



## Growing Garlic

**Modern garlic farmers are doing more than just hauling their bulbs to market.**

By Rick Gush

### About the Author

Rick Gush is an American small farmer based in Italy. Garlic easily ranks as one of the top five favorite kitchen seasonings on the planet. But sometimes, growing garlic can be surprisingly difficult. "Most small growers, especially new ones, fail to appreciate the high risks involved in acquiring and trading garlic seed," says Dr. Fred Crowe, Department of Botany & Plant Pathology at the Central Oregon Agricultural Research Center in Madras, Ore.

Dr. Crowe isn't exaggerating. Once a garlic field has been infected with white rot fungus, it may take 40 years before the dormant infection disappears. Another deadly pest of garlic is a nematode that may breed within the seed garlic for up to six seasons before the plants show any major symptoms, at which point it is not uncommon for the entire crop to be suddenly destroyed.

History of Garlic Garlic is a member of the Lily family, and a close relative to onions, shallots, leeks and chives. Garlic is native to either India or Siberia, depending on the information source.

Garlic was likely the first plant to be domesticated.

Documented garlic cultivation first started in India and then moved to the Mediterranean.

Garlic was introduced to the Americas in the 1500s. "A few years ago, a group of 30 small garlic growers in Australia all went out of business together because they had been trading seed garlic back and forth among each other. Once the nematode levels reached critical mass, everybody's crops went down at once," explains Dr. Crowe.

But, that's enough of the scary stories. In general, garlic is a reliable crop, not difficult to grow and if handled well, usually finds a ready market.

### Garlic Types

The taxonomy of garlic is a bit muddy. There are as many as 600 varieties of garlic in use around the world. But because garlic has been heavily traded between various countries, and there is no official registry, and since viruses may make the same garlic species appear in different forms, many of the 600 varieties are undoubtedly duplicates with different names.

It is safe to say that there are two main types of garlic: hardneck (*Allium sativum ophioscorodon*) and softneck (*Allium sativum sativum*). The hardneck types, also called topset garlic, produce fewer, but larger cloves, while the softneck types produce smaller, but more numerous cloves. Most of the commercial garlic available in the supermarkets is of the softneck type. Of the predominantly softneck commercial crop, 25 percent goes to the supermarkets and 75 percent goes to the dehydrating market.

Small farmers on the other hand, more often grow the hardneck varieties. These do not usually store as well as softneck types, but many claim the flavor is better. There are three types of hardneck garlic: Rocambole, Purplestripe and Continental (also known as Porcelain). These all tend to grow better in colder climates.

Hardneck garlic plants send up a central flower shoot called a scape (softneck types sometimes produce scapes too, in times of stress); this scape can be harvested and sold, because it provides a tasty garlic product out of season (springtime) when no other fresh garlic is available. Scapes left on the plants produce flowers that contain masses of bulbils that can be planted to create new garlic plants. Bulbils are produced in the scapes and are smaller than peas; the bulb, on the other hand, contains the cloves. Many small farmers grow hardneck garlic on a two-year cycle, using the bulbils as planting stock instead of the largest cloves as other growers do.

### Garlic Uses



**Garlic as a Pesticide:**Garlic is finding new applications these days as an insecticide, though the practice is several centuries old. Garlic treatments are sometimes efficient preventatives against aphids, thrips and even difficult pests such as bollworms and certain nematodes. Even conventional agribusiness farmers are starting to use garlic as a pesticide. Garlic sprays are usually combined with an oil to make them stick better to leaves. Garlic sprays and drenches are environmentally friendly.

**Garlic and Health:**Eating a small amount of garlic daily is often recommended as a preventive action against cardiovascular problems. Regular garlic consumption is claimed to reduce cholesterol and reduce blood pressure. Proponents claim patients with asthma, atherosclerosis, diabetes, hypertension, and hypoglycemia are all helped by eating garlic. Garlic is known to be antibacterial and antifungal. Some doctors insist the consumption of garlic lowers bad cholesterol and breaks down blood clots. Before vaccines were developed against polio, garlic was used to prevent the disease. Freshly cut cloves of garlic or garlic powder may be beneficial as a topical antibiotic. Allicin, the active ingredient in garlic, has an effect similar to penicillin. Softneck varieties are not usually recommended in colder northern climates. The two main commercial garlic varieties are both softnecks: Californian Early and California Late. These two softneck varieties make up over 90 percent of the commercial plantings in the United States. One reason hardneck varieties are less frequently grown commercially is that the cloves must be planted in an upright position, and this is a difficult task for automated equipment. Softneck garlic cloves on the other hand, can be successfully planted at any angle.

Another general type of garlic is known as Elephant, or Buffalo garlic (*Allium ampeloprasum*). This plant produces the largest cloves, has the mildest flavor, and is mainly used for roasting or stewing. Other types of garlic include Bear's (*Allium ursinum*), Serpent (*Allium sativum ophioscorodon*), Round-headed (*Allium sphaerocephalicum*) and Shoshone (*Allium falcifolium*).

"In recent years, we've become more acquainted with many of the other garlic varieties grown in the world, as they have been increasingly popularized by smaller growers selling into small, local markets and even over the Internet," says Dr. Crowe.

#### Growing Garlic

Garlic growing can be profitable. Buying the cloves to plant a new field of garlic will cost somewhere around \$1,200 per acre, and if all goes well, a farmer can expect to increase the amount of garlic he has planted by somewhere between five and eight times.

Garlic is most often a crop that requires about nine months, from planting in the fall to harvest in the early summer. In warmer areas, it is sometimes acceptable to plant garlic in the spring. Spring planting usually results in far lower harvests of garlic, but large commercial growers on the West Coast and the Southern states regularly plant garlic crops during this time. When spring planting is desired, growers subject the bulbs to a vernalization period (false winter) through refrigeration for a month or more.

Where winters are cold, garlic should be planted before first frost, and should be heavily mulched. The new shoots that emerge in the spring will not have any trouble poking up through even thick mulches. Good mulch also reduces weed growth and keeps the ground a bit warmer and softer. Mulch in the warmer season also acts as a good weed retardant and keeps the soil cooler.

#### Garlic Seed

Garlic seldom produces true seeds, and crops are almost always planted from cloves or bulbils. When buying garlic cloves for planting, farmers should pay a bit more and buy seed cloves that come from a certified clean source. Discounts on planting stock mean higher chances of the cloves being infected with viruses, nematodes or fungal diseases.

In general, the Rocambole types produce a few large bulbils, while the Porcelain types produce lots of small bulbils. When planted, these varieties produce a small plant with a single round bulb at the base. These single bulbils can be replanted the following year, producing full-sized bulbs with many cloves inside. Many small growers plant extra bulbils in order to harvest some in the spring. These young plants can be sold for fresh cooking use at a time when no other fresh garlic products are available. Small farmers also often count on cutting some of the scapes later in spring in order to have a fresh garlic product to sell at that time. Scapes that are left to mature will take energy away from the developing bulbils, so it is a good idea to only leave scapes on those sections that are intended to produce bulbils for future planting.

#### Garlic Pests

Garlic fields are subject to many possible problems. Weeds are a big enemy of garlic and can easily out-compete the young garlic plants. Mulching and/or cultivation are essential to realizing a large harvest. Additionally, growing garlic may be a limited opportunity for each farm, as land that has experienced disease or pest problems may become undesirable for



planting garlic again except after several decades of other crops. If either white rot or nematodes have caused serious problems with a crop, those fields are usually best left to non-Allium crops.

#### White Rot

Far and away the most problematic disease of the garlic industry is white rot, *Sclerotium cepivorum*. This fungal disease strikes all Allium crops, including onions and garlic. The leaves of white rot-infected garlic plants yellow, die back partially and wilt. The roots also rot, allowing infested plants to be easily uprooted. In the soil, a white fungal mycelium develops and then produces a number of round black sclerotia that are the size of a pinhead. It is typical to see the development of white rot from mid-season to harvest.

White rot sclerotia can lie dormant in soil for 20 to 40 years, waiting to detect the scent of a growing Allium root to break their dormancy. These sclerotia are not wind or water borne, but are most frequently relocated by farmers moving onions, garlic or contaminated soil or tools.

Small growers can avoid major trouble and keep the disease under control by constantly being on the lookout and pulling out any diseased plants that may appear in their fields. These are noticeable because they've wilted, and will usually only be in groups of a few plants here and there. "Very careful inspection in the early stages of infestation is an effective control practice, but it will likely need to be sustained forever," explains Dr. Crowe. "Once populations have built to moderate or higher levels, white rot is nearly impossible to control."

Of course, strict sanitation and using disease-free planting material is also a key. Some growers further combat the disease by applying garlic-scented materials to the unplanted fields. These odiferous treatments cause dormant sclerotia to emerge, and then die when they find no plants to infect, but this treatment only works on fields that have not had an Allium crop planted on them for at least six months. Dr. Crowe recommends using a mix made from the juice of 10 pungent onions for every 50 gallons of soil drench (pesticide treatment), and encourages two or three applications before the field is replanted to garlic or other Alliums again.

#### Nematodes

The second nastiest and certainly the sneakiest of garlic pests is the stem and bulb nematode *Ditylenchus dipsaci*. This microscopic (adults are 0.9 to 1.8 mm long) wormlike animal is endoparasitic, meaning it lives inside its host. The nematode lives and reproduces inside the garlic plants, eating parts of the stems, leaves and bulbs. It is capable of living without water and can survive for several years in the surrounding soil. Sometimes the growth of the plant is not affected significantly, but the bulb quality is reduced due to tissue breakdown, deformation or discoloration.

The nasty part of garlic nematodes is that the populations of this pest usually build up for several seasons without appreciable damage being visible. Healthy garlic plants can tolerate moderately large densities of these nematodes without a significant drop in production. Then, all at once, populations can reach a level in which the entire crop can be destroyed in a single year.

Getting clean planting material is the first step in the fight against nematodes. Because garlic seldom produces seed, cloves or bulbils must be used to propagate the crop and these always have the possibility of carrying nematodes. Commercial growers can use sources that rigorously screen the seed fields for nematodes, but small growers have a harder time finding guaranteed nematode-clean stock.

**Thrips**  
Onion thrips are a garlic plant's most common insect pest. Thrips rasp the leaves to acquire sap, causing damage that slows growth and bulb production. Severe thrip damage may cause the plants to wilt and die. In general, thrips begin to enter garlic fields when the weeds in neighboring fields start to dry. Growers usually monitor thrip migrations with sticky traps in their fields.

#### Garlic Harvesting Storage

Commercial garlic growers use mechanized harvesters, but small growers usually harvest by hand. Freshly harvested garlic should be hung in a sheltered location to dry and harden. In California and other warm, dry regions, garlic can be stacked in the field to dry, but the bulbs are covered with the leaves to prevent sunburning.

Once the bulbs are dried, they may be moved to long-term storage locations. Garlic will usually store well for eight months or more if kept cool and dry. Moist storage areas often have problems with mold of the *Penicillium* genus.

#### Garlic Marketing

As with most other aspects of being a small farmer these days, marketing the crop is all-important. Farmers' markets are of course a boon to small growers, but modern garlic farmers are doing more than just hauling their bulbs to market. Fresh garlic is now sold more frequently during the harvest period, because some cooks think that particular ultra-fresh



flavor is superior. The sale of garlic scapes is also an expanding phenomenon. Many growers are also selling first-year bulbs planted in trays, so that customers can trim the plants like chives. Of course, value-added marketing is booming and garlic is being included in dried-flower arrangements, scapes are being pickled, and new garlic sauces are being canned and sold. The health benefits of garlic are more widely understood by today's general public, and this is driving a great number of garlic sales systems.

Consumption of garlic products in America tripled during the 1990s, and the trend looks to continue. Garlic acreage is actually increasing and small farmers are managing a sizeable chunk of that new acreage.

#### Garlic Politics

The world of commercial garlic growing is changing these days. Encroaching suburbs are raising the price of farmland and pushing growers out. Foreign imports of garlic are rising dramatically. Chinese-grown garlic is particularly prevalent in today's major agricultural markets. Battles with pests are also dictating tremendous changes, as white rot prohibits the further growth of garlic on much acreage, and restrictions on chemical use are squeezing the big growers. Throw in a mold epidemic here and there and one can easily see why being a big garlic farmer is more difficult than ever.

Commercial farmers around the world are having the same problems. South Korean growers in particular are upset with some of the shifty political maneuvers that have recently allowed Chinese garlic to flood their markets. Of course Chinese garlic isn't all bad, and many of the largest garlic outfits regularly import Chinese garlic to fill their needs.

At the same time, the small farmer garlic industry is booming. The growth of farmers' markets, the comeback of rural farms selling directly to customers, and the tremendous marketing capacity of the Internet are all factors that have made it a better-than-ever time for small growers to get into the garlic business.

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