Dryas octopetala subsp. *alaskensis:* Potential for a Hardy, Novel Flower

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Executive Summary

Dryas octopetala, Mountain Avens, is a new sprawling variety of ground cover which may become available in northern climates near you. This extremely cold-tolerant plant will spread easily in your garden or within a larger pot with other plants. With petite white flowers blooming late in the spring, and placed gingerly upon thin red stalks, their beauty persists throughout the summer. This perennial ground cover will return year after year, regardless of the harshest winters. Purchase a few and watch as they creep around your yard, or simply buy one and propagate your own, with ease, through cuttings. The northern consumer may often feel left out by the lack of perennial flowering plants, but with this new species you can soon become the envy of your friends residing in the south. Minimal input is required for these beautiful white flowers to flourish in your domain. Pick up your own in a local floral retailer and fall in love over and over, each spring, as they bound back to life.

I. Introduction

A. Species

The distribution of the genus *Dryas* is worldwide; they are often found in harsh areas such as arctic and tundra regions (Springer et al., 2019). *Dryas octopetala* is currently on the market as a decorative, flowering plant, although subsp. *alaskensis* is not. It can be purchased as a seed from multiple vendors, coming in such names as “Mountain Evans,” available through GeoSeed company (https://www.geoseed.com). These plants are marketed for their small white flowers, and their noted tolerance to harsh climates – GeoSeed company rates their “Mountain Avens KL” plants with a Zone 3 hardiness. The subspecies

alaskensis is found within the state of Alaska, see figure 1, but little information has been gathered about this cultivar. If alaskensis shows the same traits as other subspecies of *Dryas octopetala* it could be utilized as a showy flower in regions with inclement weather.

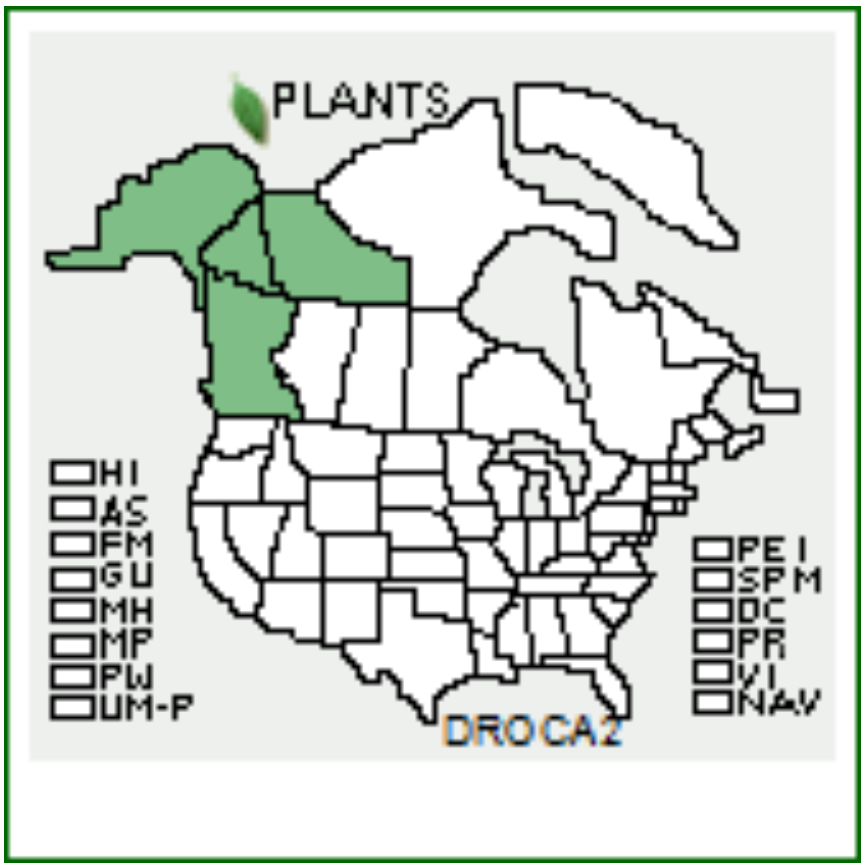

Fig. 1 showing the native range of *D. octopetala* ssp. *alaskensis* (Dryas octopetala L. ssp. alaskensis (A.E. Porsild) Hulten Alskan mounain-avens; USDA, 2019) *https://plants.usda.gov/core/profile?symbol=DROCA2*

B. Taxonomy and Distribution

Dryas octopetala is a short, flowering shrub found in North America, Eurasia, arctic alpine and boreal regions (Springer et al., 2019). Within North America it can be found in Northern Canada, in the Northwest and Yukon Territories as well as Alberta and British Columbia; in the United States the plant can be found in Alaska, Colorado, Idaho, and Oregon (USDA, 2019) – see figure

2. Species within the *Dryas* genus are wide-spread within the arctic and sub-arctic, making up a significant amount of ground cover and biomass (Springer et al., 2019). *Dryas* are regarded as important to the fragile northern environments where they are found. *Dryas octopetala* can be characterized as a pioneer plant which forges the way for other species to thrive. The plant will form mycorrhizal associations within the soil, which can be beneficial to other species. Not only will *D. octopetala* form symbiosis with fungi, the root systems contain nitrogen-fixing nodules, not unlike a legume (Springer et al., 2019). The increased nitrogen found in areas with *Dryas* species create favorable environments that support the growth of spruce seedlings, like the *Picea glauca* (Springer et al., 2019).

Fig. 2: Native range of *D. octopetala* (USDA, 2019)
https://plants.usda.gov/core/profile?symbol=droc

Dryas octopetala is a small and dense variety of plants. There are basal leaves, either singular or in a group of two; leaves are lanceolate and narrow with

persistent petioles, typically with an entire margin, but they have been observed to have one to two teeth (Springer et al. 2019). The leaf blade can be in different forms, from lanceolate to oblong or ovate. Species within this genus are prone to hybridization meaning each specimen may have slight morphological differences, this can cause confusion when attempting to correctly identify different subspecies. The inflorescence are terminal, meaning the plant will not grow past the point where the flowers emerge; the flowers are solitary, standing along upon a pedicel (Springer et al., 2019). The flowers contain between 8-10 sepals, which are ovate to lanceolate in shape; see figure 3. There are 8-10 petals that make up each corolla of the inflorescence; these flowers are typically white but have been observed to be yellow. The flower will produce 20-40 achene fruit, which may be aggregated, and measure 0.8-3.5mm (Springer et al., 2019).

The genus is found within the Rosaceae or rose family (USDA, 2019). There are approximately 90 other genera found within this family; some notable crops include apples, cherries, almonds (Sytsma, 2019). The subfamily of *Dryas* is Dryadoidea, which only consists of four different genera; these plants all form a symbiosis with a bacterium, *Frankia*, which fixes nitrogen (Springer et al., 2019).

Fig.3. an image of Mountain Avens by Duncan Shaw.

https://pixels.com/featured/mountain-avens-dryas-octopetala-duncan-shaw.html

II. Crop Species

A. History and Uses

Dryas octopetala can be found in a few retail locations. The GeoSeed company sells seeds of the cultivar "Mountain Evans KL" to growers. They recommend a hardiness zone no more than 3; the growers guide states that it is imperative that the seeds go through a cold stratification period in order to germinate and that they are exceptionally hardy. Plants will grow to approximately 4 inches, 10.2cm, in height and produces white flowers.

Dryas octopetala is sold as a mat-forming, or ground cover plant (Fertig et al., 2018), due to their low-lying nature. The plants will require a well-drained soil. They are evergreen, meaning they will produce a nice color in winter months when few other plants remain colorful. The flowers bloom in mid-spring

producing single flowers, typically white and containing a silky seed head after pollination (Mountain Avens, 2019).

III. Production Information

A. Anticipated Cultural Requirements

Dryas octopetala is a small, hardy perennial shrub, meaning it will return year after year; single plants can live upwards of 100 years when favorable conditions persist (Walker, 2015). In order for the seeds to germinate in the Spring, there must be a cold stratification period that lasts at least 2 months; the winters in its native habitat will suffice. The leaves will remain green throughout the winter until new growth begins in early Spring; once new growth is initiated, the leaves from the previous season will deteriorate rapidly (Brodin, 2015). Once established, *D. octopetala* will form a matted ground cover; this mass will typically reach 3ft in diameter, by 8in tall (91.4cm wide by 20.3cm tall) (Brodin, 2015). The mass of plants can be described as a clonal colony due to the way it spreads along the ground utilizing "creeper" shoots; however, *D. octopetala* is a sexually reproducing plant (Walker, 2015. Wada, 1999). The active growing season is relatively short, at 12 weeks (Wada, 1999), likely due to the fleeting warm-weather months typical of its native, high-latitude range. The shrub will begin flowering in late spring and persists through the Summer months (Guide to Growing, 2019); the flowers are typically white, containing 8 petals, but 6 to 10 petals is not uncommon (Walker, 2015). Flowers are single, and upon a peduncle; they are typically perfect hermaphroditic flowers, but male flowers are commonly found as well (Wada, 1999).

Dryas species are found in cold climates and are considered a hardy genus of plants; *Dryas octopetala* can be grown anywhere from zone 2 to zone 6 (Guide to Growing, 2019). The root stock is woody and tough, allowing it to penetrate the crevices of rocks; fine lateral roots enable proper absorption of water and nutrients in tight spaces (Walker, 2015). The shrub enjoys rocky and calcareous - or basic – soils (Brodin, 2015). *D. octopetala* will spread rapidly when unimpeded (Brodin, 2015); sympodial shoots allow for the horizontal spread of the shrub, typically once the apical meristem has been terminated (Walker, 2015). Grazing from animals such as rabbits and reindeer will not hinder the growth, in fact it may further increase the production of flowers and sympodial shoots (Brodin, 2015).

Production of *D. octopetala* either from seed or through vegetative propagation can be a long process, requiring multiple steps. Typically these will be propagated by vegetative cuttings, in a greenhouse setting. In order to increase flowering, and as to not impede growth of the plant, cuttings should be taken in mid to late-July; these cuttings should be at least 7cm in length, and contain multiple, fully-formed leaves (Brodin, 2015). If cuttings are not to be planted immediately, they should be kept both moist and cold. Once you are prepared to plant the cuttings, it is important to ensure the wounds is fresh; if you waited to plant, simply remove a few centimeters from the cut-end of the stem (Brodin, 2015). An application of 1000ppm of an IBA solution will aid the plant in producing new root-tissue; immediately following the application, the stem may be placed into a bed of either sand, perlite, or standard germination mix (Brodin,

2015). Cuttings should be placed into a mist house with a temperature around 21C for a period of 4 to 5 weeks, or until sufficient root-tissue is noted; be mindful of over-misting the cuttings as this can cause the leaves of the plant to rot (Brodin, 2015). Once the roots are plentiful, you will transplant the cuttings into plug trays with 160ml volume cells; the cuttings will perform best in a well-drained media consisting of a 1:1:1 ratio of peat, sand, and perlite (Brodin, 2015). After transplanting, the cuttings will require a period of 4 weeks inside of a shade house before being relocated to a full-sun location (Brodin, 2015). The cuttings will take a full year to develop, being harvested the following July, at which point they should be overwintered outside protected by insulated foam and a snow-cover if the weather permits (Brodin, 2015). Throughout this process, it is important that the soil is kept moist, but be mindful that overwatering is harmful to *D. octopetala.*

Growing *Dryas octopetala* from seed is possible but is regarded by some as less successful than through vegetative propagation. Seeds should be sown in flats in autumn in preparation for a stratification period of at least 2 months, which can be accomplished outside. The flats should have some protective covering and must be monitored for adequate moisture levels (Guide to Growing, 2019). Utilizing insulating foam and snow cover will benefit the seeds. In early spring the seeds can be brought inside to grow further, transplanting either that spring of the following autumn (Guide to Growing, 2019). Seeds may also be placed into moist towels and stratified for at least two months; however, seeds may not germinate for 1-12 months (Brodin, 2015). Pinching the plants at the

apical meristem to initiate lateral growth, as well as increased flower production, is optional, but should increase the overall health of the plant, as this mimics what native fauna would do in the wild (Wada, 1999).

B. Market Niche

D. octopetala is a perfect ground-cover plant for consumers in temperate to cold climates. Plants that are propagated through cuttings are ready for sale one-year post-cutting, typically in late July (Brodin, 2015). Planting in autumn will give the consumer a nice evergreen foliage that will persist through the harshest winter, and which will flower the following Spring. Being a perennial means it only must be purchased one time. The long flowering period, lasting most of the Summer, will add a splash of white flowers to any rock bed or poor, gravel-filled soil (Guide to Growing, 2019). The shrub does not need to be overwintered in a greenhouse, meaning plants that are not sold the autumn following their final transplanting can be purchased as a small leafy shrub the next Spring. Plants sold in late spring – just in time for Mother's Day - can be pinched to increase the quantity of flowers, enticing consumers (Wada, 1999). For consumers who prefer to grow their own plants from seed, seeds can be sold in mid-summer to autumn in preparation for over-winter stratification.

The hardy shrub which can live more than 100 years is likely to grow in most areas within zone 2 to zone 6. The plant is susceptible to over watering and does require a well-draining soil (Brodin, 2015). Consumers in lime-heavy areas, or anywhere soil is basic, will have no trouble growing *D. octopetala* (Brodin, 2015). It is important to choose a location where the plant will receive full to

partial-sun, as too much shade may harm the plant (Brodin, 2015). This plant can spread rapidly and may grow out-of-hand quickly if not kept in check; consumers should mulch the area around the plant each season (Guide to Growing, 2019).

Dryas octopetala is the perfect evergreen ground-cover for those living in the harshest of environments. Give a splash of green to any rock bed in your yard and watch as the petite white flowers take over and persist through the summer months. This plant can take a beating from poor soils and inclement weather alike. Plant a single ramet in the autumn and watch as it fills in those hard-to-reach spots the following season. A hardy contender to any other ground-cover; replace your Thyme and Creeping Juniper, no more need for Wintercreeper or Ajuga. Try *Dryas octopetala* and watch as it flourishes in your garden.

IV. Product Information Guide

Dryas octopetala is best produced through vegetative propagation within a greenhouse with misting capabilities. In order to do so, a stock plant, or plants, must be chosen. Choose a specimen with a branching growth habit; *D octopetala* is a small variety of plant so multiple stock plants is recommended for this process. Take cuttings approximately two to three inches from the apical meristem of a branch, making certain to do this just below an internode. In order to have the crop ready for sale at the end of spring, take these cuttings early in the year – about week two at the latest – since this plant is slow to root. If a larger root system is desired, for purposes such as transplanting by the consumer, cuttings should be taken in late fall, approximately at week 48 or prior. Utilizing a solution of 2000 ppm of IBA growth

hormone, in talc or other forms, will ensure root development of your cuttings; cuttings treated with an IBA solution of 1000ppm or 3000 ppm will not perform as well, and will take longer to produce roots. Cuttings should be placed in a medium of sand, perlite, or standard germination soil within a 128 cell plug tray or larger. Once your cuttings have had the proper growth regulator and are in a suitable medium for root development, they must be placed in a mist house until sufficient root development is observed – approximately three weeks. Plants can be moved to a capillary mat after two weeks of misting if leaves show deterioration due to a lack of nutrients. New vegetative cuttings should remain in the original plug tray for a minimum of 5 weeks, until a decent size is obtained; it may be advantageous to use a plug tray larger than 128, but this will take up more space in the greenhouse while producing fewer cuttings. This method of propagation resulted in an observed success rate of 90% at 5 weeks after the cuttings were taken; this may be reduced after a longer period of growth.

Once vegetative cuttings have shown sufficient root development, week 7, they should be transplanted to larger containers to avoid them becoming root bound within the plugs. A standard SVD 350 container will be sufficiently large enough for the crop to mature, while making it easy for consumers to choose and purchase their own plants. Since *D. octopetala* is a ground-cover type plant, consumers may prefer the plant remain potted; in such an instance, transplanting into a two-gallon pot will allow you to plant multiple specimens per container – no more than three should be planted together to avoid overcrowding. Use a medium such as “Promix” that will benefit the plants with added microhryzae colonies; this will ensure a healthy microbiome within

the soil so that roots can uptake water and nutrients efficiently. Avoid media that will not drain well, such a peat, to avoid the plant becoming water-logged, which could damage root and shoot tissue beyond mitigation. Plants should be watered twice daily while in the greenhouse; water should be infused with a standard NPK fertilizer mix to ensure growth and overall plant health is kept up until sale.

Your *Dryas octopetala* should be ready for sale by week 16 of the year. Plants will begin to flower around this time, or shortly after, at the beginning of summer. If plants are still on your shelves by week 18, pinching the plant just below the flowers, or where the flower buds have begun to initiate, will ensure more inflorescence will be produced for consumers shopping around the week 19 mark. The plant will flower for the duration of summer, so they can remain on shelves for the whole season, as long as they are given proper attention and pinched intermittently to stave off deterioration of tissue. The plants are a perennial found in cold climates, so they can be marketed for fall sales to consumers who wish to watch the plants come back from dormancy the following spring; this can ensure the entirety of your product is sold in the same year it was produced.

Producing *D. octopetala* from seed is possible, but this is a longer process. Seeds must go through a vernalization period of a couple months for best results. You may choose to sow seeds at the end of the growing season, around week 44, in 128 plug trays or larger. If you are producing within a cold climate, you may choose to place the plug trays in a protective covering outside for the remainder of the winter. If this is not an option for your location, the sown seeds may be placed within a cold storage freezer for no less than six weeks (1000 hours). Once seedlings emerge, the plug tray

should remain on a capillary mat for a period of two weeks or more, until they can be transplanted into a larger, SVD 350 container.

The Mountain Avens is a hardy plant, native to harsh climates devoid of nutrient rich soils. While in greenhouse production, they should be watered multiple times a day with the same fertilized water utilized for you other crops. If you wish to save on overhead costs, you may choose to water once per day, when the temperature in the greenhouse has risen; *D. octopetala* is drought tolerant and should perform well with less water than other common plant varieties. The crop withstands cold winters and cool summers, so heating within the greenhouse is not a major necessity. If you have plants remaining at the end of your peak season, you can choose to save greenhouse space and resources by placing them in an uninsulated walk-through, or simply outside where you have space. This is a cold-climate plant and will perform best in northern climates where the winters are cold and dark. If your location does not have a winter sufficiently cold enough to induce dormancy, the crop should be overwintered in a cooler to ensure proper growth the following spring.

Acknowledgments

To all the plant enthusiasts and scientists who braved the harsh climate where this genus is found, thank you for your time and sacrifice in bringing us this hardy plant and the knowledge to grow it.

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