Salix caprea

INTRODUCTION

Salix caprea, is a common species of willow native to Europe and western and central Asia. It is a deciduous shrub or small tree.

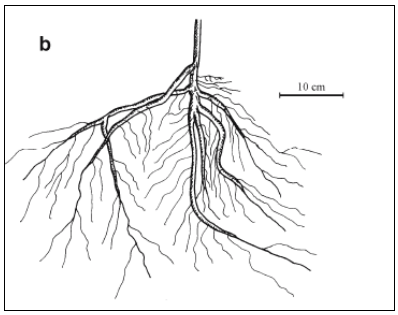
Photo: www.it.wikipedia.org, Author-willow

GENERAL INFORMATION

Scientific name: *Salix caprea*
Common name(s): Goat Willow, Pussy Willow or Great Sallow (English), Salicone (Italian)
Family: *Salicaceae*
Habitat description: humid wood, 0-1800 m;
World range: Eurasiatica;

DESCRIPTION

Height: 6-12 m
Spread:



Picture: 3-year-old S. caprea root system. From: J. Dušek et al. ,2006.

Roots habit

S. caprea creates fibrous roots with the majority of fineroots found in the upper 20–30 cm of the soil profile.

Photo © Carl Farmer

Foliage

The leaves are 3-12 cm long and from 2-8 cm wide, broader than most other willows.
Leaf arrangement: alternate
Leaf type: simple, deciduous
Leaf margin: irregularly toothed or entire
Leaf shape: oblong
Leaf color: grey with a dense covering of short hairs below
Fall color: yellow

Photo: www.commons.wikimedia.org, Author-F.Vincentz

Flower

The male and female catkins are on different plants (dioecious). Male catkins are showy. Blooms in April.

Flower color: white, silky, silvery

Fruit and seed

The fruit is a small capsule 5-10 mm long containing numerous minute seeds embedded in fine cottony hairs. The seeds are very small (about 0.2 mm) with the fine hairs aiding dispersal; they require bare soil to germinate.

Photo: www.therampantgardener.co.uk

Trunk/bark/branches

Yellowish-brown stems, pubescent, older bark is dark brown

OCCURRENCE

Salix caprea occurs both in wet environments, such as riverbanks and lake shores, and in drier sites, wherever bare soil becomes available due to ground disturbance.

CULTURE, USE AND MANAGEMENT

The tree is not considered a good source of timber as its wood is both brittle and known to crackle violently if burned.

Both tannin and salicin can be extracted from Goat Willow bark.

As with the closely related *Salix discolor* (American Pussy Willow), it is also often grown for cut.

Unlike almost all other willows, pure specimens of *Salix caprea* do not take root readily from cuttings; if a willow resembling the species does root easily, it is probably a hybrid with another species of willow.

A small number of cultivars have been selected for garden use.

There are two varieties:

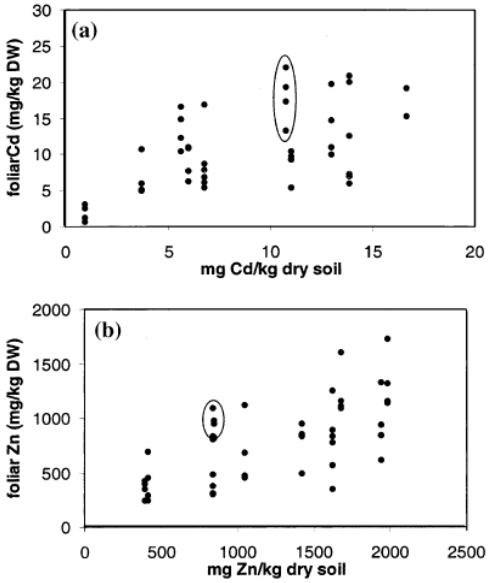
- *Salix caprea* var. *caprea*. Lowland regions throughout the range. Leaves thinly hairy above, densely hairy below, 5-12 cm long; stipules persistent until autumn.
- *Salix caprea* var. *sphacelata* (Sm.) Wahlenb. (syn. *S. caprea* var. *coaetanea* Hartm.; *S. coaetanea* (Hartm.) Floderus). High altitudes in the mountains of central and northern Europe (Alps, Carpathians, Scotland, Scandinavia). Leaves densely silky-hairy on both sides, 3-7 cm long; stipules early deciduous.

Hybrids with several other willow species are common, notably with *Salix cinerea* (*S.* × *reichardtii*), *Salix aurita* (*S.* × *multinervis*), *Salix viminalis* (*S.* × *smithiana*), and *Salix purpurea* (*S.* × *sordida*). Populations of *Salix caprea* often show hybrid introgression.

USE IN PHYTOREMEDIATION

----------Experiment 1----------

Contaminants of concern	Zn, Cd
Plant species	*Salix caprea*
Interaction of plant and contaminants: Tolerant plant (enhancement of microbial community) / phytoremediation	Significant relation was found between soil total Zn or Cd and foliar Zn or Cd; it makes willows useful bioindicators.
Mechanism involved: Phytostabilisation/rhizodegradation/phytoaccumulation/phytodegradation/phytovolatilization/ evapotraspiration	Phytoaccumulation
Types of microorganisms associated with the plant	Not reported in the publication
Laboratory/field experiment	Field experiment
Initial contaminant concentration	Soil Cd concentration: 5.7 mg/kg DW Soil Zn concentration: 1989 mg/Kg DW
Length of Experiment	4 years (to determine temporal variability of the foliar concentrations, samples were taken yearly during 4 years)
Post-experiment contaminant content	The folowing grafic (from the reported publication) shows the foliar Cd (a) and Zn (b) concentrations expressed on a dry weight base relative to soil concentrations for willows clones *(S.Alba, S.Cinerea, S.viminalis* and *S.caprea*) on 12 dredged sediment landfills. The graphic has been extrapolated from the reported publication.



Post-experiment plant condition

Not reported in the publication

Soil characteristics

Polluted dredged sediment landfills characterised by high clay and organic matter content.

The table below (from the reported publication) shows soil properties of the landfills where volunteer willow vegetation was established

	S. caprea
Clay (%)	32
Silt (%)	64
Sand (%)	4
P (g/kg DM)	2.4
S (g/kg DM)	2.5
N (g/kg DM)	3.3
$CaCO_3$ (%)	2.3
OC (%)	6.0
pH-H_2O	6.9
pH-$CaCl_2$	6.9
EC (μS/cm)	1500

Age of plant at 1st exposure
(seed, post-germination, mature)

Not reported in the publication.

Requirements for phytoremediation
(specific nutrients, addition of oxygen)

Not reported in the publication

Contaminant storage sites in the plant
(root, shoot, leaves, no storage)

Not reported in the publication

Reference	B. Vandecasteelea, B. De Vosa, F. M.G. Tack, 2002. Cadmium and Zinc uptake by volunteer willow species and elder rooting in polluted dredged sediment disposal sites . The Science of the Total Environment 299; 191–205

----------Experiment 2----------

Contaminants of concern	Zn, As, Cd, Pb
Plant species	*S. caprea*
Interaction of plant and contaminants: Tolerant plant (enhancement of microbial community) / phytoremediation	Phytoremediation
Mechanism involved in phytoremediation: Phytostabilisation/rhizodegradation/phytoaccumulation/phytodegradation/phytovolatilization/ evapotraspiration	Phytoaccumulation
Types of microorganisms associated with the plant	Not reported in the publication.
Laboratory/field experiment	Laboratory experiment (pots placed outdoors).
Initial contaminant concentration	The soil contained 28 mg/kg As, 5.46 mg/kg Cd, 956 mg/kg Pb, and 279 mg/kg Zn.
Length of Experiment	Two year
Post-experiment contaminant content	Comparing among the fast growing trees investigated in the same study, willows accumulated usually more Cd and Zn than poplars. On the other hand, poplar trees took up more Pb compared to willows. The following table (from the reported publication) shows the average content of elements in aboveground biomass (mg/kg, n = 10) of plants investigated in the same study.

Species	As	Zn	Cd	Pb
	x	*x*	*x*	*x*
A. halleri	6.07[a]	2746[a]	82.3[a]	21.9[a]
T. caerulescens	5.30[a]	1500[b]	271[b]	57.6[b]
S. smithiana	1.25[b]	432[c]	23.6[c]	6.84[a]
S. dasyclados	0.964[b]	591[c]	41.1[ac]	10.9[a]
S. caprea	1.08[b]	475[c]	32.8[ac]	8.14[a]
P. trichocarpa	0.825[b]	337[c]	20.4[c]	17.3[a]
P. nigra	0.918[b]	344[c]	17.3[c]	16.7[a]

Trees compensated lower metal content in shoots with higher biomass production compared to hyperaccumulators (A. helleri and T. caerulescens),

Post-experiment plant condition

All the plant species tested in the experiment were grown on medium contaminated soil showing no visible symptoms of toxicity.

Soil characteristics

Anthropic contaminated Cambisol from the Pribram area (Central Bohemia, Czech Republic)

Age of plant at 1st exposure
(seed, post-germination, mature)

Not reported in the publication.

Requirements for phytoremediation
(specific nutrients, addition of oxygen)

The plants were fertilized with 0.5 g N, 0.16 g P, and 0.4 g K added in five kilograms of dry homogenized topsoil applied to each pot. In addition, plants were once or twice fertilized during the vegetative period with a complex of macro- and micronutrients.

Contaminant storage sites in the plant
(root, shoot, leaves, no storage)

Not reported in the publication

Reference

Z. Fischerova, P. Tlustos, J. Szakova, K. Sichorova, 2006. A comparison of phytoremediation capability of selected plant species for given trace elements Env. Poll. 144; 93-100.