



From Garden to Table:

Leafy Greens!

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Leafy greens not only add color to your plate, but they add bountiful nutrition and potential health benefits. Green vegetables are among the types most likely lacking in the American diet. The purpose of this publication is to provide information about growing and preparing leafy greens, including lettuce, spinach, Swiss chard and kale. Try growing a variety of leafy greens, and see the recipes to tempt your palate.

Cool-season Crops

Cool-season greens are the perfect first crop for winter-weary gardeners who are anxious to work in the garden. Greens such as lettuce, spinach, arugula, beets, Swiss chard and kale can be sowed when the soil temperature has reached 50 F. In North Dakota, this is usually late April or early May, depending upon the weather and your location in the state.

Cool-season greens are adaptable to the variable weather and can take a light frost. Optimal growing temperatures are in the range of 55 to 70 F.

For lettuce, spinach and arugula, summer heat and long daylight hours will cause the plants to produce a flowering stalk and set seed (bolting). Bolting will cause the leaves to turn bitter and end the growing season. Therefore, planting greens that will mature before the onset of summer temperatures is important.

Swiss chard is more heat resistant than lettuce, arugula and spinach and can be harvested throughout the summer. Kale can be planted in early spring but tastes better as a fall crop because frost exposure moderates the bitter flavor of the leaves.

Lettuce

Lettuce (*Lactuca sativa*) is so much more than the bland iceberg lettuce offered in grocery stores around the country. Growing your own lettuce allows you to produce gourmet varieties economically.

Lettuce varieties are grouped into five types, depending upon leaf shape and the tightness of the head (Table 1):

- **LOOSELEAF LETTUCE** does not form a head but instead produces a cluster of mild-tasting leaves. This type of lettuce is the easiest to grow and matures in 40 to 50 days. Individual leaves are harvested. If the leaves are cut 1 inch above the crown of the plant, they may regrow for a second harvest. Looseleaf varieties come in attractive shades of red and green. Interplanting both colors of lettuce adds beauty to your garden.
- **BUTTERHEAD OR BOSTON LETTUCE** produces a loose head of lettuce. Many home gardeners plant this type for the large, soft leaves that have a sweet, buttery flavor. This delicious lettuce matures in approximately 55 to 65 days. Individual, outer leaves can be picked or the entire head can be harvested.
- **SUMMER CRISP OR BATAVIAN LETTUCE** is an intermediate type between the soft, loose heads of butterhead lettuce and the crispy, firm heads of iceberg lettuce. Like butterhead lettuce, summer crisp varieties mature in 55 to 65 days. This type, which originated in France, tends to be slower to bolt than iceberg lettuce when exposed to summer heat.

Table 1. Recommended lettuce varieties by type.

Looseleaf (red)	New Red Fire, Red Sails, Red Salad Bowl
Looseleaf (green)	Salad Bowl, Slobolt, Tropicana
Butterhead/Boston	Buttercrunch, Nancy, Red Cross
Summer Crisp/Batavian	Nevada, Sierra
Romaine	Crisp Mint, Green Forest, Parris Island

Source: Lettuce recommendations from Tom Kalb, NDSU Extension horticulturist, 2014, "Recommended Vegetable Varieties for North Dakota Gardens."

- **ROMAINE LETTUCE** forms heads with stiff, elongated leaves and a prominent white midrib. This is the type of head lettuce that is featured in Caesar salads. Romaine is challenging to grow in North Dakota because the average maturity date is 70 to 75 days. For best results, this lettuce should be started indoors and transplanted into the garden to get a jump start on the season.
- **ICEBERG OR CRISPHEAD LETTUCE** is the familiar, globe-shaped head found in grocery stores and salad bars around the country. Slowest to mature, this tightly folded lettuce head may take 80 days to grow and is more sensitive to summer heat. Consequently, this type is not suited to North Dakota's short spring season. Unless started indoors, this lettuce most likely will bolt in the field and not produce a satisfactory head of lettuce. Iceberg lettuce also has the lowest nutritional levels of all lettuce types and will not be recommended in this publication. It ships well, and that is the main reason it is found in practically every store.

Arugula

Arugula (*Eruca vesicaria* ssp. *sativa*) is a trendy green that is increasingly available in the grocery store. Otherwise known as salad rocket, this leafy green features a pungent, peppery flavor and is in the mustard family along with kale.

The scalloped leaf margins somewhat resemble dandelions. Salad types usually feature a broader, mild-flavored leaf. Wild types with highly serrated leaves, such as the variety Dragon's Tongue, are spicier. Arugula is a quick crop, with 35 days to maturity, although younger leaves also may be harvested.

Fun Arugula Fact

In Italy, raw arugula frequently is added to pizzas as they come out of the oven.



Red and green lettuces planted with parsley. (Esther McGinnis, NDSU)

Spinach

Spinach (*Spinacia oleracea*) is so versatile and is a popular component of salads and cooked dishes. This all-star of the kitchen deserves a place in the garden. With average maturity dates of 40 to 45 days, this is a quick and easy cool-season crop. If desired, baby leaves can be harvested before maturity.

Spinach has three basic types:

- **SMOOTH SPINACH** leaves are smooth and flat. Gardeners may prefer this type because the leaves are easier to wash. Olympia and Space are examples of smooth varieties.
- **SAVOY SPINACH** has crinkled leaves that may catch soil during rainfall events. Some gardeners prefer the flavor and texture of savoy spinach. Bloomsdale Long Standing is a common savoy variety.
- **SEMI-SAVOY SPINACH** has lightly crinkled leaves and includes Indian Summer, Melody and Tyee varieties.

Do not be confused with spinach sound-alikes. Malabar spinach is a leafy vine with red stems. Although the leaves can be used like spinach, this plant is not a true spinach and cannot be grown under cool, spring conditions. Likewise, New Zealand spinach is a warm-season plant. These are fun alternative crops to plant, but their growing conditions are outside the scope of this publication.

Fun Spinach Fact

Spinach is believed to have originated in Persia (now Iran) and has been grown for more than 2,000 years.



Beets

Beets (*Beta vulgaris*) can yield two separate but delicious crops for gardeners. Most obvious is the root crop that is harvested in late summer or fall. Not as obvious are the beet greens.

Beets are sowed quite thickly in the spring, and the germinated plants must be thinned to 3 inches apart to ensure good root development. If gardeners wait to thin the plants until the leaves are 4 to 6 inches tall, then they are rewarded with tasty beet greens for a salad or other entrees.

Swiss Chard

Swiss chard (*Beta vulgaris* var. *cicla*) is closely related to garden beets and sugar beets. However, unlike its relatives, Swiss chard does not produce a beetlike root. Instead, gardeners consume the wrinkled leaves and the colorful stems in soups and other dishes. Varieties such as Bright Lights, Neon Lights and Peppermint produce such beautiful, colorful stems that they can be integrated into flower beds or used as edible landscaping.

Swiss chard is seeded like beets and must be thinned to make room for growing plants. Optimal spacing is 6 to 9 inches between plants. The tender thinned plants can be eaten.

In comparison to other cool-season crops, Swiss chard and garden beets usually do not bolt under longer day lengths and warmer temperatures because they are biennial crops that require cool winters to flower. Swiss chard typically matures in 55 to 65 days, but leaves can be harvested into summer.

The best way to harvest is to use a knife to cleanly cut the outer leaves. If you do not take more than one-third of the leaves at a time, you will be rewarded with continued production from the center of the plant. Leaves that are less than 12 inches long tend to be the most tender and flavorful.



Kale

Kale (*Brassica oleracea*) used to be commonly displayed as an attractive plate garnish in restaurants or as an ornamental landscape plant. Times have changed, and this former garnish is now the main attraction on the dinner plate.

Kale is essentially a leafy cabbage without the tightly folded head. It can be planted in early spring for a late-spring crop. However, kale is a better fall crop because fall frost softens the bitterness of the greens and imparts a nutty flavor.

Kale comes in several types, including ornamental varieties. Commonly available edible varieties for North Dakota include Winterbor, Redbor, Dwarf Blue Curled Vates, Black Magic and Lacinato.



The last two are varieties of dinosaur kale, otherwise known as Tuscan kale. The striking blue-green leaves of dinosaur kale have become extremely popular across the country.



Dinosaur kale is so beautiful it can be planted in your ornamental beds. (Esther McGinnis, NDSU)

Cultural Conditions

Spring and Fall Planting

Leafy greens normally are direct-seeded in the spring in the garden once the soil has warmed to 50 F. This is normally when the soil is dry enough to be worked. Alternatively, smaller varieties of leafy greens can be grown in containers on a deck or apartment balcony.

The seed packet contains instructions on sowing depth, seed spacing, row spacing and thinning.

For a continuous supply of leafy greens, consider successive planting dates at 10- to 14-day intervals. Lettuce varieties that require a long, cool growing season may be started indoors and then transplanted. Transplants should be acclimated to outdoor temperatures gradually for three or four days before transplanting.

Leafy greens also can be planted in late summer for fall harvest. To calculate the planting date, first find the number of days to maturity found on the seed packet. For leafy greens, the days to maturity usually include germination time. Include an additional 10 days for cooler growing conditions in the fall, plus seven to 10 days to allow time for harvesting the greens. Using this sum, count backward from the average first frost date for your area. For most of North Dakota, the first frost is usually between Sept. 15 and Oct. 1.

This formula is not an exact science because of weather variability from year to year. However, most leafy greens can take a light frost (30 to 32 F). Furthermore, greens can be somewhat protected from frost with insulating blankets. For fall sowing of lettuce, your best option is to plant looseleaf varieties due to their shorter maturity date. Unlike other greens, kale can take a hard frost and continue to grow. Kale is a fine choice for fall planting.

Soil and Fertilizing

Conducting a soil test is the best way to determine your soil's fertility, as well as its pH. For information on how to take a soil test, contact your local Extension agent or consult the NDSU Soil Testing Lab website: www.ndsu.edu/soils/services/soil_testing_lab.

Leafy greens grow best in well-drained soils that are rich in organic matter. Compost is an excellent soil amendment for heavy clay soils and sandy soils; 2 to 4 inches can be incorporated.

Alternatively, well-rotted manure can be added in the fall prior to the year of planting. For food safety purposes, the best time to incorporate manure into the soil is the fall **prior** to planting to allow harmful bacteria such as *E. coli* and *Salmonella* to break down. Otherwise, you run the risk of food poisoning.

In place of manure, a general-purpose garden fertilizer can be broadcast and worked into the top 6 inches of the soil in the spring prior to planting. Please follow the instructions on the fertilizer's label for best results.

Watering and Weed Control

Soil moisture is important to ensure good crop yields, particularly for leafy greens. During a dry spring or fall, the garden should be irrigated to maintain even soil moisture. On average, greens require 1 to 1½ inches of rain or irrigation per week, depending upon the temperature and the soil type.

To prevent plant diseases, water during morning hours and avoid overhead watering. Instead, use drip irrigation or water at the base of the plant. Mulch may be used to conserve soil moisture and prevent weed germination.

Greens do not compete successfully against weeds. Weeds can be controlled between rows using a garden hoe. Cultivation near the plants should be avoided to prevent damage to the fragile roots. Weeds growing near plants can be pulled carefully by hand.

Insect Pests

The most common insect pests of leafy greens include aphids, slugs and flea beetles. Aphids, sometimes referred to as plant lice, have piercing-sucking mouthparts that are used to suck plant juices. A high-pressure spray of water will knock the aphids off the plant. Alternatively, insecticidal soaps may be used. Be sure to follow the labeled instructions.

Slugs are a soft-bodied mollusk that resembles a snail without a shell. They can be controlled by raking up plant debris and avoiding overly moist conditions in the garden.

Trapping using boards can be an effective control method. Trapping involves laying a board or shingle on the soil to provide shelter for slugs. In the morning, lift the board and kill the slugs that are taking refuge under the board by crushing them or placing them in a bucket of soapy water.

Flea beetles are ⅛-inch-long black beetles that chew small pits and holes in plants and give them a shot-hole appearance. Seedling plants are most susceptible to flea beetle infestations. Flea beetles can be controlled by using row covers to exclude the beetles from feeding on the foliage. Row covers should be installed right after seeding or transplanting.

Common insect pests that feed on kale include the imported cabbageworm (*Pieris rapae*) and the cabbage looper (*Trichoplusia ni*). The imported

Nutrition by the Bunch

cabbageworm adults are the familiar white moths that flutter around cole crops such as kale, cabbage and broccoli.

The caterpillar larvae are green and can grow to be 1 inch long. The voracious caterpillars are a serious pest of cole crops. Cabbage loopers are pale green and lack legs in the middle of their bodies. As a result, they move with a familiar looping motion.

Floating row covers can exclude adult moths from laying their eggs on cole crops. Alternatively, the imported cabbageworm and the cabbage looper larvae can be treated with a soil-borne bacterium called *Bacillus thuringiensis* (Bt). This is an organic pesticide that specifically targets the larvae of moths. Bt works best when the larvae are smaller. Good coverage of the leaves is essential.

Harvesting

As soon as leafy greens reach a usable size, they are ready to enjoy on your menu. Individual leaves or the entire plant can be harvested. By harvesting the “baby” greens, you can ensure multiple pickings. You also can plant more than one crop of leafy greens during the growing season.



Did You Know?

Bagged salads labeled “ready to eat,” “washed” or “triple washed” do not need to be rinsed prior to eating unless the package directions instruct you to do so.

Dark green leafy vegetables provide a variety of nutrients and fiber. They are rich in vitamins A (from the carotenoid natural pigments), C, K and the B vitamin folate. Leafy greens also contain calcium and iron.

Leafy greens also provide a variety of phytochemicals (plant chemicals) that have potential health benefits. Phytochemicals initially provide protection for the plants. When we eat the vegetables, many of these natural chemicals may help protect us from chronic diseases, including cancer and heart disease.

While we think about carrots as eye-protecting agents, dark leafy greens exceed their abilities. Dark leafy greens also provide the natural pigments lutein and zeaxanthin, which have been shown to reduce our risk for macular degeneration, a leading cause of blindness.

Naturally Low in Calories

Leafy greens are low in calories. Lettuce has about 10 calories per cup. If you are trying to maintain or lose weight, remember not to drench your lettuce in salad dressing, but add some healthful fat to increase the absorption of the vitamins. In most cases, add the dressing to the salad right before serving or serve it on the side.

TIP: If you prefer your dressing “on the side,” consider dipping the tines of your fork in the salad dressing and then into the lettuce. You will be much less likely to overdo your dressing.

Selecting and Handling Leafy Greens Safely

When enjoying fresh leafy greens, whether from your own garden, a farmers market or a grocery store, be sure to handle them safely at home. Select leafy greens that are not wilted, damaged or discolored. Maintain their quality by storing them at refrigerator temperature (40 F).

Cross-contamination has been linked with several foodborne illness outbreaks associated with leafy greens. Always wash your hands before beginning food preparation, and be sure that all equipment and utensils that come into contact with leafy greens are clean. Keep leafy greens separate from raw meat, poultry, seafood and their juices.

To clean leafy greens, rinse them under plenty of running cool water. Sometimes soil can be difficult to remove, so you can place the leafy greens in a bowl of cool water and allow them to sit a couple of minutes to loosen the soil. Rinse with cool water and remove excess moisture by blotting the lettuce with a clean paper towel or by placing the greens in a salad spinner.

Recipes

Enjoy leafy greens with your favorite salad dressing. Some leafy greens, such as spinach, chard, beet greens and kale, can be enjoyed sauteed or in cooked dishes. For more recipes, visit www.ag.ndsu.edu/food and click on the recipe database, then search for an ingredient such as spinach.

Key to Abbreviations

tsp. = teaspoon	c. = cup
Tbsp. = tablespoon	g = grams
lb. = pounds	mg = milligrams

TIP: Swiss chard sometimes is confused with rhubarb, but you probably will not enjoy it in pie! This colorful vegetable may have white, orange, red or yellow stems and veins in green leaves. Use Swiss chard like spinach in salads or try sauteing it with garlic.

Wilted Swiss Chard With Garlic

2 lb. Swiss chard, cleaned and coarsely chopped
3 Tbsp. olive oil
2 cloves garlic, minced
Salt and ground black pepper to taste
Fresh lemon juice, optional

Rinse the greens in several changes of cold water. Remove the stems and chop them into 1-inch pieces. Set aside. Stack the leaves and roll them into a tube shape. Using a sharp knife, cut across each tube until all the greens are prepared. Mince the garlic and set aside. Heat a skillet or saucepan over medium-low heat. Add oil and chopped stems. Cook five minutes. Add garlic and cook an additional few seconds. Add the wet chard one handful at a time. Stir after each addition. Cover with a tight-fitting lid. Cook the greens about five minutes, keeping the bright color. Remove the lid and cook over medium-high heat until all the liquid has evaporated, about two to three minutes. Season with salt and pepper to taste. Serve with a squeeze of lemon juice, if desired.

Makes four servings. Each serving has 140 calories, 11 g fat, 9 g carbohydrate, 4 g fiber and 4 g protein. The sodium content will vary depending on how much salt you add.

(Recipe courtesy of Illinois Extension) ◆

TIP: Kale often is listed as a “super food” on popular lists. Kale is an excellent source of vitamins A, K and C and fiber. Try it in soups, salads or these popular green chips.

Baked Kale Chips

1 bunch kale
2 tsp. olive oil (approximately)

Preheat the oven to 200 F. Lightly spray two large baking sheets with vegetable oil cooking spray. Wash and thoroughly dry the kale. A salad spinner works well, followed by patting the kale dry with paper towels or a dish towel. Cut with kitchen shears or tear leaves from stems and thick center rib in middle of leaves, then tear into large sections. Toss with 1 teaspoon oil in a large bowl. You may wish to use your fingers to distribute the oil on the leaves. Use slightly more oil if needed.

Place in a single layer on baking sheets; use separate oven shelves if needed. Bake about 20 minutes. Then remove the baking sheets from the oven, turn kale chips over and switch shelves if the pans were placed on separate shelves. Check after an additional 10 minutes to determine if they are evenly crisp. Continue baking if needed. The time may vary with your oven. For future reference, record the time that works for you. Let chips cool slightly on a baking sheet placed on a cooling rack. Finally, transfer to a bowl and sprinkle lightly with salt, grated Parmesan cheese or your favorite spice if desired.

A nutritional analysis of kale chips is not readily available, but 1 c. of chopped kale has about 35 calories, 1.3 grams (g) fiber and 7 g carbohydrate. The sodium value in your chips will vary depending on your choice of seasonings. ◆

Loose-leaf Green Lettuce Salad for One

2 tsp. mild-flavored vegetable oil, such as canola oil or sunflower oil
1 tsp. apple cider vinegar
½ tsp. sugar
2 c. loose-leaf lettuce, rinsed thoroughly and drained
Optional add-ins: sliced radishes, finely sliced apples, mandarin oranges, cranberries, chopped pecans

Whisk oil, vinegar and sugar together in small bowl.

Makes one serving of dressing (about 1 Tbsp.), with 90 calories, 9 grams (g) fat, 3 g carbohydrate, 0 g protein and 0 milligrams sodium. The nutrition information of the overall salad will vary depending on your added ingredients.

(Recipe courtesy of University of Nebraska Extension - Lancaster County) ◆



(NDSU photo)

Spinach Salad With Poppy Seed Dressing

- 8 c. bite-sized pieces fresh spinach
- ½ c. julienne strips jicama or carrot sticks
- ½ c. sliced fresh radishes
- 1 medium mango or 3 medium fresh oranges, peeled, seeded and cut up
- Optional: ¼ hard-cooked egg, chopped, on each serving
- Optional: strawberries as garnish

Dressing:

- 2 Tbsp. honey
- 2 Tbsp. white vinegar
- 1 Tbsp. yellow mustard
- 2 Tbsp. finely diced onions
- 2 tsp. poppy seeds
- ¼ tsp. salt
- ⅓ c. canola oil

In tightly covered container, shake all dressing ingredients. In a large bowl, toss dressing and remaining ingredients. Garnish with egg and/or strawberries, if desired.

Makes four servings. Each serving has 270 calories, 20 grams (g) fat, 23 g carbohydrate and 3 g protein.



Make Your Own Salad Dressings

Besides these recipes, try experimenting to create your own salad dressing. Try a ratio of four parts oil to one part vinegar, lemon juice or other acid, then add your favorite seasonings such as fresh or dried herbs.

QUICK TIP: Store prepared dressings in the refrigerator for up to a week.

Fresh Herb Vinaigrette ◆

(Makes ¾ cups)

- ⅓ c. olive or canola or other salad oil
- ⅓ c. vinegar (red wine vinegar, rice vinegar or white vinegar)
- 1 to 2 tsp. sugar
- 1 Tbsp. snipped fresh oregano or basil (or ½ tsp. dried oregano or basil)
- ¼ tsp. dry mustard or 1 tsp. Dijon-style mustard
- 1 clove garlic, minced
- ⅛ tsp. black pepper

In a screw-top jar, combine oil, vinegar, sugar, herb mustard, garlic and pepper. Cover and shake well. Serve immediately or cover and store in refrigerator for up to three days if using fresh herbs. If using dried herbs, store covered in refrigerator for up to one week. Shake before serving.

Balsamic Vinaigrette: Prepare as above, except use regular or white balsamic vinegar instead of the listed vinegar options.

Orange Balsamic Vinaigrette: Prepare Balsamic Vinaigrette as above, except reduce balsamic vinegar to 3 Tbsp. Add ½ tsp. finely shredded orange peel and ¼ c. orange juice.

(Vinaigrette recipes courtesy of Better Homes and Gardens New Cookbook, Bridal Edition, and University of Kentucky Extension Service)

Italian Dressing Master Mix ◆

- | | |
|----------------------|--------------------|
| 1 Tbsp. garlic salt | ¼ tsp. thyme |
| 1 Tbsp. onion powder | 1 tsp. basil |
| 1 Tbsp. sugar | 1 Tbsp. parsley |
| 2 Tbsp. oregano | ¼ tsp. celery salt |
| 1 tsp. pepper | 2 Tbsp. salt |

Mix together and store in an airtight container until ready to use. Label, date and store in a cool, dry place. Use within three months.

To prepare dressing, mix together:

- ¼ c. cider vinegar
- ⅔ c. olive or canola oil or other salad oil
- 2 Tbsp. water
- 2 Tbsp. dry Italian dressing mix

Recipes (continued)

Ranch Dressing Master Mix ◆

2 Tbsp. dried parsley flakes
5 Tbsp. dried minced onions
1 Tbsp. salt
1 tsp. garlic powder

Mix together and store in an airtight container until ready to use. Label, date and store in a cool, dry place. Use within three months.

To prepare ranch salad dressing, mix together:

1 c. low-fat mayonnaise
1 c. low-fat buttermilk
3 Tbsp. dry ranch mix

Chill salad dressing for a couple of hours in the refrigerator before serving to blend flavors. Shake and serve.

Sweet Poppy Seed Dressing Master Mix ◆

½ c. sugar
1 tsp. salt
1 tsp. dry mustard
1 Tbsp. poppy seeds
1 Tbsp. dried minced onion

Mix together and store in an airtight container until ready to use. Label, date and store in a cool, dry place. Use within three months.

To prepare dressing, in a blender combine:

1 recipe of Sweet Poppy Seed Mix
½ cup olive oil or canola oil
½ cup vinegar

Blend five to eight seconds. Chill at least three hours or overnight before using.

(Master mix recipes courtesy of Utah State University Extension)



Swiss chard with its colorful stems. (Esther McGinnis, NDSU)

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