protect esparto from excessive harvesting or grazing, although over-grazing has become a severe problem in the late twentieth century (Puigdefàbregas & Mendizabal, 1998). Accounts of harvesting vary, but it appears that traditionally two methods are used. In hand harvesting the leaf blade is broken off from the leaf sheath. For faster gathering, leaves are twisted around a stick and jerked free of the plant; any leaf sheaths or roots that are pulled up are removed in the factory. With this type of harvest, one person could gather 300–400 kilograms in a day (Dodge, 1897; Kirby, 1963).

Most local use is for cordage, either as dry leaves, or as fibres after retting in sea water. Uses include making sandals, ropes, brushes, matting, mattress-stuffing and, in Italy, covers for wine bottles. The use of esparto fibres for paper-making is comparatively recent and originated in the British Isles. Here, in the early nineteenth century, an increase in literacy and the development of machine printing led to a huge increase in demand for paper, which could not be met from the existing raw material of linen and cotton rags. A range of plant fibres were tried, including straw which was difficult to process and made poor quality paper. Much pioneering work was carried out by Thomas Roulledge (1819–1887), an engineer who collaborated with the Royal Botanic Gardens, Kew on new paper sources [see page 67]. By 1850 he had decided to focus on esparto grass, applying for his first patent in 1856. The dried esparto leaves were imported from Spain and North Africa in compressed bales. Roulledge began production at the Ford Paper Mill, South Hylton on the River



*Lygeum spartum*

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Wear, in County Durham; location on a river was important for effluent disposal. Extraction of clean fibres for paper-making involved boiling chopped esparto with caustic soda, washing, bleaching with calcium hypochlorite, and re-washing. The resulting pulp was then dried and sent to the paper factory. (Chester, 1976; Walker, 1984).

Esparto grass proved to be highly suitable for paper-making. As only the leaves are used, there are no stem nodes to create lumps in the paper, it pulps easily at atmospheric pressure, and its digestion results in a yield of 38–45 per cent fibres. These fibres are 1.5 mm long and are thick-walled, remaining springy and sinuous after drying, and they bond to make a fine, even paper that has good opacity and stability (Rance, 1980). In view of this it became much used for high quality colour printing, for example in illustrated magazines such as the *Illustrated London News*. Production soon increased at the Ford Mill and other paper mills and by 1890 Great Britain was importing 190 000 tons each year, but from the 1860s onwards the production of wood pulp for paper-making increased. Supplies of esparto grass were cut off by the outbreak of war in 1939, further encouraging a shift to wood pulp production, and today little esparto paper is produced in Europe. However, esparto grass continues to be important in industrial paper-making in North Africa.

**CULTIVATION.** In spite of grasses being at a peak of popularity as garden subjects for their aesthetic appeal, the very unusual *Lygeum spartum* is not in general cultivation and is at present unlikely to be found outside botanic gardens. It is not, for example, listed in the current edition of *The RHS Plant Finder* (Lord, 2001), nor is it included in books devoted to the ornamental aspects of grasses, such as Darke & Griffiths, *RHS Manual of Grasses* (1994) and *Ornamental Grasses* by Roger Grounds (1989).

The plants of *Lygeum spartum* in the Grass Garden at the Royal Botanic Gardens, Kew, were originally grown from seed collected near Almeria in Southern Spain. The field notes indicate that the plants were growing in light soil in rocky, dry conditions, so in cultivation it follows that this grass requires a well-drained soil and should be planted in an open, sunny position. Too much moisture in the winter months can lead to rotting so the soil must never become waterlogged; for this reason some plants were lost at Kew during the extremely wet winter of 2000–2001.

This species often flowers well in the summer but few seeds are set on the plants at Kew. When they are produced, the seeds are large and easy to collect. They are sown in spring in a free draining, loam-based soil mix and the pot is then kept in a cool, frost-free glasshouse. The germination rate is usually high and as soon as two leaf blades have appeared the seedlings are pricked out into individual pots and grown on. In late spring these pots are placed in a sheltered position outside, prior to planting out in early summer. The seedlings are fairly slow-growing and will take around 3 years to produce good-sized plants. An alternative method of propagation is to carefully divide established clumps in spring, as new growth commences; the divisions must be replanted immediately and watered in.

**Lygeum spartum** Loefl. ex L., Gen. Pl., ed. 5, addend. pag. ult. post ind. (p. '522') 1754. Type: Spain, *Loefling* (LINN).

DESCRIPTION. *Creeping perennial*. *Rhizomes*, short, straight, tough and with very short internodes; culms wiry, up to 70 cm high, clothed at the base in brown, glossy, coriaceous scales. *Leaf-blades* wiry, up to 50 cm long and 1.5 mm in diameter; ligule membranous, bluntly pointed, 5–11 mm long. *Inflorescence* a single terminal spikelet enclosed by a spatheole; spatheole inflated, many-nerved, 25–55 mm long, acute or often bearing a reduced blade 3–20 mm long. *Spikelet* large, 2(3)-flowered, urn-like, 35–55 mm long, protruding from the side of the spatheole, falling entire. *Glumes* 0. *Lemmas* many-nerved, 20–30 mm long, villous with silky hairs 10–15 mm long, fused below along opposing margins to form a cylindrical coriaceous tube, the upper half chartaceous, free and divergent. *Paleas* as long as the spikelet, fused back to back below and forming a transverse septum within the lemma tube, free above. *Lodicules* 0. *Stamens* 3 with anthers up to 15 mm long. *Stigma* 1.2–3 cm long, glabrous. *Caryopsis* fusiform, the embryo  $\frac{1}{4}$  its length; hilum linear.

DISTRIBUTION. Western, central and southern Mediterranean region, recorded in Spain, Italy (including Sicily and Sardinia), Malta, Crete, Morocco, Algeria, Tunisia, Libya, Egypt.

HABITAT. Rocky sites, often in limestone crevices, and sandy places, and in grassy plains and salt-marshes.

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