

Arctic Willow

Salix arctica ssp. *crassijulis*:

Cold Resistant Willow of the Tundra

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EXECUTIVE SUMMARY

Salix arctica Pall ssp. *crassijulis*, the Arctic Willow, is a low growing shrub that has potential use as a new floricultural crop. *Salix arctica* ssp. *crassijulis* is truly a one of a kind species of plant that can tolerate extreme weathers and soil conditions and its hardiness is nothing of the ordinary for it has adapted to one of the harshest climates in the world, the frozen tundra. Its shallow roots allow it to withstand these conditions and the warmth within the miniscule roots are held proportionally allow it to easily hold the heated resources. The subspecies can be found across the northern tiers of the planet and can be grown in the climates of nearly any greenhouse if the conditions are met and even in some states such as Minnesota if proper care is kept. Since this willow has short, creeping or horizontal growth it would be a perfect trailing foliage crop for hanging baskets, containers, or in hardscapes on ledges. The white flowers in the spring are attractive and the seeds, at dispersal, form soft white, inflorescences with ornamental value. There are no boundaries to this plant and could very soon be creeping into your yard and the market soon as the properties that make the plant what it is will be discovered by the average grower and plant breeder. Perhaps one boundary to this plant is too much heat so growers in the south must be cautious growing the crop due to its ability to stand cold temperatures but never has had a chance to go through generations in the warm climate areas. The Arctic Willow could replace many cold hardy plants that exist the gardens around you everywhere you look and soon you might see the tiny little catkins poking out of the ground and will bring joy to your life; there are no limitations with this plant that will stop the average grower from growing it in their gardens for it is a perennial and will overwinter so it will be there for many years to come. The Arctic Willow is soon to hit the markets and every major flower shop near you, but will you be the first one in your neighborhood to behold the power the plant holds?

I. INTRODUCTION

A. Study Species.

The species in question is *Salix arctica* Pall ssp. *crassijulis* otherwise known as the Arctic Willow, is one of three recognized subspecies of *Salix arctica* (ssp. *arctica*, ssp. *torulosa*), but is not synonymous with other similar looking *Salix* genera such as *S. polar* and *S. phlebophylla*.

Salix arctica Pall. ssp. *crassijulis* (Trautv) is a low growing shrub that is similar to other subspecies *arctica* where it is sturdier than the latter. The main differences are that when the plant is young the branches and leaves appear to be have more pubescent qualities, and the leaves have longer petioles styles. The catkins are also larger with this subspecies.

B. Taxonomic Classification and Geographic Distribution in the Wild.

Salix arctica Pall ssp. *crassijulis* belongs to the Plantae Kingdom and to the Tracheobionta (vascular plants) subkingdom. This plant lies in the Salicaceae or the willow family. It is comprised of three genera, *Populus*, *Chosenia*, and the genus this plant belongs to is *Salix*, which are known to be the willows. The plant species, *Salix arctica*, is also known as the Arctic Willow and falls under the in the subspecies category of *crassijulis*.

The geographic distribution of *Salix arctica* is circumpolar, meaning that it is situated around the poles (North Pole) (Figure 1). It can be found in the northern reaches of the rest of the North American tundra, or a treeless plain, such as in Alaska, Northern Greenland, all the way to far reaches of the arctic circle. The subspecies and the plant in focus, *Salix arctica* Pall ssp. *crassijulis*, can be found in the western coast of the United States including Washington and Oregon (Northwestern US) and the southeastern coast of Alaska along the Aleutian Islands (Trautvetter). It was found to be associated with nitrogen-rich *Alnus* thickets in south-east Alaska (Aiken, et al). It is also widely distributed in Canada throughout most of the territories as well. It also ranges outside of North America, where it can reside in the eastern edges of Russia. *Salix arctica* prefers to grow close to open bodies of water near the coast. Other places you can find this is species are bogs or salt flats composed of course sandy soil in a climate that is consistent with dry air (low relative humidity) and a cold temperature (-70F → 20F).



Figure 1. Distribution Map of Salix Arctica in North America (Flora of North America) .

The short growing plant is abundant in the wild, but due to its habitat, is quite susceptible to issues because it has a short root depth leading to damage to those roots. Due to its location in the tundra and the low primary nutrient abundances in these soils (NPK), it is hard for it to take up the necessary nutrients it needs to survive due to the low chemical fertility soil because there are low primary nutrient abundances such as nitrogen, phosphorus, and potassium (Blue Planet).. *Salix arctica* is a perennial dicot, possessing a growth habit of what would be considered a low growing shrub (USDA). Its leaves are shiny, round/oval, dark green on the bottom and light green on top and have silky pubescent hairs that cover the leaves. Because it is a dioecious plant, the catkins on the plants appear to have different colors, the male being yellow and female being red (good distinguisher). The plant blooms in the spring and the flowers consist of unisexual non-petaled panicle-like spikes. It is a tremendously slow growing long-lived plant. It appears that neither *Salix arctica* Pall. nor its subspecies *crassijulis* is known to be invasive in its North American range. However, further research needs to be done to conclude whether it is invasive, or whether it will become invasive.

II. CROP SPECIES

A. History and Potential Uses.

The Arctic Willow has been used throughout history in many different ways by different creatures. Animals of the tundra, feed on several parts of the plant such as the twigs, bark, and buds. *Gynaephora groenlandica* (Arctic Woolly Bear Moth) is a species of moth that chooses this plant as its primary source of nutrition (Kukul, et al). Humans have tended to take a liking to the Arctic Willow. More specifically the indigenous tribes of Alaska, the Inuit and Gwich'in, have used it for generations. These tribes use this plant as a source of fuel for their oil lamps, a food source, and several medicinal purposes from anywhere to help stop bleeding (used on cuts and wounds) to aiding ingestion and diarrhea (Aiken, et al).

Salix arctica and its subspecies *crassijulis* can be propagated vegetatively or by seed. It is best to take softwood tip cuttings in late spring to early summer just prior to the end of dormancy by the buds. (Washington). Vegetative propagation is most successful method of propagation. Although it is possible, but inconvenient to grow from seed, but they tend to have low germination rates and it takes about a year to grow (Washington).

Salix arctica has many subspecies and varieties including, *crassijulis*. The plant has a lack of studies towards it and therefore there is not a lot of information on it, which translates into an inability to recognize its marketability for widescale production. The seeds are available to purchase but it is very difficult to do so, even online. Currently there does not appear to be any cultivars on the market, and they are being sold by large companies. Perhaps a small-scale greenhouse/nursery may have seeds available.

III. PRODUCTION INFORMATION

A. Anticipated Cultural Requirements.

Salix arctica spp. *crassijulis* can be placed in the market as a perennial low growing shrub. The plant can be noticed by its light to dark green ovular leaves that have long fuzzy silvery hairs with small petioles that extend from the base (Trees Planet). The size itself is only a few inches tall and doesn't spread much further than its height. Its most distinguishable feature is the catkin that extends from the middle of the plant and can be often white or pink in color. Due to the

plants form and habit, it would best as a perennial bedding crop because of its low growth and ability to spread and create a compact colony. Its traits fit best in a garden bed particularly in a colder environment that would complement the surrounding crops that could overwinter and provide a low protection of the environment. The crop can be grown either as a flower crop or for aesthetic purposes but also can be used as a food source for animals if you choose to do so because it a valuable source of nutrition for animals that live in its native habitat, but it is not usually used for food for humans, but the outer bark of young shoots of the can be eaten for Vitamin C (Bhaddok).

Looking at the region in which these plants are native (Northern North America, Northern Asia) the plant can be expected to grow in colder regions. One way of expressing a value to the plants ability to thrive and survive in a location is to assign a zone using the USDA Plant Hardiness Zone Map. Considering the native geographical region that plant can range from Zone 1A (-60°F → -55°F) to Zone 3A (-40°F → -35°F), meaning these are the minimum temperatures that these plants can withhold before plant death occurs. This plant would be well suited for the upper midwestern region of the United States including the northern reaches of Alaska Montana, North Dakota, Wisconsin, and Minnesota. Another way of expressing a value to the ability of plant to withstand temperatures and climate is the American Horticulture Plant Heat-Zone Map where it measures the average number of days per year above 86°F and assigns a zone based on the number of days. Based on the habitat range of the crop, Arctic Willow would be able to fall in ranges of Zone 1-3, comprising of less than 14 days above 86°F. Based on this data, this plant is not usually subject to many days of heat and by growing the crop in an area with more heat days than what it is used to could cause irreversible damage to the plant from the heat.

The Arctic Willow relishes in open areas near water on calcareous silty clay or coarse sandy soil (Flora). Competitions between neighboring plants in lower energy systems for light and water have been noted (Noemie). The plant has adapted to cold dry climates in its native region so higher temperature requirements are not needed; the main issue would be if it were too cold or too hot in the growing environment which could cause plant death. It would grow best in a course sandy soil throughout the production phases. If the height of the plant becomes too tall for the garden, a plant growth regulator can be applied to help maintain the height. Once the seedlings have been grown it would be best to transplant them into the garden so the roots have room to grow or they can be put in bulb pan pots due to its wider diameter than height. Fungicide applications may not be necessary unless there are instances of such disease in the environment, but a rust fungus called *Melampsora* has been noted to be found on the Arctic Willow; applications may be at the grower's discretion (Blanchette).

B. Market Niche.

The target sales date for this crop would best fit in the spring time when the flowers bloom; the plant doesn't have much aesthetic until the catkin is developed. This plant is a perennial and can resist harsh conditions so the plant could be programmed to be forced year-round. One limitation would be the horizontal growth of the individual plants and the collective outgrowth of all the plants in the plot designated for them in the garden. Another limitation would be temperature, especially if the temperature is too high the plant may not be used to extreme temperatures which could cause improper plant growth. This plant can compete with other low growing/dwarf shrubs in the gardens such as junipers like *Juniperus horizontalis*, or possibly even a few varieties of Hydrangeas.

The Arctic Willow is the perfect shrub to complement your garden to add a little flare and varieties to your creation! Its ability to withstand extreme cold temperatures and its extreme salt tolerance is a perfect combination for the dream plant of the Midwest, we all know about the salty roads. Its beautiful pink/red/yellow catkins are sure to catch yours and your neighbors' eyes. What more is there to ask for in a plant? You can expect this new subspecies to hit the market in just a couple years when full testing has been completed; as of right now little is known for the best requirements for the crop but will be found soon. Soon, the Arctic Willow can be yours!

C. Product Informational Guide

GrowerFacts

Salix arctica ssp. *crassijulis*

Cold tolerant plant of the tundra

General Information

Exposure	Bloom Season	Height	Spread	Spacing
Full Sun	Spring	2-5"	<10'	6-12"

Germination

Seed Form	Recommended Plug Size	Seeds/Cell	Plug Crop Weeks	Days to Germinate	Initial Media pH/EC	Cover Seed
PRM, PPM	288	1	10	7-21	3-12	Light

Plug Production

Moisture	moist to wet
Temperature	Cold hardy; frost tolerant; dont exceed 86 degrees Fahrenheit; usually -70 to 20 degrees Fahrenheit in wild
Light	prefers full light (6 hours per day)
Fertilizer	n/a
PGR	n/a

Where Grown: greenhouse/field

Growing on to Finish

Growing on Temperature	Target Media pH/EC	Fertilizer	Day/length
-70 -20 degrees Fahrenheit	highly acidic alkaline	n/a	6+ Hours

Crop Scheduling

Container Size	Plugs/Pot	Crop Time	Season
Cell Pack	288	4-6 weeks	spring
Cell Pack	306	5-7 weeks	spring

Common Problems
possibly invasive to other areas; short roots

Other:

can be propagated through cuttings and grown through the cuttings rather through seed.

use of greenhouses and high tunnels are efficient for proper growth under the conditions listed in this FIG

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