

Department of Plant Sciences

LEAFY CROPS FOR THE TENNESSEE VEGETABLE GARDEN

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*Natalie Bumgarner, Residential and Consumer Horticulture Extension Specialist
Department of Plant Sciences*

Crop Descriptions

Leafy crops are grown and harvested for their leaves. Most often, quality harvests occur before flower and seed production begin. Many leafy crops can be harvested at a range of sizes from baby to larger leaf, so they are well suited to containers and raised beds.

There are both warm- and cool-season crops that fall under this leafy crop description. The cool-season crops grow well on the growing season edges of spring and fall, while the warm-season crops can be grown in summer.

There are also several crop families represented. Arugula is in the family Brassicaceae with the more common broccoli and cabbage. Lettuce, endive, escarole and radicchio are in the large family Asteraceae where many common flowers (sunflowers, asters, daisies, mums) are found. Beet greens, Swiss chard, spinach and orach are in the family Amaranthaceae that contains both common weeds and crops. New Zealand spinach and Malabar spinach are not actually spinach and are in families that don't have other common garden crops.



Figure 1. A young oakleaf lettuce plant showing an open head and deeply lobed leaves with a light green color. This is the AAS award-winning cultivar 'Sandy'.

Planting and Growing

As with other vegetable crops, good soil drainage is essential for leafy crops. While soil types can vary, soil that is free from crusting and compaction is important to germinate and grow these generally small seeded and relatively shallow rooted leafy crops (especially those that are cool season). Soil pH should be above 5.5 and between 6 and 6.5 is optimum for most of these crops.

While many of these leafy crops are commonly direct seeded, they respond well to being transplanted if conditions are appropriate in the transplant growing area and care is taken to water and fertilize to minimize transplant stress. Mulches, either plastic or natural, can be useful to moderate soil temperature and moisture. In general, optimum temperatures for growth are 60 to 70 F for the cool-season crops. Row covers also can be used on these crops to extend growing or harvest season in the early spring or late fall. In fact, the most cold hardy of these crops may remain through the winter in some Tennessee locations, especially with row covers or protection.

The warm-season leafy crops are often more tolerant of low moisture and high temperatures and are not frost tolerant. Their ideal temperatures for growth are 70-85 F.

A pre-plant fertilizer is usually applied and a side dressing of a high nitrogen fertilizer is often applied a few weeks after transplanting or seeding. Baby leaf crops (lettuce, spinach, arugula) have such a short growing season that it is common to only apply a pre-plant fertilizer. Rapid, consistent growth is best for all of these leafy crops. So, be sure to avoid times of nutrient or water deficiency, which can occur quickly due to the relatively shallow rooting of many of the cool-season leafy crops. Weed management is also important for these leafy crops. Specific notes about growing conditions for each of the crops are included below and cultivar suggestions can be found in the table that follows.

Cool-season Leafy Crops

Lettuce (*Lactuca sativa*) — This generally mild flavored salad crop is likely the most well-known leafy crop. It is a cool-season annual crop that can be harvested quite small or after forming a head (but always before flower initiation). Head or iceberg lettuce is well-known on the grocery store shelf, but it isn't the best for the garden. Try the softer textured butterhead and oakleaf lettuce with open heads and deeply lobed leaves, or more well-known romaine types for heading lettuces that are better suited to the garden. Also, the range of loose leaf lettuces provide a range of leaf shape, size, texture and color in a short (often around 30-40 days) timeframe. Optimum growing conditions for lettuce are around 50 F at night and 60-70 F during the day. Warmer temperatures, and especially daytime temperatures above 85 F reduce lettuce quality and combined with long days, can lead plants to bolt. Bolting is the plant beginning to flower.

Endive and Escarole (*Cichorium endivia*) — The two common names of this type of chicory refer to their leaf shape. Endive has curly leaves that are narrow with deep cuts (Figure 2) while escarole has leaves that are broader and more crumpled in appearance. While a cool-season crop, endive can be a little more adaptable to warm conditions than lettuce. The leaves have a slight bitterness generally absent in lettuce, but high temperatures and water stress can increase these flavors.

Radicchio (*Cichorium intybus*) — Radicchio is actually another type of chicory that produces small heads. The most well-known of these cool-season crops are the red and white 'Chioggia' types that are commonly mixed in salads for their color, texture and slightly bitter or nutty flavor. When temperatures get warm, tipburn, which is the death of the tissue near the tips of leaves, can be an issue for radicchio.

Arugula (*Eruca sativa*) — This cool-season crop has a nutty flavor than can be sharp or even bitter. Peppery is a common description of arugula. It is in the same family as cabbage and mustard, so some similar flavor trends are present. Rapid growth in cool conditions with plenty of moisture produce the more generally favorable nutty flavor qualities. Arugula is often mixed with other greens in salad to mitigate its strong flavor.

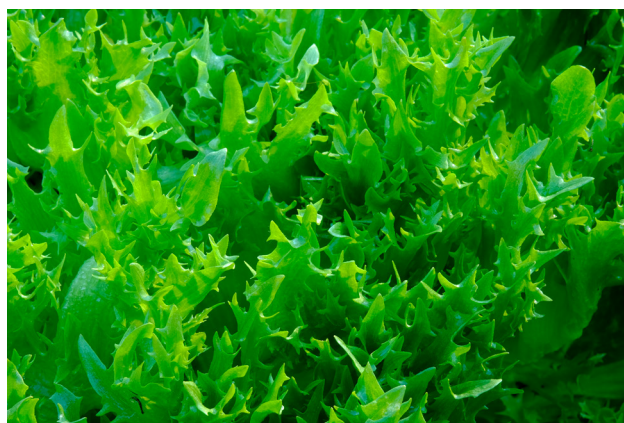


Figure 2. Close up of deeply serrated endive leaf. (Shutterstock image.)

Beet greens and Swiss chard (*Beta vulgaris*) — Garden or table beets and Swiss chard are actually in the same genus and species, but they are distinct in whether or not they produce a root. Beet greens are simply harvested before the plant has enlarged the root structure. Select beet cultivars based on your preference for green versus root production. Swiss chard has a very similar leaf, but it can be harvested larger because it is a foliage type beet that doesn't have an enlarged root. Leaves can be picked as soon as they are large enough to eat. Beets and chard are often direct seeded, but are slow to germinate (10-14 days). So, soaking in warm water can speed up germination. Beets and chard can be more tolerant of warmer spring temperatures than spinach and some of the other leafy greens more prone to bolting and reduced quality. While beet root quality can be negatively impacted by warm temperatures, growing beets for greens provides a bit more margin with temperatures.

Spinach (*Spinacia oleracea*) — After lettuce, spinach is the second most familiar leafy crop, and it is known for its cool-season performance as well as its nutrient density. Germination can sometimes be a challenge, and presoaking seeds or transplanting can be useful. Leaves can be picked as soon as large enough to eat individually or whole plants can be harvested at larger stage. Like lettuce, spinach grows best with daytime temperatures in the 60-70 F range with poor results when the temperature approaches 85-90 F and the day length increases. When well hardened, spinach can survive down to 10 F, which is lower than lettuce. Spinach prefers soil pH above 6.5 as it is sensitive to acid conditions.

Warm-season Leafy Crops

Orach (*Atriplex hortensis*) — While not a common crop in the US, orach (also known as mountain or French spinach), offers summer leafy options because of its tolerance to heat and low moisture. It is usually direct seeded. Like many of the rest of these leafy crops, it can be harvested as a whole plant or individual leaves over time. It can be eaten in salad mixes or cooked, and leaves are still harvestable after flowering has begun.

New Zealand spinach (*Tetragonia tetragonioides*) — Although not actually a spinach, New Zealand spinach is often used to produce a similar leafy product during seasons when traditional spinach would not be viable. Soaking can speed germination. It has leaves somewhat similar to spinach, but they are often thicker, slightly smaller and have a more triangular shape. New Zealand spinach is not frost tolerant, but it does well in warm or hot summer weather to provide a steady supply of leafy greens.

Malabar spinach (*Basella rubra*) — Like New Zealand spinach, Malabar spinach (Figure 3) is not actually in the same family as traditional spinach. It is a warm-season vining crop that performs well in summer and early fall conditions when daytime temperatures are more than 80 F. The leaves are rather thick and glossy. Leaves can be used fresh or cooked, which may be preferred due to texture. While taste may be similar to some spinaches, the texture of the leaves is quite different. Red and green leaf types are available and these plants can serve both edible and ornamental purposes. They can be direct seeded or transplanted after the danger of frost, but germination may be slow. They will need a trellis for support.



Figure 3. Malabar spinach later in the season showing both leaves and fruit.

Leafy Crops for the Tennessee Vegetable Garden

Crop	Spring Planting		Fall Planting		Plant Spacing/ Row Spacing	Days to Harvest	Cultivars
	East TN	West TN	East TN	West TN			
Lettuce	3/15-4/30	3/1-4/15	8/1-9/1	8/15-9/15	6-12 inches/18-36 inches (often planted in a grid in raised beds) Leaf lettuce is often planted in 4-inch-wide bands (about 60 seeds/foot).	30-60 (seed)	Butterhead — Adriana, Nancy, Mirlo, Red Cross Oakleaf — Panisse, Oscarde Romaine — Coastal Star, Green Forest, Salvius, Winter Density Leaf — Green Star, Salad Bowl, Two Star, Tropicana, New Red Fire (a range of mixes are also available)
Endive, escarole, radicchio	3/15-4/30	3/1-4/15	8/1-9/1	8/15-9/15	9-12 inches/18-36 inches (often planted in a grid in raised beds)	50-70 (seed)	Endive — Salad King, Curlesi Escarole — Natacha Radicchio — Indigo, Perseo
Arugula	2/1-3/31	2/1-3/31	8/15-10/15	8/15-10/15	Banded or scattered 25-50 seeds per foot.	25-50 (seed)	Astro
Beet greens, Swiss chard	3/1-4/15	3/1-4/1	9/1-9/30	9/15-10/1	2-4 inches (beets) 6-18 inches (chard)/18-24 inches Can be banded 40 seeds/foot for immature harvest	35-65 (seed)	Beet greens — Early Wonder, Bulls Blood Swiss chard — Bright Lights, Fordhook giant
Spinach	2/1-3/31	2/1-3/31	8/15-10/15	8/15-10/15	Plants can be grown in a grid pattern where there are typically 10 plants/square foot. For baby leaf crops, spinach can be planted in 4inch wide bands of about 40 seeds per foot.	30-70 (seed)	Tyee, Bloomsdale, Whale
Orach	5/15-7/15	5/1-8/1	Grown as summer or main season crop		6-8 inches/18-36 inches	30-50 (seed)	Red and green leaf types are available and these may be sold as species rather than cultivars.
Malabar spinach	5/15-7/15	5/1-8/1			6-10 inches/12-24 inches	60-90 days (seed)	
New Zealand spinach	5/15-7/15	5/1-8/1			8-10 inches/18-36 inches	30-50 days (seed)	

Harvesting and Storage

Lettuce, Endive, Escarole, Radicchio (harvested as head) — Pick when leaves form desirable heads. Some lettuces (oakleaf, Little Gem) as well as endive and escarole often form more open heads, so leaf closure is not a clear sign of maturity. As plants get closer to maturity (especially for spring crops), quality can change rapidly. So, watch closely for any signs of bolting (flower stalk formation) or tipburn which can lead to loss of quality. Cut whole plant above ground level and remove any damaged leaves before storage. Harvesting in early morning before leaf temperatures increase is preferable. Best stored at 32-40 F with high humidity for up to two or three weeks of storage life.

Lettuce, Spinach, Arugula, Beet greens, Swiss chard (harvested as individual leaf) — Individual leaves can be harvested any time they reach a desirable size, and multiple harvests can be made until warm or cold temperatures slow growth or reduce quality. Outer leaves can be removed by hand or with a sharp knife. Cut above the crown of the plant to avoid removing the growing point and young expanding leaves. Harvesting in early morning before leaf temperatures increase is preferable. These leaves typically won't have as long a storage life as heads. Sort and remove any damaged or diseased leaves before storing. Best stored at 32-40 F with high humidity for 7-14 days.

Orach, Malabar spinach, New Zealand spinach — These warm-season crops can be harvested as whole plants (orach, New Zealand spinach) or individual leaves (common with Malabar spinach). Essentially, simply pick when leaves are crisp, firm and are the size you prefer for eating raw or cooking. Best stored at 32-40 F with high humidity for up to two weeks of storage.



Figure 4. *Cercospora beticola* on beet leaves. (Bruce Watt, University of Maine, Bugwood.org)

Common Pests, Diseases and Issues in Leafy Crops

Description	Possible Cause(s) and Indicators	Prevention/Control Steps
Death with plants falling over near soil level	<ul style="list-style-type: none"> Damping off complex of diseases. 	Don't overwater, increase air movement around stems, and don't seed when soil is very wet or cool. Make sure soil is well drained.
Leaf spots	<ul style="list-style-type: none"> Downy mildew — Yellow spots, may age to dead, brown dry spots. Cercospora — Tan or brown spots; can have a border that is purplish spots. 	Protective fungicides, rotation, some resistance in some crops.
Dead tissue on leaf tips (can be hidden in center of head)	<ul style="list-style-type: none"> Tipburn — Can be related to water deficits or rapid growth and environmental changes occurring rapidly. 	Provide even and adequate water and moisture, monitor often as harvest nears and consider harvesting a bit early.
Moderate to large feeding holes	<ul style="list-style-type: none"> Caterpillar (immature moth) feeding — Many species can feed on leafy crops. 	Netting or row covers can exclude these pests, and biological (Bt, spinosad products) or conventional insecticides can be used.
Small insects feeding on plant	<ul style="list-style-type: none"> Aphids (sap sucking pests) — Check undersides of leaves and center of plants. Lettuce aphids, green peach aphids and potato aphids are some of the common pests. 	<p>Conventional insecticides or insecticidal soaps.</p> <p>There are predators and parasitoids that may reduce the population of aphids, and a few lettuce species have resistance to lettuce aphids.</p> <p>Controlling weeds can reduce thrips issues as well.</p>



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