




# Growing Garlic in Minnesota

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UNIVERSITY OF MINNESOTA  
EXTENSION


Spring Garden Fair  
Shorewood, MN  
March 14, 2020



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## Topics

- Background – garlic types
- Review of cultural practices
  - Garlic seed
  - Planting
  - Fertilizing
  - Irrigation
  - Weeds
  - Pests & Diseases
  - Grading & Storage
- Varietal characteristics
- Details on growing garlic in Minnesota
  - <https://conservancy.umn.edu/handle/11299/198792>



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## Garlic Botany & History

- *Allium sativum* L. (member of the onion family)
- Cultivated for thousands of years
- Garlic does not produce true seed under normal conditions – area of research
- Some do not flower
- Vegetatively propagated from cloves
- Diversity has been preserved over many years

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## Broad Categories

- Based on morphological characteristics – Ron Engeland (1991 & 1995)
- Hardneck garlic
  - Develops a flower stalk
- Softneck garlic
  - Does not develop a flower stalk
- Varieties within each category



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## Complicating Factors

- Varietal characteristics can vary with climatic conditions
- May be a softneck in one location, but produce a flower stalk in another
- Sometimes a partial flower stalk is produced
- General classification based on morphology over different environments is difficult

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## Complicating Factors

- No standardization on naming varieties
- Many are renamed by growers
- Best to try out several varieties to determine what is best for a particular area

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### Hardneck vs. Softneck Varieties

- **Hardneck**
  - Produce a flower stalk or scape
    - "topsetting", "bolting"
  - Flowers abort and form bulbils or aerial cloves
  - 3-12 cloves surround the flower stalk
  - Cloves are easy to peel
  - Difficult to braid
  - Tends not store well as well as softnecks
  - Better adapted to cold climates
- **Softneck**
  - Partial or no flower stalk
  - 10-20+ cloves per bulb
  - Easy to braid
  - Flops over near harvest
  - Stores for up to a year



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### Garlic Seed

- **Garlic from grocery stores is not recommended as planting stock**
  - Often not well adapted to MN conditions (some are treated to prevent germination)
- **Purchase from local growers or reputable dealers (MN Garlic Festival)**
  - Filaree Farm, Peaceful Valley Farm Supply, Territorial Seed Co., Garlicstore.com, see garlic bulletin
- **Typical price for garlic seed: \$10.00 to \$34.00 per lb**

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### Cultural Practices

- **Soil and planting requirements:**
  - Well-drained loam, high in organic matter
  - Do not follow other alliums like onions, leeks, or shallots
  - Green manure/compost before planting is recommended
  - pH 6-7
  - Soil test to determine nutrient needs



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### Fertilizer Needs

- **Base P and K needs on soil test; apply before planting**
- **Apply most of N @ planting, remainder in the spring**
- **Moderate to high need for N (0.2 to 0.3 lb N/100 ft<sup>2</sup>)**
  - 1 to 1.5 cups of urea/100 ft<sup>2</sup>
- **Composted manure or other organic amendments can be used to supply all or part of nutrient needs**
  - 200 to 300 lbs compost/100 ft<sup>2</sup>

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### Planting Garlic

- **Popping cloves**
- **Time of Planting**
  - Plant cloves in fall (late Sept. to late Oct.)
  - Chilling required for adequate bulbing
  - Spring planting possible (late March or early April)
- **Depth and Spacing (pointed end up)**
  - 1-2" deep; 4-6" apart in 2 to 4 row beds
  - Space beds 2 to 3 feet apart




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### Mulching

- Straw mulch is recommended to avoid winter damage
- Mulch can be removed in spring or left on
- Soil will warm faster if removed, but more labor is involved



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The top-left photo shows a field with rows of straw mulch. The top-right photo shows a field with green plants growing through a mulch layer. The bottom photo shows a close-up of green plants growing through a mulch layer.


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### Spring Growth

- Shoots emerge in late March or early April
- Shoots may emerge in a warm fall
- Winter damage on hardy strains will not occur if mulched
- Spring snow will not damage shoots



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A close-up photograph of straw mulch. A white circular probe is inserted into the mulch, and a digital display shows "33°F @ 6\"

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### Cold Damage

- May occur with sudden temperature changes
- 60°F end of March, mulch removed
- 5°F first week in April

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The top-left photo shows a plant with a broken stem. The top-right photo shows a plant with a broken stem. The bottom-left photo shows a plant with a broken stem. The bottom-right photo shows a plant with a broken stem.

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### Irrigation

- Shallow root system
- Irrigation is essential for sandy soils
- Bulbing is the critical stage (May-June)
- Stop irrigation 2 weeks before harvest

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### Weed Management

- Poor competitor with weeds
- Use green manure in summer to reduce annual weeds
- Cultivate and use straw mulch
- Some post-emergence herbicides are available



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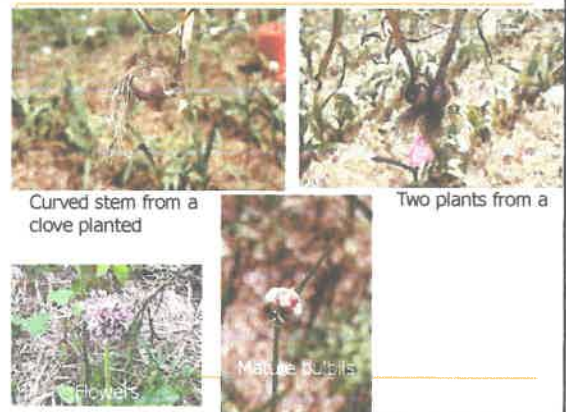
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### Scape Removal

- Scapes should be removed in June to increase bulb yield
  - Yields are 5-30% lower if scapes are left on
  - Use as a vegetable for stir fries
- Leave scapes on if you want to save the bulbils for seed



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### Harvesting




- Usually 1st week in July to late July
- Half of leaves should be brown (do not let all leaves turn brown – cloves break through)
- Varieties mature at different times
  - Very Early – Turban, Asiatic
  - Early – Artichoke, Asiatic, Glazed purple stripe
  - Mid – Rocambole, Creole
  - Late – Porcelain, Silverskin, Purple stripe




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### Harvesting & Curing



- Dig bulbs with roots and shoots attached
- On heavier soil, wash bulbs before curing
- Tie in bunches of 10-15 plants
- Hang in cool, dry area for 3-4 weeks
  - Fans
  - Dehumidifiers

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### Processing

- After curing, cut tops 1/2 to 1" above main bulb
- Trim roots to the base of the bulb
- Brush away any remaining soil and remove outermost skins

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### Grading & Storage

- Based on bulb diameter
  - Bulbs greater than 1.5" are USDA #1
- Suggested grading:
  - <1.75, 1.75-2", 2-2.5", 2.5-3", >3"
  - Bulbs greater than 2.5" are considered premium
- Save seed for next year (about 15%-25% of the crop)
- Storage
  - Table stock
    - 32-35 F (optimum)
    - Refrigerator will promote sprouting
    - Room temperature (will dehydrate faster)
    - 60-70% humidity
  - Planting stock
    - Room temperature only ~ 60-70 F
    - 60-70% humidity

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### Pests and Diseases

- Insects usually not a problem in MN
  - Bulb mites have been found in MN; yield losses are minor, but causes splitting
    - More frequent in recent years
  - Occasional armyworm/cutworm
- However...
  - In 2012, a leafhopper infestation devastated many garlic fields by infecting plants with aster yellows

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### Leafhoppers and Aster Yellows

- Leafhoppers overwinter in southern states and are blown up north with winds in the spring
- In general leafhoppers do not like to feed on garlic
- Spring of 2012 was warm and garlic was one of the only plants green at the time
- Some leafhoppers carry a disease organism called aster yellows

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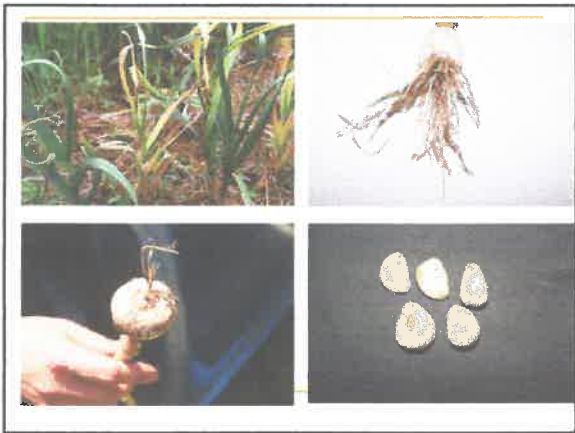


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### Fusarium

- Present in all soils – considered a secondary invader
- Attacks weak plants
- Active at higher temperatures
- Bulbs further decay in storage

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### Fusarium - control

- Use a 4 to 7-year rotation
- Remove infected plants immediately
- Plant disease free seed
- Bio-control (?) – eg. Kodiak



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### Embellisia (skin blotch)

- Common problem under humid/wet conditions
- Symptoms
  - Appear as irregular dark areas on the outer scales of the garlic heads, usually near the base of the bulb
  - Mostly infects dead tissue (outer part of bulb)
  - Often occurs during curing



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### Control of Leafhoppers and AY

- Remove and discard infected plants
- Do not plant cloves from infected plants
- Only plant cloves from bulbs that do not show any symptoms
- Purchase new seed from areas that have not been exposed to AY
- Cover rows with cloth screen (Reemay)
- Use approved insecticides

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### Animal Pests

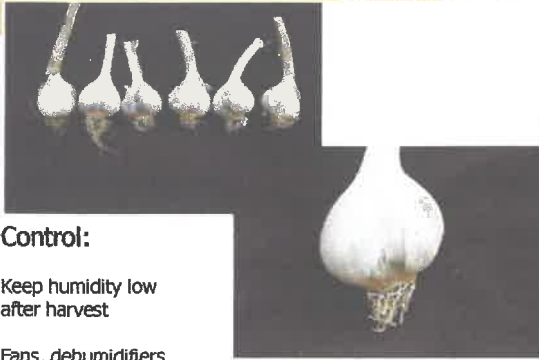
- Gophers
 
- Deer, rabbits, squirrels, birds do not eat
 

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### Penicillium Molds

- Characteristics
  - Field and storage disease
  - Active during cool season (spring)
  - Symptoms – blue-green color on cloves
  - Sometimes plant can out-grow the disease
  - Spreads by air-borne spores
- Control
  - Do not use infected cloves for planting stock
  - Avoid bruising or wounding stored bulbs
  - Immediately cull out plants showing symptoms (small stunted plants)

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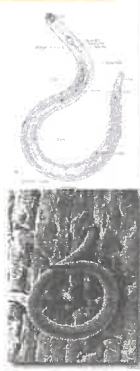
**Control:**

- Keep humidity low after harvest
- Fans, dehumidifiers

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### Nematodes

- Stem and bulb nematode
  - Ditylenchus dipsaci*
- Hosts – most alliums, celery, potato & many others
- One of the most serious problems in garlic
- Recently discovered in Minnesota
- Spread by planting stock
  - Diseased cloves often do not show symptoms



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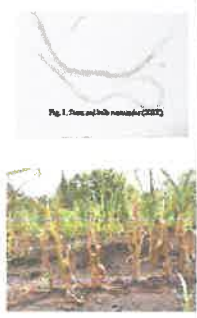
### Nematode Damage in Garlic




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### Nematodes - control


- Rotate out of alliums for at least three years
- Cull out any plants with symptoms
- Remove plant debris
  - Do not return composted garlic debris to the field
- Hot water treatments
  - 40 min at 100°F then 20 min at 120°F
  - <http://www.oma8a.ucv.ca/tenofish/crdnst/hdrf/news/shpntmat@2014/22hrf1.6e1.htm>
- Plant clean seed stock



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### Virus


- Almost all garlic sold for home gardeners contains some virus
- Usually not lethal but may cause mottling of leaves and lower yields
- Cull out disease plants
  - do not use as seed stock
- Larger bulbs usually have less virus



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### Ten Major Garlic Types

- Hardnecks**
  - Rocamboles
  - Purple Stripe
  - Glazed Purple Stripe
  - Marbled Purple Stripe
  - Porcelain
  - Asiatic
- Softnecks**
  - Artichoke
  - Silverskin
  - Creole
  - Turban

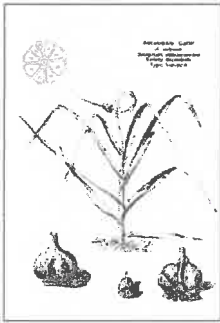


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### Rocamboles

- Flower stalk forms tight coils
- Uncoils as it matures
- 10-12 cloves/bulb
- Stores less than 5 months
- Susceptible to Fusarium
- German Red, Spanish Roja, Gourmet Red

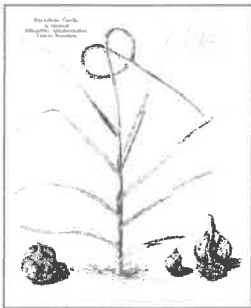


Filaree

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### Porcelain

- Very vigorous
- Small bulbils
- 4-6 large cloves/bulb
- Good for cooking disadvantage for seed
- Stores for 5-6 months
- Music, German White, Georgian Fire, Northern White, Krasnodar White, Armenian

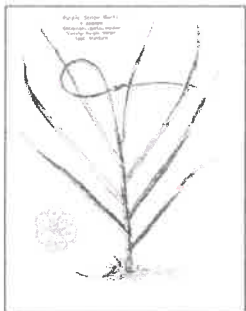


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### Purple Stripe

- Vigorous and well-adapted to cold climates
- Flower stalks do not develop tight coils
- 8-10 cloves/bulb
- Stores for 5-6 months
- Chesnok Red, Persian Star, Dugansky, Rose Deerfield Purple



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### Other Purple Stripes


- Glazed Purple Stripe
  - Purple Glazer, Red Rezan
  - Similar to purple stripe except more intense purple, red purple clove skins
  - Matures early
- Marbled Purple Stripe
  - Siberian, Brown Tempest, Krasnodar Red, Gourmet Red, Bogatyr, Metachi
  - Very vigorous in cold climates



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### Artichoke


- Small plants with large bulbs
- 10-30 cloves in multiple layers
- Partial or complete bolting can occur
- Stores for 6-7 months
- Inchelium Red, Susanville, California Early, Lokalen



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### Partial Bolting of Inchelium Red



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### Asian Tempest

- Always develops a flower stalk under MN conditions
- No curling of flower stalks
- Bulbils very large
- Asian Tempest, Japanese




Asian Tempest  
A. J. ...  
...  
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Filaree

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### Silverskin

- Smaller bulbs and cloves under MN conditions
- White outer wrappings
- Easy to braid and stores for up to 1 yr
- Bolting not common
- Silverwhite, S&H Silverskin




Silverskin  
A. J. ...  
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Filaree

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### Turban

- Blossom, Red Janice, Xian, Tzan, Hohhot
  - Weak scape in cold climates, very early maturing, does not store well, intense purple striping or blotching of bulb skins

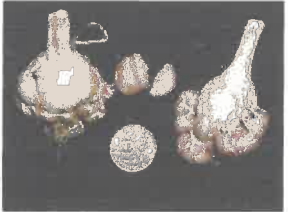


Red Janice  
Minnesota

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### Creole

- Adapted to warmer climates
- Reddish clove skins
- Sweet taste
- Weak bolting in MN
- Subject to winter damage
- Often performs better if spring planted (start in basement)



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### Creole Varieties

- Creole Red
- Ajo Rojo
- Burgundy



Fall Planted

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### General Variety Recommendations

- Highest yielding hardnecks
  - Marbled Purple Stripes
    - Siberian, Krasnodar Red
  - Porcelains
    - Music, Armenian, Georgian Crystal
  - Purple Stripes
    - Chesnok Red, Rose Deerfield purple
- Highest yielding softnecks
  - Artichokes
    - Inchellium Red



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**15<sup>th</sup> Annual Minnesota Garlic Festival**  
August 15, 2020  
McLeod County Fairgrounds – Hutchinson, MN



<http://www.sfa-mn.org/garlicfest/>

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