The Arctic Iris (*Iris setosa* subsp. *arctica*): From Alaska to Your Backyard

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EXECUTIVE SUMMARY

The species under investigation in this study is *Iris setosa* subsp. *arcica*, a native of the Aleutian Islands of Alaska. This perennial, winter hardy crop grows similarly to most Iris species. It produces large linear green leaves with lavender-blue falls and standards. It is typically propagated by division of rhizomes making it an easy crop to propagate and establish within any landscape. This paper will focus on breaking down the species taxonomic classifications for further understanding of its characteristics. It will also address its geographic distribution and climate conditions in the wild, historical relevance and how those relate to its potential uses, its anticipated cultural requirements such as its life cycle, plant characteristics, potential environmental production conditions, winter hardiness, and heat and drought tolerance. Its potential within the market will be looked at through target sales dates, potential competitors, and any limitations it possesses. Lastly, a product information guide will be discussed to better understand how this crop can be grown for commercial use by consumers in their landscape and for commercial production within a greenhouse setting.
INTRODUCTION

Study Species
The species under investigation in this study is *Iris setosa* L. subsp. *arctica*, also known as the Arctic Iris. This report will provide information pertaining to the species taxonomy, geographical distribution, history, potential uses within the market, marketing strategies, cultural requirements for commercial production, and a production information guide for domestication of the wild species.

Taxonomic Classification

**FAMILY: IRIDACEAE**

*Iris setosa* subsp. *arctica* is in the Iridaceae, which contains over 65 genera and 2050 species (USDA, NRCS. 2019). It gets its name from the irises but also includes other well-known cultivated plants, like freesias, gladioli, and crocus (Hampton, 2011). Common characteristics in this family include (Hampton, 2011; USDA, NRCS. 2019):

1. Basal grass like leaves in an erect fashion with small moldings down the center vein
2. Solitary flower per petiole
3. Three sepals, petals, and stamens
4. One style, that is often branching
5. Inferior ovary, below attachment point of the sepals and petals
6. Rhizome or corm, as an underground storage organ

The above ground parts are deciduous in tropical regions, while others are evergreen throughout the winter. During the cold periods, bulbs, corms, or rhizomes will enter into dormancy once the above ground parts die down (Hampton, 2011; Holloway, 1987). Dormancy is broken upon the arrival of the first rainfall the following year (Hampton, 2011; Holloway, 1987).

**GENUS: IRIS**

The genus *Iris* has a variety of species with showy flowering parts and currently contains more than 150 species grown in northern climates (USDA, NRCS. 2019). Common characteristics of species within this genus include (Hunt and Wright, 2007):

1. Bisexual flowers
2. Three sepals, true petals, and stamens
3. Each plant produces multiple flowers, but only one per stalk

Seeds are produced within the ovary of these species, many of which are known to be poisonous. However, most species are propagated by division of rhizomes (Hunt and Wright, 2007). However, it is suggested by the USDA to propagate wild Iris sexually, by collecting their seeds so that the ground is not disturbed (USDA, NRCS. 2019). Iris species have become a popular garden ornamental due to their feasibility to propagate and grow.

**SPECIES: SETOSA**

This species is known primarily for its vigour and purple-blue flowers that bloom between May and June (USDA, NRCS. 2019; Gewaschsk, 1820). It is a perennial plant with leaves up to 30.5 cm high, however there are some dwarf cultivars (USDA, NRCS. 2019; Gewaschsk, 1820). The leaves originate from shallow, large, branched rhizomes and appear stiff, narrow, and green with a somewhat purple base (Gewaschsk, 1820; USDA, NRCS. 2019; Wilson, 2019). The petals do not exceed the base of the sepals and are typically reduced in their size (USDA, NRCS. 2019).

**SUBSPECIES: ARCTICA**

This particular crop is very unique as it is a subspecies of *Iris setosa*. This taxonomic category ranks below a species and typically refers to a population within a specific geographical region. The subspecies is genetically distinguishable from others within its species. This species is native in the Aleutian Islands of Alaska, where it experiences cold and warm seasons with varying day lengths.

According to the USDA, many iris species are rare or becoming rare due to continued loss of habitat due to climate change (USDA, NRCS. 2019). This may explain why the subspecies under investigation has little to no pertinent research surrounding it. However, there may be an increase in visibility of this species due to expansion of the subarctic flora to the Aleutian Islands, and the other surrounding islands of Alaska (Carlson et al., 2018).

**Geographic Distribution and Climate Conditions in the Wild**

The specific subspecies under investigation (*Iris setosa* subsp. *arctica*) was found and collected on the Aleutian Islands in Alaska during the summer of 2018. *Iris setosa* is commonly found throughout parts of Alaska and Canada (Yukon and British Columbia. (Figure 1) (Hampton, 2011). Growing either alone or in dense strands in moist ground of bogs, meadows, beachheads, headlands and on lakeshores, *Iris setosa* subsp. *arctica* has also been observed in drier areas.
According to the USDA Plant Hardiness Zone Map, those islands range from USDA Zones 6-7 (Figure 2) (USDA, NRCS. 2019). However, the review of the literature has found that species *Iris setosa*, is hardy to USDA Zone 2, making its subspecies unique (Bron & Sons Nursery Co., 2019; Hunt and Wright, 2007). Other species and subspecies of *Iris* have been distributed west to coastal, eastern Asia and as far south as Japan (Carlson et al., 2018; Hampton, 2011). Other growing conditions include full sun exposure and wet to mesic soils (Hampton, 2011). Blooms of this species occur one month after snowmelt (Hampton, 2011). The growing and flowering conditions of this crop could be manipulated in a greenhouse setting for cut flower production.

Based upon the little amount of literature found on the subspecies *arctica*, the assumption can be made that this subspecies is native to Alaska and Canada and developed in these regions during the Ice Age (Carlson et al., 2018). With this in mind, this could potentially be a good crop to produce in northern states of the United States, like Minnesota, due to similar day lengths during the flowering season (May to June) (Alaska Daylight, 2019). There is no evidence to suggest that this species would be an invasive ornamental crop, that any parts are edible, or used for medicinal purposes. However, it has been noted in the literature and by the USDA that the seeds of some species of Iris are poisonous.

**CROP SPECIES**

**Historical and Potential Uses**

*HISTORICAL ANALYSIS OF DOMESTICATION AND CURRENT CULTIVARS ON THE MARKET*

There is no evidence in the literature of this subspecies (*Iris setosa* subsp. *arctica*) ever being domesticated through a breeding program. However, there are two nurseries that have sold these seeds and currently provide information about this subspecies: Little Valley Wholesale Nursery in Brighton, CO (https://www.lvwn.com/) and Born & Sons Nursery Co. in Grand Forks, Canada (https://www.bronandsons.com/).

Little Valley Wholesale Nursery currently sells *Iris setosa* subsp. *arctica* (Dwarf Blue Flag). This plant matures to a height of 20 cm and displays purplish-blue flowers. The flowering season is similar to that of the species under investigation: spring. Along with the description of the plant on their website; “Purplish-blue flowers blotched with white at the base on its rounded petals. Rich bluish-green, slender sword-like leaves create a compact clump.” (Figure 3). (Little Valley Wholesale Nursery, 2019).
Born & Sons Nursery Co. also currently sells *Iris setosa* (Arctic Iris). This variety matures to a height of 20-30 cm and is described by them as a native to Alaska with variable dark-veined blue standards and bloom in June. It grows best in moist soils, is extremely hardy, and can develop drought tolerance during the summer after flowers have come and gone (Bron & Sons Nursery Co., 2019)

Domestication of this subspecies could have been through seed collection, which is recommended by the USDA for Iris species, or by division of the rhizomes (USDA, NRCS. 2019). However, for most iris species, sexual propagation through seed is not recommended, as the seeds can be poisonous. Asexual propagation through rhizome division is the next best option. When dividing the rhizome it is best to do it during the spring and to make sure there is at least one strong bud on the source/stock plant (Hampton, 2011).

**POTENTIAL HORTICULTURAL DISTRIBUTION CHAIN**

Below is a potential distribution chain for the domestication and production of *Iris setosa* subsp. *arctica*. Only sections that maybe involved in the initial distribution of the potential new crop are shown, along with potential firms that could handle it.
Plant Explorer
Dr. Neil Anderson
University of Minnesota

Product Development

Public Private Sector
Breeding Programs
Ex. University of Minnesota

Seed Products

Vegetative
Products

Producer Companies
Propagators
Ex. Ball Seed Company

Distributors
Ex. Malmborg’s or Wagners
Greenhouse

Commercial Growers
Ex. Malmborg’s or Wagners
Greenhouse or Bachman’s

Retailers
Ex. Bachman’s or Cal’s Market

Consumer

Packet Seed
Companies
Johnny’s
Select Seeds

Seeds
PRODUCT INFORMATION

Anticipated Cultural Requirements

LIFE CYCLE AND PLANT CHARACTERISTICS

Irises have evolved to adapt to a wide range of cultural conditions, which have in turn developed a variety of species that are adapted to many environments. They are one of the easiest species to identify based upon its long slender leaves and elegant flowers (Canadian Iris Society, 2014). Species within the genus Iris can be found growing in the wild on almost every continent making them extremely adaptable and pleasing to the landscaper, home gardener, or horticulturalist.

Irises are typically sold as perennial plants, returning year after year, and as cut flowers (Canadian Iris Society, 2014; National Gardening Association, 2019). The development of a rhizome, or underground stem that produces adventitious roots, allows for these plants to go dormant over the winter (Canadian Iris Society, 2014). Over this period, the rhizome will form new growth buds where next year’s leaves and flowers will originate (Canadian Iris Society, 2014). This form of storage organ allows for easy propagation of this crop through division, making it once again a popular and easy crop for many home gardeners. Its bright and beautiful flowers also add to its value in the floriculture industry.

WINTER HARDINESS AND HEAT OR DROUGHT TOLERANCE

The Arctic Iris is native to Alaska, US, and Siberia, Russia where temperatures change throughout the year and growing seasons tend to be shorter. These regions cover a wide range of hardiness zone based upon the USDA Hardiness Zones. However, this particular species was collected on the Aleutian Islands in Alaska, which is in zones 7 to 8 (USDA Plant Hardiness Zone Map, 2012). According to Longfield Gardens, most Iris species can survive in zones 3 to 9, making them once again a very adaptable group of plants (Longfield Garden, 2019).

The Plant Hardiness map is a great tool to use to determine which plants will winter over in the landscape (American Horticultural Society, 2019). However, cold is not the only component in concluding if plants will survive and grow for many years. Heat has a large impact on our plants, specifically during drought seasons (American Horticultural Society, 2019). Damage from heat can kill the plant instantly and be just as traumatic as damage from the cold (American Horticultural Society, 2019; Longfield Garden, 2019). According to the USDA Heat Zone Map, this species was collected in the Northern Temperate Zone, between the Arctic Circle and the
Tropic of Cancer (American Horticultural Society, 2019; USDA Plant Hardiness Zone Map, 2012). This zone experiences moderate temperatures due to the slanted rays from the sun that decrease towards the Poles (USDA Plant Hardiness Zone Map, 2012). If grown in the Torrid Zone or tropical zone, between the Tropic of Cancer and the Tropic of Capricorn, heat damage may occur in different parts of the plant (American Horticultural Society, 2019; USDA Plant Hardiness Zone Map, 2012). For example leaves may drop and lose chlorophyll, making them more attractive to insects and flower buds may wither with extreme heat conditions (American Horticultural Society, 2019).

Based upon these two components positioning of *Iris setosa* subsp. *arctica* for commercial production outside would be in areas located within hardiness zones 3 to 9 and heat zones within the Northern Temperate zone (potentially in the Southern Temperate Zone). Combining these two factors would result in regions in Canada and the upper northern areas of the United States.

**POTENTIAL ENVIRONMENTAL PRODUCTION CONDITIONS**

The life cycle of most Irises (perennial) and habitat regions discussed above, allow us to draw conclusions based upon the potential environmental growth factors needed for each stage of production. Table 1 indicates important growth factors to consider during each stage when growing *Iris setosa* subsp. *arctica*. However, further research will need to be conducted to get more accurate information and uncover any unique characteristics this subspecies contains.

<table>
<thead>
<tr>
<th><strong>Table 1. Growth factors for each stage of growth for potential production of <em>Iris setosa</em> subsp. <em>arctica</em> (Canadian Iris Society, 2014; National Gardening Association, 2019; Valleybrook Gardens, 2001).</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Season</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Light (Quality, Quantity, Duration)</strong></td>
</tr>
<tr>
<td><strong>Day Temperatures</strong></td>
</tr>
<tr>
<td><strong>Night Temperatures</strong></td>
</tr>
</tbody>
</table>

produce new shoots the following year (~4.5 °C) below 10 °C

Nutrition or Fertilization
None required 6 to 8 weeks before blooming (10-10-10 or 6-10-10 fertilizer)
None required

Media Type
Light sandy and medium loamy soils; prefers moist or wet soil
Light sandy and medium loamy soils; prefers moist or wet soil
Light sandy and medium loamy soils; can tolerate dry soil at this phase

If sold commercially to consumers Iris’s typically come in 10.6 - 12.7 cm (4 to 5 in) pots, from here they can be transplanted into gardens or incorporated in landscapes (Longfield Garden, 2019). A few producers may sell them to you with a well-established rhizomes with roots and leaves cut back (Figure 5) (Longfield Garden, 2019). From this form, new bloom stalks will emerge and eventually produce flowers.

In the floriculture industry, cut flower Irises are typically sold by the stem, most of the time before the flower has opened. Production of this crop for this industry may be possible with further research around the crops life cycle and forcing techniques around flower and vegetative growth. It could also be grown as a flowering potted plant for spring sales or as a dwarf herbaceous perennial.

Market Niche

TARGET SALE SEASON & PROGRAMMABILITY
The primary target sales date suggested for this perennial crop would be during the late summer to early fall (August is the usual month for division and sale of rhizomes). This is the best time for the crop to be planted into the ground. It tends to adapt better when transplanting at this time of year because flower blooms have already occurred and the plant is in a state to put all its energy into adapting to its new environment (Canadian Iris Society, 2014; National Gardening Association, 2019; Valleybrook Gardens, 2001). Planting at this time also allows for vigorous growth during the next season. However, for those consumers who are looking to plant the Arctic Iris in their landscape right away, this species can be sold and transplanted during the spring.

Unlike many other crops, Iris are not usually forced all year round unless being used for cut flower production. It could also be grown as a flowering potted plant for spring sales or as a
A dwarf herbaceous perennial. This species and others within this genus are mainly used as a landscape plant within home gardens, commercial businesses, and local parks. In these settings it would be an early flowering plant and provide foliage for the remainder of the summer.

**POTENTIAL LIMITATIONS OF THE ARCTIC IRIS**

To assess any and all limitations that may be imposed by this crop, study of its entire life cycle would be vital. This would allow the assessment of any issues that may arise in growing them outside in the landscape and in controlled environments for cut flower production.

An experiment was conducted to understand propagation techniques for this species (Figure 6). It can be propagated through division of the rhizome, however like most Iris a portion of the vegetative growth must be present and cut back (Canadian Iris Society, 2014; National Gardening Association, 2019; Valleybrook Gardens, 2001). It was shown that when roots were removed from the rhizome, the rhizome was divided into smaller sections with no vegetative growth, and when the rhizome was planted as a whole there were no significant changes or initiation of adventitious roots or shoots.

**COMPETITIVE CROPS**

Other species of Iris will be this new crop’s main competitor. Iris in general are a very popular perennial within the United States, primarily due to its ease of care and blooming time, which is right after the spring bulbs but just before the rest of the garden (National Gardening Association, 2019). Consumers may question why they would select this Iris over others. The main difference is the Arctic Iris has its bloom color, which is a much lighter purple color with darker purple veins. Although, with further research on the species life cycle potential longer flower time or vegetative growth could be an advantage and draw consumers more towards this crop.

**MARKETING STORY**

The Arctic Iris is bound to be recognizable by growers, gardeners, and landscapers due to its distinguishable leaves and flowers commonly found throughout the Iris genus. However, the color of the flowers are noticeably different compared to other irises already on the market. Its light purple color and origination from the Aleutians Island would add fresh and unique features to home and commercial landscapes. The Iris’s ability to be sold as a cut flower adds to its
quality. Florists and floral consumers would enjoy the bright but subtle color it brings to bouquets for spring, Easter, and Mother’s Day.

The anticipated launch of this product on the market would be 5 to 10 years from now. This allows enough time to study the life cycle of *I. setosa* subsp. *arctica* and produce a strong product for both the horticulture and floriculture markets.

**PRODUCT INFORMATION GUIDE & CROP SCHEDULE**

All information provided in this production information guide for crop scheduling was collected from general growing information for *Iris setosa* and experiments conducted in the Plant Growth Facility at the University of Minnesota. Additional research may need to be conducted to determine more accurate information for successful growing by commercial growers.

*Iris setosa* subsp. *arctica*

Arctic Iris

**General Information**

<table>
<thead>
<tr>
<th>Plant Type:</th>
<th>Perennial</th>
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<tbody>
<tr>
<td>Foliage</td>
<td>2-4 linear, 4-sided upright dark green leaves; usually same height at flowers</td>
</tr>
<tr>
<td>Flowers</td>
<td>Medium sized flowers &lt;br&gt; Lavender-blue with silver white veins</td>
</tr>
<tr>
<td>Blooming Time</td>
<td>Late Spring to Early Summer</td>
</tr>
<tr>
<td>Plant Height</td>
<td>6-12 inches (15-30 cm)</td>
</tr>
<tr>
<td>Plant Spacing</td>
<td>8-12 inches (20-30 cm)</td>
</tr>
<tr>
<td>Container Size</td>
<td>3”/4”/5” pots depending upon maturity</td>
</tr>
</tbody>
</table>

**Propagation**

Rhizome Division (preferred)

Divide: July to August

- Typically 4-6 weeks after flowering

Plant outside: August to September

- Cut back the leaves to aid in root development
- This gives the plant enough time to establish its roots while there is still sun so it can survive the winter.
- When planting leave a portion of the top of the rhizome above the soil for aeration
- Division is recommended every three years but can be done annually
- Preferred shipping time for rhizomes
Crop time from division to new foliage: 5-6 weeks
Flowering time: Late Spring to Early Summer (2-4 weeks after foliage is established)
Total Crop Time: 7-10 weeks

Growing Conditions

<table>
<thead>
<tr>
<th>Sun Exposure</th>
<th>Full Sun to Partial Shade (6-8 hours per day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soil Types</td>
<td>Normal, Sandy, or Clay</td>
</tr>
<tr>
<td>Soil Moisture</td>
<td>Average to Moist</td>
</tr>
<tr>
<td></td>
<td>Well drained soil is preferred to reduce root rot</td>
</tr>
</tbody>
</table>

Uses in the Landscape

- Edging
- Sunny rock gardens
- Mass planted as a sort of ground cover
- Cut Flowers

Sustainability for Future Production
Iris’s in general are a sustainable crop to produce because they require very little amounts of energy and inputs to produce. Most survive on their own in good soil and temperatures. This provides great insight into the sustainability of this crop within the market.

FIGURES

Figure 1. Geographical Distribution of *Iris setosa*, primarily found in Alaska and Northern Canada (Hampton, 2011).

Figure 2. USDA Plant Hardiness Zones for the State of Alaska (USDA, NRCS, 2019).
Figure 3. *Iris setosa* (Dwarf Blue Flag) distributed by Little Valley Wholesale Nursery in Brington, CO. (Little Valley Wholesale Nursery, 2019).

Figure 4. *Iris setosa* (Arctic Iris) distributed by Bron & Sons Nursery Co. in Grand Forks, British Columbia. (Bron & Sons Nursery Co., 2019).

Figure 5. Established rhizomes with roots and leaves cut back for propagation (Longfield Garden, 2019).
Figure 6. Photos from experiments conducted on division of the rhizomes of *Iris setosa subsp. arctica*. Each were placed in soil in the greenhouse for 6 weeks (a) A small section of the initial rhizome with no roots attached (b) The rhizome cut in half (c) Division of a whole rhizome.
LITERATURE CITED


Canadian Iris Society. 2014. Iris Cultural Information. (http://www.cdn-iris.ca/culture.html, 1 April 2019).


Hampton N. 2011. Iris setosa. Lady Bird Johnson Wildflower Center: Plant Database. The University of Texas at Austin.


