

Growing, Harvesting, Storing & Marketing Garlic in the Northeast

Ed Frasier, Fraser's Garlic Farm

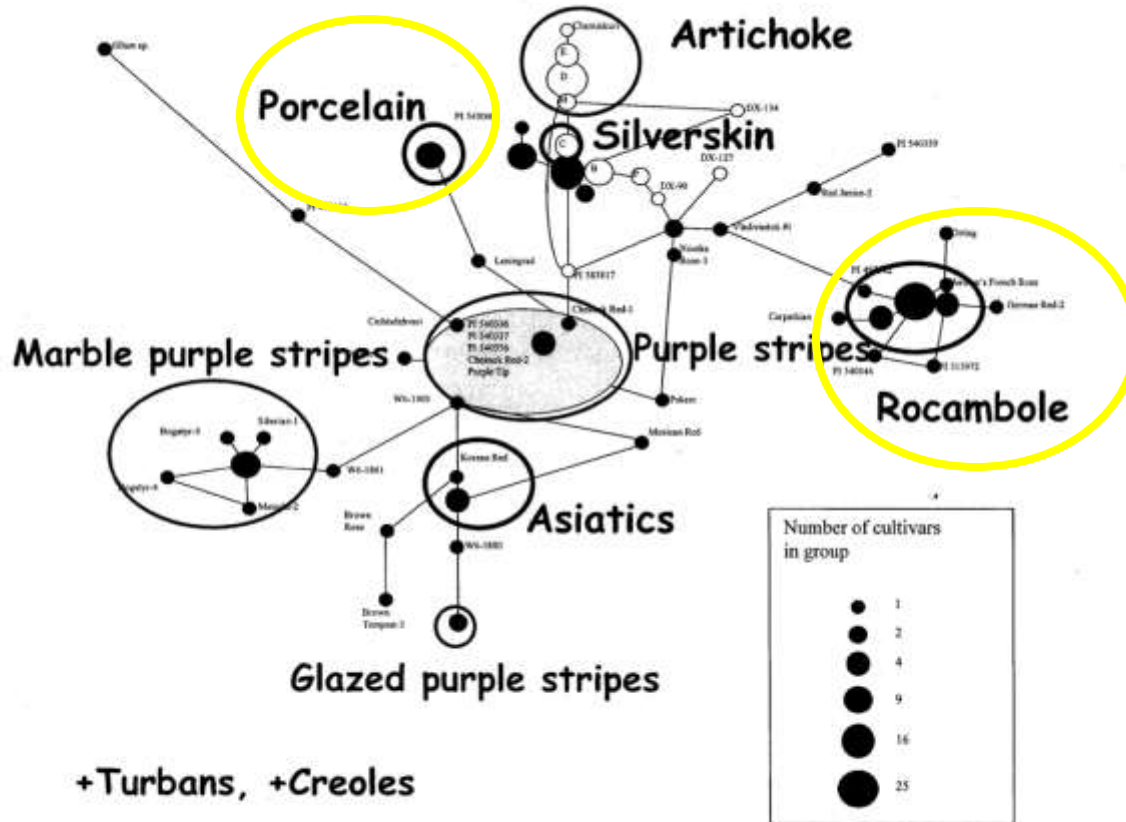
Crystal Stewart, Cornell University Cooperative Extension

Lots to talk about!

- ⌘ A little about *Allium Sativum*
- ⌘ Soil preparation
- ⌘ Fertility
- ⌘ Planting
- ⌘ Weed control
- ⌘ Disease control
- ⌘ Harvesting
- ⌘ Post-harvest handling
- ⌘ Storage
- ⌘ Marketing



Garlic Varieties



Purple stripe



Artichoke



Rocambole



Porcelain



Elephant garlic is a leek!

⌘ *Allium ampeloprasum*

⌘ Bulb contains compounds found in both garlic and leek, but is more closely related to leek

⌘ Mild garlic flavor



Soil Preparation

- & Plant garlic in the fall for good root development
- & Use cover crops to prepare the ground
- & Avoid year after sod



Biofumigant cover crops



Garlic Fertility

Garlic	Nitrogen (N) Lbs/A	Phosphorus (P2O5) Lbs/A					Potassium (K2O) Lbs/A				
		Very low <3lbs/A	Low 3-6	Medium 7-13	High 14-40	Very High >40	Very low <50	Low 51-100	Medium 101-200	High 201-300	Very High >300
Incorporate at planting	0	200	150	100	50	0	200	150	100	50	0
Sidedress before emergence	25-50	0	0	0	0	0	0	0	0	0	0
Sidedress 2-3 times, 3-4 weeks apart	25-50 divided among sidedressings	0	0	0	0	0	0	0	0	0	0
TOTAL	50-100	150	100	75	50	0	150	100	75	50	0

Source: Cornell Recommendations for garlic, used by Agro-One Soil Lab. Based on use of a Morgan extract.

Planting Garlic

First, and most importantly:
plant garlic
with the root
plate down!



Planting details

Depth:

- ⌘ Generally, place tip of garlic 1.5 inches below soil surface
- ⌘ Varies by soil type, mulch type, and environment

Spacing:

- ⌘ Grid spacing: 6 by 6, 8 by 8, 4 by 8, etc.
- ⌘ Row-crop spacing: 4 or more inches in-row, 18 inches or more between rows
- ⌘ Double-row planting: two rows in a 6 by 6 inch grid, 18 or more inches between double rows

Left: Double offset rows at 4 inches

Right: Triple row on standard bed,
6 by 10 inch grid





Add picture of Fred's
platform

To mulch, or not to mulch?

Weed control in garlic

Garlic is an extremely poor competitor with weeds

Weed pressure can easily reduce yields by 30%

Weed control starts before planting and continues until shortly before harvest



Weed Control Step 1: Control Perennials

⌘ Perennial weed control should happen before planting.

⌘ Tillage

⌘ Cover Crops



Step Two: Winter annuals

- ⌘ Look for winter annuals such as chickweed emerging before the garlic emerges. These weeds can be controlled through flaming or very shallow cultivation.



Step Three: Season-Long Control

⌘ Don't stop! Don't ever stop!!



Images: University of Maine

So many options to choose from!

- ⌘ Mechanical cultivation (especially between rows)
- ⌘ Hand weeding (especially in row)
- ⌘ Mulch (plastic/Biotello, hay, leaves)
- ⌘ Vinegar

Mechanical weed control

Hand weeding

Mulch



Vinegar for weed control

- ⌘ 10% is the recommended rate
- ⌘ Applications made on sunny days with temperatures greater than 70 degrees F are most effective
- ⌘ Small (cotyledon stage) plants are most easily controlled
- ⌘ Cosmetic damage to garlic may result

Scaping



Removal sends more energy back into the bulb. Scapes add value to the crop, with prices ranging from \$2 to \$12+ per pound.

Diseases of the field



Fusarium bulb rot (left) and Fusarium basal rot (right).

Severity varies



Control factors

1. Start with clean seed
2. Create a great growing environment for garlic
3. Cull suspicious plants during the season and destroy them
4. Surface sterilization will not control *Fusaria*.

Garlic Bloat Nematode





Ditylenchus dipsaci

Control measures:

1. Start with clean seed—have it tested!
2. Create a great growing environment for garlic
3. Cull suspicious plants during the season and destroy them
4. Surface sterilization will not control Garlic Bloat Nematode

Harvest!

Now your job is to maintain the high quality product you have grown.



Image: Skymeadow Garlic Farm

How much do you like your back?

- & Digging fork
- & Undercutter
- & Potato digger
- & Root digger
- & Middle buster
- & Moldboard plow
- & ETC



Harvesting garlic, Zanjaan, Iran







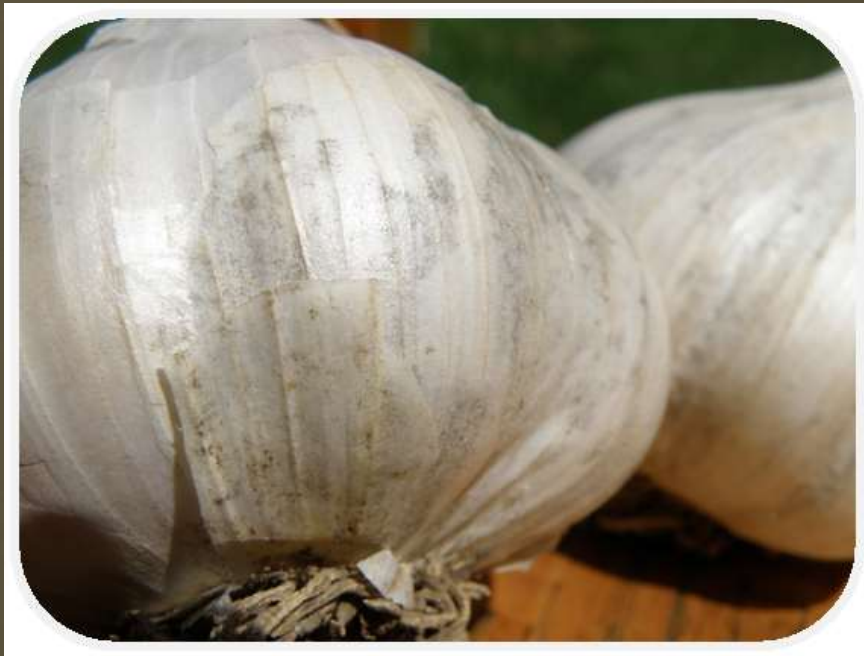




Post-Harvest Handling

⌘ Need a nice picture here.

Post-Harvest Diseases of Garlic



Embellisia (left) and Aspergillus (right). These two diseases are largely cosmetic, but can negatively affect the marketability of garlic. Closely tied to postharvest handling.

Disease continued



Penicillium blue mold (left) and Botrytis neck rot (right). Both diseases are airborne and widely present, but post-harvest conditions play a role in disease severity.

Experimental treatments

A	Trim Roots flush with basal plate
B	Trim tops to 6" long
C	Wash
D	Cure in High Tunnel
E	Cure in open-air structure
F	Leave Roots and tops un-cut

Treatments were combined in every possible combination, for a total of 16 treatments.

Treatment combinations

A=Trim roots flush with basal plate
B= Trim tops to 6" long
C= Wash D=cure in high tunnel
E=Cure in open-air structure
F= leave roots and tops un-cut

F+E	F+D	A+E	A+D
A+E+C	A+D+C	A+E+B	A+D+B
A+E+C+B	A+D+C+B	B+E	B+D
B+C+D	C+E	C+D	B+C+E



A. Root Pruning. Roots were cut while garlic was still moist using a knife or pruning shears. Care was taken not to damage the basal plate.



B. Top cutting. Tops were cut to a height of six inches while garlic was green. The mechanical cutting showed some variation of height.

Top cutting



Tops cut 6" tall with sickle-bar mower. Greens left in field. Garlic was undercut to harvest.

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C. Washing was completed using a garden hose and a nozzle. Power washers were not used. After washing, garlic was air dried before being placed in the curing area. Garlic was washed until dirt was removed from the bulb.



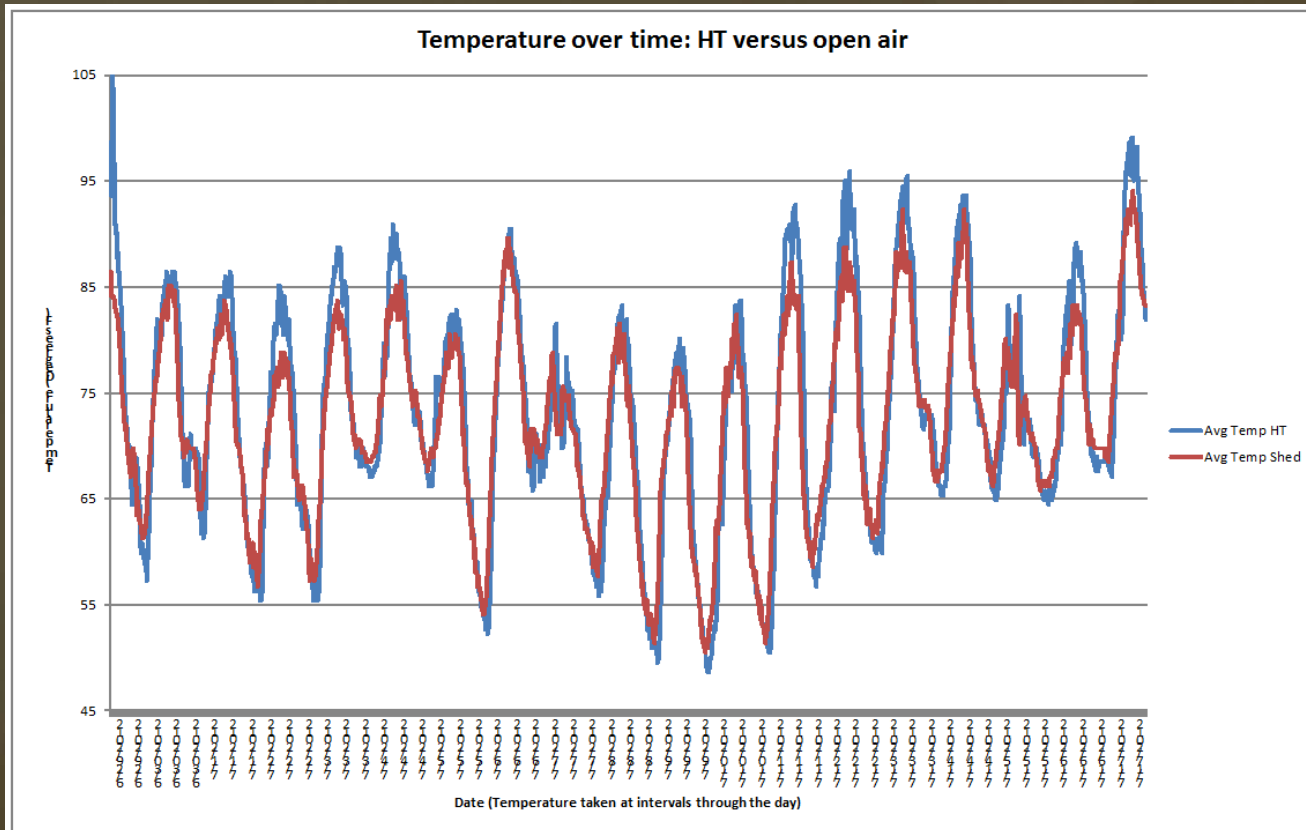
D. Curing in high tunnels: Garlic was moved to high tunnels immediately after other treatments were completed. All high tunnels had a shade cloth and were ventilated with fans, preventing temperatures from exceeding 110 degrees F.



E. Open-Air Curing: These treatments were placed in solid but well-ventilated buildings such as barns and sheds to dry without supplemental heat from the sun.

About High Tunnel Drying

The high tunnel drying temperatures for this year were kept conservatively cool, relative to the outdoor temperatures. Temperatures inside only averaged about 5 degrees warmer in the tunnel than outside. Next year temperatures will be increased to an average of 110°F during the day in the high tunnel. Overall this was a warm, dry curing season whether drying in a tunnel or in an open air system. Increased benefits of the high tunnel system are expected in cooler years.





F. Roots and tops

uncut: Garlic was left completely uncut in this treatment. It was spread out on drying racks to leave space for the bulbs to be one layer deep or it was tied into bundles of 6-10 and hung.

Results: HT vs Open Air

- ⌘ Across the three trials, garlic in high tunnels dried an average of three days faster in high tunnels than in open air structures.
- ⌘ Garlic dried in high tunnels had slightly better wrapper quality (tighter, less discoloration) at one site.
- ⌘ Garlic dried in tunnels also had slightly lower disease incidence (*Aspergillus* and *Embellisia*) in two of the three sites, though disease was not severe in any site or treatment.
- ⌘ No garlic treatments showed damage from being dried in the high tunnel.

Results: Root Trimming

& **Trimmed vs. untrimmed:**
No statistically significant differences were observed between these treatments in regards to bulb quality, weight, or disease incidence.



Treatment: Roots trimmed, tops trimmed, washed, open-air dried

Results: Trimming Tops

Benefit: Speed of harvest is increased

Space taken up in drying area is reduced

Amount of moisture introduced to drying area is reduced

Possible Drawback: bulbs with cut tops had slightly lower average weight

Farm	Average Weight/Bulb Tops Cut	Number of bulbs in sample	Average Weight/Bulb Tops Uncut	Number of bulbs in sample
1	0.11	386	0.15	375
2	0.11	346	0.1	365
3	0.12	304	0.14	232

What does that reduced weight mean?

If you grow 10,000 bulbs, sold at \$8 per pound:

Average cut weight: 0.11

Average uncut weight: 0.13

Difference: 0.02 lbs/bulb, or 200 lbs * \$8 = \$1600

BUT

If you lose 20% of your crop to disease due to poor storage, you lose

$10,000 * 0.13 = 1300 \text{ lbs} * .20 = 260 \text{ lbs loss}$

Results: Washing bulbs

Washed garlic looked very good initially, but became more discolored than the unwashed garlic during the drying and curing process. Disease incidence, particularly *Aspergillus* and *Embellisia*, was slightly higher in washed garlic.

Additional question: In a wet year, would washing mud from bulbs be better than leaving large amounts of dirt on them?



R to L: Immediately after washing, after curing, 1 leaf removed, two leaves removed

Year one conclusions

- ⌘ Drying garlic in HT did not cause post-harvest breakdown or increase disease incidence
- ⌘ Cutting the tops at approximately 6 inches did not increase post-harvest breakdown or increase disease incidence
- ⌘ Washing garlic immediately improved appearance but had minor effect on long-term appearance and disease incidence

For more information...

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Storage

⌘ Could use a picture or two. I might have one from Rich somewhere....

Marketing!

⌘ Any pictures? I have one of Saugerties....