Species Productivity Schedule for the *Gaultheria hispidula*

Anna Arias
Ethnobotany – Instructors: Prof. Scott Herron and Matt Pierle
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Nomenclature

Family: Ericaceae
Scientific name: *Gaultheria hispidula* (L.) Muhl. Ex Bigelow
Common Names: Creeping Snowberry, moxie, moxie-berry, and moxie-plum (Cassidy 1995)
Anishinaabe Name: amiinadekag "berry that smells good" (Kenny & Parker 2004)

***On the scientific name*:**

In 1753, Linnaeus originally named this plant *Vaccinium hispidulum* (Cafferty & Jarvis 2002). In 1817, Salisbury renamed it *Chiogenes serphyllifolig.* In the 1950s, scientists saw a connection of the plant to *Gaultheria procumbens* in terms of its berry and connection to intermediate forms of the genus in South America. Thus, the plant received the name *Gaultheria hispidula*. Gaultheria comes from a Canadian court physician and naturalist in the early 1700s named Jean-Francois Gaulthier (Sulak 1981). Hispidula is a latin word that refers to the hairs on the leaves and stem (Shackleford 2011).

On the common name:

G. hispidula and its relative *Gaultheria procumbens* (Wintergreen) were also called moxie, moxie berry, moxie-plum. *G. hispidula* was also called creeping pearlberry. The term moxie may have come from the base "mashihka" (Cree) and "maskikky" (Ojibwa) meaning "herb infusion" (Cassidy 1995). Dr. Augustin Thompson named his nerve medicine that could have been made out of *G. hispidula* or *G. procumbens* "moxie" presumably from the Cree and Objibwa medicine (Cassidy 1995, Shackleford 2011). The term moxie was used for a soda drink with a certain tonic quality and, later, as slang for "vigor, verve, or pep" (Cassidy 1995).

On the Anishinaabe Name

Ojibway Elders of Lac Seul First Nation named *Gaultheria hispidula* as amiinadekag or "berry that smells good". They place amminadekag into a larger category of "assagakik." Assagakik could be used in the general sense for deciduous plants and in the narrow sense of nonwoody herbaceous plants, including ferns (Kenny and Parker 2004).

Description

Gaultheria hispidula is a creeping evergreen herb or subshrub that has leaves 2-10 mm long and 1-7 mm wide with acute tips (Middleton 1991, Reznicek, Voss, & Walters 2011, Elias & Dykeman 1990, Flora of North America Editorial Committee 2009). *G. hispidula* is no taller than 15 cm (USDA-NRCS 2012). The leaves are green to dark green on the top and light green on the bottom (Reznicek et al. 2011, Elias & Dykeman 1990). The leaves have a slightly revolute margin, meaning that that they are rolled down towards the middle of the leaf (Transeau 1906, Hickey & Kling 2000). The stem is strigose; it looks hairy. In addition, there are bristle glands or hairs on the undersides and margins of the leaves (Reznicek et al. 2011).

The bell-shaped flowers of the *G. hispidula* are solitary in the junction of the leaves on a droopy stalk (Elias & Dykeman 1990). The flowers are tetrameous or in parts of four (Middleton 1991). In fact, the white flowers are 2-3 mm in length with 8 stamens and 4 petals (Rickett 1963, Middleton 1991) The fruit of the *G. hispidula* is a 6-10 mm long white berry that is slightly longer than wide. This fruit is a capsule with a fleshy floral axis, unchanged calyx lobes, and 4-5 locules with seeds inside (Elias & Dykeman 1990, Middleton 1991, Voss 1996).

G. hispidula can be confused with *Vaccinium oxycoccus*, which grows in a similar environment. *G. hispidula* can be distinguished from *V. oxycoccus* due to its green color on the bottom, hairlike structures on stems and leaves, and wintergreen scent (Reznicek et al. 2011).

Figure 1: Picture of *G. hispidula.* from Robert H. Mohlenbrock. USDA NRCS. 1995. *Northeast wetland flora: Field office guide to plant species*. Northeast National Technical Center, Chester. Courtesy of USDA NRCS Wetland Science Institute.

Figure 2: *G. hispidula* with a berry.

Figure 3: *G. hispidula* with a flower.

Phenotype and Reproduction

Gaultheria hispidula is an evergreen, retaining leaves year round. The plant has an active growth period in the spring and summer (Hays 2001). It flowers between May to early August (Elias & Dykeman 1990, Flora of North America Editorial Committee 2009). The berries ripen from July to September, but the berries are usually ready in August in the United States and can be found through the following winter (Elias & Dykeman 1990, Flora of North America Editorial Committee 2009, Pearle Personal Communication).

G. hispidula reproduces both by seed and through vegetative (asexual) reproduction. Its seeds spread rate is slow while its vegetative growth is medium (USDA-NRCS 2012). The plant is an autogamy, the ovules of the flower are fertilized by pollen of the same flower (Brooklyn 2012, Hickey and Kling 2000). *G. hispidula* requires pollination by insects including bumblebees, solitary bees, bee flies and syrphid flies (Rook, 1998 cited in Hays 2001). The seed is dispersed by endozoochory, they are eaten with the berry and defecated, mostly by chipmunks and deer mice (Brooklyn 2012).

Figure 3: Bumblebee, solitary bee, bee fly, and syrphid fly which pollinate *G. hispidula*

Ecology

Relationships with other plants and animals

G. hispidula does not appear to compete with other native plant species and is often in association with plants that are unique or rare like small yellow lady's-slipper (*Cypripedium parviflorum)*and Labrador-tea (*Rhododendron groenlandicum*) (Hays 2001). Herbivores do not appear to be a major problem for the plants, but further research needs to be done to understand the affects of competition and herbivory on *G. hispidula.* (Hays 2001, Brooklyn 2012).

Interactions with its environment

G. hispidula is shade tolerant and has medium drought tolerance (USDA-NRCS 2012). Hays (2001) suggested that the original *G. hispidula* in an area may be affected by lowering water tables, and dryer environments, but the plant is able to disperse to appropriate locations to grow. *G. hispidula* also has high fire tolerance (USDA-NRCS 2012). For example, Algren (1960) found the presence of *G. hispidula* in sites of fire and undisturbed sites, suggesting that the species can both withstand fire and continues to grow through mid and late succession.

Human interactions

Trampling and loss of habitat due to human effects can be a major concern for *G. hispidula* (Hayes 2001). The small population size in some areas causes the species to be threatened and endangered (Hayes 2001, USDA-NRCS 2012). Propagation of *G. hispidula* by humans can be performed by stock, cuttings, and seed (USDA-NRCS 2012). The seed requires cold stratification (Hays 2001). A similar method as *Gaultheria procumbens*, might be used for *G. hispidula*. *G. procumbens* can be propagated by chilling a seed for 30-75 days and then germination at 21 degrees Celsius after a physiological dormancy (Baskin & Baskin 2001). No propagation of *G. hispidula* has been performed for conservation (Hays 2001).

Habitat and Distribution

G. hispidula is found in moist forests, thickets, and swamps of confiners including cedar, spruce, and tamarack (Reznicek et al. 2011). *G. hispidula* requires an acidic soil of 4.0 to 6.5 and requires some shade to full shade to grow (USDA-NRCS 2012; Pennystone 2012) It will often be found on mossy logs and hummocks (Reznicek et al. 2011).

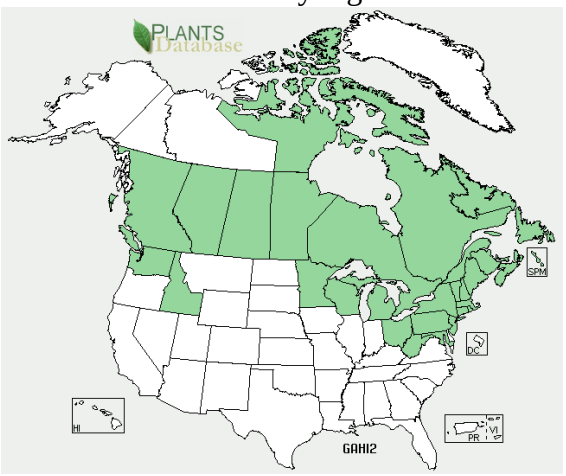

Figure 4: Map of location of *G. hispidula* in the United States and Canada

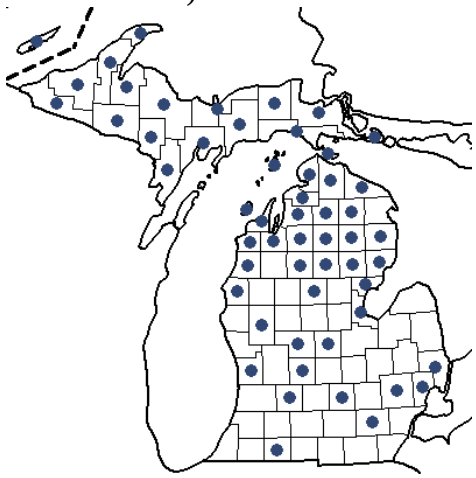

Figure 5: Map of the location of *G. hispidula* in Michigan

G. hispidula is found in several Northeast States and Northern States of the Great Lakes (See Figure 4). It is native in the same states it is found in today (USDA-NRCS 2012). In

Michigan, one can find *G. hispidula* in all Upper Peninsula counties, most of the tip of the Lower Peninsula, and a few counties in southern Michigan (Reznicek et al. 2011) (See Figure 5). It is also found in parts of Canada. *G. hispidula* has a sensitive status in Connecticut, and Washington, a rare status in Pennsylvania, an endangered status in Maryland and New Jersey, and is presumed to be extirpated in Ohio (USDA-NRCS 2012).

Cultural Uses

Uses of Gaultheria hispidula

Indigenous people of the Americas utilized both the berries and leaves of *G. hispidula* for both medicine and food. In terms of medicine, *G. hispidula* has been utilized as a gastrointestinal aid, as an aid for sleeping, and for symptoms of diabetes. Frank Gouldsmith Speck (1917) described how the Micmac-Montagnis of Newfoundland utilized *G. hispidula* as a tea through a decoction. He lists this as a medicinal use but does not specify the particular purpose (Speck 1917). Jacques Rousseau (1946) also described how *G. hispidula* was used as a sedative to facilitate sleeping by the Anticosti. According to Meredith Jean Black, the Algonquin of Quebec utilized *G. hispidula* as a medicine in the form of a gastrointestinal aid. The leaves were infused and used as a tonic for overeating (Native American Ethnobotany Database 2003). The Cree Elders of Eeyou Istchee reported that they utilized *G. hispidula*, which they call Pieuminaan for symptoms of diabetes. Two elders of 34 interviewed in the area mentioned the use of the berry (Leduc et al. 2006).

In terms of food, *G. hispidula* leaves are used for making tea and the berries have been eaten. The Chippewa utilized the leaves of *G. hispidula* in a beverage. Frances Densmore (1928) describe how she found that the Chippewa placed a heaping quantity of dried or fresh leaves tied into a packets with a strip of basswood into a quart of boiling water. The Chippewa might sweeten their drink with maple sugar and would drink it hot (Densmore 1928). The Algonquin of Quebec ate the berry as food (Native American Ethnobotany Database 2003).

Today, the berries continue to be collected for eating or preserves in late summer through winter and have a wintergreen flavor (Shackleford 2011, Elias & Dykeman 1990). The leaves can be collected all year round for making tea by a decoction or the leaves can be cooked and have a similar wintergreen flavor (Elias & Dykeman 1990).

The Chemistry of Gaultheria hispidula

G. hispidula use as a medicine seems appropriate due to the presence of a molecule called methyl salicylate. Methyl salicylate is closely related to aspirin and is used for pain and fever relief (see Figure 6). Distillation of the leaves of *G. hispidula* can produce an essential oil, oil of wintergreen, which should be used with caution (Cauplan 1998; Elias & Dykeman 1990). Methyl salicylate is often found in lotion for muscle pain relief, but an overdose of the oil can be very dangerous (US National Library of Medicine 2012).

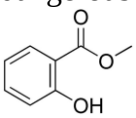

Figure 6: Structure of methyl salicylate.

In addition to the presence of methyl salicylate, *G. hispidula* showed an ability to stop the formation of advanced glycolation end products (AGE) at low levels, which are associated with the effects of diabetes. *G. hispidula* ha several phenolic compounds that could facilitate this moderation of the formation of AGE. These compounds suggest that *G. hispidula* could be utilized to moderate the effects of diabetes (Harris et al. 2010).

Notes

On the cover, there are symbols for when *Gaultheria hispidula* interacts with other living things. The first symbol is from the perspective of the plant and the second symbol is from the perspective of the human or animal interacting with the plant. The author interpreted the loss of *Gaultheria hispidula* as a negative for humans and animals because it is utilized by these groups.

Key:

+/+ Positive for plant and human/animal

0/+ Neutral for plant, positive for human/animal (neutrality for the plant depends on what happens to the plant after use)

-/- Negative for plant and human/animal

Picture references

Figure 1: from Robert H. Mohlenbrock. USDA NRCS. 1995. *Northeast wetland flora: Field office guide to plant species*. Northeast National Technical Center, Chester. Courtesy of USDA NRCS Wetland Science Institute.

Figure 2: http://www.thismia.com/G/Gaultheria_hispidula.html

Figure 3: http://www.robsplants.com/critters/flies.php

http://winstonsdad.wordpress.com/2010/08/08/four-walls-by-vangelis-hatizyannis/http://www.eduwebs.org/bugs/bumble_bee.htm

brisbaneinsects.com

Figure 5:USDA-NRCS 2012

Figure 6: Reznicek et al. 2011

Figure 7: http://www.sgarochem.com/methyl-salicylate.htm.

Cover: http://www.pfaf.org/user/Plant.aspx?LatinName=Gaultheria+hispidula

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