

Growing Great Garlic

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Stages of garlic growth

- 🕒 We have no control over *when* garlic starts to make bulbs, only over how large and healthy the leaves are when bulbing starts, and how large the final bulbs can be.
- 🕒 Bulbs start forming once day-length exceeds 13 hours. Air temperatures above 68°F (20°C) and soil temperatures over 60°F (15.5°C) are secondary triggers - no more leaf growth!!
- 🕒 12 hours of daylight = spring equinox. Northern latitudes reach 13 hours of daylight before southern ones, but garlic does not start bulbing there then because it's too cold. Temperatures cause harvest dates to be earlier in warmer zones than in cooler areas at the same latitude.
- 🕒 It is important to establish garlic in good time so roots and leaf growth are as big as possible before the plants start making bulbs. Small plants on the trigger date only make small bulbs!

Pre-plant soaking treatments to reduce some diseases and pests.

Stem and bulb (bloat) nematode:

1. Soak the separated cloves for 30 minutes in 100°F (37.7°C) water containing 0.1% surfactant (soap).
2. Or soak for 20 mins in the same solution at 120°F (48.5°C).
3. Then cool in plain water for 10-20 mins.
4. Or soak in 10% bleach water for 10 mins, warm water rinse.
5. Allow to dry for 2 hours at 100°F (37.7°C) or plant immediately.

Fusarium:

1. Soak the cloves in a 10% bleach solution, then roll them in wood ash (wear gloves). The wood-ash soaks up the dampness of the bleach and provides a source of potassium.
2. Add wood ashes when planting, or possibly dust the beds with more ashes over the winter. (Use moderation - don't add so much that you make the soil alkaline.)

Mites:

1. Separate the cloves and soak them overnight (up to 16 hours) in water. The long soaking loosens the clove skins so the alcohol can penetrate and reach the hidden mites.
2. Optional additions to the water: 1 heaping tablespoon of baking soda and 1 tablespoon of liquid seaweed per gallon (around 8 ml baking soda and 4 ml liquid seaweed per liter).
3. Just before planting, drain the cloves and cover them in rubbing alcohol for 3-5 minutes, so the alcohol penetrates the clove covers and kills any mites inside. Then plant immediately.

Various fungal infections:

1. Separate the cloves and soak them for 15-30 mins in water (optional extras as for mites).
2. Just before planting, drain the cloves and cover them in rubbing alcohol for 3-5 minutes.

Planting rates

- Divide the amount you intend to produce by 6 to figure out how much to plant. 3-9 lbs (1.4-4.2 kg) per person per year in the US
- Single rows, 8 lbs (3.6 kg) of hardneck or 4 lbs (1.8 kg) of softneck per 100' (30 m).
- Large areas 750-1000 lbs/ac (842-1122 kg/ha) for plantings in double rows, 3-4" in-row (7.5-10 cm), beds 39" (1 m) apart

Planting time: Fall-planting is best.

- We plant in early November. 9 am soil temperature 50°F (10°C) at 4" (10 cm) deep. If the fall is unusually warm, wait a week.
- Garlic emerges quickly in the fall
- Roots grow whenever the ground is not frozen
- Tops grow whenever the temperature is above 40°F (4.5°C).
- Get *enough* top growth so garlic has a roaring start in the spring, but not so much that the plants can't endure winter
- If planted too early, too much tender top growth happens before winter

- If planted too late, there won't be enough root growth before winter, and you'll get a lower survival rate and smaller bulbs
- If garlic gets frozen back to the ground in the winter, it can re-grow, and be fine. If it dies back twice in the winter, the yield will be lower than it might have been if you had been luckier with the weather
- When properly planted, garlic can withstand winter lows of -30°F (-35°C)

Popping the cloves

- Separate the seed garlic bulbs into cloves 0-7 days before planting.
- Sort good size cloves in big buckets, tiny cloves in tiny buckets - plant for garlic scallions

Planting

Our method is

- ☞ mark the bed with a row-marker rake
- ☞ make furrows with pointed hoes
- ☞ lightly press the cloves into the furrows at the chosen spacing, using measuring sticks
- ☞ Hardneck - plant pointy end up!
- ☞ Pull soil over the cloves using regular hoes or rakes
- ☞ tamp the soil down with the back of the tool.

Some growers who also plant by hand make a planting jig to make four or more holes at a time in loose soil, rather than make a furrow. Plant a clove in each hole and cover with the right depth of soil

Spacing: Give each plant 32 to 72 square inches (206 -465 cm²). 3" (7.5 cm) is too close. The shading of one plant by another reduces yield. We like 5" (13 cm) spacing in the row, and 8-10" (20-25 cm) between rows, 4 rows in a 3.5-4' (1-1.2 m) wide bed. That's 40 in² (258 cm²) each.

Depth: In the **South, 1.5-2"** (4-5 cm) of soil over the top of the cloves

- ☞ In the **north 3-4"** (8-10 cm) of soil
- ☞ In **Michigan 6"** (15 cm) - Prevent too much top growth
- ☞ In **Arizona**, some growers set the cloves **on the soil surface**, then cover with 6" (15 cm) straw

To grow garlic scallions, set aside the smallest cloves when planting your main garlic crop

- Plant close together in furrows, dropping them in almost shoulder to shoulder, just as they fall. Close the furrow and mulch over the top with spoiled hay or straw.
- We harvest garlic scallions from early March, once they reach about 7-8" (18-20 cm) tall,
- They last till May, unless we need to use the space.
- Loosen the plants with a fork rather than just pulling.
- Trim the roots, rinse, bundle, set in a small bucket with a little water, and you're done!
- Scallions can be sold in small bunches of 3-6 depending on size.
- Or cut the greens at 10" (25 cm) tall, and bunch them, allowing cuts to be made every two or three weeks. Greens wilt quicker than scallions

Weed Control is important Weeds can decrease yield by as much as 50%.

- Kill the spring cool-weather weeds, then kill the summer weeds.
- Take care when hoeing or cultivating and hand-weeding. Keep the leaves in good shape.
- Each leaf damaged or removed will cause about a 17% yield reduction for that plant.

Weed control methods without mulch

- Cultivate fairly frequently
- Tractor cultivation: use tine weeders up until garlic is 6-8" tall. Then hillers will deal with the between-row weeds and some of the in-row weeds, but be careful not to cover too much of the foliage as this reduces yields.

Flame-weeding can achieve as good results as hand-weeding using one-third of the labor.

- Can be used for relatively mature garlic, but young plants (four or fewer leaves) are too easily damaged.
- Direct the flame at the base of the plants, in the morning, when the plants are turgid.
- Don't flame-weed if you have mulch!

Vinegar weeding: Useful to control broadleaf weeds, but has no effect on grass weeds. Can reduce labor by 94% using vinegar rather than hand-weeding, so if broadleaf weeds are what you get, this is a good solution.

2004 SARE Grant report by Fred Forsburg.

- 5 applications of 10% acetic acid vinegar spray during the growing season.

- Start when the garlic is 18" (46 cm) tall
- Spray about every 10 days, from both sides of each row.
- Wear a mask and gloves, long sleeves and long pants, this strength of vinegar is caustic.
- www.honeyhillfarm.com

Diseases are mostly fungal: White Rot, Rust (cold weather); *Fusarium*, *Botrytis*, (hot weather), *Penicillium* Molds, Purple Blotch, Powdery Mildew and Downy Mildew. Bacterial soft rots are also sometimes seen.

Pests include nematodes, thrips, onion maggots, cutworm, armyworm, and mites. Weekly scouting is a good practice. Use pre-planting treatments against nematodes and mites.

Garlic Scapes: Garlic scapes are the firm, round seed stems that grow from hard-neck garlic, starting to appear in our region 3 weeks before harvest, as the bulbs size up. Day-length and temperature determine when.

- If these are removed, the garlic bulbs will be bigger and also easier to braid, if you want braids from hardneck varieties.
- Contrary to ideas mentioned by some sources, leaving scapes in does not increase the storage life.
- 1 acre (0.4 ha) of hardneck garlic produces 300-500 lbs (136-226 kg) of scapes
- Most people who remove scapes cut them where they emerge from the leaves. We prefer to pull ours, to get the most out.
- Harvest scapes 2 or 3 times/week, for 3 weeks in May.
- Late morning is a good time to pull scapes (or early afternoon). Wounds heal quickly then, reducing water-loss from the plant and the risk of disease
- Don't wait for the top of the scape to loop around - they begin to toughen and reduce the final yield of the garlic.
- As soon as the pointed caps have cleared the plant center, grasp the round stem just below the cap and pull slowly and steadily straight up. The scape emerges with a popping sound - you have the full length of the scape, including the tender lower part
- Enjoyable task - it's a stand-up job, and there's a friendly competition to see who can get the longest scape. (Encourages everyone to perfect their technique.)
- Gather into buckets, with scapes upright, put a little water in the bucket.
- Scapes are aligned, easy to bunch or cut up. Scapes sell in bunches of 6-10.
- Store well in a refrigerator for months if needed.

Preparing for garlic bulb harvest

- Day-length as well as accumulated degree days determines when scapes appear and when bulbs are ready to harvest. This is a good time to be paying more attention to your garlic crop, and what better way than walking through pulling scapes?
- Remove any diseased plants from the patch at the same time. 3 weeks before the expected harvest, remove the mulch to help the bulbs dry down, and to prevent fungal diseases.
- In our rotation, the spring broccoli is next door to the garlic, and we move the old garlic mulch to the broccoli to top up the mulch there. It helps us stay on track with getting the broccoli weeded too.
- Hot weather above 91°F (33°C) ends bulb growth and drying down starts. It is important to get plenty of good rapid growth before hot weather arrives.
- Garlic can double in size in its last month of growth, and removing the scapes (the hard central stem) of hardneck garlic can increase the bulb size 25%.

Determining when to harvest: Garlic is ready to harvest when the sixth leaf down is starting to brown on 50% of the crop. The point is to have five green leaves still on the plant, to provide the protection of five intact skins over the bulb. Second method: Cut across hardneck garlic – airspaces around stem show maturity. Our softneck variety is ready a little later than our hardneck.

Mechanical harvest: Use a tractor-mounted undercutter to loosen the bulbs, or a root-harvester

Manual harvest: Use digging forks to loosen the soil – lift, don't pull. Stressing the necks will not improve the curing.

In drought years use overhead irrigation the evening before, to loosen soil enough to harvest without damage.

Treat the bulbs like precious sun-sensitive eggs! Bruised bulbs won't store well, nor will sun-scalded ones. It's better not to wash them, as drying is what's needed. Shake off the soil, without banging the bulbs.

Don't let garlic get above 121°F (49°C) as it will cook.

Hang garlic to cure or spread on racks for 3-4 weeks. Use fans.

Snipping: Test the curing garlic by rolling the neck of a few sample bulbs between finger and thumb. If it feels dry, rather than moist, it's ready. Use scissors to cut off the roots close to the bulb and the tops ¼ - ½ " (0.5-1 cm) above the bulb. Don't remove any skin.

Sorting:

- Decide if the bulb is dry. Feel the cut neck. The remains of the stem may have a Styrofoam texture. The stem should not be damp.
- If damp at all, put the trimmed bulb on a Farm Use rack.
- If not damp, decide if it's storable.
- If the bulb is damaged or mushy anywhere, or the cloves have sprung apart, put it on the Farm Use rack.
- If storable, decide if it's seed size and quality (next slide).
- When all the hardneck garlic is trimmed, weighed and recorded, take it away to storage.
- Then start on the soft neck garlic, if dry. Do the same as with the hardneck garlic. Use different colored bags

Selecting seed garlic: Decide if each bulb is seed size and quality

- If it could be between 2 and 2 ½", measure it. If smaller *or larger*, put in a red bag. It's for eating.
- Don't just save all the biggest bulbs for seed - they tend to be uneven in shape and quality, with cloves of all sizes.
- If 2 - 2.5" (5-7 cm) in diameter, with an even shape and cloves that are tight together, not opening up (and not obviously more than 10 cloves), put it in a green bag.
- We use about 50 lbs per 1000' of seed garlic (hardneck and softneck). This allows some slack.
- When we have enough seed garlic, stop measuring. Simply snip, sort and bag

Storing seed stock

- 🕯 Ideally, store at 50-65°F (10-18°C) and 65-70% relative humidity.
- 🕯 Our seed garlic goes on a high shelf in the shed, at quite variable temperatures, and does fine until early November when we plant it.
- 🕯 Don't refrigerate - prolonged cool storage results in "witches-brooming" (strange growth shapes), and early maturity and lower yields
- 🕯 Avoid temperatures of 40-50°F (4.5-10°C) during the summer, as this causes sprouting before you are ready to plant.
- 🕯 Storage above 65°F (18°C) results in delayed sprouting and late maturity.

General storage:

- We store our eating garlic in a dry, coolish basement at 60-70°F (15.5-21°C) over the summer.
- In late September we move it to a walk-in cooler at 35-38°F (1.5-3°C). At 32°F (0°C) it will store for 6-7 months. Garlic does not freeze until 21°F (-6°C).
- **Avoid the middle temperature range of 40-56°F (4.4-13°C), as this encourages sprouting.**

Resources

Growing Great Garlic, Ron Engeland, 1991, Filaree

ATTRA, *Organic Garlic Production*, www.attra.ncat.org/attra-pub/summaries/summary.php?pub=29

The Garlic Seed Foundation, www.garlicseedfoundation.info An organization of growers and eaters. Website lists suppliers and resources, including the ARS Germplasm Resource, which supplies small amounts of plant material to growers. Extensive library and information on building your own harvesting equipment.

Dr Gayle Volk's Garlic DNA Analysis, (How many garlics are there?) www.garlicseedfoundation.info/allium_sativum_DNA.htm

Bloat Nematodes, www.garlicseedfoundation.info/bloat-nematode-new-york.htm

www.garlicseedfoundation.info/images/nematode-cce.jpg

Fred Forsburg has designed a tractor-drawn planting platform www.honeyhillfarm.com

Vinegar to kill weeds: 2004 SARE Grant report by Fred Forsburg] [FNE03-461 Final Report](#)

Sources for Seed

Southern Exposure Seed Exchange, VA, www.southernexposure.com 540-894-9480,

16 varieties, mostly Organic

Gourmet Garlic Gardens, www.gourmetgarlicgardens.com 325-348-3049,

81 varieties, grown in the US by small growers across the country. Growing instructions, pests and diseases and more

Filaree Farms, WA, www.filareefarm.com

509-422-6940, over 130 varieties

Territorial Seeds, OR, www.territorialseed.com

800-626-0866, 18 varieties

Irish Eyes Garden Seeds, WA, www.irisheyesgardenseeds.com 509-964-7000 or 509-925-6025, 4 varieties

The Garlic Store, CO. www.thegarlicstore.com 800-854-7219. 54 Organic varieties