

LETTUCE AND GREENS



LETTUCE

LACTUCA SATIVA

FROM THE ASTER FAMILY

LOOSE LEAF LETTUCE HAS
MORE NUTRIENTS THAN
HEAD LETTUCE

DARK GREEN LEAVES HAVE
MORE NUTRIENTS THAN
LIGHT COLORED LEAVES

FIBER, VIT. A AND C,
CALCIUM, AND IRON



SPINACH

SPINACIA OLERACEA

FROM THE GOOSEFOOT
FAMILY

FIBER, VIT. A AND C,
CALCIUM, PHOSPHORUS,
IRON, AND SOME PROTEIN



SWISS CHARD

BETA VULGARIS VAR.
CICLA

FROM THE GOOSEFOOT
FAMILY (FROM THE
MEDITERRANEAN)

A VARIETY OF BEET THAT
DOES NOT GROW A LARGE
ROOT

TASTE OF SPINACH

CHARD KEEPS HIGH
QUALITY EVEN IN HEAT
AND DOES NOT BOLT



ASIAN GREENS

MOSTLY RELATED TO
CABBAGE AND MUSTARDS
(BRASSICA FAMILY)

MIZUNA

TAT SOI

KOMATSUNA

PAC CHOI

HONG VIT

HON TSAI TAI

BOK CHOY



SPECIALTY GREENS

ARUGULA

CILANTRO

CRESS

MACHE

MINER'S LETTUCE

DANDELION

KALE

COLLARDS

ORACHE

PURSLANE

NEW ZEALAND SPINACH

AMARANTH

SORREL AND FRENCH
SORREL



SITE PREPARATION

SMALL SEEDS OF LEAFY GREENS LIKE RICH, FLUFFY SOIL WITH HIGH LEVELS OF ORGANIC MATTER

SOIL MUST DRAIN BUT HOLD MOISTURE SINCE THESE PLANTS HAVE SHALLOW ROOTS AND LOSE A LOT OF WATER THROUGH THEIR LEAVES

SOILS NEED TO HAVE GOOD FERTILITY, ESPECIALLY NITROGEN

GREENS CAN BE STARTED AS TRANSPLANTS

PLANTING THEM 3 TO 4 WEEKS PRIOR TO WHEN YOU WOULD WANT TO MOVE OUTDOORS



STARTS

CAN USE YOUR OWN
STERILIZED POTTING MIX
OR YOU CAN BUY A MIX

THE GROWING MEDIUM
CAN BE A MIX OF
COMPOST, PEAT,
SPHAGNUM,
VERMICULITE, PERLITE,
NATURAL STERILIZED SOIL,
AND A SOURCE OF
NUTRITENTS (IF NOT ALL
READY IN THE SOIL OR
COMPOST)

180 TO 200 DEGREES FOR
30 MINUTES



STARTS

- 1.** Fill plastic or styrofoam cell trays with potting soil, or make individual blocks with a soil blocker. Cells as small as 1 inch in diameter are fine.
- 2.** Barely cover the seeds with a small amount of soil, since they need light to germinate.
- 3.** Label the trays with variety and planting date.
- 4.** Keep soil moist but not wet.



STARTS

5. The temperature at night should be 10-15 °F cooler than during the day.

6. Thin seedlings to one plant per cell or plug, or one plant every inch.

7. Seven to ten days before transplanting out to the field, harden off the plants by putting them outside for a few hours each day during the warmest time of the day, or move plants into the high tunnel or a cold frame.



PLANTING LETTUCE

Lettuce prefers weather between 65°F and 70°F during the day and 45°F and 55°F at night. Some varieties of lettuce grow better under long days while for others day length does not matter (they are “day-neutral”). If lettuce gets too hot under the long days of summer it can produce an early seed stalk (“bolt”) and poor flavor.



PLANTING LETTUCE

Plant more every 2-3 weeks as long as there is cool weather. You can plant some varieties that tolerate heat as late as early July. Under the best conditions, lettuce seed will germinate in 2 to 4 days and come up shortly after. If the soil is cooler, then germination is slower; and if the soil is warmer (above 77°F) then germination stops.



SPACING LETTUCE

For head lettuce, plant 3 seeds every 8 inches in rows 12-18 inches apart.

❖ Thin head lettuce to 1 plant every 8 inches.

❖ For leaf lettuce, plant either in rows 2-4 inches wide or in beds.

❖ Plant leaf lettuce close together and thin to 1-2 inches between plants.



PLANT SPACING

Decide whether you want to combine seeds to mix varieties within the planting beds or grow them separately and mix leaves together after harvest. Since these seeds need light to germinate you should barely cover the seeds with a small amount of soil when you plant them. Sprinkle lightly with water to give the plants even moisture.



PLANTING SPINACH

Spinach grows best at 55-65°F. If you plant in the heat of summer, long days and warm temperature causes spinach to send up an early seed stalk (to bolt) and stop making large leaves. Spinach is very hardy. If the plant is used to cold, it can take some freezing down to 14 to 20°F.



PLANTING SPINACH

You can plant spinach in late fall the year before and plants will either grow to maturity before frost or grow big enough (3-4" diameter) to survive the winter. Early the next spring they will begin to grow new leaves. If you plant spinach seeds in late fall or early winter and cover them with mulch they might sprout early the next spring.



PLANTING SPINACH

- ❖ Plant in rows or in beds.
- ❖ For salad mix, plant seeds $\frac{3}{4}$ inch apart in rows 2-4 inches wide.
- ❖ For full sized leaves, plant $1\frac{1}{4}$ inches apart in rows 12-18 inches apart.
- ❖ For salad mix, clip leaves when they are small.
- ❖ For full sized leaves, pick outer leaves first.



PLANTING SPINACH

Seed should be planted 1/2 inch to 3/4 inch deep. In cool weather, between 40-45°F, almost all of the seeds will germinate but will take up to 3 weeks to come up. In warmer weather, germination is faster (7-10 days) but the percent of seeds that germinate goes down.



PLANTING SWISS CHARD

You can plant chard pretty early and then every four weeks. If you grow it for salad mix pick it until 30 days before frost. If you grow it for full sized leaves pick it until 60 days before frost. Cold weather can cause bolting, an early seed stalk, which stops leaf growth and makes leaves bitter. Plant either in the field or use transplants.



PLANTING SWISS CHARD

- ❖ For salad mix, seed 1/2 inch deep in the same spacing as for leaf lettuce.
- ❖ For full sized leaves, space plants 8-12 inches apart in the row.
- ❖ For salad mix, clip leaves when they are small.
- ❖ For full sized leaves, pick outer leaves first.



PLANTING ASIAN GREENS

Plant Asian greens when the weather is cool, in spring and fall. If you plant in the heat of summer, Asian greens will start to flower and the leaf flavor will be bitter.

- ❖ For salad mix, plant seeds closer together.
- ❖ For full sized bunches, plant seeds 1/4 inch deep and 2 inches apart in rows 18 inches apart.
- ❖ For salad mix, clip leaves when they are small.
- ❖ For full sized leaves, pick outer leaves first.



	Plants or seeds needed for 100 ft of row	Seed depth (inches)	Spacing (inches) ^b		Days to first harvest ^c	Estimated yield (lb/ft of row) ^d
Vegetable			Between rows	Between plants		
Lettuce, head	100 plants	-	15-18	8-10	60-75	0.50
Lettuce, leaf	¼ oz	¼	15-18	2-3	40-60	0.25
Spinach	1 oz	¾-1	15-18	1-2	40-60	1.00
Chard	1-1¼ oz	½	15-18	12	40-50	2.00
Asian Greens	1/6 oz	¼	15-18	2-6	35-45	0.25-0.50

FLOATING ROW COVERS

Floating row covers are special sheets of white fabric made of spun-bonded polypropylene which lets sunlight and water through the fabric but stops insects.

- ❖ You can use row covers to protect plants from frost, wind, and insects.

- ❖ Row covers come in different weights and the thicker ones can warm plants by 4-8°F.

- ❖ You can plant salad greens 3-4 weeks earlier in the spring and harvest 3-4 weeks later in the fall.

- ❖ You can wash and re-use row covers for two to three seasons.



FLOATING ROW COVERS

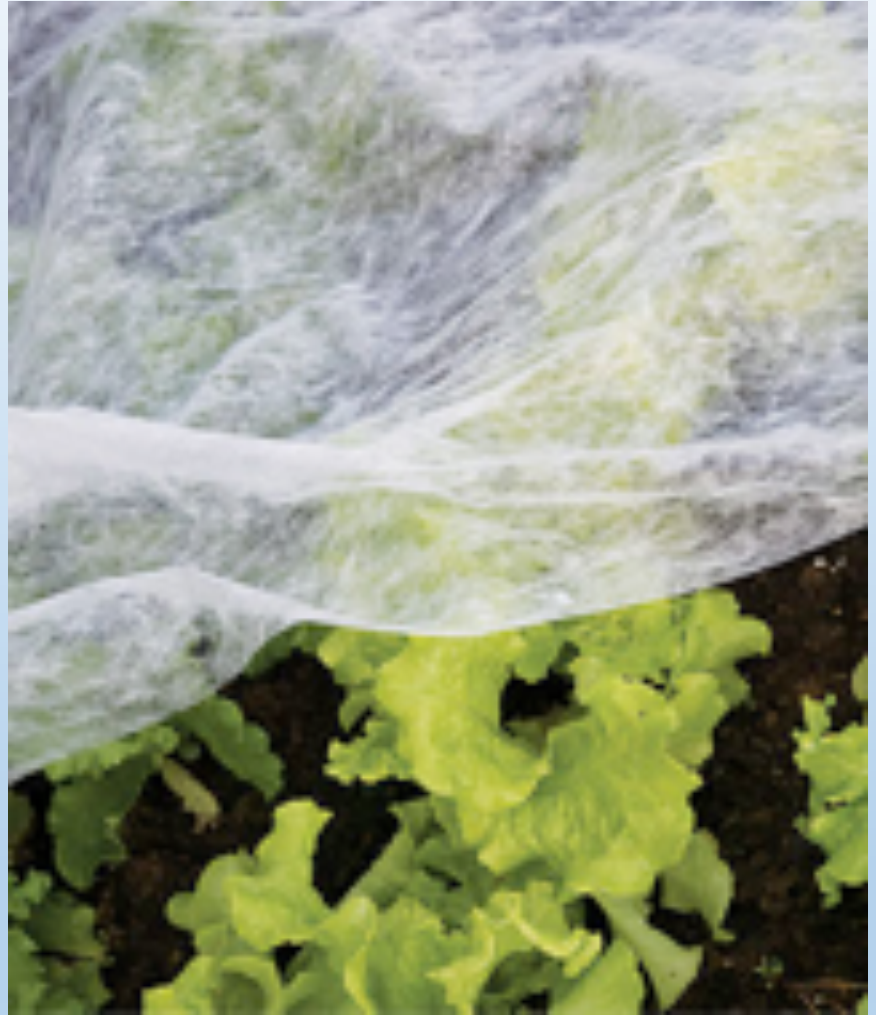
Put the row cover on top of the crop or hold it up with wire hoops. If you use wire hoops to hold up the row cover, put 6 feet apart and buried 1 foot deep on each side of the row.

If you gather the edges and loosely bury them along the crop row, then as the crop grows it will push up enough fabric to form a “floating” cover. You can also use rocks or heavy posts to hold down the edges. If you want the row cover to keep out insects you must seal all the edges tightly to the ground.



FLOATING ROW COVERS

If you use row covers for early spring or late fall crops, take them off when the air is warm enough for the crop to grow. Before this, let the plants harden off for a few days to prevent heat and sun from burning the crops. Do this by removing covers on cloudy days or for a few hours on sunny days. On very hot days, be sure to lift the row cover to give plants some air.



HIGH TUNNELS

Salad greens grow well in greenhouses or plastic hoop houses, where you can plant 4-6 weeks earlier than outside.

You can use floating row covers on top of crops in a greenhouse or hoop house to give extra warmth.

Be careful to control nitrate levels when you grow salad greens inside in low light, especially spinach. Nitrate can build up in these plants and form nitrite which is toxic to people.



HIGH TUNNELS

Keep leaf nitrate levels down by using the least amount of nitrogen fertilizer and putting it just along the plants instead of over the whole area. Give plants many small amounts of fertilizer through the growing season instead of one large amount.



SOIL PH

Soil pH measures acidity and should be between 6.0 - 8.0 for salad greens so they can take up the most nutrients from the soil and have enough minerals. If they don't have enough minerals plants can turn yellow, form brown spots on leaves, or other problems. For lettuce, pH 6.0-8.0 is best and less than 5.5 is too acidic; for spinach, 6.0-7.5 is best, and for chard 6.5-7.5. If the pH is below 6.0, apply lime to raise the pH.



FERTILIZER

Leafy greens need nitrogen, phosphorus, and potassium in large amounts and many other nutrients in small amounts. Leafy greens have a shallow small root system, so they need small amounts of fertilizer often. Also, this schedule gives fast steady growth for crisp high quality leaves. Nitrogen is the most important nutrient for leafy greens. Put down no more than half the amount of nitrogen you need during the growing season when you make the field ready for planting. Later, such as when you thin the plants, put down more.



Annual nitrogen, phosphate, and potash for salad greens

	Nitrogen			Phosphate and potash				
	Organic matter	Amount to apply ^a			Amount to apply ^a			
					Phosphate (P ₂ O ₅)		Potash (K ₂ O)	
Vegetable	%	lb/a	oz/100 sq ft	Soil test categories	lb/a	oz/100 sq ft	lb/a	oz/100 sq ft
Asian Greens ^b	<2.0	145	5.4	—	Heavy feeder, more than lettuces			
	2.0-9.9	120	4.4	—				
	10.0-20.0	95	3.5	—				
	>20.0	50	1.9	—				
Lettuce and Swiss Chard	<2.0	120	4.4	optimum	40	1.5	160	5.9
	2.0-9.9	100	3.7	high	20	0.7	80	2.9
	10.0-20.0	80	2.9	very high	—	—	40	1.5
	>20.0	40	1.5	—	—	—	—	—
Spinach ^c	<2.0	100	3.7	optimum	20	0.7	50	1.8
	2.0-9.9	80	2.9	high	10	0.4	25	0.9
	10.0-20.0	60	2.2	very high	—	—	10	0.4
	>20.0	30	1.1	—	—	—	—	—

FERTILIZER

When you give the plants fertilizer later in the season, put it in a strip near the plant roots. Give the plants more nitrogen in the last few weeks before harvest, because most of the plant's growth happens at that time.

Choose fertilizer from organic or inorganic sources. Healthy soil has tiny organisms (microbes) that break down organic matter into nutrients that plants need to grow. Over time, organic fertilizer can build your soil and make the soil more healthy and fluffy which lets plants grow more easily.



FERTILIZER

Inorganic fertilizers give plants nutrients quickly but do not build the soil. Some inorganic fertilizers have a lot of salt which is bad for soil organisms. Organic fertilizers can come from manure, compost, fish meal, bone meal, and live compost tea that includes oxygen. Recent studies show that live compost tea helps prevent plant diseases and also gives nutrients to plants. Live compost tea is made by carefully mixing fungi, bacteria, sugars, water, and a steady stream of air to grow active soil micro organisms.



IRRIGATION

Salad greens need water regularly because they have big leaves and a small shallow root system. Before germination, water the soil so a crust does not form. As plants grow, notice if leaves wilt in the middle of the day. If so, they need water. Plants that wilt for a short time will not produce as big a yield. Plants that wilt often or for a long time might die.

Use either drip irrigation or sprinkler. Drip irrigation saves water and helps prevent leaf diseases. Prevent tip burn with frequent watering. Mulch can help keep moisture in the soil.



HARVEST, HANDLING, AND STORAGE

Most people pick salad greens by hand.

Growers either pick and sell the outer, older leaves from each plant or cut all the leaves at once. Either way, plants grow new leaves and you can get many harvests from each planting.

Taste your own crop to learn the best time to harvest from your field. If you know your own crop well you can talk about the high quality of your produce with customers. Most salad greens can be cut when they are young and on to a point where they begin to lose their flavor.



HARVEST, HANDLING, AND STORAGE

Some salad greens turn bitter if you harvest too late. Also, plants harvested late tend to get more diseases. Some growers sell “micro” greens: tiny leaves picked when the first true leaves appear.

If you cut bunches of leaves or heads, use a sharp knife or scissors. Cut heads below the lowest leaf. Remove the outer leaves and any other leaves that don't look good. Take a mesh bag such as you use for laundry and use it to line the harvest container. Pick leafy greens into the mesh bag to save time later.



HARVEST, HANDLING, AND STORAGE

Leafy greens stay fresh and crisp if you cool them quickly and keep them in high humidity.

❖ Put the bagful of greens in a cool water bath for a few minutes right after harvest.

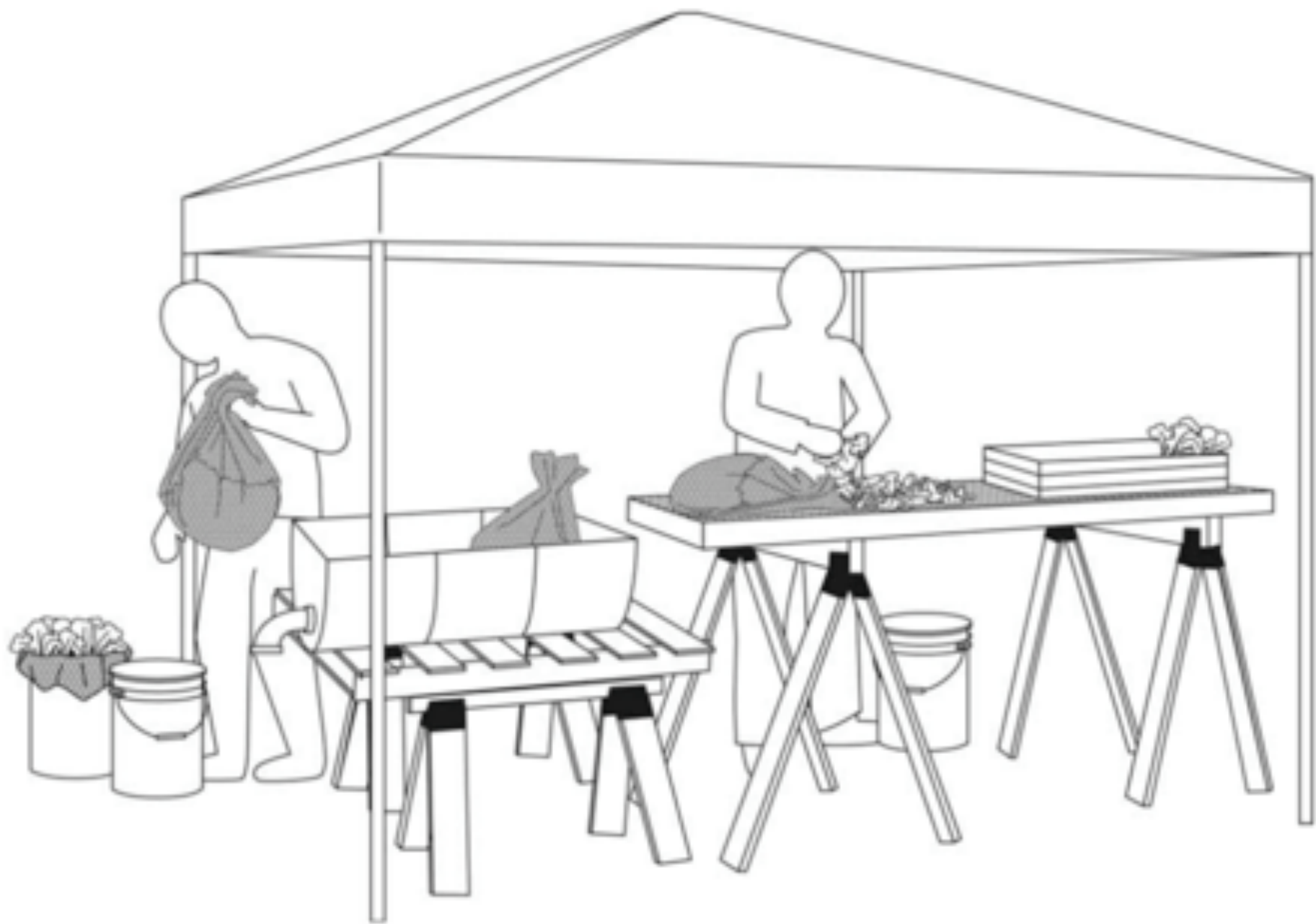
❖ If the leaves are dirty, change the water once or twice.



HARVEST, HANDLING, AND STORAGE

Buy or make washtubs. You can use plastic food barrels cut in half the long way. Build a wooden framework to hold the washtubs at a good height for work. Cut a hole in the short end to put in a plastic (PVC) pipe elbow and valve (from the plumbing section of your hardware store). Put this pipe into a long plastic (PVC) pipe to drain the water away from your work station. Or choose a bigger tank to wash greens, such as an old stainless steel bulk milk tank from a dairy farm. Some growers use a spa type of motor for a bulk milk tank to make a bubble-type washing system for salad greens.





HARVEST, HANDLING, AND STORAGE

Dry greens by spinning them for a few minutes or laying them out on screen tables.

- ❖ You can spin dry a small amount of washed greens by swinging the mesh bag in wide circles over your head.
- ❖ Some growers use a small tabletop salad spinner that you crank by hand.
- ❖ If you have larger amounts to dry you can build a spinner from an old washing machine. Put two bags of greens into the washing machine and set it to “spin cycle” for a few minutes.
- ❖ You can also use a restaurant salad spinner with an electric motor to spin dry a lot of greens.



HARVEST, HANDLING, AND STORAGE

Pack greens into waxed cardboard boxes and store them in a cooler.

- ❖ Line the box with a clean damp cloth to keep humidity high.

- ❖ Do not let the temperature fall below 32°F. See below for storage details about each crop.

- ❖ Do not store apples, melons, or tomatoes in the same cooler as greens because those crops give off a gas as they ripen (ethylene). This gas makes leafy greens turn yellow.

Sell greens bulk by the pound or in plastic produce bags as soon as you can after harvest. You can keep greens in a cooler for 1-2 weeks.



HARVEST, HANDLING, AND STORAGE

Butterhead lettuce is mature and ready 42-70 days after planting. The exact length of time depends on weather and the variety you grow. Leaf lettuce is mature in 48-58 days, Romaine lettuce in 50-70 days, and crisphead lettuce in 60-120 days. You can cut and sell all of the lettuce types (except crisphead) before they are mature. You can also pick and sell some leaves from each plant at least 3 weeks before they are mature. Many types of lettuce will keep growing leaves. Store lettuce at 33-35°F and 90-95% relative humidity. This way it can keep good quality for up to 2-3 weeks.



HARVEST, HANDLING, AND STORAGE

Spinach matures in 35-50 days and you can start to harvest it earlier, when 5-7 leaves grow on the plant. Keep harvesting until the new leaves are too small or a seed stalk forms. Spinach keeps well for up to 2 weeks if stored at 32°F and a relative humidity of 85-95%.



HARVEST, HANDLING, AND STORAGE

Swiss chard is mature in 50-60 days but can also be harvested early, about 3 weeks before. Store chard for up to 2 weeks at 32°F and a relative humidity of 85-95%.

Asian greens are mature in 35-45 days and can also be harvested early. You can start picking leaves after 4-5 weeks. Asian greens will keep well for up to 2 weeks if stored at 32°F and a relative humidity of 90-95%.



STRESS ON THE BODY

Try to prevent stress on your body when you grow leafy greens.

- ❖ Try to prevent stooping or bending.
- ❖ Change your position often.
- ❖ Sit on a stool or a pail. You can use a stool that you wear as a belt, or a stool on wheels that rolls along the row like a cart.
- ❖ Use garden carts and wagons as often as you can so you do not lift and carry so much.
- ❖ If you use a standard plastic container that stacks and is easy to load, unload, and clean, you will save time.



STRESS ON THE BODY

In the place where you pack your crops, try to have a smooth level floor so it is easier to work with carts and wagons.

- ❖ Set up your wash and pack area so you walk, carry, stoop, and bend as little as possible.
- ❖ Set up work areas the same height as a table.
- ❖ Short people might want to stand on a stool to reach the tables more comfortably.
- ❖ To move boxes of produce, there are systems you can use with small pallets and hand pallet trucks.
- ❖ You can also buy roller table to move heavy boxes of produce.



WEED CONTROL

You must control weeds to grow a good crop of salad greens. Weeds take water, nutrients, space, and light away from your crop. Also, weeds left in the field might be picked by mistake with the salad greens. Before you plant, remove weeds.

- ❖ Cultivate or hoe regularly to remove annual weeds. If you cultivate early in the season you prevent most weed problems.
- ❖ Cultivate shallow, not deep. Do not harm the small roots of the salad greens.

ALSO WEED BY HAND



PESTS

The common insects that attack leafy greens are aphids, thrips, cutworm, leaf miner, and flea beetles.

Aphids and thrips are both tiny insects you will see more easily with a magnifying glass. Look on the under side of leaves. Aphids have a soft pear shaped body which can be white, yellow, black, brown, red, or green. They suck plant juices and their waste is a clear sticky sap. Thrips have a long, shiny body that is black or yellow. They suck plant juices and also cut into leaves, causing tiny silvery white spots. Both aphids and thrips can carry viruses into salad greens. Viruses can cause disease.



PESTS

Aphids and thrips

Keep your fields and the edges of neighboring areas as weed free as you can to prevent aphids and thrips. You can add helpful insects (beneficial insects) such as lady bugs and lacewings to eat aphids and thrips. If the insects caused a lot of damage, use a soap spray meant to kill insects.



PESTS

Cutworms can also chew on young leaves and stems. They are a long (1 1/2" -2") larvae of a moth and they curl into a "C" shape. Crush them to kill them.



PESTS

Leaf miners are small larvae from a fly. The larvae eat and make tunnels in between the top and bottom parts of a leaf. They live in soil over winter. Use row covers to protect plants. Remove leaves that have leaf miners. Also remove weeds that attract leaf miners.



PESTS

Flea beetles are small (1/8" long) shiny black beetles that jump. In spring and summer they eat small holes in leaves and stems. Asian greens attract flea beetles. Flea beetles attack young plants more easily than older plants, and they attack plants that do not have enough water or nutrients. Remove weeds to prevent flea beetles. Use row covers to protect plants.



PESTS

Root Maggots are larvae of flies that lay eggs at the base of Brassica plants. The maggots eat away plant roots, especially on mustard greens and bok choy as well as cabbage.

Use row covers and rotate crops.



OTHER PROBLEMS

Tip burn on lettuce looks like brown and rotted areas on the edges of inside leaves. Tip burn happens when the lettuce plant loses more water from leaves than it can take up from the roots. This is more common during hot weather when plants do not get water often enough and do not take up enough calcium. It is more common on soils that have a lot of nitrogen.



OTHER PROBLEMS

Nitrogen Deficiency on lettuce is common and causes a yellowing and pale looking plant. The remedy is to apply a rapidly dissolving nitrogen fertilizer or item such as compost tea.



OTHER PROBLEMS

Diseases also affect leafy greens and are worse when it is wet. Choose disease resistant varieties, plant in well drained soil or on raised beds, and space plants so air flows between them. Water plants early in the day so they can dry. Rotate crops in a field to keep the spores from building up in the soil. Sprays of compost tea may work to prevent and control fungal infections.



QUESTIONS?

