

***Lupinus arcticus* S. Wats.**
Arctic lupine

Family: Fabaceae



Figure 66. Documented range of *Lupinus arcticus* in northern British Columbia.



Figure 67. Growth habit of *Lupinus arcticus* under cultivation.

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(continued)**

Arctic lupine

Background Information

Lupinus arcticus is found north to Alaska, the Yukon and Northwest Territories, and south to northern Oregon and southeastern Alberta. It is reported to be very common throughout British Columbia, except it is absent from the Queen Charlotte Islands (Taylor 1974, Douglas et al. 1999a). Two subspecies are recognized: *L.a. ssp. subalpinus* (Piper & B.L. Robins.) Dunn is characterized by more cauline (stem) leaves and is more abundant south of 55°N. *L.a. ssp. arcticus* has mostly basal leaves and is the common form north of 55°N (Douglas et al. 1999a). We did not distinguish the two subspecies in our collections, and noticed many intermediate forms; our seed production plots include both forms and their intermediates.

Growth Form: Branched woody stem base; palmate compound leaves originate at the base of the plant in the north subspecies, but along the stem in the southern subspecies; 6–10 pointed to rounded leaflets; bluish elongated cluster of pea-like flowers; mature plant size to 60 cm tall (MacKinnon et al. 1992, Douglas et al. 1999a). Forms nitrogen-fixing symbiotic root nodules with *Rhizobium* bacteria.

Site Preferences: Found in early successional ecosystems, in moist to mesic open clearings, slash-burned clearcuts formerly occupied by *Picea engelmannii* and *Pinus contorta* var. *latifolia*, gravel bars, meadows, roadsides, open forests, and some dry slopes (Quinton 1984, Klinka et al. 1989, MacKinnon et al. 1992, Douglas et al. 1999a). Widely distributed in the ESSF but restricted to drier sites in the wetter sub-zones; found only in the moist subzone in the SBS on modal sites; found on impoverished sites in the BWBS (SNR >C, SMR 3-5); on poor dry sites in SBPSmc and on poor to rich sites in the SBPS (SMR 2-4). Reported to be shade intolerant and to increase in abundance in pioneer and young seral stages (Beaudry et al. 1999). We have observed very high abundance (ca. 5-15% cover) in an SBSmc clearcut two or three years after logging; it almost completely disappeared the following year. Similarly, Hendrickson and Burgess (1989) reported 21,600 *Lupinus arcticus* stems per ha with a biomass of 159 kg/ha on a lodgepole pine site logged four years earlier.

Seed Information

Seed Size: Length: 3.65 mm (3.25 - 4.09 mm)
Width : 2.65 mm (2.19 - 3.06 mm)

Seeds per gram: 108 (range: 98 - 121)

Volume to Weight Conversion: 709.0 g/L at 97.2% purity

Germination Capacity: At 30°/20° C untreated: 40.1%
(23% -60%)
stratified: 46%
scarified/stratified: 95.2%
At 25°/15° C untreated: 72.7%
(70 -75%)
stratified: 44.3%

The seed from pods harvested while still green had 13% lower germination than seed from fully ripened pods (Burton and Burton 2001b).

Germination Speed: To first germination: 6.5 days
To 50% potential: 14.2 days

Seed Longevity: Seeds stored in our warehouse for one year, under cool dry conditions, had higher germination rates in the second year after harvest. There are reports that *Lupinus arcticus* seeds may retain their viability for hundreds or even thousand of years (Porsild et al. 1967).



Figure 68. Seeds of *Lupinus arcticus*. Rule divisions are 1.0 mm.

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(continued)**

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Considerations for Growing

Techniques for Seed Production

Seed treatment: High germination may be attained with a combined pre-germination treatment of stratification and scarification. Emery (1964) suggests that fresh seeds of perennial lupines do not require pretreatment but stored seeds require hot water or acid scarification. Under laboratory conditions, scarifying seeds increases and hastens germination at both 30°/20° C and 25°/15° C.

Soil considerations: *Lupinus arcticus* can grow in loam, sandy loam or gravelly soil. Untreated seeds germinate best in cooler soils.

Stand establishment: Site should be free of all weeds, especially rhizomatous grasses and other persistent species because there are currently no selective herbicides that can be used once plants are growing.

Row spacing: Unknown; suggest 75 to 120 cm under dryland conditions, 30 to 90 cm with good irrigation.

Seeding density: Unknown at present; suggest 60-100 PLS seeds per linear metre (Smith and Smith 2000).

Seeding depth: 1 cm (Pahl and Smreciu 1999).

Stand maintenance: Regularly cultivate rows and spot spray with herbicide to keep plot weed free; annual fertilization with low N formulations may extend the life of the plot. Stands may be relatively short lived (3 to 5 years), especially if subject to competition from grasses or annuals.

Lupinus arcticus is a host for a *Macrosiphum alibifrons* (lupine aphid; Cohen 1986), but its effects on seed yield appear to be negligible.

Harvesting and Seed Processing

Dates of selective harvesting in the Bulkley Valley of northwestern B.C. range from July 10th to August 26th. Timing of harvest is important as pods dehisce very easily when ripe.

Hand clipping: Use sharp hand clippers. Hold the seed heads over bins placed alongside the plants being clipped or place a bag over the seed heads before clipping to minimize seed loss. Do not allow seeds to become over-ripe or pods will dehisce before harvest and you will lose many seeds. Plastic between rows is recommended so dehisced seeds can be salvaged. It has been our experience that as soon as some of the pods (typically the top ones) on the seed stalk have turned dark (black or brown), one can safely clip the entire the stalk and allow the remaining seeds to ripen in the pod while curing in the sun.

Vacuum: Not recommended.

Seed stripper: In our experience these seeds easily dehisce when ripe, so use of a seed stripper is not recommended. However, Young and Young (1990) suggest that *Lupinus* sp. can be harvested with a seed stripper.

Combine/thresher settings: Run at 1241 rpm with 4 mm gap. Remove seed shaken loose after each batch before rethreshing more uncleaned seed; any remaining cleaned seeds will crack otherwise. After threshing is completed, remove any intact pods from the thresher and run through once more to remove any remaining seed.

Seed cleaning: Put through fanning mill with the following configurations: prescreen 4.9 mm round; top screen 4.8 mm round, bottom screen 1.2 mm square. If pods and trash are still abundant, put through a second time with a just 4 mm square top screen (or hand screen), then through a vacuum separator with speed set high and suction set to low to remove dust and <5% of seeds.

