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Growing Garlic in Alaska

by Heidi Rader and Julianne McGuinness

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Alaskans are growing garlic successfully all over the state — from Tok to Ketchikan. Why grow garlic in Alaska? The reasons are many, from health benefits to flavor:

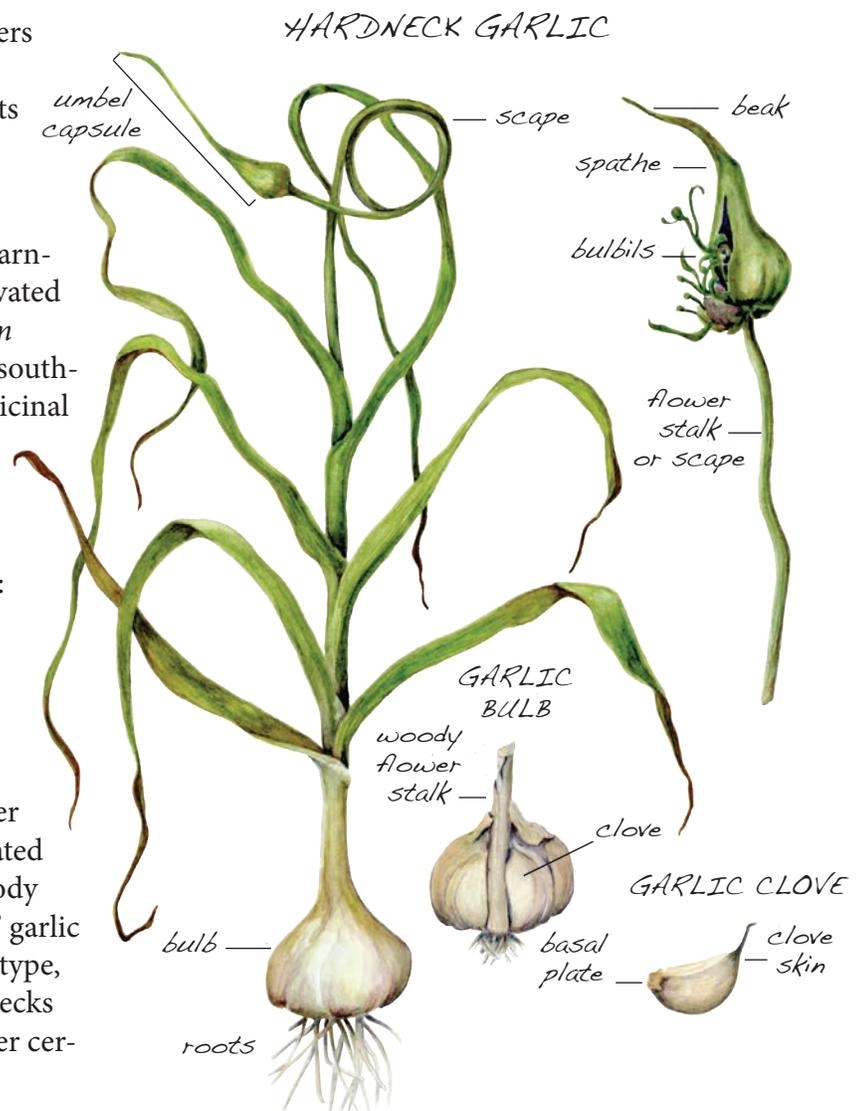
- You can grow more flavorful types than you can find in the store.
- It is a staple ingredient in the dishes of most world cuisines.
- It has documented health benefits: It lowers blood pressure and cholesterol, improves iron metabolism and endurance and fights harmful bacteria.

History and Types of Garlic

Garlic is native to central Asia. We are still learning about the ancestry and evolution of cultivated garlic. It is descended from the species *Allium longicuspis*, which grows wild in central and southwestern Asia. It has been a culinary and medicinal staple in Asia, Africa and Europe for more than 6,000 years.

Until recently, cultivated garlic was thought to fall into two main types of *Allium sativum*: hardneck garlic (*Allium sativum* var. *ophioscorodon*), also known as “bolting” or “top-setting,” and softneck garlic (*Allium sativum* var. *sativum*), or “non-bolting.” Experts do not agree about whether these types are different subspecies. Hardnecks produce a flower stalk, called a scape, and are most closely related to wild garlic. Softnecks do not have this woody stalk, and they comprise most “supermarket” garlic varieties. New evidence suggests that a third type, “weakly bolting” garlics, are genetically softnecks that exhibit characteristics of hardnecks under certain environmental conditions.

Softneck garlic produces more cloves per bulb and stores longer than hardneck garlic. Softnecks lack a hard stalk, which makes them easy to braid together for storage. However, in cold climates like Alaska, hardneck types are much hardier and more flavorful, produce much larger bulbs, and can be quite productive with optimal cultivation.



This publication will emphasize hardnecks, which grow better in northern regions. However, some of the weakly-bolting types have performed surprisingly well in cold climates. Experimentation is encouraged as we continue to learn about this fascinating plant.

There are more than 200 cultivars of garlic now available in the U.S. from seed catalogs and farmers markets. Longtime garlic grower Ron Engeland, formerly of Filaree Farm in Okanogan, Washington, developed and refined the most commonly-used classification system for garlic, which genetic research has generally substantiated. In this system, there are about 10 garlic subtypes within the major types. Within each subtype are multiple cultivars (see Table 1). Specific characteristics of a cultivar, such as taste and stalk formation, can vary significantly due to changes in climate and region. A specific cultivar may be a true softneck in one place but may produce a flower stalk when grown in another area.

Since there is no official standardization; some garlic producers may rename a particular selection, which leads to confusion. (Indeed, geneticists have determined that some differently named cultivars are actually identical.) In Alaska, it is best to choose hardnecks and experiment with different cultivars to determine which perform best in your location. For example, some Turban and Asiatic cultivars have been productive in the Anchorage area.

Garlic Research in Alaska

There have been few replicated garlic trials in Alaska. The Alaska Botanical Garden began multi-year garlic trials in 2013, and the Southeast Alaska Garlic Growers Association conducted trials between

Alaska lacks a certification program to ensure disease-free garlic seed stock. Planting of supermarket garlic stock is not recommended in Alaska because the types available may be regionally inappropriate and, more importantly, harbor pests and disease. Some recommended seed sources are listed at the end of this article.



Korean Mountain is one weakly bolting Asiatic cultivar that has performed well in Southcentral Alaska. Photo by Julianne McGuinness

2012 and 2013 in Ketchikan, Juneau, Douglas, Gustavus and Haines. On average, there was a 92 percent survival rate for Russian Giant, Killarney Red, Purple Glazer and Chesnok Red. Productivity was also high, with clove size, on average, doubling. Additional research trials are needed to evaluate the effects of variety selection, growing conditions, latitude and climactic conditions on crop productivity and hardiness.

Growing Garlic in Alaska

Seed Stock

Most garlic is clonally propagated from high-quality cloves separated from bulbs after harvest and curing. Until recently, garlic was thought to have lost the ability to produce fertile seed. Recent research has determined that some subtypes can be coaxed to produce true seed under the right conditions. Propagation from seed will eventually improve genetic diversity in the crop. In the meantime, most farmers and gardeners purchase or save their own high-quality bulbs for use as seed stock.

As mentioned previously, choosing a cold-hardy type is important for successful garlic growing in Alaska. Hardneck garlics grow best here, while softnecks are not recommended (see Table 1).

Table 1. A snapshot of garlic classification based approximately on Ron Engeland's scheme.

Hardneck		
Subtype	Some Cultivars	Notes
Rocamboles	German Red, Spanish Roja, Russian Red, Killarney Red, Montana Giant	Most recommended for Alaska. Moderately sized plants 3-4 feet tall with scape uncurled. Scape coils two to three times then straightens out. Clove skins are brownish, easy to peel. Prone to double cloves.
Purple Stripe	Chesnok Red, Persian Star, Red Grain, Brown Tempest	Recommended for Alaska. Moderately sized plants 3- 5 feet tall with scape uncurled. Scape forms a partial coil or a downwards U before straightening out. Clove skins are brownish and more difficult to peel than Rocamboles. Bulbs store for 5-7 months. One pound of garlic is about 60 large cloves.
Glazed Purple Stripe	Purple Glazer, Red Rezan	Recommended for Alaska. Similar to Purple Stripe except clove color is more intensely purple; fewer cloves per bulb. One pound of garlic is about 60 large cloves. Scape tends to form a full coil before straightening out.
Marbled Purple Stripe	Siberian, Brown Tempest, Krasnodar Red	Highly recommended for Alaska. Scapes are weak in some strains and form random coils. A typical bulb has 4 to 7 cloves. One pound of garlic is about 50 very large cloves. Very vigorous in cold climates.
Porcelain	Romanian Red, Georgian Crystal, Music, Polish Hardneck, Zemo, Georgian Fire, Northern White, German White, Krasnodar White. (Note: Genetic research shows many Porcelain garlics are identical.)	Highly recommended for Alaska. Large and vigorous plants 4-6 feet tall with scape uncurled. Scape is loose with random coils. Bulbs are large, with 4-6 cloves. Clove skins are smooth and white. Difficult to peel. Bulbs store for about 5-7 months. Very vigorous in cold climates. One pound of garlic is about 35 very large cloves.
Weakly-Bolting		
Subtype	Some Cultivars	Notes
Asiatic (may be a sub-group of Artichoke variety)	Asian Tempest, Japanese, Korean Mountain, Pyong Vang	Short plants, 3 feet tall when the scape is mature. Flower stalks form under cold conditions. Scapes do not curl and may droop with a long bulbil capsule. One pound is about 50 medium cloves. Double cloves occur. Cloves are brownish, with bulb colors from white to pink to purple striped. Clove skins are tight and difficult to peel. Some grow well in cold climates. Cloves split if harvested too late. Bulbs store for 5-7 months.
Turban (may be a sub-group of Artichoke variety)	Chengdu, Basque, Red Janice, Blossom, Xian, Tzan, Chinese Stripe	Some grow well in Alaska. Related to softnecks but forms a flower stalk under northern conditions. Scapes are weak and tend to form a downwards U. One pound of bulbs is about 60 cloves of variable size. Cloves are brownish; bulb color is usually dark purple striped. Clove skins are loose, easy to peel. Stores 3-5 months. Matures 1-3 weeks earlier than other types.
Creole (may be a sub-group of Silverskin variety)	Ajo Rojo, Burgundy, Creole Red	Not recommended for Alaska. Considered a softneck but may form a flower stalk under northern conditions. Best suited to warm climates and mild winters. Sweeter taste and dark purple clove skins, which are difficult to peel. Bulbs store 6-8 months.
Softneck		
Subtype	Some Cultivars	Notes
Artichoke	Inchellium Red, California Early, Susanville, California Late, Early Red Italian, Machashi, Red Toch	Not recommended for Alaska. May bolt after cold winters, with bulbils forming just above the bulb, making the bulb unmarketable. Bulb color is whitish to purple blush. Bulbs contain 12-20 cloves. One pound is about 80 small cloves. Cloves are difficult to peel. Bulbs store for 6-9 months.
Silverskin	Silver White, Nootka Rose, Mild French, S&H Silver, Idaho Silver	Not recommended for Alaska. A true softneck, with rare flower stalks; best for braiding. One pound is about 90 small cloves. Best for warm climates and mild winters. Bulb size is small (less than 2 inches in diameter). Because of their weak necks, plants lay down (lodge) 1 week before harvest. Peeling is difficult. Bulbs store up to 1 year.
Note. Elephant garlic is not true garlic, but a type of leek, <i>Allium ampeloprasum</i> .		

Some hardnecks that have done particularly well in Alaska include Music, German White, Siberian, Chesnok Red, German Red, Russian Giant, Purple Glazer and Khabar. Of 38 cultivars tested in Illinois, Music outperformed other cultivars for weight in five years of replicated trials. Although these trials may provide some useful comparative data, garlic often exhibits different traits in different climates. It's best to try a few hardneck or weakly-bolting subtypes and ask other gardeners in your region which cultivars they have found to be hardy.

Planting time

Unlike most vegetables we grow, garlic is planted in the autumn, not the spring. Spring-planted garlic will be smaller and generally lacking in bulb differentiation. In Alaska, garlic should be planted between mid-September and mid-October, within a week or two after the first killing frost (when the air temperature reaches about 32°F for the first time in the autumn) or about four to six weeks before the ground freezes for the first time in the autumn. In Southeast Alaska this could be early October, while in Interior Alaska it's more likely to be mid-September. The ideal planting date will vary from year to year. The goal is to plant the garlic so that it has enough time for root growth but not for leaf growth. If leafy shoots emerge from the ground in the autumn, they will be killed by winter cold. See www.ncdc.noaa.gov/climate_normals/clim20supp1/states/AK.pdf, then look for your town to find your likely first frost date. Add one or two weeks for the estimated planting date.

This raised bed is prepped with holes spaced appropriately for planting garlic. Photo by Mary Kate Reeder



Soil

Fertile, fluffy soil with lots of organic matter (such as well-composted manure) is ideal for garlic. Dense, clay soils should be amended with compost before planting. A pH of 6 to 7 is recommended, as is planting in large raised beds. Container planting is not advised because it lacks insulation.

Fertilization

Garlic's fertilizer needs are moderate. In the autumn, prior to planting, choose a nitrogen-rich fertilizer and apply 1.5 pounds per 100 square feet. In the spring, side-dress the garlic after the shoots emerge with 2 pounds of nitrogen-rich fertilizer per 100 square feet. Do not fertilize after late June.

Planting Technique

Just before planting, break bulbs into individual cloves, keeping the bulb wrapper intact. If you tear a wrapper, eat that clove rather than planting it, because it will be prone to mold and rot in the ground. Small cloves grow small bulbs, so plant the big ones. Plant basal side down (pointy side up), 3 to 4 inches deep — a little deeper than planting depths in warmer climates. Space garlic plants 5 to 6 inches apart for optimal bulb development.

Mulch

Adequate mulch and snow cover help protect garlic from extremely cold Alaska winters. Alaskans have used chopped leaves, straw, compost and even seaweed for mulch. Add about 4 to 10 inches of mulch. In Juneau where rains are particularly heavy, garlic farmer Joe Orsi covers his crop with a tarp in November. Other growers recommend mulch that will allow moisture to penetrate. The freeze-thaw cycles pose additional challenges for some areas, so mulch removal in spring is important to prevent ice matting. If mulch is left on the bed, the soil will not warm as rapidly and crop growth will be reduced.

Cultivation

Garlic does not compete well, so keep it well weeded. Use care around shallow roots when cultivating. During the prime growth stages, keep soil moist, but reduce watering as the season progresses to avoid bulb rot. Garlic develops best in a wet spring



Cut garlic scapes when they start to curl. Photo by Mary Kate Reeder

and drier summer. A protective structure may be beneficial in particularly rainy climates.

Remove Scapes

Hardnecks put up a tall, woody flowering stalk called a scape (also called a “whistle”) with bulbils at the top. Cut these scapes off when curls form to optimize energy devoted to bulb formation. Use them as you would a scallion or chive to add a fresh garlic taste to a meal (scapes make great pesto!).

Pests and Diseases

Crop rotation is very important to reduce disease and pest transmission. Avoid planting garlic where other *Alliums* (onions, leeks, chives, etc.) have grown in the past three years. Be sure to plant garlic from a reputable source. So far, most of the pests and pathogens of garlic in other regions have not been observed in Alaska, but growers should maintain vigilance to keep crops clean.

Garlic is particularly susceptible to white rot (*Sclerotium cepivorum*), basal rot (*Fusarium culmorum*) and viruses, among other soil-borne pathogens. Indeed, most garlic seed stock in the U.S. harbors viruses that are transmitted from generation to generation through clonal propagation. Many conditions, particularly viral ones, are asymptomatic and may not affect the quality of the crop, although continued weakening of the gene pool is a concern.

Symptoms of some of the more severe rot and soil-borne diseases of garlic include premature yellow leaves and tip burn as well as stunted and rotting bulbs.

A significant pest of garlic in most of the U.S. and Canada is the garlic bloat nematode (*Ditylenchus dipsaci*), which has caused major crop losses. Bulb mites are also a pest of concern for garlic. Symptoms of both of these pests include stunted growth, yellow or wilting leaves and root destruction. Lab analysis of infested specimens may be necessary because of the microscopic nature of most pests. It is important to destroy any infested plants. Please report your garlic pests and diseases for identification to the University of Alaska Fairbanks Cooperative Extension Service Integrated Pest Management program: www.uaf.edu/ces/ipm/cmp/sample-submission/.

Harvest

Harvest when more leaves are brown than green, usually in August or early September. You can check to see if the garlic is ready by digging up a few bulbs. If you harvest too early, bulbs will be small and won't store well. If left in the ground too long, hardneck bulbs will divide and spread apart, collecting soil and moisture, which may lead to rot. In nice fluffy soil, garlic plants may be pulled by hand, but it is usually best to use a tool to gently loosen the bulb. The entire garlic plant is edible in all stages, so relish it at any time!

Cleaning

Gently brush soil off from around the roots and lay plants in a dry, shady spot. **Never wash garlic, and keep moisture to a minimum to avoid rot and mold.**

Curing

After harvesting garlic, it is time to cure it. Experts differ on recommendations about root and stalk pruning prior to curing. Some experts believe that roots left on will wick moisture up into the bulb, encouraging rot. Whether or not you trim the roots and stalks, it's best to hang the garlic in a dry, well-ventilated area. Allow the bulbs to dry for a few weeks to improve storage ability (you can use



After harvest, keep bulbs in a dry place and brush off soil. To deter mold, never wash garlic. Photo by Mary Kate Reeder

fresh garlic at any time — drying is simply a step to avoid mold and rot in the stored crop). Use a fan in the curing space if necessary. If you live in a humid area, curing may take longer and you may need to add low heat to assist the drying process. After it's cured, your garlic is ready for storage or to plant again for next season.

Before storing, clean any remaining soil off bulbs gently with a soft bristle brush, preserving as many layers of the papery skin as possible. Store in netted bags (onion bags) for optimal air circulation. Ideal storage conditions are 45-55°F at about 60% relative humidity to deter both rot and dehydration. Garlic stored below 40°F, or in the refrigerator, will sprout. Garlic grown in Alaska usually has fewer bulb wrappers (leaves), so it may not store as long as garlic grown in a warmer climate.

Save Your Own Seed

Garlic is grown from cloves, so it's easy to save your own seed stock to replant for harvest next season.

Garlic is an increasingly popular crop for Alaska gardeners and farmers to grow—why not give it a try?

Preparing and Cooking with Garlic

By Sarah R-P Lewis, Extension Faculty, Family and Community Development

Basics and Tips:

- The entire garlic plant is edible, raw or cooked, in all stages; relish it any time from the garden.
- Cut scapes when they begin to curl. They become woody when the bulbils/blossoms begin to form.
- To peel garlic, first cut the basal part of the clove off and hit with a knife to loosen the wrapper.
- One fresh garlic clove is equal to about 1 teaspoon garlic powder (but not garlic salt!).
- Cutting or crushing garlic 10-15 minutes before using in a recipe helps develop its healthy organosulfide compounds and retain them more effectively when cooked.
- The more a clove is cut or crushed, the more powerful the flavor will be. Crushing with a pinch of salt can moderate the strength.
- To avoid burning garlic (which tastes unpleasantly bitter) when frying, add the garlic near the end of the process and remove garlic bits from food that will be grilled on an open flame.
- When garlic turns blue-green, it has reacted with an acid in the recipe but is safe to eat.
- To get rid of garlic breath, eat fresh parsley or drink milk. Garlic smell on your hands? Rub them on your stainless steel kitchen faucet and rinse well.
- Garlic can be frozen, tightly wrapped/contained (1) as individual unpeeled cloves, (2) as a block to be grated from (first dice the garlic) or (3) as one part garlic to two parts oil pureed together (soft enough when frozen to scrape amounts off for cooking).
- If you want to make garlic infused oil, be aware that you're providing an ideal environment for *Clostridium botulinum*, the bacteria that causes botulism, to grow. If you make it, refrigerate immediately and store for less than three days. If kept at room temperature for more than 2 hours, then discard.

Garlic Scape Pesto

Puree ¼ pound (⅔ cup) chopped scapes with ½ cup olive oil in a food processor until smooth. Stir in ¼ cup pine nuts (or walnuts), 1 cup grated Parmesan cheese and 3 tablespoons lime or lemon juice. Puree to desired consistency and season with salt and pepper to taste. Serve on bread, crackers or pasta.

Vinegar Pickled Garlic Scapes

Combine ¾ cup apple cider vinegar, ¾ cup water and 1 tablespoon pickling salt in a pot and bring to a boil. Place 1 teaspoon dill seed and ½ teaspoon whole black peppercorns into a pint jar. Cut any hard ends off of ½ pound garlic scapes, then cut into lengths (can include the blossoms) that will fit in the jar, leaving ½ inch headspace. Pack scapes into the jar. Pour the vinegar brine over the scapes, leaving ½ inch headspace. Let the pickles cure for one to two weeks in the fridge before eating. (There is no USDA/Extension-tested recipe for canning vinegar pickled garlic scapes in a water bath.)

Garlic Dressing

Place in a blender 1 cup olive oil, ½ cup lemon juice, 3 peeled garlic cloves, 2 teaspoons of preferred herbs (thyme, rosemary or dill, for example), and ½ teaspoon of salt. Blend until thoroughly mixed. Use immediately or refrigerate up to four days.

Dehydrated Garlic

Peel and finely chop garlic cloves. No pre-treatment or blanching is needed. Dry in an oven or dehydrator at 140°F for 6-8 hours or until brittle or “crisp.” Store in an airtight container and use within a year.

Oven Roasted Garlic

Preheat oven to 350°F. Wash chosen number of whole garlic heads with outer wrapper leaves still on and pat dry. Remove outer wrapper leaves. Keep the heads whole and cut across the top to expose the tops of the cloves. Cut a sheet of foil to wrap each head of garlic. Place heads on foil, cut side up, drizzle each with ½ tablespoon olive oil and season with salt and pepper to taste. Wrap each head tightly and roast for 30-60 minutes until packages are soft when pressed. Squeeze each wrapped clove to push soft garlic onto bread or crackers.

Garlic Soup with Thyme **(recipe by Julianne McGuinness)**

Sauté two large, diced shallots and one head of crushed garlic cloves in 3-5 tablespoons olive oil until sizzling and starting to brown. Add ½ cup dry sherry, Manzanillo or Marsala wine, ¼ cup fresh thyme leaves, 1 teaspoon fresh oregano leaves and a dash of smoked paprika; stir for a few minutes. Add 5 cups of vegetable broth, fresh grated lemon peel, and salt and pepper to taste. Simmer to blend flavors. Garnish with extra fresh thyme. Enjoy as a soup or adapt as a sauce for fish or pasta.

Garlic Bread

Arrange preferred number of thick slices of crusty Italian or French bread on a broiler pan. Crush one clove of peeled garlic for each slice and mix into softened, but not melted, butter. Spread on top of bread and sprinkle with grated Parmesan cheese. Broil until lightly browned.

Vinegar Pickled Garlic

Heat to boiling 1½ cups white vinegar (5 percent acidity), ½ cup sugar and ½ teaspoon pickling salt. Add 3 cups of peeled garlic cloves to a separate pan of boiling water. When garlic water returns to a boil, boil for 1 minute. Drain and pack garlic into hot half-pint jars, leaving ½ inch headspace. Cover with vinegar brine to ½ inch headspace. Run a non-metallic utensil around the inside of jars to remove trapped bubbles. Wipe rims of jars and secure lids. Process in a boiling-water canner for 10 minutes. Remove jars and set aside for 12 hours. Store sealed jars in pantry and eat within a year for best quality. If a jar does not seal, store in the refrigerator and eat within a month.

*A purple stripe bulb prior to separation and planting in a 3-year trial at the Alaska Botanical Garden in 2013.
Photo by Mary Kate Reeder*



Garlic Seed Sources:

Filaree Farm: www.filareefarm.com

Irish Eyes Garden Seeds:

www.irisheyesgardenseeds.com

Johnny's Selected Seed: www.johnnyseeds.com

The Garlic Store: www.thegarlicstore.com

References

Aaron, C. 1997. *The Great Garlic Book: A Guide with Recipes*. Ten Speed Press.

Block, E. 2010. *Garlic and Other Alliums: The Lore and the Science*. Royal Society of Chemistry.

Brust, G. 2013. "Garlic Problems... Again." University of Maryland Extension. Retrieved from <http://extension.umd.edu/learn/garlic-problemsagain>

Engeland, R. 1991. *Growing Great Garlic*. Filaree Productions.

Engeland, R.L. 1995. Supplement to *Growing Great Garlic*. Filaree Productions.

Etoh, T. and P. W. Simon. 2002. "Diversity, fertility and seed production of garlic." *Allium Crop Science: Recent Advances*. H. D. Rabinowitch and L. Currah, editors. New York: CAB International.

Kamenetsky, R. 2007. "Garlic: botany and horticulture." *Horticultural Reviews* 33: 123-172.

Koch, H.P. and L.D. Lawson. 1996. *Garlic: The Science and Therapeutic Application of Allium sativum L. and Related Species*. Williams & Wilkins.

Love, D. and N. Love. 2014. "Garlic production trials, preliminary trials and simple market analysis, Southeast Alaska." Final report for Specialty Crop Competitive Grant, Alaska Department of Natural Resources.

Meredith, T. J. 2008. *The Complete Book of Garlic*. Portland, Oregon: Timber Press

National Oceanic and Atmospheric Administration National Climatic Data Center (NOAA NCDC). 2000. "Alaska Freeze/Frost Occurrence Data 1971-2000." Retrieved from www.ncdc.noaa.gov/climatenormals/clim20supp1/states/AK.pdf.

Rabinowitch, H. D. and L. Currah. 2002. *Allium Crop Science: Recent Advances*. CABI publishing.

Rosen, C., R. Becker, V. Fritz, V., B. Hutchison, J. Percich, C. Tong and J. Wright. 1999. *Growing Garlic in Minnesota*. University of Minnesota Extension.

Schwartz, H.F. and S. K. Mohan. 1995. *Compendium of Onion and Garlic Diseases*. APS Press.

Voigt, Charles. 2004. *2004 Garlic Trial in Northeastern Illinois*. Dept. of Natural Resources and Environmental Sciences, University of Illinois.

Volk, G. M., A.D. Henk and C.M. Richards. 2004. "Genetic diversity among U.S. garlic clones as detected using AFLP methods." *Journal of the American Society of Horticulture Science* 129(4): 559-569.

Video

"Growing Garlic with Heidi Rader," www.youtube.com/watch?v=iYmnx5qn5x0

Websites

Alaska Botanical Garden: www.alaskabg.org

Filaree Garlic Farm: www.filareefarm.com

Garlic Seed Foundation:

www.garlicseedfoundation.info

Orsi Organic Produce: www.orsiorganicproduce.com

Growing Garlic in Alaska, uaf.edu/ces/garlic

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Heidi Rader, Tribes Extension Educator, and Julianne McGuinness, former Executive Director of The Alaska Botanical Garden, garlic grower and consultant



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