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BASIL

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Basil (*Ocimum basilicum*) is one of the most popular and easy to grow garden herbs. There are many varieties and related species that make up the group of annual basilis, but all are warm-season, sun-loving herbs. Basil originally came from India, but found its way into popular Italian tomato and Thai recipes. This relative of mint is often used in tomato sauces, pesto sauce, and as a flavoring agent for oils, vinegars and teas.

Culture

To grow any cultivar of basil, choose a sunny site in the garden. Although basil prefers full sun, it grows reasonably well in part-sun (six hours of sun per day). Have the soil tested, and till or mix into the soil the recommended amount of dolomitic limestone to bring the soil pH to between 6.0 and 6.5. This is also the best pH range for most vegetables. It is best to apply the lime during the fall to allow adequate time for the lime to reduce the soil acidity and to provide the necessary calcium and magnesium for the plants.



'Genovese' basil (*Ocimum basilicum*)
Joey Williamson, ©2009 HGIC, Clemson University

Mix organic matter, such as compost, manure or composted pine bark, into the garden soil before planting, as basil grows best in a rich, well-drained soil. The addition of organic matter will improve the ability of sandy soils to hold water, and aid in water drainage within clayey soils. It also greatly improves the ability of the soil to hold onto fertilizers.

Seed are typically sown indoors four to six weeks ahead of the outdoor planting time. Plant basil seeds ¼-inch deep. Germination should take 5 to 10 days at 70 °F. Once the seedlings have 2 sets of true leaves, individual plants should be potted into small containers for faster growth. For more information, see [HGIC 1259, *Starting Seeds Indoors*](#).

Basil should not be transplanted into the garden until the daytime temperature is consistently in the 70s, and the nighttime temperatures are above 50 °F. If a late frost does threaten, the plants can be covered with pine straw, inverted pots or buckets until the temperature rises the next

day.

Basil plants should not be over-fertilized because the flavor in the foliage will be reduced during rapid plant growth. A soil test is always recommended before planting a garden to be sure the correct amount of nutrients is added. In the absence of a soil test, evenly spread 3 pounds (3 pints) of 5-10-10 per 100 square feet of garden before planting and mix the fertilizer into the soil. With a spacing of 2 feet between plants and 3 feet between rows, a 100 square foot garden space has room for 16 plants.

Approximately two months after planting, the basil may be fertilized again if plant growth is reduced and foliage color has become paler green. Evenly spread $\frac{1}{4}$ to $\frac{1}{2}$ pound of calcium nitrate over the 100 square foot mulched area and water in the fertilizer. Calcium nitrate is the typical side dressing fertilizer used with vegetable crops and is available at most farm supply stores.

Although basil plants need well-drained soil, they still need a relatively constant supply of soil moisture. Mulch the plants with pine needles or ground up leaves to a depth of 3 inches. This will help maintain a more constant soil moisture level, keep the foliage clean from rain-splashed soil and reduce the occurrence of weeds. It is best to water by soaker hoses, drip irrigation or by hand at the base of each plant. Do not wet the foliage, as it will be more prone to disease.

The terminal growth of basil plants may be pinched out periodically to encourage branching. This will create thicker plants with more tender foliage for harvest. By mid-summer, many cultivars of basil will begin producing flower spikes. For the most flavorful foliage, flower buds should be pinched out as soon as they appear. However, some cultivars have more colorful flowers of purple or pink, and these may be left if the plants are grown more as an ornamental. Some flower spikes may be allowed to develop if seed is to be collected.

If basil seed is to be saved from the current crop and remain true to type, the different cultivars must be separated by 150 feet to prevent cross-pollination. The seeds are formed in seed capsules, which can be easily harvested and separated by hand. Seed can be stored in vials, old film canisters or baggies. If well-sealed and stored in a cool, dry room, the seed will remain viable for several years. A couple of basil diseases can be seed-borne, that is, be present in the seed to affect the next year's crop. If the current crop had Fusarium wilt or bacterial leaf spot, the seed should not be saved.

Before the first fall frost kills the basil, plants can be cut back for harvest, and the root systems dug up and potted in containers for continued growth indoors. Put plants in a sunny window. Water the plants regularly, but do not over-water, and do not let the plants stand with water in their saucers.

Harvesting & Storage

Basil leaves may be harvested individually or the ends of branches can be pinched off with one or two sets of leaves. Leave enough foliage on each plant after harvest so that plant growth is not significantly reduced. If larger quantities of basil are anticipated for the season, choose cultivars with larger leaves for a less time-consuming harvest. Harvested basil leaves do not

store long, even under refrigeration.

Alternatively, the foliage may be air-dried or dried in a food dehydrator at less than 125 °F until leaves are dry. Also, small bundles of cut stems with foliage may be hung upside down in a warm, well-ventilated room to dry. Crumble the completely-dried leaves and store in small, air-tight containers for up to 12 months. See [HGIC 3086, *Drying Herbs, Seeds & Nuts for more information*](#).

Cultivars

‘Genovese’ is a vigorous, large leaf basil cultivar with a sweet, spicy taste that is most commonly used for making pesto. Plants typically will grow to 3 to 4 feet tall and should be spaced at 2 feet apart.

‘Pesto Perpetuo’ is a variegated-leaf basil with small leaves edged in creamy white. This is one of the few basil cultivars, which does not produce flower spikes. ‘Pesto Perpetuo’ is a very attractive plant and would make a beautiful addition to any annual and perennial flower planting. Plants will grow to approximately 16 inches tall.



‘Pesto Perpetuo’ basil (*Ocimum x citriodorum*)
Joey Williamson, HGIC, Clemson University

‘Purple Ruffles’ basil has dark purple leaves and a mature plant height of 18 inches. It was an All-American Selections winner in 1987, and offers an interesting ruffled foliage texture for the garden. With its purple color, Purple Ruffles basil has additional uses as an attractive garnish and in herb vinegar. The large, purple foliage also makes a nice contrast with green-leaf cultivars in the garden.

‘Serata’ basil has unique green ruffled leaves and grows 22 to 24 inches tall. The leaves are large enough for easy harvest, and the flavor is very good for pesto. ‘Serata’ basil does not make many

flower spikes. ‘Green Ruffles’ basil is very similar to ‘Serata’, has serrated and quilted leaves, and also grows to 24 inches tall.

‘Siam Queen’ basil is a 1997 All-America Selections winner with licorice fragrance and flavor. The leaves are large enough for easy harvest. ‘Siam Queen’ basil is often used in salads, sauces and in Thai cooking. Mature plants will reach 24 inches tall with purple flower spikes.

‘Dark Opal Purple’ basil was a 1962 All-America Selections winner and is a purple-leaf cultivar that reaches 24 inches in height. Its purple leaves also make an attractive garnish, can be used in salads or to make tangy, purple vinegar. The cultivar ‘Rubin’ was released in 1993 and is very similar to ‘Dark Opal’, but has more consistent purple coloration.

‘Sweet Dani’ basil has aromatic lemon-scented leaves and is excellent for drying. This 1998

All-American Selections winner is a slender plant with narrow leaves and grows to 26 inches tall.

‘Newton’ is a more recent introduction with intermediate resistance to Fusarium wilt. It is an Italian type basil with 4-inch long leaves.

‘Prospera®’ is a new release with strong resistance to downy mildew, as well as Fusarium wilt resistance. The leaves are 3-inches long, glossy, and dark green.

Many other interesting basil cultivars are available. Some have fragrances of



‘Serata’ basil (*Ocimum basilicum*)
Joey Williamson, HGIC, Clemson University



‘Siam Queen’ basil (*Ocimum basilicum*)
Karen Russ, HGIC, Clemson University

lemon, lime, cinnamon, licorice or anise. There are dwarf cultivars, such as ‘Spicy Globe’, that make nice ornamentals for containers or edging flower beds. A few are not used in cooking, but have unique, sweet fragrances, such as ‘Holy Basil’ and ‘African Blue’ basil. Basil seeds are readily available from many mail-order companies, with several selling organically-grown seed.

Diseases

Fusarium Wilt: Fusarium wilt of basil is caused by a soil-borne fungus (*Fusarium oxysporum* f. sp. *basilicum*). The fungus attacks the water-conducting tissue (xylem) within the stem. Infected

basil plants will grow normally until they are six to twelve inches tall, then become stunted and exhibit browning of terminal growth. Once water uptake is totally blocked, the basil plants will suddenly wilt. Promptly remove and dispose of any wilt-infected plants.

The Fusarium wilt pathogen can survive for many years in the soil; therefore plant resistant basil varieties. Three Genovese-type cultivars of basil have been selected for resistance to Fusarium wilt. The first cultivar released was ‘Nufar’, which grows to 24 inches tall and has medium-sized leaves with mild flavor. Later, ‘Aroma 1’ and ‘Aroma 2’ were released and both have very good fragrance. ‘Newfar’, ‘Newton’, ‘Elidia’, and ‘Prospera’ are newer releases with stronger resistance to Fusarium wilt. These cultivars are readily available from mail-order seed companies.

Gray Mold: Basil is an herbaceous plant that is highly susceptible to gray mold (caused by

Botrytis cinerea). Infections usually begin on the surface of stem cuts that are made during harvest. The gray mold pathogen then moves down the stem, and kills the leaves and secondary leaf buds. Infected leaves will fall off. If the infection reaches the main stem, the entire basil plant will die.

Gray mold outbreaks often occur when individual leaves and stem ends with foliage are harvested during rainy days or when watered by over-head irrigation before the wounds can heal. The wounded stems are very susceptible to infection soon after harvest. However, by 24 hours after harvest, the stems are much less susceptible to infection. At 48 hours after harvest, the cut stems have completely healed and are no longer susceptible to gray mold. To reduce



Fusarium wilt of basil (*Fusarium oxysporum* f. sp. *basilicum*)
Debbie Roos, NCSU Agricultural Extension Agent,
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the chance of gray mold or other foliar disease, do not wet the foliage with irrigation water, and do not harvest in wet weather. Pick up and dispose of any diseased plant tissue on the ground around the plants, and cut out and dispose of any infected plant parts to reduce disease spread.

Bacterial Wilt: Bacterial wilt (caused by *Ralstonia solanacearum*) has been commonly diagnosed on tomatoes grown in South Carolina. Basil is also susceptible to this soil-borne disease; therefore do not plant basil in garden sites where tomatoes have died from bacterial wilt. The bacteria invade the root system and multiply rapidly inside the water-conducting tissue of the lower stem, filling it with slime. The plants rapidly wilt, while the leaves stay green. This bacterium will remain in the soil for several years after disease has occurred. Since there are no resistant varieties of basil, rotate the location within the garden where the basil is grown. Infected plants and the soil immediately around each plant should be removed and disposed of promptly.

Leaf Spots: Three fungal leaf spots (caused by *Cercospora* spp., *Alternaria* spp., and *Colletotrichum* spp.) occur on basil in South Carolina. To reduce the incidence of foliar disease, always water at the base of the plants and never wet the leaves with sprinklers. Pull off and dispose of diseased foliage at first sign of disease. For minor fungal foliar disease occurrence, basil plants may be sprayed weekly with a fungicide containing potassium bicarbonate, such as Bonide Remedy, Monterey Bi-Carb Old Fashioned Fungicide, or GreenCure Organic Fungicide.

Downy Mildew: Mid-summer conditions were conducive for a severe outbreak of downy mildew (caused by *Peronospora belbahrii*) in South Carolina during 2014. Basil downy mildew is spread by wind-dispersed spores and by infected seed, and can quickly devastate a home garden planting of basil.

Initially, the symptoms of downy mildew on basil will be a slight yellowing of the foliage, with



Basil with *Cercospora* leaf spot (*Cercospora* sp.)
Margaret Williamson, Plant Disease Diagnostician, Plant
Problem Clinic, Clemson University

a spread that is limited by the major leaf veins. At first, the yellowing of the foliage looks similar to a nutritional deficiency. Soon, brown spots begin to develop within the yellow leaf tissue, which continue to cover the leaf surface. Sporulation occurs on the lower leaf surfaces that correspond to the yellowed areas above. The spores are purplish-gray and are easily wind-disseminated. Soon the diseased foliage will drop from the plant.

Downy mildew rapidly spreads during mild, humid summers. The key to

cultural control is to reduce leaf wetness and promote good air circulation around the plants. Water basil with drip irrigation or soaker hoses to reduce plant wetness. Plant basil in a very sunny site and space the plants far enough apart to promote rapid leaf drying from dew and after rainfall. If disease occurs, prompt removal and disposal of plants showing symptoms along with any fallen leaves may slow down the spread of this disease. The cultivars 'Prospera', 'Rutgers' Devotion', and 'Rutgers Obsession' are new releases with strong resistance to downy mildew. Rotate where basil is planted in the garden each year. Downy mildew can be controlled by sprays every 7 to 10 days during warm, wet weather with products containing the biocontrol bacterium *Bacillus subtilis* QST-713 (such as, Serenade Garden Disease Control Concentrate or Ready To Use, from Planet Natural) or potassium salts of phosphorous acid (such as, Monterey Garden PHOS or Organocide Plant Doctor). Do not apply to basil plants if they are under heat or drought stress.



Downy mildew on basil foliage with initial symptoms of pale yellowing and small necrotic (dead) spots. Joey Williamson, ©2014 HGIC, Clemson Extension

Root Rots: Two root rots (caused by *Pythium* spp. and *Rhizoctonia* spp.) were diagnosed on basil in South Carolina. Both *Pythium* and *Rhizoctonia* root rots will cause a yellowing and unthriftiness of basil plants. Branch dieback will occur starting at the tips. With *Pythium* root rot, a sloughing off of the outer layer of the roots will be noticed. With *Rhizoctonia* root rot, brown lesions on roots are first observed, and roots will eventually turn completely brown.

To reduce the occurrence of root rot, provide excellent soil drainage by the addition of compost

or composted pine bark to improve the drainage of heavy clay soils. However, basil must be watered often enough so the plants do not wilt. A layer of mulch in the garden will reduce the need to water as often. Diseased plants and soil immediately around each plant should be removed and disposed of promptly. To reduce the chance of root rot, rotate the position of basil in the garden each year.

Insect Pests

The most common pests of basil are Japanese beetles, slugs and aphids. Japanese beetles are usually present for about a month in the summer. They skeletonize the foliage (i.e., eat the leaf blades, but do not consume the larger veins of the leaves). The result is a lace-like appearance to the foliage. Japanese beetles can be hand-picked from the plants and crushed or dropped into soapy water.

Aphids, spider mites, whiteflies and other soft-bodied pests can be controlled with an insecticidal soap, such as:

- Bonide Insecticidal Soap Concentrate
- Natural Guard Insecticidal Soap Concentrate
- Safer Insect Killing Soap Concentrate
- Espoma Earth-tone Insecticidal Soap Concentrate
- Garden Safe Insecticidal Soap Insect Killer Concentrate

Always spray plants in the early evening to reduce the chance of damage to the foliage from the insecticidal soap. Many of these pests will be located on the lower leaf surface and must be directly contacted with the spray, so pay special attention to these areas when spraying.

Alternatively, basil may be sprayed with azadiractin, which is a natural product extracted from Neem trees. Azadiractin products (such as Align, Azatin, Neemex, Ornazin, or Gordon's Azatrol) will control numerous insect pests on basil, including aphids, beetles, thrips, spider mites and whiteflies.

Slugs climb up on basil plants and eat ragged holes in the foliage. Mulch, although quite beneficial to plants, provides a hiding place for slugs during the daytime. Protect basil plants by sprinkling diatomaceous earth over the mulch around the plants. Diatomaceous earth is very sharp and scratches the skin of the soft-bodied slugs, resulting in their dehydration and death. It must be reapplied after a rain or watering.

Newer, safer slug baits are now available. These products contain iron phosphate, such as in:

- Monterey Sluggo – Kills Slugs & Snails
- Garden Safe Slug and Snail Bait
- Gardens Alive Escar-Go (Slug & Snail Control)
- Garden Safe Slug & Snail Bait

- Bonide Slug Magic Pellets – Makes Slugs Disappear
- Whitney Farms Slug & Snail Killer
- Bonide Bug & Slug Killer (also contains spinosad)
- Gardens Alive Garden Pest Bait (also contains spinosad)
- Brandt Sluggo Plus T & O (also contains spinosad)
- Monterey Sluggo Plus (also contains spinosad)

Iron phosphate will stop feeding by slugs quickly and is much less harmful to pets, birds, and non-target insects than the older product, metaldehyde. Spinosad is natural insecticide that will also kill cutworms, ants, and earwigs.

Basil-Walnut Pesto Recipe

For a delicious use of fresh basil, please consider this basil-walnut pesto recipe.

Pesto ingredients:

2 peeled, medium-sized garlic cloves

½ cup walnut pieces

1 cup Parmesan cheese

4 cups packed basil leaves

⅓ cup extra-virgin olive oil

In a food processor, briefly mince two garlic cloves. Add ½ cup walnuts and process until thoroughly ground. Add 1 cup Parmesan cheese and briefly mix with garlic and walnuts. Add 2 cups basil leaves and half of the ⅓ cup olive oil. Pulse the food processor until leaves are ground. Add the remaining 2 cups of basil leaves and remaining olive oil. Again, pulse leaves until ground. Cook ½ pound pasta and drain well. Return the drained pasta to the cooking pot. Add half of pesto, and mix thoroughly with the pasta. Pesto tends to adhere best to either angel hair or rotini pasta. Serve hot.

Scrape the remaining half of pesto from the food processor into a quart-size freezer bag, label and date, and immediately freeze. Pesto freezes well without loss of flavor or color. To use frozen pesto, thaw in refrigerator or defrost in microwave. Don't allow pesto to overheat in microwave, as it should not cook. Once pesto is warm, spoon onto hot pasta, mix thoroughly and serve.

The leftover pesto should be dated and immediately refrigerated. It is best to use pesto within 3 days. Pesto, or other herbs in oil, should not be canned because of the risk of botulism (please see [HGIC 3051, Most Frequently Asked Canning Questions](#)).

If this document didn't answer your questions, please contact HGIC at hgic@clemson.edu or

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