

Garlic

An Herb Society of America Guide



The Herb Society of America
9019 Kirtland Chardon Rd.
Kirtland, Ohio 44094

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Introduction

Mission:

The Herb Society of America is dedicated to promoting the knowledge, use and delight of herbs through educational programs, research, and sharing the experience of its members with the community.

Environmental Statement:

The Society is committed to protecting our global environment for the health and well-being of humankind and all growing things. We encourage gardeners to practice environmentally sound horticulture.

Purpose, Scope and Intended Audience

This guide was designed to provide an overview of the uses, cultivation, history, folklore and types of garlic. It was written to accommodate a variety of audiences, providing basic information appropriate for beginners to herbs and herb gardening with supplemental information for intermediate level herb enthusiasts. It can be used as a starting point for those interested in pursuing individual research or developing an herbal presentation/program.

Disclaimer: Information is provided as an educational service. Mention of commercial products does not indicate an endorsement by The Herb Society of America. The Herb Society of America cannot advise, recommend, or prescribe herbs for medicinal use. Please consult a health care provider before pursuing any herbal treatments.

Contributors & Acknowledgements

Text by: Michele Meyers, HSA Director of Education, except where otherwise noted

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Horticultural Advisor: Robin Siktberg, HSA Editor/Horticulturist

Contributors

The Herb Society of America would like to thank the following contributors, without whose expertise and input this guide would not have been possible:

James Adams

Jim Adams has been gardening and growing herbs since childhood. He earned his horticulture degree from Michigan State University. He completed numerous internships at some of the country's premier horticultural institutions before becoming the Assistant Curator of the Fern Valley Native Plant Collection at the U.S. National Arboretum. In 1997, he changed posts and became Curator of the National Herb Garden, also at the arboretum. Jim is a member the Potomac Unit of The Herb Society of America as well as various other horticulture-related organizations. He lives in Washington, D.C.

Gwen Barclay

Gwen is Director of Food Services at The International Festival-Institute at Round Top, Texas. A member of the both the Pioneer Unit and the South Texas Unit of HSA, she is a nationally recognized expert on herbs and herbal cuisine. Gwen and her mother, Madalene Hill, are co-authors of *Southern Herb Growing*.

Susan Belsinger

Susan Belsinger is a culinary educator, food writer and photographer whose articles have been published in *Woman's Day*, *Organic Gardening*, *Victoria Magazine* and *The Herb Companion*. She is the author of *Flowers in the Kitchen*, co-author, with Carolyn Dille, of *The Garlic Book*, *Herbs in the Kitchen*, and *The Greens Book*, and co-author of *Basil: An Herb Lovers Guide* with Thomas DeBaggio. Susan is a member of the Potomac Unit of The Herb Society of America.

Joan DeLauro

Joan is HSA's Garden Consultant and is responsible for the design and maintenance of the demonstration garden at HSA Headquarters. She previously served as Urban Gardening Coordinator at Cleveland Botanical Garden and currently runs her own freelance gardening business. She lives in Cleveland, Ohio, and is a member at large of The Herb Society of America.

Henry Flowers

Henry is a native Texan with a B.S. in Horticulture and a Master of Agriculture degree in Floriculture from Texas A&M University. He has worked as a retail nursery manager and garden manager in Georgia and Texas, and presently works with Madalene Hill as Director of Gardens and Grounds for the International Festival-Institute in Round Top, Texas. Henry is a member of HSA's Pioneer Unit.

Madalene Hill

Madalene was president of The Herb Society of America from 1986-1988 and has been a member since 1957. She organized the South Texas Unit and was a charter member of the Pioneer Unit. Madalene was awarded HSA's Helen de Conway Little Medal of Honor in 1978. She is an accomplished plantswoman, and her garden at The International Festival-Institute at Round Top, Texas, attracts visitors from all over the world.

Lorraine Kiefer

Lorraine Kiefer is the founder and current chairman of the South Jersey Unit of HSA. With her husband, Ted, she owns and operates Triple Oaks Nursery & Herb Garden, a retail garden center and gift shop. Lorraine is a regular garden columnist for several local newspapers and has contributed articles to *Green Scene* and the Brooklyn Botanic Garden's *Gardening for Fragrance*. She lectures regularly at the Philadelphia Flower Show on topics ranging from flower arranging and kitchen gardening to herbal history and fragrant plants.

Pat Reppert

Pat Reppert, founder of Shale Hill Farm & Herb Gardens in Saugerties, NY, has been growing and cooking with herbs since 1965. A graduate of Duke University, she has lectured nationally on herbs, herb gardening, cooking with herbs and herbs for sustaining health. For 13 years she was a familiar voice on Hudson Valley radio, hosting a daily cooking program and appears regularly on the "Martha Stewart Living" television program. She is the founder of the very popular Hudson Valley Garlic Festival held each year in Saugerties, NY, the last weekend of September. Pat is a member and past-president of the International Herb Association, a member of Garden Writers of America and a member at large of The Herb Society of America.

Susanna Reppert

Susanna Reppert is a member at large of HSA, and a fifth-generation folk herbalist still learning about the magic of herbs. She gardens in Mechanicsburg, PA, with her husband, clinical herbalist David Brill and their little herbs Zachery (8), Angelica (4) and Cedar (1). She and her family run The Rosemary House, a herb and spice shop founded in 1968 by her mother Bertha Reppert (1919-1999). An active member of Penn Cumberland Garden Club, The Herb Growing and Marketing Network and the Me-

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chanicsburg Chamber of Commerce, in her spare time she loves to travel, relax and enjoy strawberry garlic margaritas.

Arthur O. Tucker, Ph.D.

Dr. Tucker is a research professor at Delaware State University specializing in the chemistry and identification of herbs. He is a member of the Rosemary Circle and the Northern New Jersey Unit of HSA and has received HSA's Nancy Putnam Howard Award for Excellence in Horticulture, the Helen de Conway Little Medal of Honor, and the Gertrude B. Foster Award for Excellence in Herbal Literature. Art has a B.S. from Kutztown State College and M.S. and doctoral degrees from Rutgers University. He is a nationally recognized expert on flavor, fragrance and medicinal plants and has been published many times in scholarly and popular publications. Dr. Tucker is co-author of *The Big Book of Herbs* with Thomas DeBaggio.

Janet van Nostrand

Janet van Nostrand has been a member of the Southern Ontario Unit of The Herb Society of America for over 20 years and served as president of The Society from 1994-1996. She received the Helen de Conway Little Medal of Honor in 2001.

Charles E. Voigt

Charles Voigt is a member at large of The Herb Society of America. He is the vegetable and herb specialist with the Department of Natural Resources and Environmental Sciences at the University of Illinois at Urbana-Champaign. Mr. Voigt is also the Horticulture Committee Chair of the International Herb Association.

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Gretchen Faro, HSA Executive Director 2002-2005

Arlene Kestner, Ph.D., HSA President 2002-2004

Linda Lain, HSA Communications Committee Chair 2002-2005

Michele Meyers, HSA Director of Education

Lois Sutton, Ph.D., HSA Education Committee Chair 2003-2006

Janet Walker, HSA Botany & Horticulture Chair 2002-2003

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Cover photo credits: Pictured clockwise from top: garlic bulb and cloves by Pat Kenny, flowering *Allium sativum* var. *ophioscorodon* by Pat Kenny, *A. sativum* var. *ophioscorodon* scape from The Herb Society of America collection, photographer unknown.

Description

Garlic – *Allium sativum*

Formerly classified in the lily (Liliaceae) family, garlic is now a member of the Alliaceae (84,85) and is related to onions (*Allium cepa*), chives (*Allium schoenoprasum*) and ornamentals like star of Persia (*Allium cristophii*). Although many plants include “garlic” as part of their common names, only plants in the genus *Allium* with the specific epithet *sativum* are true garlics. Plants like garlic chives (*Allium tuberosum*) have a mild garlic flavor but are not really garlic. Elephant garlic (*Allium ampeloprasum*), which closely resembles true garlic but has very large cloves and a milder flavor, is actually a type of leek.

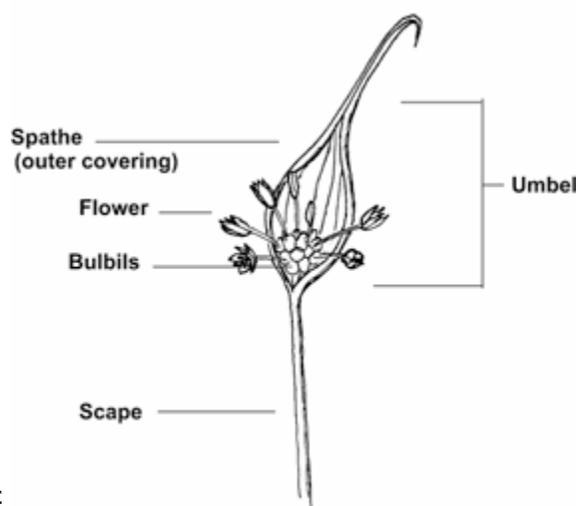


Hardneck bulb (left), softneck bulb (right) and hardneck flower stalk (top)
Photo by Charles Voigt

Most people think of garlic as a bulb made up of cloves. This is the portion of the plant we all experience in kitchens, restaurants and grocery stores. Garlic bulbs can range in size from 1.5 to 3 inches in diameter depending on variety and cultivar (25) and can have from 4-60 cloves of various shapes and sizes (25, 46, 70). Cloves are enclosed in a white or pink-purple tinged papery membrane and are actually swollen “specialized leaves” (25). Garlic plants also have 6-12 flat, narrow “regular” leaves and can reach from just under 10 inches to over 6 feet in height (21, 70, 71, 82).

There are two basic types of garlic: hardneck and softneck. Hardneck garlics are characterized by hard, woody central stalks that extend down to the basal plate at the bottom of the bulb (59). They send up a flower stalk (scape) and umbel covered by a pointed spathe (46). In the *A. sativum* var. *ophioscorodon* hardneck variety, the scape curls or loops. The umbel contains a cluster of greenish-white or pink flowers from which aerial cloves called bulbils develop (46, 70). Bulbils are generally smaller than cloves but, like cloves, can vary in size and number.

Softneck garlics are thought to have evolved from hardneck garlics (25, 70). Softnecks have a non-woody pseudostem formed from overlapping leaf sheaths and rarely send up a flower stalk, unless stressed by climatic conditions (76). If you’ve purchased garlic at the grocery store it was probably a softneck cultivar, since softnecks make up the majority of the U.S. commercial crop.



Hardneck garlic scape and umbel

Garlic is a perennial that is for the most part grown as an annual. Although garlic plants can flower, they have sterile pollen and don’t produce fertile seed (except, rarely, in research laboratories) (76). Garlic is primarily cultivated, but can also reproduce naturally when bulbils fall or bulbs left in the ground break apart into individual cloves (46). For information on growing garlic, see the Cultivation section of this guide.

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There is some debate about garlic's taxonomy (25, 68 cited in 67, 70, 82). Garlic was at one time known as *Allium controversum* (12, 66), which hints at the problems classifying the herb. Most sources recognize one major hardneck variety, *A. sativum* var. *ophioscorodon*, and one major softneck variety, *A. sativum* var. *sativum*. One other little-known variety, *A. sativum* var. *pekinense* (Peking garlic) also exists (70), but most gardeners won't be able to experience this variety firsthand, and information about it is difficult to locate. In the garlic trade, garlics are often separated further into groups based on shared traits, but these are not an official part of garlic's taxonomy and nomenclature. Groups referenced in the trade include Rocambole, Silverskin, Purple Striped, Artichoke and Porcelain. To complicate matters, these groups are sometimes called "varieties" in seed catalogs, but this is a horticultural distinction, and they are not varieties in the botanical sense. See the Varieties and Cultivars sections of this guide for additional information.

Chemistry

Often called the “stinking rose,” garlic may be known for its odor as much as its flavor, but garlic is actually odorless until its cells are ruptured by being “bruised, cut or crushed” (66, 70, 82). Garlic’s signature scent comes primarily from sulfur compounds. When a garlic clove is cut, alliin, an “odorless, sulfur-containing amino acid derivative” (67) reacts with the enzyme alliinase to form allicin and other sulphur compounds (46, 70, 82). Allicin breaks down into diallyl disulfide, which is largely responsible for garlic’s odor (46, 70).

In addition to scent, allicin is also responsible for many of garlic’s health benefits including its anti-oxidant, anti-microbial, cholesterol-lowering and blood-thinning properties (11) and is likely to play a role in garlic’s anti-cancer effects (46). For more information on garlic’s medicinal properties, see the Medicinal Uses section of this guide.

The same compounds that cause garlic’s odor contribute to garlic’s best known side-effect: garlic breath. A major contributor to garlic breath is garlic particles left in the mouth after eating (70), but garlic’s sulfur compounds are also present in perspiration and can produce a lingering garlic scent (5, 46, 82). According to HSA garlic aficionados Susan Belsinger and Pat Reppert, garlic powder is more likely to produce an offensive odor than fresh garlic (5, 58).

There are many folk remedies for garlic breath. Many recommend chewing chlorophyll-rich plants like parsley or mint (5, 39) or cloves, fennel seeds, anise seeds and coffee beans (82). Other possible remedies include bathing in warm water, eating milk, yogurt or honey, and drinking red wine (67). One source suggests rubbing peppermint oil on the feet to remove the scent (41). According to Susan Belsinger, although some of these remedies may help, none will eliminate the odor completely. She recommends eating garlic everyday and encouraging everyone else around you to do the same. Then no one will notice (5)! Regular consumption of small amounts of garlic may also reduce the odor (82). To remove garlic odor from hands after peeling, Pat Reppert recommends rubbing hands with salt and lemon juice, then rinsing with water (58).

Nutrition

A garlic bulb is composed of about 65% water, 28% carbohydrates, 2% protein, 1.5% fiber and only 0.15% fats (11). According to analysis by the USDA, an average clove of raw garlic has just under 5 calories, 12 mg potassium, over 5 mg calcium, 4.59 mg of phosphorus, .94 mg of vitamin C, plus small amounts of a variety of other vitamins and minerals (73). Garlic also contains ten different sugars, cellulose, mucilage, peptides, pectin (82), polysaccharides and saponins (36). Garlic essential oil is GRAS (Generally Recognized as Safe) at 0.01 to 40 ppm (70).

Although garlic is loaded with nutritional value and health promoting effects, it should be given only “sparingly” and with “caution” to small children since it can irritate their sensitive digestive tracts (24, 51). Some sources also caution use while breastfeeding (11, 36) since garlic is excreted into breast milk (51, 82). Note that large doses of garlic may cause gastrointestinal distress in some individuals (24), and those allergic to garlic may need to avoid it altogether. In addition, garlic and other alliums can be toxic to cats, dogs and other animals if eaten in large amounts (83, 86). For additional information on toxicity, see the Medicinal Uses section of this guide.

History & Folklore

Although its exact place of origin is unknown, most experts agree that the garlic cultivated today originated somewhere in Central Asia, and may have evolved from a wild ancestor, *A. longicuspis* (25, 27, 70, 71). Records of garlic's use date back about 5,000 years in China and the Sumerian civilization of ancient Mesopotamia (6, 8, 41). Nomads and traders brought garlic to Egypt, India, Europe and other parts of the world (25, 41, 82), and some believe the Spanish conquistador, Cortéz, introduced garlic to North America in the 1500s (67).

Over the years, garlic has gone by many names including the “stinking rose” and poor-man’s treacle (or cure-all). The Latin name, *Allium sativum*, means “cultivated onion” which suggests that garlic may have been one of the earliest plants to be cultivated by humans (70). The common name derives in part from the shape of the foliage and comes from the Anglo-Saxon words for spear/lance (gar) and pot-herb (leac) (67, 70, 82).

Garlic’s reputation over the centuries has been mixed. It has been valued for its medicinal properties since ancient times and has been a fundamental part of Asian and Mediterranean cuisines, but it has also had a variety of negative associations and was considered unfit for the upper classes due to its smell (41).

Garlic has long been associated with laborers, warriors and peasants. It was eaten by the Egyptian pyramid builders, early Olympians, and Greek and Roman soldiers for strength and vitality, and was a key component in “Four Thieves Vinegar,” a concoction that was believed to prevent infection during The Great Plague of 1655 (6, 7, 21, 81, 82). In Europe, garlic was eaten to help a runner win a race (35).

Herbals

The classic herbalists were somewhat ambivalent about garlic. Gerard and Culpeper considered garlic a poisoning antidote and a cure for intestinal worms, the stings of “venomous beasts,” and a variety of other conditions (19, 33). Culpeper described garlic as “a remedy for all diseases or hurts (except those which it self breeds)” but cautioned that it could “send up strange fancies and as strange visions to the head” if taken in excess (19). Gerard had similarly mixed feelings, writing that garlic “yeeldeth to the body no nourishment at all, it ingendreth naughty and sharpe blood [blood]” (33).

Religious Legends

The ancient Egyptians considered garlic sacred (6) and used it in oath-taking and as part of burial rituals (25, 35, 67). Garlic bulbs were found in Tutankhamen’s tomb (70), and the Egyptian Book of the Dead includes twenty-two remedies involving garlic (41).

Garlic has been associated with Mars, the god of war, and Hecate, “goddess of the night sky, the underworld and enchantment” (41), and was traditionally eaten during rituals celebrating her (20, 35).

The Bible includes only one specific reference to garlic, Numbers 11:5: “We remember the fish, which we did eat in Egypt freely; the cucumbers, and the melons, and the leeks, and the onions, and the garlick” (1). Although it is not mentioned specifically, some believe that garlic was one of the bitter herbs associated with Passover in the Old Testament (37). In addition, according to one legend surrounding the biblical story of Adam and Eve, as Satan left the Garden of Eden after the fall, garlic sprouted from his left footstep and onion from his right (12, 35).

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The association of garlic with the devil and “unclean thoughts” has been part of a variety of religious traditions, including sects of Christianity, Zen Buddhism, Islam and Hinduism (41). Garlic was thought to “enhance sensual feelings” and be “unfit for gods and the sages” in Hindu religion (53). Yet, according to an Indian proverb garlic is “as good as ten mothers” (7). Although it was considered a tonic in ancient Greece, worshippers were forbidden from entering the temples of Cybele after consuming garlic (41).

Protection & Luck

Even though garlic has been associated with the devil, it has more often been viewed as a dispeller of evil and a protective charm. In Sanskrit, garlic means “slayer of monsters” (41). Garlic’s most famous protective use is as a vampire repellent, but it has also been used to ward off scorpions and snakes and has been said to repel evil and invite luck and prosperity if hung over a door (81). In Sephardic culture, garlic was used to shield households from the “evil eye” (48). Brides can carry garlic in their pocket on their wedding day to protect them from evil (20), and in Sicily, garlic is placed in the birthing bed for a successful delivery (41).

Garlic has also been carried by mountaineers and sailors to guard against inclement weather (41), rubbed on cooking pots to protect food (and no doubt also add flavor!), and used to guard against theft (20). According to Homer, yellow garlic helped Ulysses “escape from being changed by Circe into a pig” (35). Garlic’s magical powers are said to vanish if it is rubbed with a magnet or lodestone (20).

In addition to protecting people, some cultures have used garlic to safeguard farm animals and pets. In Scandinavia, garlic was hung around the necks of goats to protect them from trolls (81). Roosters and dogs have been fed garlic in Bohemia to fend off evil influences, and garlic bulbs have served as a protective charm for cows (46).

According to folk tradition, feeding garlic to chickens would do more than protect them. It would actually improve the quality of their eggs (35). Recent research shows that there may be some fact behind the folklore. A study published in *Poultry Science* in December 2002, showed that hens fed garlic paste laid lower cholesterol eggs (17).

Love & Lust

Garlic may have a reputation for producing garlic breath, but it has also long been considered an aphrodisiac. Garlic was traditionally worn by Hebrew grooms to guarantee marital bliss (6), “hung over a marital bed [to ensure] that the couple will have children” (81), and was forbidden for Hindu holy men due to its ability to inspire lust (6). Some suggest that garlic’s aphrodisiac properties are due to mild irritation of genitourinary tract (81).

Language of Flowers

In the Victorian language of flowers, garlic signifies both a “charm against evil” and “I can’t stand you” (34).



Garlic wrapped for a wedding gift
Photo by Pat Kenny

Garlic Today

Today garlic is embraced and celebrated by people around the world. California is the capital of U.S. commercial garlic production and the site of America's largest garlic festival, held annually in Gilroy, but there are many festivals and gatherings around the country. Every year, HSA member, Susanna Reppert, holds an annual garlic Halloween dinner with several courses of garlic, and 30,000 to 50,000 people attend the Hudson Valley Garlic Festival, which was founded by Pat Reppert in Saugerties, New York, and is now produced and sponsored by the Saugerties Kiwanis Club.

Literature & Art

References to garlic can be found in literature around the globe from the dawn of literary history to the present. Garlic appears in the works of Homer, Chaucer, the Latin poet Horace (65 B.C.-8 B.C.), the Greek playwright and poet Aristophanes (448 B.C.-388 B.C.), the Roman poet Juvenal (first-second century), the French writer Rabelais (1490-1553), the Spanish playwright, poet and novelist Cervantes (1547-1616), and Shakespeare. In many cases, garlic was associated with the peasantry or lower classes.

One of the earliest mentions of garlic is in Homer's *Iliad* (circa 700 B.C.):

The draught prescribed, fair Hecamede prepares,
Arsinous' daughter, graced with golden hairs:
(Whom to his aged arms, a royal slave,
Greece, as the prize of Nestor's wisdom gave:)
A table first with azure feet she placed;
Whose ample orb a brazen charger graced;
Honey new-press'd, the sacred flour of wheat,
And wholesome garlic, crown'd the savoury treat...
- Book XI. *Argument. The Third Battle, and the Acts of Agamemnon* (42)

Although Homer portrayed garlic in a positive light, the same cannot be said for Chaucer. In *The Canterbury Tales*, garlic is used in the description of the coarse and "lecherous" Summoner:

A Somnour was ther with us in that place,
That hadde a fyr-reed cherubennes face,
For sawcefleem he was, with eyen narwe.
As hoot he was, and lecherous, as a sparwe;
With scalled browes blake, and piled berd;
... Wel loved he garleek, oynons, and eek lekes,
And for to drinken strong wyn, reed as blood.
-Volume IV. *The Canterbury Tales* [from *The Complete Works (1894-1897)*] *The Prologue*
(15)

Garlic appears in Shakespeare's *A Midsummer Night's Dream*, Act IV Scene 2, when Bottom instructs the actors: "eat no onions nor garlic, for we are to utter sweet breath, and I do not doubt but to hear them say, it is a sweet comedy" (65). Matters are somewhat more serious in the Persian tale, *The Thousand and One Nights*, when a bride orders her husband's two fingers and two large toes to be cut off after he eats a garlic dish (82).

The list of nineteenth and twentieth-century authors who mention garlic in their works is a veritable literary who's-who and includes Oscar Wilde, Elizabeth Barrett Browning, Mark Twain, Bram Stoker, Thomas Hardy, James Fenimore Cooper and Percy Bysshe Shelley, among others. Although most refer-

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ences to garlic in the classics are brief, some modern authors devote entire poems, stories or books to garlic. In the short story, *Wild Garlic* by Mary Flanagan, garlic, “dispeller of evil; purge and protection,” is a symbol for the main character’s struggle for identity and redemption (30). Poems about garlic include *Garlic* by Marvin Bell (1987), *Ode to Garlic* by former Poet Laureate of the State of Oregon, William Stafford, *Wild Garlic* by Gillian Clarke (1993), and *Self Portrait with Garlic* by Indian author Sujata Bhatt (1988). This last poem is just one in *The Stinking Rose* (1995), a book by Bhatt including twenty-five poems devoted to garlic.

Although literary references to garlic abound, documentation of garlic’s portrayal in art is scarce and somewhat obscure. Some of the earliest garlic art may be the carvings of garlic found in the tombs of the Egyptian pharaohs (10 cited in 67). A nameless fifteenth century copper etching by Hausbuchmeister, shows a young man holding a garlic coat of arms (46). Holder and Duff, in their book, *A Clove of Garlic*, mention an unnamed French manuscript that includes an illustration of a man and woman harvesting garlic (41). Garlic images also appear in various herbals, and garlic is depicted in a woodcut in *The Hortus Sanitatis*, 1485, printed in Mainz by Peter Schöffler (46).

Cultivation

Garlic is a relatively easy plant to grow, even for the beginning gardener. It requires little maintenance, and if you have the patience to wait out its lengthy growing period, produces a delicious end product. Although softneck garlic prefers dry, mild climates, and hardnecks generally flourish in colder climates (59), garlic can be grown in many different areas, and there are cultivars suited to different regions (7). This section provides everything you need to get started with helpful insights from HSA’s garlic experts.

Propagation

Since most garlic does not produce fertile seed, garlic is propagated using the cloves. Garlic can also be cultivated from bulbils, the smaller, aerial cloves that form at the top of the scape in hardneck varieties. When planting bulbils, extra patience is required since the bulbs won’t be ready for harvest for 2-3 years (59, 77).

Even though garlic does not reproduce sexually, it shows a remarkable amount of adaptability and variation (58, 76). According to Charles Voigt, HSA member and herb specialist at the University of Illinois at Urbana-Champaign, the same cultivar that produces white bulbs for him in his alkaline soil in Illinois can produce different colors when grown in the South or West (76).

One of the first things to consider when planning a garlic planting is your planting stock. Cloves should be healthy and unblemished without any soft spots, discoloration or other signs of disease (7, 25). The size of the clove affects the resulting bulb; select larger cloves to produce the most substantial bulbs. According some growers, however, for the *Allium sativum*. var. *ophioscorodon* hardneck variety, very large bulbs produce lower quality plants (25).

There are many sources of garlic bulbs for planting. Filaree Farm in Okanogan, Washington, is a knowledgeable source offering many different cultivars. Farm markets, local growers and garlic festivals like the Hudson Valley Garlic Festival in New York State are also excellent sources. One advantage of purchasing planting cloves locally is that local growers will know which varieties work best in their region (58).

OUTDOOR CULTIVATION

Garlic is a perennial that is usually grown as an annual and is hardy from zones 4-9 (12). If treated as a perennial and left in the ground, garlic bulbs will break apart and spread, but the resulting bulbs are likely to be small due to inadequate spacing. Many growers who plant garlic regularly experience this result first hand when a few bulbs are inadvertently overlooked at harvest time. James Adams, Curator of the National Herb Garden, sometimes leaves cloves in the ground or lets bulbils fall purposely, but thins them in the spring before the plants get too big. This way the remaining plants have proper spacing, and James can enjoy eating the tender stalks of the thinned plants (2).

Soil

Garlic can be grown in a variety of garden soils (23 cited in 25, 67) with a pH ranging from 4.5 to 8.3 (66) but prefers light, well-drained loam, rich in organic content (25, 41, 67, 70) with a pH between 6.5 and 6.7 (70). A soil test from a local county extension service can determine soil needs and provide recommendations for improving the soil (39, 58). If growing in the South, Madalene Hill and Gwen Barclay suggest using manure, ashes and sand or gypsum to prepare the soil (40). Susan Belsinger, who gardens in Maryland, and has clay soil, adds lime and green sand or granite dust (5). If soil is particularly wet, raised beds can be helpful (77).

It is important to keep the soil light and loose, and James Adams suggests loosening with a digging fork, especially if you have clay soil (2). Soil that is too heavy may produce irregularly shaped bulbs (67). Adding straw mulch in the fall or early winter can protect from winter weather and “frost heaving” (58, 70, 77) and can prevent weeds (6, 7, 41). The “Goddess of Garlic,” Pat Reppert, recommends moving mulch away from plants in early spring when weather begins to warm so that plants aren’t insulated from the higher spring temperatures and then bringing the mulch back up around the plants “when the green tops are out” (58). Mulching will reduce the need for watering and avert weeds.

Planting

To separate cloves from the bulb, Susan Belsinger recommends removing the outer papery skin then carefully removing the cloves from the basal plate of the bulb (5). Peeling the cloves is not necessary (5, 77, 82). When breaking apart bulbs into individual cloves for planting, take care not to bruise cloves or damage the hard basal plate at the bottom of the clove (5, 59). The stem grows from the basal plate, and bruised cloves can succumb to disease (59).

The planting depth of the cloves depends on your region and the size of the clove (45). In general, cloves can be planted 1-2 inches deep, with the pointed side up (6, 7, 70). In zones 5-10, cloves should be planted about 1-2 inches deep, but in colder zones a deeper planting may be necessary (7). James Adams and Charles Voigt recommend a depth of 3-4 inches in this case (2, 77). Joan DeLauro and Pat Reppert like to plant at a depth that is about three times the size of the clove (22, 58). Lorraine Kiefer plants at a 4-inch depth in southern New Jersey but points out that the bigger the clove, the deeper you plant (45). Deeper planting helps insure that the cloves aren’t expelled during frost heaving (25).

Space cloves 3-8 inches apart * (2, 6, 22, 39, 70). If you are growing garlic for the greens rather than the bulbs, plant small cloves or bulbils close together in the fall (5, 77). This is a good way to make use of smaller cloves that might not be appropriate for bulb-harvested plants. Row spacing can range from 6-32 inches (2, 5, 70), but remember that garlic doesn’t have to be planted in rows. It can also be planted

** In general, ranges in this guide are based on recommendations from sources cited, but exact numbers, measurements and timeframes from individual sources vary.*

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in clumps of three or five plants for an attractive display (39) or in a large circle, like the arrangement in the culinary garden at the National Herb Garden (2).

In general, garlic should be planted in the fall about the same time as tulips and daffodils, 3-8 weeks before the ground freezes (7, 25, 70, 76). The exact time of planting depends on your location, and there is quite a bit of flexibility. In zones 6-10 this is usually September through November (7). In parts of the South and maritime regions where the ground typically does not freeze (38) planting can even occur in December or January (25), although Madalene Hill and Gwen Barclay, who garden in Texas, usually plant in September or October (39). Garlic cloves can also be planted in the spring, but will be larger and more robust with a fall planting.

There are several problems with spring plantings. For optimum results, garlic requires about 9 months gestation (5). Spring planting does not allow the clove enough time for the roots to develop, and because there isn't enough daylight energy before bulbing occurs, there is increased likelihood of producing a round, which is a bulb without divided cloves (76). See the Light & Temperature section for more information on light requirements. Another problem with spring plantings is the dampness of the soil. Charles Voigt points out that in his area, it is sometimes necessary to wait until April for the soil to be dry enough for a spring planting (76). Despite the potential pitfalls of spring planting, keep in mind that if you plan on harvesting green garlic rather than the bulbs, a spring planting can be fine (5).

Light & Temperature

Garlic does best in full sun, but can also be grown as an ornamental in partial shade. If grown in shade, bulbs won't be as big, but if you are growing garlic as an ornamental, this may not be as much of a concern (2).

Garlic's light and temperature requirements are not just a matter of sun vs. shade, however. For proper growth, garlic needs a period of cold followed by a period of light and heat. Garlic does best with 6-8 weeks below 40°F for optimum bulb development (70), and some sources recommend chilling bulbs prior to planting if outdoor temperatures are not in the target range (41, 82). In warmer climates, Patricia Reppert suggests cold-treating bulbs in a paper bag in the refrigerator for 10-14 days (58). Very low temperatures (below 32°F) can also be a problem and can cause small cloves and rough bulbs (25, 70). In general, a cold dormancy period is more critical for hardnecks than some softneck types (25, 76).

Although garlic requires low temperatures in preparation for bulb development, the increased daylength and heat of the spring are necessary for bulbs to begin forming. About 13 hours of daylight and a soil temperature above 60°F are required to initiate bulb growth (70). This is a general guideline, however, and some cultivars are less daylength sensitive than others (70, 82).

Water

According to Madalene Hill and Gwen Barclay, good drainage is the most important consideration for growing garlic (39). Without proper drainage, garlic will be susceptible to a variety of diseases (2). Garlic is not a picky plant when it comes to watering. Depending on where you live and how much rainfall you get, proper drainage may be a bigger concern than watering. Pat Reppert suggests digging down 3-4 inches into the soil. If it is dry, the garlic needs water (58). Arthur Tucker and Thomas DeBaggio recommend irrigating so that the soil is moist to a 12-18 inch depth (70). Stop watering several weeks to a month before harvest (5, 70) so that the papery skins surrounding the bulbs stay dry and the bulbs stay

healthy and don't rot or split apart into cloves prematurely (5).

Fertilizer

There are different approaches to fertilizing garlic organically. James Adams, Pat Reppert and HSA garden consultant, Joan DeLauro, add compost to the soil at planting time but don't add any additional fertilizer (2, 22, 58). Susan Belsinger prepares the soil with compost or aged manure then tries to add fish emulsion containing kelp once a month starting within a week of planting and continuing until a month before harvest (5). Henry Flowers, Director of Gardens and Grounds for the International Festival-Institute in Round Top, Texas, believes that preparing the soil with compost often eliminates the need for additional fertilizer after planting (39).

If you prefer standard fertilizers, Charles Voigt recommends planting with 1-2 pounds 10-10-10 or 12-12-12 fertilizer for every 100 square feet and sidedressing with 1 cup of nitrogen fertilizer per 50 feet of row in early spring when soil warms to 50-55°F (77). Bloodmeal (25), compost tea and manure are good, organic sources of nitrogen (77). Nitrogen is helpful in early spring but should be discontinued in late spring or bulb growth will be delayed (25).

Companion Planting

Garlic has a reputation as a good companion plant for roses and is said to improve their scent (41, 61). It has also been planted around fruit trees to repel borers and is considered an aphid deterrent (61). Some gardeners warn that garlic should not be planted with peas, beans or other legumes (12, 41).

Pat Reppert and Susanna Reppert like to grow garlic with roses for their beauty and to help keep roses pest and disease free (58, 60). Although James Adams hasn't noticed any insect repellent properties he likes to plant garlic with roses for the visual effect and for cultural reasons. Garlic and roses make attractive companions, and garlic won't overtake or smother the roses. If garlic does grow too much, you can always harvest and use the excess (2).

Scientifically, garlic essential oil has been found to have insect repellent properties (46, 54 cited in 70), which may account for the insect repellent effect some gardeners observe. Art Tucker and Thomas DeBaggio point out, however, that due to differences "in local environments and microclimates," gardeners in different areas won't necessarily observe the same results (70).

Containers

In addition to ground plantings, garlic can be grown outdoors in containers. Susan Belsinger grows garlic in whiskey barrels with her children, and each child is in charge of her own barrel. The children plant cloves from one whole bulb around the perimeter of the barrel in fall, and in the spring, plant spring flowers in the center of the barrel to grow along with the garlic (5).

INDOOR CULTIVATION

Most garlic growers don't recommend growing garlic indoors since it is dependent on climate and requires a period of cold and specific daylength (5, 58). Garlic can be started in a greenhouse (39), however, and can be part of a windowsill garden that makes a nice winter children's project (60).

Windowsill-Grown Green Garlic

Fill a goblet or wine glass with marbles and fill $\frac{1}{3}$ with water. Use a clear glass so children can watch the roots growing down into the marbles. Put two cloves on the marbles making sure they don't touch the water and place the goblet on a sunny windowsill. In a couple of weeks, the clove will throw out roots and green tops. Keep a pair of child-safe scissors nearby so kids can cut the green tops.

—Susanna Reppert

See the Culinary Uses section for suggestions for using green garlic.

Pests & Diseases

Garlic has insecticidal properties and is a key ingredient in many organic pest control sprays. Despite its ability to repel certain pests, garlic can succumb to others. Luckily for home growers, however, many pests only plague commercial plantings (25, 82). With proper care, most home gardeners will experience few problems.

Garlic's primary pests are the stem and bulb nematode (*Ditylenchus dipsaci*) and onion thrips (*Thrips tabaci*) (70). Stem and bulb nematodes cause soft, swollen bulbs and stems and require removal and burning of infected plants (25, 82). These are the worst troublemakers for commercial garlic crops (25, 70). *Thrips* cause streaking, spotting and shriveling of leaves (25, 82). To control *Thrips* organically, remove manually and crush, spray with soapy water (82), or use ladybugs, predatory mites (*Amblyseius cucumeris*) or fish oil (25). Eriophyid mites (*Aceria tulipae*) can be a problem for stored bulbs (25, 70, 82), causing them to "shrink and wrinkle" (82). Infected bulbs must be destroyed (25, 82), but one source suggests dusting with sulfur to prevent spreading (82). Onion maggots, army worms and wireworms are other potential pests (25, 70). Depending on your region, larger critters like gophers may develop a taste for garlic and raid your plantings (25, 70, 76). The best defense against gophers is growing garlic in a planting box lined with hardware cloth (76).

Garlic's diseases include onion yellow dwarf virus, which causes small bulbs and yellowing of leaves (25, 70), and various fungal diseases. White rot (*Sclerotium cepivorum*) attacks leaves and roots and can survive in the soil for 10 years (25). Garlic is also subject to downy mildew (*Peronospora destructor*) and neck rot (*Botrytis allii*) caused by excess water (12, 25). According to Susan Belsinger, moisture is the most dangerous "pest." Good air circulation and drainage are essential to prevent mold or fungal rot from destroying an entire crop (5). Basal/bottom rot (*Fusarium oxysporum*) and clove rot (*Penicillium corymbiferum*), a blue green mold, can infect stored bulbs as well as plants. Other garlic diseases include onion smut (*Urocystis magica*) and pink root (*Pyrenochaeta terrestris*) (25, 70). Diseased plants should be removed and destroyed.

With good soil, crop rotation, good planting stock and adequate drainage, garlic can be pest and dis-

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ease free. Since many pests and diseases can survive in the soil, wait 5 years before planting where onions have grown to ensure a healthy garlic crop (70). Avoid chemical pesticides and fungicides, which may cause resistant strains to develop and can be hazardous to human health (21). For more information about garlic's pests and diseases, see *The Big Book of Herbs* by Arthur O. Tucker and Thomas DeBaggio and *Growing Great Garlic* by Ron L. Engeland.

Pruning & Harvesting

Hardneck garlic, *Allium sativum* var. *ophioscorodon*, should be pruned when its flowering stalk (or scape) uncoils and begins to straighten (58, 77). Pat Reppert compares the graceful movement of the stalk to a "garlic ballet" since all of the plants of the same cultivar will generally uncurl simultaneously (58). Remove the topsets (top portion of the scape and bulbils) at this time, so that energy can be directed to the bulb (70, 77). According to Charles Voigt, "depending on the cultivar," pruning topsets can produce "25-30% or more in increased bulb weight" (76). Keep in mind, however, that different cultivars will need to be pruned at different times, and "pruning too early may affect the curing and eventual storage life of the bulbs" (76). Softnecks don't require pruning since they don't normally produce topsets and bulbils. Pruned bulbils can be eaten or replanted later, but will probably take 2 years to reach maturity and be ready for harvest (7, 77).

Traditional wisdom dictates that most herbs are harvested in the morning just after the dew has dried, but this doesn't apply to garlic. Since the bulb rather than the foliage is being harvested, garlic can be harvested at any time of day, as long as the weather is dry (45, 76) and sunny (5, 39). Susan Belsinger likes to harvest during the harvest moon for improved bulb storage (5). As with pruning, harvest time will depend on region and cultivar but is usually between June and July (77), about 9 months after planting (5). In general, softnecks can be harvested earlier because they grow faster than *A. s.* var. *ophioscorodon* hardnecks (25).

Garlic is ready to harvest when leaves begin to yellow or brown and fall over, but there are still about 3-4 (60, 76, 77) or 50% green leaves on the plant (5). Harvesting while some green leaves remain insures that the bulb's papery wrapper remains intact and aids storage (76, 77). If left in the ground too long, the cloves will eventually separate and break free from the bulb (5). To test harvest readiness, Charles Voigt and Pat Reppert suggest digging up one bulb and checking for clove segmentation (58, 76), which can be done by cutting the bulb in half horizontally (59). For hardnecks, if cloves are segmented but not pulling away from the stem they are ready to harvest and should be harvested within 24 hours (58).

To prevent bulb damage, dig garlic rather than pulling it (5, 6, 76, 77). Dig down about 5 inches into the soil, lift the bulb out with a fork (58) and shake off soil (40, 45, 58).

Garlic can also be harvested for its greens, the 10-12 inch edible garlic sprouts (6). If garlic was planted in the spring, the greens can be harvested in about 2½-3 months (5). Fall planted garlic



Green garlic
Photo by Susan Belsinger

greens can be harvested in early spring before the bulb begins to form (77). Remember to leave some plants intact if you plan to harvest bulbs later from mature plants (38).

Susan Belsinger harvests plants from greens to mature stage and loves garlic straight from the ground. According to Susan, although the flavor of fresh, uncured garlic is not as pungent and complex as cured garlic, fresh garlic is “sticky,” “wet,” “flavorful” and “delicious” (5).

Preserving & Storing

Curing

Although garlic can be eaten without being cured, curing strengthens flavor and increases shelf-life (59). Curing is a partial drying process that reduces the moisture content of the bulb (76). Charles Voigt compares curing garlic to aging a wine: the peculiarities of the cultivars develop and flavor intensifies and becomes complex (76).

There is more than one way to cure a garlic bulb. Pat Reppert ties her garlic in bunches of three to five plants and hangs the bunches on strings in a shed for 4-6 weeks. To check for readiness, Pat cuts the stem of one plant ½ inch above the bulb. If there is no greenness, curing is complete. After curing, she cleans the bulbs with a mushroom brush and removes a few of the dirty outer wrappers (58). Susan Belsinger prefers to remove the dirty outer skin as well as any slimy, wet or diseased tops before curing and spreads the plants on a large screen or piece of plywood in the shade for about 2 weeks or until skin is dry. She cautions against curing in direct sun, which can cause skin to peel back and make garlic impossible to store (5). Madalene Hill and Gwen Barclay break off the brown tops before curing and cure in a dry area for several weeks, until the outer shells become papery and dry like parchment (39). Charles Voigt leaves the tops and roots intact until after the curing process is complete (76). If you are going to braid garlic, don't remove the tops, even after curing. Whichever method you choose, be sure to cure your garlic in a dry, dark area with good air circulation. For optimum results, Arthur Tucker and Thomas DeBaggio recommend drying in the shade at 60-70°F and 60-70% humidity for 1-2 weeks, then curing for 4-6 weeks at 80-100°F (70). Most cured garlic will keep 4-12 months depending on cultivar and variety (77), with softneck types having the longest shelf-life (25).

Storing

After garlic is cured, it should be kept in a cool, shady area with good air circulation (6). Mesh bags, cardboard boxes or baskets work well (5, 7, 77). Don't store garlic bulbs in the refrigerator or they may succumb to mold (7). Unlike the bulbs, green garlic can be stored in the refrigerator for about 2 weeks in loose paper or plastic bags but may cause fruits to have a garlic scent (7).

Some sources warn that sprouting cloves have a bitter flavor, but Pat Reppert and Susan Belsinger would like to dispel this common misconception. Even when sprouts appear near the end of the storage season, garlic is still fine to eat and should retain its flavor (5, 58).

Preserving in Oil

Storing garlic in oil is not recommended for long term preservation due to the threat of botulism, caused by toxins produced by the *Clostridium botulinum* bacteria that can grow in oxygen-free, low-acid

environments (14, 28). After reported cases of botulism from garlic and oil preparations, the FDA began requiring microbial inhibitors and acidifying agents in non-refrigerated commercial garlic and oil mixes (28). If preparing garlic in oil, freeze immediately (38) or store in the coldest part of the refrigerator and use or discard within a week.

Freezing

Some garlic lovers claim that freezing garlic alters the flavor (5, 22), but freezing is one way to extend an abundant harvest. Madalene Hill and Gwen Barclay put whole bulbs in the deep freezer in a freezer bag or freezer-rated plastic or glass container. Moisture makes each clove expand and breaks its shell so it's easier to peel. Cloves will have an altered creamy-yellow color but the excellent quality and flavor will be preserved (39). Pat Reppert peels cloves, purees with a little water, and pours into ice cube trays. When the mixture freezes, she transfers the cubes to freezer bags. This is a good way to preserve garlic that is approaching the end of its shelf life (58).

Pickling

Susanna Reppert pickles garlic in vinegar with dill seed, mustard seed, onion, salt and a little bit of sugar. Cloves can be eaten alone or added to sauce, soup, stews and salsa. To reduce the vinegar flavor, rinse the cloves before using (60).

Other Preservation Methods

Commercially, garlic is also dehydrated and made into powder, granules, chips, garlic salt and spice mixes.

Uses

CULINARY USES

Garlic is central to the cuisines of Mexico, the Caribbean, South America, the Middle East, India and China (6) and can impart a robust flavor to many different types of dishes. Economically, garlic is used as a commercial food flavoring (80). Garlic oil/oleoresin is used by the food industry in stews, soups, sauces, vinegars, breads, meats and pickles (66). In addition to more traditional culinary uses, extracts have also been included in baked goods, ice cream, candy, gum and beverages (32 cited in 67). Opportunities for the home cook are equally diverse, and garlic can be an essential component in everything from meats, dressings and vegetables to desserts.

Different garlic cultivars have different levels of heat and flavor, but the method of preparation also influences flavor. Whole and roasted, poached or stewed cloves have a milder flavor (6). Processing or mincing releases more oil and produces the strongest flavor (6). Cooking garlic makes it sweeter and milder (6), and roasting produces a “complex, nutty, caramelized” flavor (7). Madalene Hill and Gwen Barclay use roasted garlic to add a nutty, smooth, rich taste to salad dressings and sauces (38).

Garlic can be peeled with the help of the flat blade of a knife or using only your hands. Susan Belsinger recommends “carefully holding the handle of the knife with the flat blade of the knife parallel to the work surface. Place the garlic clove under the flat blade and press down firmly or give a gentle whack to slightly bruise the clove, which helps release the papery skin” or, simply press down firmly on the clove with your thumb or heel of your hand to break the skin (7).

For those who like garlic flavor but don’t like chunks of garlic in their food, Madalene Hill and Gwen Barclay suggest a garlic paste. To make a paste, slice cloves, then mince and sprinkle with salt. After garlic is minced, pull an angled chef’s knife across the garlic to mash. The salt will pull out the moisture and the paste can be added to dishes to provide a uniform flavor. This method works especially well for non-cooked dishes in which even distribution of garlic is essential (39).

If garlic is going to be sautéed, Pat Reppert prefers cutting it into matchsticks rather than mincing, to prevent burning (58). If adding garlic to sauces, a garlic press may be appropriate (58). Susan Belsinger prefers hand chopping but notes that presses and processors can be effective for strongly flavored dishes like marinades and “long-simmered dishes” (6). Madalene Hill and Gwen Barclay don’t recommend garlic presses and caution against aluminum or “cheap” stainless steel presses, which they consider difficult to clean and can corrode and, according to Madalene and Gwen, affect garlic flavor (38).

Whenever possible, use fresh garlic rather than commercially processed powders, cloves and granules. The flavor of fresh garlic is far superior to dehydrated versions, and garlic powder may contain less than 20% actual garlic due to the addition of large amounts of salt and anti-caking agents (67).

The cloves aren’t the only part of garlic that is edible. Leaves and flowers can be added to salads (7). Flowers have a mild flavor and can be used like scallions (5). Green garlic (young scapes or greens) also have a mild flavor similar to garlic chives (5). They can be added to salads, green garlic mayo or baked in the oven with wine or cream and salt/pepper (5). HSA member, Janet van Nostrand, likes to steam scapes for 2-3 minutes and then sauté in butter (75). Bulbils are also edible and don’t need to be peeled before using (76). They are crunchy and hot and can be delicious added to omelets with extra-

virgin olive oil (58).

Despite the myriad ways to prepare and serve garlic, sometimes simplicity is best. In the words of Charles Voigt: “It’s hard to beat a good bulb of garlic, roasted to perfection, and squeezed out onto tasty, crusty bread and savored.” (76)

Recipes

Whether traditional or adventurous, there are garlic dishes to suit many different tastes. In this section, HSA members share some of their favorites:

ROASTED GARLIC

Roasted garlic can be used in many dishes, but I probably like it best warm, squeezed from its skin and smeared onto bread with a little of its roasting oil. You can use less oil for roasting, but it is tasty and good in most recipes. It is wonderful in soups, vinaigrettes, and sauces, and makes the world’s best mashed potatoes. It can be combined with cream to make a delicious sauce for vegetables, pasta and fish. Slow roasting makes garlic lose most of its heat and turn nutty and sweet, with a pleasant mild garlic flavor. I always roast a few heads at a time, since I use it quite liberally. Although I like it the day it is roasted, leftover cloves can be squeezed into a small dish and just covered with olive oil—then stored tightly-covered in the refrigerator for a few days.



Photo by Susan Belsinger

2 garlic bulbs

About 1/3 cup olive oil

2 or 3 thyme sprigs, a bay leaf, a few sage leaves, or a sprig of rosemary

Salt and freshly ground pepper

Preheat the oven to 300 to 325°F. Remove the outer papery skins of the garlic and break the garlic bulbs into cloves; leave the inner skins on the cloves. Place the garlic in a small oven-proof dish and add the olive oil, herbs of choice, and season lightly with salt and pepper.

Cover the dish with foil. Bake the garlic until it is very tender, check it in about 30 to 35 minutes. It will take about 40 to 50 minutes to roast this many cloves. Test for doneness by squeezing a clove or two—it should be soft and golden. Remove from the oven and let the garlic cool a bit, until it is not too hot to handle.

Makes 2 bulbs of roasted garlic

Recipe © Susan Belsinger

FETTUNTA

I was introduced to fettunta in a Tuscan farmhouse, around the large kitchen hearth. It was a revelation about simplicity in food: saltless whole wheat bread, garlic, olive oil, and coarse sea salt made one of the most satisfying dishes I have ever eaten. I still like to toast the bread over an open fire and make a little hearth-ceremony of rubbing it with garlic and anointing it with a really good Italian extra-virgin olive oil before serving it to friends and family. We probably eat this at our home at least two or three nights a week—almost whenever we have soup, stew, or pasta—and always when we have the grill going. Make it yourself using the following recipe.

4 garlic cloves
About ½ cup extra-virgin olive oil
½ teaspoon salt, or to taste
12 ½-inch thick slices Italian bread

Peel the garlic. Mix the olive oil and salt in a small dish. Toast the bread until it is golden brown on both sides over an open flame, under the broiler, or in the toaster oven. Rub the toast on both sides with the garlic; the toasted bread acts like a grater for the garlic. Then dip one side of each slice briefly in the olive oil. Serve the fettunta immediately.

Makes 6 servings

Recipe © Susan Belsinger, originally printed in *The Herbarist* 2003 (6)

HERBES de PROVENCE and ROASTED GARLIC PESTO

All the flavors of Provence blended into a convenient concentrate.

1 medium head garlic, roasted with olive oil and wine in oven or top of stove
1 cup each firmly packed fresh basil and sweet marjoram or mild oregano leaves and tender stems
¼ cup firmly packed fresh thyme leaves and tender stems
2 tablespoons each firmly packed rosemary, sage and winter or summer savory leaves and tender stems
4-5 large fresh bay leaves, tough center stem removed and leaves cut into several small pieces
1 tablespoon whole fennel seeds, ground
2 tablespoons fresh or dried lavender flowers (be sure flowers do not contain potpourri fragrance oil)
2 tablespoons orange peel, cut into small pieces
1 teaspoon salt
⅔ to ¾ cup extra virgin olive oil

Break garlic into individual cloves and squeeze out soft garlic from pointed end. Blend with remaining ingredients in a food processor until smooth. Use concentrate in very small amounts since flavor is quite pungent. Use as a rub to season meats, in sauces and vegetables or dilute with vinegar and additional olive oil for a delicious salad dressing or marinade. To keep oil-based mixtures fresh and safe, use immediately or store up to 2 years in an airtight container in freezer.

Yield: about 2 cups

Recipe © Madalene Hill and Gwen Barclay

GARLIC RICE PILAF

6 cloves of garlic, peeled
1 onion, peeled
3 tablespoons extra-virgin olive oil
1 cup Basmati rice (or similar rice)
2½ cups beef (or chicken) broth
1 tablespoon fresh garlic chives or regular chives, snipped finely
1 tablespoon fresh parsley, minced

Pre-heat oven to 350°F.

Cut the garlic into slices, then into thin strips. Let sit 15 minutes before frying (see note below). Cut onion into thin slices. After 15 minutes is up, then heat oil in a frying pan and sauté the garlic and onions, until just barely browning. Do not let the garlic burn as it will develop acrid flavors.

When the onions and garlic are just beginning to brown, then add the rice and stir to coat each grain with the oil. Add the broth, stir well and pour everything into an ovenproof casserole (or leave in the skillet if it can go into the oven). Bake in pre-heated 350°F oven for about 40 minutes or until the broth is absorbed and rice is tender.

Just before serving stir in the snipped chives and parsley.

Note: the 15-minute wait is to allow the garlic to develop flavors and the compounds which contribute to good health (allicin). If you use fresh garlic, you will not develop garlic breath after eating nor will the dish be too strong in garlic flavor. **DO NOT USE GARLIC POWDER OR DRIED GARLIC GRANULES** (these are loaded with sulfur and contribute to garlic indigestion and garlic breath).

Recipe © Patricia Reppert, from *Mad for Garlic* (57). Printed with permission.

GARLIC MUSHROOMS with ROSEMARY

2 pounds of large fresh mushrooms
¼ pound sweet butter (no substitutes – Plugra butter is my favorite)
1 medium onion, chopped finely
10 cloves garlic, peeled & minced
1 tablespoon Worcestershire sauce
½ teaspoon each salt and coarse grind black pepper
2 tablespoons fresh rosemary, chopped coarsely
parsley – finely snipped as garnish

Cut the stems off the mushrooms. (I cook the stems separately, using the same recipe, decreasing amounts proportionally.)

Spread the mushrooms in an oblong Pyrex dish (9½" x 13" or thereabouts). Spread the rest of the ingredients over the top and bake – uncovered – in a 350°F oven for 40 minutes. Time this, as you don't want to overcook them and it's hard to tell just when they are done.

Stir the mushrooms and sprinkle some finely snipped fresh parsley over the top.

Yield: serves 6 as side dish and 15 as hors d'oeuvres

Recipe © Patricia Reppert, from *Mad for Garlic* (57). Printed with permission.

RUSSIAN GREEN BEAN SALAD

With garlic, walnuts, basil, cilantro and coriander seed

- ½ cup broken walnuts
- 2 large cloves garlic, peeled and each cut into several pieces
- 4 tablespoons extra-virgin olive oil
- 2 tablespoons white wine vinegar
- 1 tablespoon lemon juice
- 1 tablespoon water
- 1 teaspoon ground coriander seed
- ⅛ to ¼ teaspoon hot pepper sauce such as Tabasco
- 2 tablespoons firmly packed parsley leaves and tender stems
- ¼ cup firmly packed basil leaves
- ¼ cup firmly packed cilantro leaves and tender stems
- 1 pound fresh green beans, stems removed and steamed until crisp – tender and cooled in ice water
- ½ cup thinly sliced green onions
- ½ cup thinly sliced radishes
- Salt and freshly ground pepper to taste

To prepare dressing, place walnuts and garlic in food processor fitted with knife blade; chop, using pulse control, until evenly fine. Add olive oil, vinegar, lemon juice, water, coriander seed and hot pepper sauce; process until smooth. Add parsley, basil and cilantro leaves, and evenly chop, using pulse control.

Pat beans dry and combine with dressing, green onion and radishes; season well with salt and pepper. Add more hot pepper sauce or vinegar/lemon juice as needed to balance flavors. Let stand at room temperature for ½ hour to marry flavors. Do not combine beans with dressing more than 1½-2 hours before serving or beans may change color.

Yield: 4-6 servings

Recipe © Madalene Hill and Gwen Barclay

SPICY GARLIC SHRIMP with FRESH ROSEMARY served over PENNE PASTA

3½ to 4 cups dry penne pasta + boiling water and 1 tablespoon salt
6 tablespoons extra-virgin olive oil
8 cloves garlic – peeled and cut in match sticks
2 tablespoons fresh rosemary leaves – finely snipped
3 medium onions – peeled and sliced
30 extra-large raw shrimp – peeled and de-veined
1 green pepper – seeded and cut in strips
1 red bell pepper – seeded and cut in strips
½ cup pitted cured black olives – cut in halves
1 teaspoon sugar
⅓ teaspoon salt
1 teaspoon coarse grind black pepper
1 tablespoon + 2 teaspoons Tamari sauce (a type of soy sauce)
2 teaspoons Worcestershire sauce
¼ cup dry sherry wine
¼ cup fresh basil leaves – cut in chiffonade
Optional: 2 or 3 dashes of Tabasco sauce

1. Prepare all vegetables, shrimp, etc. and measure out all ingredients as the cooking goes rather swiftly so you want to have everything ready to go in at the appointed time.
2. Bring large kettle of water to a boil, adding 1 tablespoon salt. When water is boiling add the penne and cook until done. (Don't overcook – a little beyond al dente – but NOT limp.) Drain and keep hot.
3. In a large heavy sauté pan (or wok) heat the oil until hot but NOT SMOKING. Add the garlic, cut in matchstick-sized pieces, along with the finely snipped rosemary leaves. Toss and stir until the garlic just barely begins to turn color. Using a slotted spoon, remove cooked garlic from pan and set aside, keeping warm.
4. Put the sliced onions into the infused oil in the pan (adding a little more olive oil if necessary) and sauté, stirring occasionally. Cook until just beginning to color, then add the shrimp and jalapeno pepper. Stir as the shrimp are cooking. When the shrimp are about half done, add the green and red peppers, plus the pitted and sliced olives. Once again, stir and cook until the shrimp are almost done, adding the garlic from Step #3.
5. Make a well in the center – add the sugar, salt, pepper, Tamari, Worcestershire and sherry. Stir until sugar is dissolved. Then toss and stir the contents of the pan until everything is coated with the sauce. Add the fresh basil leaves – stir again – tasting for salt, and serve over hot penne pasta immediately.

Note: use only extra-virgin olive oil – Colavita or Filippo Berio are good brands that are not terribly expensive. Only buy olive oil in clear glass bottles, and check to see that the oil has a greenish tint to it. Extra-virgin olive oil is from the first cold pressing of the olives, and it should smell slightly fruity with no rancid overtones. Tamari sauce is an Asian type of soy sauce. If you can't find it, use regular soy sauce – a little less of it than called for above. Use only high quality sherry wine for your cooking – only wine that you would enjoy drinking by itself.

Serves 4 people

Recipe © Patricia Reppert, from *Mad for Garlic* (57). Printed with permission.

FESTIVAL HILL ROASTED GARLIC CHICKEN with TARRAGON

This recipe was inspired by an old James Beard classic and popularized by the Gilroy Garlic Festival. The garlic cloves become mellow and mild, delicious to spread on crusty bread.

1 fryer-broiler, 2½ - 3 pounds or favorite chicken parts
2 tablespoons olive oil
1 cup chopped yellow onion
1 cup sliced celery
½ cup dry sherry or vermouth
1 tablespoon chopped fresh tarragon
½ - 1 teaspoon salt
⅛ teaspoon freshly ground black pepper
2 whole heads of garlic – separated into cloves and unpeeled, loose, papery skins removed
1½ tablespoons chopped fresh basil
Juice of 1 lemon
Chopped fresh parsley for garnish

Preheat oven to 350°F. Cut fryer into serving pieces; heat olive oil in a large, heavy skillet that is fitted with a lid. Add chicken pieces and cook until lightly browned on all sides; stir in onions and celery, and continue cooking until vegetables are beginning to soften, but do not brown.

Add the wine, then sprinkle tarragon, salt and pepper evenly over chicken. Tuck garlic cloves around and between the chicken pieces and vegetables. Cover the pan tightly and bake for about 30 minutes. If the lid does not fit well, first cover with aluminum foil and then add lid. Reduce heat to 300°F, and continue cooking for 45 minutes to 1 hour, or until juices run clear in chicken and garlic cloves are soft; baste with liquids in pan every 15 minutes. Add more broth or water to keep liquid from evaporating but do not add more wine. When chicken is tender and no trace of pink remains near bone, add chopped fresh basil and lemon juice, stirring to combine completely; adjust flavor with additional salt and pepper. Sprinkle with chopped parsley to garnish before serving. Squeeze the roasted garlic cloves from root end onto crusty French or Italian bread. Delicious with fluffy rice, noodles or new potatoes.

To serve picnic style, remove chicken and vegetables to a serving platter and allow to come to room temperature; reserve juices and pour into a degreasing cup. Let fat rise to the top and remove broth. Pour over chicken to serve. Juices may also be thickened with cornstarch and served with chicken hot from the pan.

Yield: 4-5 servings

Recipe © Madalene Hill and Gwen Barclay

GARLIC SAUTÉ

This basic procedure can be used with many vegetables and meats; it adds a very delicious taste to almost all garden produce and makes any dish a delight.

3-4 tablespoons of virgin olive oil

5-6 cloves of garlic peeled and finely sliced or chopped

1/3 cup chopped onion is optional; more can be used with meat sauté

Meat or vegetable to be sautéed

Salt and pepper to taste

Sautéed broccoli rabe (formerly a spring dish, this “spring tonic” green is now available most of the year) – recipe is easily doubled.

1 pound broccoli rabe or any other spring green such as spinach, kale, and escarole may be used.

1. Wash the broccoli several times in cold water; trim off tough thick stems; cut into smaller pieces if desired.
2. Blanch or par boil the greens in lightly salted water for about 5-8 minutes, less for spinach; drain well.
3. Sauté the garlic and onion for about 8 minutes or until golden blond, not brown. Add the greens and 1/4 cup water; cover and sauté until tender. This might be 30 or more minutes for broccoli rabe or escarole and only 8 minutes for tender spinach. Please use your judgment for each vegetable and do not overcook.
4. Serve hot.

Recipe © Lorraine Kiefer

BASIC MEAT SAUTÉ

Begin the same with garlic and oil, and then add beef cubes, chicken breast or any other meat of your choice. A 1/2 cup or more of wine can be added once the meat begins to sizzle and brown. Thin chicken breasts or chops do not need a long time to cook and if watched and stirred often do not need additional liquid, but sometimes a little wine, water or broth can be added.

Other cuts of meat that need a long cooking time such as beef cubes will need a cup of water added from time to time. Some folks add a can of tomatoes, sliced, pureed or stewed. Once the meat is browned, potato, celery, carrots or any other vegetable can be added. A garlic sauté allows the cook to create a different combination every day.

Recipe © Lorraine Kiefer

BASIC TOMATO SAUCE

Serve with pasta or a vegetable dish such as string beans or squash.

6-8 tablespoons of virgin olive oil
8 or more cloves of garlic
½ cup chopped parsley
4 large cans of plum tomatoes, (pulverize 3 in blender and save the last to blend with the parsley and basil at the end)
1 or 2 cans tomatoes puree
1 onion chopped
4-5 basil leaves or to taste
2 chicken breasts or 1 cup of ground beef (The very old-fashioned cooks used neck bones or ribs. I often make my meatballs and cook in the microwave, then add to sauce the last hour or so.)
Salt and pepper to taste

1. Sauté the garlic, onion and then meat in a large saucepan; add more oil as needed. Cook until lightly browned.
2. Add the pulverized tomatoes; simmer for at least an hour or two on low heat to blend flavors. Some folks simmer longer, but be careful not to burn.
3. Place the last can of whole plum tomatoes in a blender with 1 cup of parsley and a few sprigs of basil; add this to the pot of simmering sauce just before serving; it explodes with a fresh garden taste.

Recipe © Lorraine Kiefer

LORRAINE KIEFER'S MOM'S REAL ITALIAN MEATBALLS

2 slices of day-old bread
½ cup of milk
1 pound ground beef or the combination of beef, pork, or veal if you prefer
2 eggs
2 cloves of garlic
3 tablespoons of Parmesan cheese
⅓ cup of parsley

Put the bread, milk, eggs and parsley in a blender and blend; add this to the meat and mix well. Shape this into meatballs; add breadcrumbs if the mixture seems too soft (roll the meatballs in breadcrumbs). Brown in olive oil for 10 minutes or cook in the microwave; some folks simply add some of the sauce to this meat pan and allow to simmer, others drain the fat and add the meatballs to sauce.

This delicious sauce can be used over your favorite pasta, rice or any vegetable. Those on a low-carb diet can serve it on soy pasta or string beans and top with lots of extra cheese. Freezes well.

Recipe © Lorraine Kiefer

GARLIC VINEGAR

Garlic vinegar can be made with just garlic or with other herbs. One of the nice things about it is that it's wonderful to use in winter when some of the herbs are not available in the garden.

Start with wine vinegar. I usually use white, but for an Italian-flavored vinegar and one that is great for a marinade you can use a light red.

For each jar:

1 quart of wine vinegar

6-8 cloves of garlic, peeled and sliced or chopped

4-5 sprigs of herbs, washed and dried (dip in inexpensive vinegar to wash and remove insects or dust; shake off)

Slices of lemon can be combined with lemon herbs and garlic for a great citrus marinade for poultry or to make a great dressing mixed with mayo or sour cream and honey. (I don't measure for this, just taste, and any sweetener can be used.)

Sterilize some quart size glass jars and put in 6-10 cloves of garlic that have been sliced or chopped into small pieces. Add several sprigs of fresh basil to one jar, tarragon to another, oregano or rosemary to another. Leave some just garlic. Pour about ½ cup of hot vinegar into each jar. (You may use microwave to heat the vinegar.)* Let this steep until the vinegar is cool and then fill up each jar with vinegar. The jars can be covered. Some folks like to use hot vinegar to fill the jar so they can seal it with a canning lid. Just keep in mind that metal should never come in contact with the vinegar. Once the vinegar has aged for at least 3-4 weeks, strain and put in bottles, and cork for storage. Use for marinade, sauces, salads and any other way you usually use vinegar.

Recipe © Lorraine Kiefer

** Note: To ensure safety, heat vinegar to 190°F. After straining out cloves and other solids, vinegar should be stored in a cool, dark place or refrigerator. Non-refrigerated vinegar should last 2-3 months but refrigeration can extend shelf-life to 6-8 months (3, 72). Discard vinegar if mold develops or it appears bubbly, cloudy or slimy, which indicates the growth of yeast (3).*

Don't be alarmed if your garlic has a green or blue-green hue when straining. The color shift does not indicate spoilage and is likely due to a change in acidity resulting from exposure to the vinegar. Anthocyanins and other plant pigments can react with vinegar and may play a role in the discoloration (31, 63, 82).

AÏOLI

4 or 5 fresh garlic cloves
1 egg yolk*
¾ cup olive oil
About 1 tablespoon lemon juice
Salt and freshly ground pepper

Slice the garlic very thin. Pound the sliced garlic to a paste in a porcelain or marble mortar and pestle. There will be some small bits that do not completely break down. If you don't have a mortar and pestle, mince the garlic very fine, then mash it well with the flat of a cleaver or large knife.

Stir the egg yolk into the garlic paste and loosen the mixture with the lemon juice. Add the oil drop by drop at first, stirring continually. After about ¼ cup of oil has been added, drizzle the oil in a thin stream, stirring continually. When the mayonnaise has emulsified, season with salt and pepper, and more lemon juice if desired.

To make the mayonnaise in a food processor, add the garlic paste to the processor, then add the egg yolk and the lemon juice. Drizzle the oil through the feed tube in a thin stream until the mayonnaise emulsifies. Season with salt and pepper, and lemon juice.

Store the mayonnaise in the refrigerator in a tightly-covered glass jar for 3 to 5 days. The flavor is best when the mayonnaise is fresh, but any left over is good in salads.

Makes about 1 cup

Recipe © Susan Belsinger and Carolyn Dille, excerpted from *The Garlic Book* (7), Interweave Press, 1993. Reprinted with permission.

* *Note: Pasteurized eggs can be used to reduce the risk of Salmonella infection that can be associated with raw eggs.*

QUICK GARLIC MAYONNAISE

2 or 3 fresh garlic cloves
¾ cup commercial mayonnaise
2 tablespoons olive oil
2 teaspoons lemon juice, or to taste

Slice the garlic and reduce it to a paste as above. Whisk the garlic into the mayonnaise. Add the olive oil in a fine stream, whisking continually. Whisk in the lemon juice. Use immediately or store in the refrigerator for 3 to 5 days.

Recipe © Susan Belsinger and Carolyn Dille, excerpted from *The Garlic Book* (7), Interweave Press, 1993. Reprinted with permission.

CHOCOLATE CHIP COOKIES with ROASTED GARLIC

When garlic is roasted it turns nutty sweet and loses its pungency. For this recipe the garlic is roasted in a nut oil which emphasizes the nuttiness—I like walnut and hazelnut oil best—you could use peanut or almond oil, but they don't really have a nutty flavor. I usually use the same type of nut in the cookies as the oil in which I roast the garlic (i.e.: walnuts or pecans with walnut oil, hazelnuts with hazelnut oil, macadamia nuts with macadamia oil, etc.) Don't tell your guests what the secret ingredient is and make them guess—even with a hint that it is an herb—they never do!

1 bulb of garlic
¼ cup nut oil
12 tablespoons unsalted butter (1 ½ sticks), softened
1 cup sugar
½ cup dark brown sugar
2 extra large eggs
2 teaspoons vanilla
1 ½ cups unbleached flour
½ cup whole-wheat flour
Scant cup of rolled oats
1 ¼ teaspoons baking powder
¾ teaspoon salt
1 ½ cups chocolate chips
1 cup coarsely chopped nuts

Preheat oven to 325°F. Remove the outer papery skins of the garlic and break the garlic bulb into cloves; leave the inner skins on the cloves. Place the garlic in a small oven-proof dish and add the nut oil. Cover the dish with foil. Bake the garlic until it is very tender; check it in about 30 to 35 minutes. It will take about 45 minutes to roast this many cloves. Test for doneness by squeezing a clove or two—it should be soft and golden. Remove from the oven and let the garlic cool a bit. When it is cool enough to handle, squeeze the cloves of roasted garlic into the oil and discard the skins.

In a food processor or a mixing bowl, combine the butter, roasted garlic, and the nut oil and process, or mash the garlic with a fork and beat ingredients together with a wooden spoon until well blended. Add the sugars and process or stir until combined. Beat in the eggs and add the vanilla; blend well until smooth and creamy.

In a small bowl, combine the flour, whole-wheat flour, oats, baking powder, and salt. Add the dry ingredients to the wet, and process, stopping to scrape down the sides, or mix well with a wooden spoon. The dough will be stiff.

Stir in the chocolate chips and nuts. Drop the dough by the tablespoonful about 2 inches apart on ungreased baking sheets. Flatten the dough with your fingers, or a fork if desired.

Bake the cookies in a preheated oven for 10 to 12 minutes, until they are just golden brown. Remove to baking racks to cool. They will keep, stored in a tightly closed tin or plastic container for a week, or they can be frozen for up to a month.

Makes about 4 dozen cookies

Recipe © Susan Belsinger

**PUMPKIN MARBLE CHEESECAKE with GARLIC GINGERSNAP CRUST
and GARLIC WHIPPING CREAM**

Crust

1 ½ cups gingersnap crumbs
½ cup finely chopped pecans
⅓ cup margarine, melted
10 garlic cloves, minced

To make crust: Heat oven to 350°F. Mix crumbs, pecans, margarine and garlic. Press onto bottom and 1 ½ inches up sides of 9-inch springform pan. Bake 10 minutes.

Filling

2 – 8 ounce packages of cream cheese
¾ cup sugar, divided
1 teaspoon vanilla
3 eggs
1 cup canned pumpkin
¾ teaspoon ground cinnamon
¼ teaspoon ground nutmeg

Beat cream cheese, ½ cup sugar and vanilla at medium speed with electric mixer until well blended. Add eggs, one at a time, mixing well after each addition. Reserve 1 cup batter. Add the rest of the sugar, pumpkin and spices to remaining batter. Mix well.

Spoon pumpkin and cream cheese batters alternately over crust, and cut through batters several times for marble effect.

Bake 55 minutes. Loosen cake from rim of pan and cool before removing rim of pan. Refrigerate.

Garlic Whipping Cream

4 cloves garlic
1 cup heavy cream
3 tablespoons confectioner's sugar

Peel and slice cloves of garlic. Marinate in heavy cream overnight in the refrigerator. Just prior to serving remove garlic cloves and discard. Whip heavy cream with confectioner's sugar. Serve on top of cheesecake.

Recipe © Susanna Reppert

CRAFT USES

The best-known garlic craft is probably the garlic braid, and braiding is an attractive way to display and store garlic. According to Madalene Hill and Gwen Barclay, although braided garlic can be used for decorative purposes they don't recommend it as a preservation method since garlic in this form is unprotected and can shrink and lose its flavor over time (39). This won't be a problem if you use your garlic quickly though, and a garlic braid can be both decorative and useful.

How to Make a Garlic Braid

by Susan Belsinger

Making a garlic braid is a simple task—there are a few different ways to do it—however they all basically use a braiding technique, just like you would use to braid hair. You can make a braid with as few as three bulbs, but I have seen braids at festivals that were 20 and 30 feet in length! A good-sized braid that looks attractive and makes a great gift can be made with twelve or thirteen bulbs.

Softneck garlic must be used to make braids—just try braiding some hardneck and you'll see why. The garlic should be cured for at least 2 weeks. I have harvested garlic from the garden, cleaned off the soil, and braided it then and there, but I do not believe that this is the best way to go. Although the tops are more pliable when first harvested, which makes it easier to braid, I don't think it dries as well and there is more of a chance of mold or rotting. If you do make your braids right after harvesting, hang or lay them in a dry place, out of sunlight, with good air circulation for at least 2 weeks until the foliage is dry.

I generally harvest my garlic, clean it up a bit and remove any black or diseased-looking leaves, and let it cure for 2 weeks (see Curing section). When I'm ready to make some braids, I choose good-looking firm heads, and sort them for size. I brush them free of dried soil and usually I trim the roots back to ½ an inch or so; sometimes I like them shaggy. I don't mind if the bulbs have a little earth on them. For a more perfect look, you can peel off the outermost skin; take care to leave at least a few of the papery wrappers surrounding the bulb.



Photo by Charles Voigt

I often make my braids with cured garlic just the way it dries. However after curing, the leaves have stiffened and become less pliable in the drying process. If this is a bother for you, or it is too hard to work with, you can moisten **JUST** the foliage, **NOT THE BULBS**. You can do this with a spray bottle of water. Spritz just the dried foliage and let them sit for 20 to 30 minutes, perhaps bending them a bit, working them gently with your hands. I have also read instructions that wrap the foliage in between two damp towels, leaving the bulbs hanging out.

Choose three good-looking bulbs to begin your braid; place the bulbs facing away from you and tops toward you. Lay down two of the bulbs so that their foliage is crisscrossing just above the bulbs. Lay the third bulb in between the first two, over the cross. (Sometimes for extra reinforcement you can tie a piece of twine around the base of third bulb and braid the twine along with the foliage. I've tried this but generally don't do it.) Make one set of three fairly tight crossovers with the first three garlics, just as if you were beginning to braid hair. Add a fourth bulb and intertwine its foliage with the foliage of

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one of the first two garlics, work three crossovers tightly, and add a fifth bulb, intertwining its foliage into the braid. Continue braiding and adding bulbs. Braids look best if the bulbs are close together. Depending upon how long the foliage is and how long your braid is, the foliage of the initial three bulbs may run out, but the continuously added garlic will add new foliage to braid.

When you have finished adding bulbs, you can continue braiding the foliage and make it as long as you like. Or, you can tie off the braid with a few rounds of twine and trim the foliage braid to whatever length appeals to you. You can also stick chiles and/or everlastings into the braided foliage for added color and ornamentation. Sometimes I loop the braided top around and hang it from the loop or I might tie a round of twine around the end of the braided foliage and make a loop of twine to hang it from. If you have moistened the foliage, let the braid lay flat until the foliage dries, before hanging.

Keep the braids in a cool dry place. Although garlic braids are used for decoration, if they hang around for too long the bulbs will dry and shrivel and you won't be able to eat them. I hang my garlic and keep a pair of scissors on hand, snipping a bulb from the bottom of the braid as I need it. I work my way up the braid until the garlic is gone and move on to the next braid. Eat your garlic—don't let it gather dust!

Garlic bulbs and umbels can also be made into wreaths, swags and dried flower arrangements. Lorraine Kiefer makes culinary wreaths with bay leaf, garlic and peppers. Madalene Hill and Gwen Barclay tie garlic bulbs into a double thickness of cheesecloth, using butcher's twine to secure to a wooden pick, which can be inserted into a straw wreath base. Bulbs can also be "wired" onto a metal wreath frame to prevent the bulbs from splitting apart when picks are inserted (38).



Photo by John Reim

Garlic skins are often described as papery due to their texture, but they can also be transformed into actual homemade paper which can be kept natural white or dyed with food coloring and accented with dried flowers and leaves (49). In addition to the craft ideas mentioned above, try a simple bowl of garlic and fruit or vegetables for an attractive and unusual centerpiece that is also quick and easy (56).

MEDICINAL USES & ETHNOBOTANY *

Garlic, whose pharmacopeial name is *Allii sativi bulbus* (11), has a long history of medicinal use by cultures around the world for a wide variety of conditions. One of the first medicines, garlic was included in the *Codex Ebers*, a 1550 B.C. papyrus that some consider the oldest medical text on record (13 cited in 67), and was mentioned even earlier in clay, cuneiform tablets from the library of Nineveh in Mesopotamia (8). It has been indispensable to Chinese medicine for thousands of years and was reportedly used by the ancient Egyptians to treat dental cavities (37) and as a general tonic (41). In his *Natural History*, Pliny listed garlic as a remedy for sixty-one ailments (7, 52 cited in 67). Ethnobotanically, garlic was used by the indigenous Cherokee, Choco and Kickapoo peoples (44).

Garlic's uses in folk medicine include treatments for bronchitis and respiratory problems, gastrointestinal problems, flatulence, leprosy, menstrual cramps, high blood pressure, diabetes and externally for warts, corns, arthritis, muscle pain, neuralgia and sciatica (35-37, 55, 66). It's no wonder that garlic acquired the name poor man's treacle, or cure-all.

* *The Herb Society of America cannot advise, recommend, or prescribe herbs for medicinal use. Please consult a health care provider before pursuing any herbal treatments.*

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In Ayurvedic medicine garlic is considered heating, diuretic, diaphoretic (induces sweating), expectorant, carminative, anti-coagulant, anthelmintic (rids the body of intestinal worms), and immune-enhancing (53). Homeopathically, garlic is used to treat upper respiratory tract inflammation, rheumatism and digestive problems (36).

Louis Pasteur first verified garlic's antibacterial properties scientifically in 1858 (46, 82), and during WWI garlic juice, water and sphagnum moss were used to bandage wounds (35, 82). It was also used in WWII to prevent septic poisoning and gangrene (67). Even before Pasteur's discovery, garlic was a military disinfectant, and poultices of moss, garlic and wine were used to treat soldiers in the army of Ancient Rome (8, 59).

Recently, science has begun to confirm many of garlic's long-standing medicinal uses. Garlic has been shown to lower blood cholesterol, blood pressure (11, 24, 36) and blood sugar (53, 66) in studies and clinical trials. Garlic has also demonstrated anti-cancer, antibacterial, anti-fungal and anti-oxidant effects (11, 24).

Medicinal garlic comes in many forms, but raw garlic is most potent medicinally (6, 70), and deodorized forms may have reduced medicinal action (70). According to a researcher at the National Cancer Institute, garlic should be chopped and allowed to sit for 10-15 minutes before cooking to stabilize beneficial compounds and maximize garlic's anti-cancer properties (47).

Other than garlic breath, garlic's side effects include digestive disturbances/flatulence, occupational asthma, postoperative bleeding and skin irritation, particularly from prolonged or excessive exposure (36). Garlic "folk remedies" have been used on children and babies in various cultures (6), but large amounts of "garlic preparations" such as oil or extracts have reportedly caused deaths in small children (66, 82). Garlic can irritate the digestive tracts of very young children (79 cited in 24), and some sources don't recommend garlic for breastfeeding mothers (11, 36). In addition, some individuals are allergic to garlic (11, 24).

GARDEN USES

Garlic plantings aren't limited to vegetable and herb gardens. Garlic also makes a nice addition to flower gardens and perennial, annual or mixed borders (7, 58). James Adams likes to plant garlic with roses and perennials and points out that garlic's grassy texture lightens gardens. The flowers and leaves are beautiful and give a garden added depth and dimension (2). Henry Flowers prefers to plant in groupings rather than rows with soft textured plants that require similar growing conditions. In the South, garlic can be grown with lettuce, kale, pansies or parsley for a border, as decorative plants (39).

Garlic is also useful in theme gardens and gardens for children (9, 69) and the disabled (62, 64). Plant it in children's alphabet, international and pizza theme gardens (9), Native American medicine wheel gardens (18), and historical gardens including Medieval or Civil War plants (50).

OTHER USES

Insect Repellent

Garlic has a long folk tradition as an insect and pest repellent used to combat aphids, white flies, spiders and other pests (61, 66, 82), but garlic's insect repellent abilities are more than just folklore. Dial-

lyl disulfide and diallyl trisulfide, two compounds in garlic oil, are insecticidal (46). In scientific studies, garlic has successfully destroyed mosquito larvae and certain species of ticks, and has repelled mosquitoes, black flies, fruit flies, and fleas (46). Garlic oil has been effective enough combating insects to be included in a patented insect repellent for humans (78 cited in 46). Garlic has also demonstrated success repelling larger pests, including rabbits, moles and deer (41). It can be used to prevent the spread of mold and repel insects from stored fruit (53), and some people even place garlic in drawers to repel moths (41).

Susan Belsinger's Garlic and Chile Insecticidal Soap

For many years I've made this spray, (which I may have read about in a long ago issue of Mother Earth News or Organic Gardening) from garlic and hot peppers and applied it to plants with an infestation of aphids and white fly. I also use this spray on my plants before moving them back into the greenhouse after spending the summer outdoors; it makes all of the critters take off and leave.

The recipe is loose, but generally to make about 3 cups of concentrate I use:

- 6 or 8 large cloves of garlic
- 3 or 4 hot chile peppers, fresh or dried
- 3 cups water
- 1 tablespoon liquid castile soap (like Dr. Bronner's or Basic-H)

Put the garlic, chiles, and water into the blender and blend until the garlic and chiles are pureed. Let stand for at least 2 hours or overnight. Pour the mixture through a strainer lined with fine cheesecloth, through a coffee filter, or even a jelly bag. You can also use a wet paper towel, though this takes longer to strain. The idea is to get rid of all of the particles because they will stop up the valve of your sprayer.

Once strained, pour into a jar with a plastic lid (not metal), add the soap, and stir. The concentrate is ready to use, or it can be stored in a cool dark place for a few months to be used as needed. My spray bottle holds a little less than a liter, so I add about 2 to 3 tablespoons of the concentrate to the bottle and fill it with water. I spray the plants late in the day, so that hot sun doesn't shine on them once they are sprayed, making sure I get both sides of the leaves. You may need to apply the spray a few times if you have a serious infestation.

Recipe © Susan Belsinger

Adhesive

Garlic "glue" can be made by simply rubbing clove juice on paper (41) or glass, and garlic adhesive has been used to repair glass in China (16, 74 cited in 55).

Cosmetics

Homemade cosmetics can be made with garlic. For a face cleanser, combine garlic and lemon with water, or cider vinegar and lavender flowers. For a scalp and hair lotion, mix garlic with vodka, water and rosemary (41). Believe it or not "garlic derivatives" have even been used in perfumes (32 cited in 67)! When using garlic in cosmetic preparations, Pat Reppert suggests applying a diluted garlic solution on the inside of the arm to check for sensitivity or irritation (59).

Garlic Varieties*

Allium sativum var. *sativum*

Genus: *Allium*

Species: *sativum*

Variety: *sativum*

Common name: common softneck garlic

Characteristics:

- o softneck (no woody central stalk)
- o no flowers or flower stalk unless stressed
- o no bulbils
- o large bulbs and highest number of cloves (8-60); cloves of various sizes, often arranged in layers
- o rough-edged leaves
- o long storing
- o easily braided

Groups referenced in the horticultural trade:

- o Artichoke – overlapping clove layers resemble an artichoke
- o Silverskin – smooth, white wrappers; longest storage time



A. sativum 'Nootka Rose' is a softneck cultivar with a pseudostem of overlapping leaf sheaths characteristic of *A. sativum* var. *sativum*. Photo by Charles Voigt

Allium sativum var. *ophioscorodon*

Genus: *Allium*

Species: *sativum*

Variety: *ophioscorodon*

Common names: rocambole, serpent garlic, hardneck garlic, topsetting garlic

Characteristics:

- o hardneck (woody central stalk)
- o curved or coiled flower stalk
- o bulbils
- o white, purple or pink flowers
- o smaller bulbs and fewer cloves (4-14), but cloves are of uniform size and arranged in a single layer around stalk; easy peeling cloves
- o smooth-edged leaves
- o often considered gourmet due to flavor and limited availability
- o short storing
- o requires cold winters for optimum growth



Hardneck bulb with stalk
Photo by Charles Voigt



Allium sativum var. *ophioscorodon*
The Herb Society of America collection



The curving scape of *A. sativum* var. *ophioscorodon*

* Profiles compiled from (4, 21, 25-27, 29, 41, 43, 46, 58, 70, 71, 76, 77, 82). For more information on horticultural groups, see *Growing Great Garlic and the 1995 supplement* by Ron L. Engeland (Note: Engeland refers to these groups as varieties, but this is a horticultural rather than a botanical distinction. They are not varieties in the botanical sense.)

Allium sativum* var. *ophioscorodon (Continued)

Groups referenced in the horticultural trade:

- o Purple Stripe – named for color of bulb wrappers; often used as ornamentals due to beauty of curved flower stem
- o Porcelain – very large cloves; longest-storing hardneck, grows well in Midwest
- o Rocambole – large cloves; flower stalk forms multiple coils; shortest storage time

A. sativum var. *ophioscorodon* in flower. Photo by Pat Kenny



Allium sativum* var. *pekinense

Genus: *Allium*

Species: *sativum*

Variety: *pekinense*

Common name: Peking garlic

Characteristics:

- o hardneck (woody central stalk)
- o broad, linear leaves that are “twisted together” (70)

Groups referenced in the horticultural trade: none

Cultivar Examples

There are hundreds of garlic cultivars of different sizes and growth habits with flavors ranging from mild and nutty to hot. Susan Belsinger recommends growing both hardnecks and softnecks for variety (5). Hardneck types tend to be considered gourmet due to their superior flavor, are more difficult to grow and don't store as long as softnecks. Softnecks are longer storing, easier to braid, and require less maintenance since they don't usually produce flower stalks and umbels that need to be pruned (76). Charles Voigt advises gardeners to “select at least a few different cultivars, for a variety of flavors, and for keeping quality. Sample many, then come up with the few that match your growing ability, style of cooking and personal tastes” (76).

Contact a grower in your area to find cultivars suited to your region and climate. Remember also, that since garlic is so adaptable, garlic grown in one area may have a very different appearance if grown in another locale with different soil and climate.

The following pages include just a sampling of the many garlic cultivars available:



Photo by Charles Voigt

***Allium sativum* 'Asian Tempest'**

- softneck; Artichoke group; purplish bulbs; sweet flavor when baked, otherwise mild; "large bulbil capsule resembles a bean pod" (76)



Photo by Susan Belsinger

***A. sativum* 'Burgundy'**

- Silverskin group (Creole); suited to mild winters; mild, sweet burgundy-colored cloves

***A. sativum* 'California Early'**

- softneck; Artichoke group; not as daylength sensitive as other cultivars; resistant to stem and bulb nematodes; mild, commercial crop

***A. sativum* 'California Late'**

- softneck; strong-flavored commercial crop; long shelf life



Photo by Gwen Barclay

***A. sativum* 'Chesnock Red'**

- hardneck; Purple Stripe group; 9-10 cloves

***A. sativum* 'Early Italian' ('Early Italian Red')**

- softneck; Artichoke group; large cloves; recommended by Susan Belsinger



Photo by Gwen Barclay

***A. sativum* 'Georgian Crystal'**

- hardneck; Porcelain group; large bulbs, mild flavor even when raw; rice-sized bulbils

***A. sativum* 'German Extra-Hardy'**

- hardneck, very winter hardy; recommended by Susan Belsinger

***A. sativum* 'German Porcelain'**

- hardneck; Rocambole group; "middle-of-the-road heat," fine flavor and good size (5)

***A. sativum* 'German Red'**

- hardneck; Rocambole group; grow in eastern U.S.; "delicious" according to James Adams (2); hot and spicy; 10-15 light brown cloves with some purple coloring

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Photo by Charles Voigt

A. sativum 'Inchelium Red'

- softneck; Artichoke group; large, layered bulbs with up to 20 cloves; Susan Belsinger's all-time favorite garlic



Photo by Charles Voigt

A. sativum 'Metechi'

- hardneck; Purple Stripe group; large cloves; long-storing



Photo by Gwen Barclay

A. sativum 'Killarney Red'

- hardneck; Rocambole group



Photo by Charles Voigt

A. sativum 'Late Italian'

- softneck; recommended by Susan Belsinger

A. sativum 'Lorz Italian'

- softneck; Artichoke group; large bulbs with 12-19 cloves in layers, spicy and hot

A. sativum 'Music'

- hardneck; Porcelain group, does well in the Midwest, highest yield in Charles Voigt's trials; hot when raw, sweet when baked



Photo by Charles Voigt

A. sativum 'Nootka Rose'
- softneck; Silverskin group; up to 35 reddish cloves; intense flavor



Photo by Gwen Barclay

A. sativum 'Oregon Blue'
- softneck; Artichoke group; long-storing



Photo by Susan Belsinger

A. sativum 'Persian Star'
- hardneck; Purple Stripe group; cloves have red tips and marbled streaks



Photo by Gwen Barclay

A. sativum 'Purple Glazer'
- hardneck; Purple Stripe group; satiny wrappers



Photo by Charles Voigt

A. sativum 'Red Rezan'
(bulbs and stalks with bulbils)
- hardneck; Purple Stripe group; strong flavor without heat; glazed purple and gold bulb

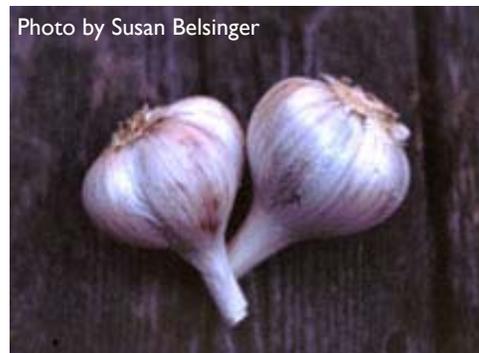


Photo by Susan Belsinger

A. sativum 'Romanian Red'
- hardneck; Porcelain group, 4-6 cloves per brown and purple bulb, hot

A. sativum 'Russian Red'

- hardneck; Rocambole group; strong flavor with hint of sweet



Photo by Susan Belsinger

A. sativum 'Siberian'

- hardneck; Purple Stripe group; large bulbs with 5-7 dark brown cloves



Photo by Charles Voigt

A. sativum 'Spanish Roja' (bulbs and stalks with umbel and bulbils)

- hardneck; Rocambole group; likes cold winters; good flavor; large, round bulbils

A. sativum 'Susanville'

- softneck; Artichoke group; grow on west coast; up to 22 cloves; long-storing



Photo by Gwen Barclay

A. sativum 'Tipatilla'

- softneck; Silverskin group; pinkish cloves, long-storing; grows well in the South

A. sativum 'Vekak'

- hardneck; Purple Stripe group; very hot, according to Susan Belsinger "may induce sweating!" (5)

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* denotes items in the HSA Library collection that circulate to members

For additional titles, see the HSA Library Garlic Resources section of this guide.

HSA Library Garlic Resources

Books

* Belsinger, Susan and Carolyn Dille. *The Garlic Book: A Garland of Simple, Savory, Robust Recipes*. Loveland, CO: Interweave Press, 1993.

This compact book from Carolyn Dille and HSA member and garlic expert Susan Belsinger includes recipes for appetizers, sauces, main courses, vegetables/salads, condiments and desserts plus garlic history, growing tips and information on preparation and storage. With color photographs.

* Bown, Deni. *The Herb Society of America New Encyclopedia of Herbs & Their Uses*. New York: DK, 2001.

Provides a general overview of the genus *Allium*, with profiles of *Allium sativum* and other *Alliums* with “garlic” in their common names. Includes color photographs.

* Braida, Charlene A. *Glorious Garlic: A Cookbook*. Pownal, VT: Storey Communications, 1986.

The cookbook is divided into sections on side-dishes, soups, pasta, main-dish vegetables, meats, seafood and specialties. Many recipes are Italian in origin. Introduction includes paragraphs on garlic history and uses plus information on growing, buying and storing.

* Crawford, Stanley. *A Garlic Testament: Seasons on a Small New Mexico Farm*. New York: HarperCollins, 1992.

A very personal and often philosophical account of the author’s labor of love – growing hardneck garlic.

* Davies, Dilys. *Alliums: The Ornamental Onions*. Portland, OR: Timber Press, 1992.

Chapters include “*Alliums* in History,” “Edible *Alliums*,” “Botanical Classification,” “Geographical Grouping,” “Cultivation,” “*Alliums* in the Garden,” and “A-Z of Selected *Allium* Species.” Includes color photographs, line drawings and glossary.

* Engeland, Ron L. *Growing Great Garlic: The Definitive Guide for Organic Gardeners and Small Farmers*. Okanogan, WA: Filaree Productions, 1991.

Considered a classic by many, Engeland’s text covers every aspect of garlic cultivation for the small farmer, from preparation and planting to harvesting and marketing. Part I discusses garlic history and includes detailed plant profiles (but note that what Engeland terms subspecies are actually botanical varieties). Includes glossary and line drawings illustrating garlic anatomy.

* Fulder, Stephen and John Blackwood. *Garlic: Nature’s Original Remedy*. Rochester, VT: Healing Arts Press, 2000.

Using a largely conversational style, Fulder and Blackwood cover garlic history and uses, including some obscure folklore, literary and historical references, a detailed discussion of the discovery of garlic’s chemistry and composition, garlic’s uses in medicine and as a pesticide, and garlic products and preparations. Includes reference list.

* Griffith, Linda. *Garlic, Garlic, Garlic: Exceptional Recipes from the World’s Most Indispensable Ingredient*. Boston: Houghton Mifflin, 1998.

Interspersed with facts and folklore, this cookbook includes recipes for starters, soups, breads, salads, sauces, meat, fish, poultry, side dishes, vegetables and desserts. Many of the recipes also include

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wine recommendations, and information on garlic cultivars (termed “varieties”) and general preparation tips are included. With a list of garlic festivals, plant sources and bibliography.

* Harris, Lloyd John. *The Official Garlic Lovers Handbook*. Berkeley, CA: Aris Books, 1986.

An eclectic and irreverent collection of essays, anecdotes, recipes, and miscellany, peppered with poems and quotes.

* Holder, Katy and Gail Duff. *A Clove of Garlic: Garlic for Health and Cookery: Recipes and Traditions*. Edison, NJ: Chartwell Books, 1996.

This compendium of garlic history, folklore and cookery includes over fifty recipes and many color photographs.

* Hughes, Meredith Sayles. *Stinky and Stringy: Stem & Bulb Vegetables*. Minneapolis: Lerner Publications Co., 1999.

This children’s book provides a nice introduction to the garlic plant including history, use, anatomy, and life cycle. With color photographs and illustrations.

* Northern Illinois Unit of HSA. *Wild Onion Cook Book: All You Want to Know About the Edible Alliums: Chives, Garlic, Leeks, Onions, Scallions*. Audubon, IA: The Northern Illinois Unit, 1997.

The Northern Illinois Unit’s tabbed cook book is housed in a three-ring binder and includes facts and folklore as well as cooking techniques and recipes for appetizers, breads, salads, soups, vegetables, eggs, poultry, seafood, pasta/grains, meats, sauces, desserts and dog biscuits.

* Platt, Ellen Spector. *Garlic, Onion & Other Alliums*. Mechanicsburg, PA: Stackpole Books, 2003.

Platt’s book covers a variety of culinary and ornamental *Alliums*, with information on garlic’s description, cultivation, history/folklore, medicinal uses, recipes and crafts. Crafts include garlic swags, braids and dried flower arrangements. With a list of garlic festivals, sources, bibliography and many color photographs.

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

A collection of nineteen scientific articles addressing *Allium* molecular biology, floriculture, agronomy and other topics. Articles with garlic information include “Evolution, Domestication and Taxonomy,” “Diversity, Fertility and Seed Production of Garlic,” “Virus Diseases in Garlic and the Propagation of Virus-Free Plants,” “Florogenesis,” and “Health and *Alliums*.”

* Reppert, Patricia. *Mad for Garlic: A Cookbook for Garlic Lovers*. Sioux City, IA: Hearts & Tummies Cookbook Company, 1997.

This recipe collection from HSA member Pat Reppert of Shale Hill Farm & Herb Gardens in New York State includes hors d’oeuvres, soups & quiches, breads, pasta, meats, seafood, vegetarian main dishes, grains & legumes, salads & dressings, vegetables, and desserts. With an introductory section on garlic growing and a bibliography.

Small, Ernest. *Culinary Herbs*. Ottawa: NRC Research Press, 1997.

This in-depth text provides information on garlic’s description, taxonomy, history, uses, recipe sources, importance, cultivation, harvest & storage, cultivars, chemistry, medicine, nutrition and curiosities. Also includes black and white line drawings.

* Tucker, Arthur O. and Thomas DeBaggio. *The Big Book of Herbs*. Loveland, CO: Interweave Press, 2000.

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This book by HSA expert members Tucker and DeBaggio provides information on garlic and other *Alliums*, with detailed description, nomenclature, chemistry, uses, cultivation, and pests/diseases information. Also includes a botanical key and extensive bibliography.

Pamphlets

Engeland, Ron L. 1995 *Supplement to the Book Growing Great Garlic*. Okanogan, WA: Filaree Productions, 1995.

Includes detailed plant profiles with black and white line drawings. The “varieties” Engeland discusses here are actually horticultural groups/types rather than botanical varieties.

Foster, Steven. *Garlic – Allium sativum*. ABC Botanical Series no. 311. Austin, TX: American Botanical Council, 1999.

This eight-page booklet provides information on garlic’s origins, history and medicinal uses, including the chemical components responsible for garlic’s medicinal effects and an overview of major research studies. Includes lengthy reference list.

Selected articles from *The Herbarist*

Belsinger, Susan. “From Cultivation to the Kitchen – Garlic: Herb of the Year for 2004.” *The Herbarist*. 69 (2003): 31-33.

HSA member and garlic expert Susan Belsinger discusses planting, harvesting, curing and cooking with garlic. Includes photographs and the fettunta recipe reprinted in this guide.

Hanelt, Peter. “Some Lesser Known Culinary *Alliums*.” *The Herbarist*. 57 (1991): 37-51.

Includes history and description of the non-*A. sativum* “garlics” great-headed (elephant) garlic (*A. ampeloprasum* great-headed garlic group) and Chinese garlic (*A. macrostemon*) as well as other *Alliums*.

Heymann, Jeanne Roquemore. “Herbs and the Herdsman.” *The Herbarist*. 51 (1985): 41-43.

Discusses garlic and four other essential herbs used by the herdsman to treat his/her herd.

Roos, Annette T. “Hysterical Water and Gingerbread: English Cookbooks from the 17th and 18th Centuries in the Levis Collection.” *The Herbarist*. 57 (1991): 77-94.

A review of fifteen cookbooks in the Levis Collection in the John Crerar Collection of Rare Books at the University of Chicago Library that includes several references to historic attitudes about garlic and garlic recipes.

Swenson, John F. “*Alliums* and Glasnost.” *The Herbarist*. 57 (1991): 27-36.

This personal account describes the adventures of the author and four other plant collectors from the U.S., Poland and (former) Soviet Union as they search for the wild ancestral garlic, *A. longicuspis* and other *Alliums*, “in the mountains of Soviet Central Asia.”

Voigt, Charles E. “Growing Gourmet Garlic.” *The Herbarist*. 69 (2003): 34-37.

This article by HSA member Charles Voigt discusses garlic cultivation, description and harvesting. Photographs include detailed captions.

Other articles

Belsinger, Susan. “The Goodness of Garlic: Celebrate 2004’s Herb of the Year.” *Herbs for Health*. 8(6) (January/February 2004): 26-31.

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Addresses garlic's medicinal properties, chemistry and uses, with recipes for Relish Raw Garlic with Fettunta, Garlic and Honey, Garlic-Miso Broth, Japanese-Style Soup, White Bean Spread with Sage, Spanish-Style Wilted Spinach and Susan's Favorite Garlic Vinaigrette. Also includes color photographs and a list of resources for garlic products.

Belsinger, Susan and Carolyn Dille. "Garlic: Glory of Gilroy." *The Herb Companion*. 9(5) (June/July 1997): 54-57.

This inside look at the U.S.'s largest garlic festival, held annually in Gilroy, California, includes color photographs and the prize-winning recipe for Tomato Garlic Panzenella Salad.

Belsinger, Susan and Tina Marie Wilcox. "Garlic Obsession: Fill an Empty Spot or an Entire Bed with the Beauty and Variety of *Allium sativum*." *The Herb Companion*. 16(4) (May 2004): 32-37.

HSA members Belsinger and Wilcox share their experiences growing and tasting garlic cultivars and provide recommendations for cultivation and harvesting. With roasted garlic recipe, bulb source list and color photographs.

Compton, K.C. "Dancing in the Kitchen with Garlic: Experience the Amazing Allure of *Allium sativum* for Yourself." *The Herb Companion*. 16(4) (May 2004): 38-42.

This collection of recipes includes tapenade, spinach dip, dressing, soup, stir fry and garlic ice cream. With color photographs.

Dille, Carolyn. "Garlic: A Cook's Notes." *The Herb Companion*. (Aug/Sept 1990): 18-24.

Provides information on cutting, storing and cooking with garlic, including recipes for Singapore-Style Fried noodles, Pineapple Cucumber Salad, Green Garlic Mayonnaise, Garlic Soup, Roasted Garlic and Mashed Potatoes and Agliata (Ligurian Bread Crumb and Garlic Sauce). With color photographs.

Daugherty, Robin Taylor. "Garlic: A Twined Basket." *The Herb Companion*. (Aug/Sept 1990): 26-31.

Not about garlic, but includes instructions for making a reed basket for storing it. With color photographs.

Ferne, Mina. "Garlic & Onion in Classic Jewish Literature." *Herbalgram*. 61 (2004): 44-47.

This in-depth article discusses references to garlic's folklore, medicinal and culinary uses in the *Mishna*, *Talmud*, *Assaf Harofeh* and other sources.

Foster, Steven. "Garlic for Health." *The Herb Companion*. 8(6) (August/September 1996): 69-70.

This brief article discusses garlic's chemistry and medicinal properties. With color photographs.

Foster, Steven and Yue Chongxi. "Garlic: A Little Chinese Story." *The Herb Companion*. (Aug/Sept 1990): 25.

A retelling of the folk tale describing the origins of the use of garlic to treat dysentery in China.

Josling, Peter. "Glorious Garlic: Nature's Antibiotic and Antiviral." *Herbs*. 26(3) (2001): 10-11.

Includes information on history, chemistry, cultivation and medicinal uses, with a discussion of garlic supplements.

Mirunalini, S., C.R. Ramachandran and S. Nagini. "Chemoprevention of Experimental Hamster Buccal Pouch Carcinogenesis by Garlic Oil." *Journal of Herbs, Spices & Medicinal Plants*. 10(4) (2003): 89-101.

This research article describes a study in which garlic oil was shown to prevent tumor growth

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when applied topically to the buccal pouches of hamsters that had been exposed to the carcinogen, DMBA. Discusses garlic oil's effect on lipid peroxidation and antioxidant levels.

Pizzi, Helene. "Glorious Garlic." *The Herb Quarterly*. 98 (Spring 2004): 20-24.

Covers garlic history, folklore, cultivation, types of garlic and recipes for Fabulous Fish, Grateful Greens, Melanzane al Funghetto and Bruschetta.

Strauch, Betsy. "Garlic: Growing the "Stinking Rose"." *The Herb Companion*. (Aug/Sept 1990): 16-17.

This brief article on growing, harvesting and storing garlic includes information on rocambole (*A. sativum* var. *ophioscorodon*), giant garlic (*A. scorodoprasum*), elephant garlic (*A. ampeloprasum*) and garlic chives (*A. tuberosum*).

Zeldes, Leah A. "Fall Garlic." *The Herb Companion*. 14(6) (August/Sept 2002): 12.

This report is targeted to Chicago gardeners and includes planting advice and information on true garlic, elephant garlic, garlic chives and globe garlic (*A. sphaerocephalum*).

* Denotes items that circulate to HSA members