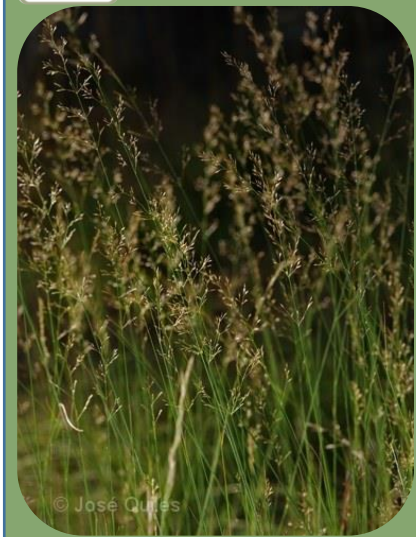
Agrostis castellana Boiss. & Reut.



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Origin and diffusion

Origin: southern Europe
Distribution: South Europe, North Africa, temperate zones of western Asia, New Zealand, South America.
Invasive potential: invasive in Austria, Belgium, France, Germany, Portugal, United Kingdom.

Introduction

Agrostis castellana, is a monocot perennial herb with short rhizomes. It grows in clearings, fallow lands and vineyards. It is adapted to a dry, cool, marine environment but it can also be planted in milder zones. It is used on golf course and for revegetation project.

Common names: highland bent, Bentgrass (English), Cappellini di Castiglia (Italian)

Description

Life-form and periodicity: caespitose herb, perennial

Height: 30-60 cm

Roots habit: short creeping rhizomes, covered with inflated scales; 50 cm (depth to which many roots extended)-63 cm(depth to which a few roots extended) deep.

Culm/Stem/Trunk: culms 30–80 cm long, erect or geniculate, with up to 10 nodes, shoots proliferating from the upper nodes.

Crown: -

Fam. *Poaceae*

Description

Leaf: leaf-sheaths glabrous on surface. Leaf-blade 2,5–10 cm long; 0,5–1,8 mm wide. Leaf-blade surface is smooth, or scabrous.

Rate of transpiration: -

Reproductive structure: the inflorescences are panicles. Panicles are wide, after anthesis they contract. Spikelets elliptic; laterally compressed; 2,3–3,7 mm long; breaking up at maturity; disarticulating below each fertile floret. Floret callus pubescent.

Propagative structure: the seeds are caryopsis with adherent pericarp. Endosperm farinose.

Development

Sexual propagation: by seed. Spread by wind and on animals. Some seeds can be accidentally ingested and dispersed internally by grazers.

Asexual propagation: by rhizome

Growth rate: fast

Habitat characteristics

Light requirement: shade/sun

Soil requirements: : moist and sub-acid soil. It requires natural seasonal disturbances for germination.

Tolerance/sensitivity: It survives in waterlogged soils. It dominates the seasonally flooded grasslands and it is found in seasonal wetlands. It is aerosol and soil salt tolerant. It shows a certain tolerance for the burning, probably thanks to the rhizome system. Drought tolerant in semi-arid grasslands.

Phytotechnologies applications

Highland bent is a candidate for plant-assisted bioremediation of **diesel oil**, which can be degraded by a number of soil microorganisms of rhizosphere (Adam et al., 1999). The plant showed to be **heavy metals** tolerant. It can accumulate As and Zn in senescent shoots, Cu and Cd in roots (De Koe, 1993).

Experimental studies

Reference	G. Adam and H.J. Duncan, 1999. Effect of diesel fuel on growth of selected plant species. Env. Geochemistry and Health 21: 353–357
Contaminants of concern	Diesel oil, a complex mixture of hydrocarbons.
Mechanism involved in phytoremediation: Phytostabilisation/rhizodegradation/phytoaccumulation/phytodegradation/phytovolatilization/ hydraulic control/ tolerant	Rhizodegradation
Types of microorganisms associated with the plant	Not reported in the publication
Requirements for phytoremediation (specific nutrients, addition of oxygen)	Not reported in the publication
Soil characteristics	Not reported in the publication
Length of experiment	The germination rates have been measured 14 days after planting
Age of plant at 1st exposure (seed, post-germination, mature)	Seed
Initial contaminant concentration of the substrate	Plant were exposed to different concentrations of diesel oil: 0 g/Kg, 25 g/Kg, 50 g/Kg..
Post-experiment contaminant concentration of the substrate	Not reported in the publication

Phytotechnologies applications

Post-experiment plant condition	Germination rates of plants exposed to 0, 25 and 50 g/kg of diesel oil: 85%, 50%, 46% respectively. The overall heights of plants grown in diesel oil contaminated soil were stunted compared to control plants grown in uncontaminated soil. Plants grown in diesel oil contaminated soil exhibit formation of adventitious roots (root structures which arise in unusual positions) plant roots avoid diesel oil contaminated areas completely if they have uncontaminated soil to grow into. If there is no available uncontaminated soil, roots will grow through contaminated regions until they find an area of uncontaminated soil.
Contaminant storage sites in the plant and contaminant concentrations in tissues (root, shoot, leaves, no storage)	No storage

Reference	T. De Koe, 1994. Agrostis castellana and Agrostis delicatula on heavy metal and arsenic enriched sites in NE Portugal. The Science of the Total Environment 145: 103-109.
Contaminants of concern	As, Pb, Mn, Zn, Cu
Mechanism involved in phytoremediation: Phytostabilisation/rhizodegradation/phytoaccumulation/phytodegradation/phytovolatilization/ hydraulic control/ tolerant	Tolerant plant
Types of microorganisms associated with the plant	Not reported in the publication
Requirements for phytoremediation (specific nutrients, addition of oxygen)	Not reported in the publication
Soil characteristics	Not reported in the publication
Length of experiment	-
Age of plant at 1st exposure (seed, post-germination, mature)	Mature

Phytotechnologies applications

Initial contaminant concentration of the substrate	Heavy metals and As have been analysed in 15 mine soils in NE Portugal : High total concentrations of: · As (up to 17000 mg kg-1) · Pb (up to 2200 mg kg-1) · Mn (up to 1100 mg kg-1) · Zn (up to 520 mg kg-1) Cu (up to 1800 mg kg-1)
Post-experiment contaminant concentration of the substrate	Not reported in the publication
Post-experiment plant condition	Not reported in the publication
Contaminant storage sites in the plant and contaminant concentrations in tissues (root, shoot, leaves, no storage)	A. castellana accumulates As and Zn up to 1900 and 4600 mg kg−1 in senescent shoots, with Cu and Cd up to 1300 and 60 mg kg−1 in roots.