



# Celery

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Production: 760 60-pound crates per acre average yield.

Good yield is 1,000 crates per acre.

Use: 60% of Michigan celery is packed in full-size containers (60 pound crates); 15% is packed as celery hearts; 25% is processed.

Recommended Varieties: Utah 52-70, 52-70H, 52-70R, Florida 2-13, Florida 2-14, Florida 683, Tall Green Light.

## Climatic Requirements

Celery is a cool season crop that produces highest yields and best quality at temperatures of 60° to 80°F. Young and mature plants can withstand moderate frosts, but prolonged frosts at temperatures below 28°F will damage the crop. Celery can be protected from frosts in spring and fall by sprinkling with water when temperatures drop below 32°F.

Celery plants may form seedstalks (bolt) after exposure to temperatures below 60°F for 10 days or longer. The number of bolting plants increases as the exposure to cold temperature increases. Sunshine and warm temperatures will reverse the effects of cold temperatures to some extent.

Celery planted in the field before April 20 is usually covered with white paper or plastic tunnels to increase growth and protect from low temperatures that induce bolting. Tunnels are usually ventilated by May 1 and removed around May 15.

Celery requires about 1 to 2 inches of water per week throughout the growing season to maintain optimum growth. When rainfall is deficient, irrigate celery regularly.

Celery is a relatively long season crop, requiring 40 to 60 days in the seedbed and 80 to 90 days from transplanting to harvest.

## Growing Transplants

Sterilize celery seedbeds, in greenhouse and field, in the fall when soil temperature is above 50°F. (See Extension Bulletin E-312, "Control of Insects, Disease and Nematodes on Commercial Vegetables," and E-1025(b), "Safe, Effective Use of Pesticides (Soil Fumigation)" for more information on soil fumigation). Soil free of disease organisms is essential for production of healthy seedlings.

Store celery seed for two years before sowing to avoid late blight (*Septoria apiicola*). This fungal disease is carried in the seed coat but is usually not viable after 2 years. About two ounces of seed will produce enough plants for one acre.

Celery seed is sown in the greenhouse starting February 1 for transplanting in the field in late March and early April. Seed is sown several times a week to provide a con-

stant supply of uniform transplants. Plant seed 1/16 to 1/8 inch deep. It is essential to keep the soil surface moist to avoid drying out the seed. This can be done by covering the seeds with a light layer of vermiculite or covering the soil surface with cheesecloth. Remove the cheesecloth about a week after germination before the seedlings grow through the cloth. Optimum temperature for germination is 70° to 75°F. Avoid night temperatures below 60°F in the greenhouse to prevent seedstalk initiation. Celery plants near outside walls in the greenhouse should be protected from low temperatures by placing a plastic sheet between the plants and the walls. Circulating the air in the greenhouse will help overcome cold spots.

Celery plants can be grown to transplant size directly from seed or they can be "double rooted." In the double root process, seed is planted in a seedbed and plants are grown for 4 weeks. Then the plants are transplanted to a larger spacing and grown for another 4 weeks. This allows for selection of larger, more uniform transplants. Whether direct seeded or double rooted, each transplant should have about 1 1/4 square inch growing space for best space utilization and plant quality. If plants grow too rapidly or planting is delayed, large plants can be clipped back to 3 to 4 inches in height without injuring the transplants.

Celery is planted in the greenhouse from February 1 to April 15. After mid-April, transplant beds are established in the field. The last seed is planted in the field June 1 for transplanting in mid-July.

Fertilize greenhouse seedbeds according to recommendations based on results of a greenhouse soil test from the MSU soil testing laboratory. Avoid use of high salt fertilizers such as 0-0-60 (KCl) to avoid buildup of salts in soil. KNO<sub>3</sub> can be used for potassium fertilization.

Water seedlings in germination beds at least once a week with a nutrient solution after true leaves have emerged. Use water soluble starter solution, such as 10-52-17 or 10-30-10 at 1 to 2 oz. per 100 square feet. After the seedlings have been transplanted in the greenhouse, water once with starter fertilizer at the above rate. Then apply a water-soluble fertilizer high in N and K, such as 14-0-44, at 2 oz. per 100 square feet at least once a week until the plants are pulled.

If celery plants are grown to transplant stage directly from seed (i.e., they are not double rooted), use the starter fertilizer for the first 4 weeks, and the 14-0-44 for the last 4 weeks that the plants are in the greenhouse.

Apply enough water several times a week so that the soil is soaked to a depth of 6 to 8 inches. This will help flush out extra salts that accumulate from the fertilizer solution.

## Soil Requirements

Virtually all celery is grown on muck soils in Michigan. It can be grown on well-fertilized and watered sandy



loams. At time of planting, the soil surface should be smooth and fairly firm, for successful setting of transplants.

### Fertilization

Add lime to maintain a pH above 5.5 on muck soils. To produce a 1,000 crate-per-acre crop, the following quantity of nutrients are required: 200 lbs nitrogen (N), 150 lbs phosphate ( $P_2O_5$ ), 600 lbs potash ( $K_2O$ ), 390 lbs calcium (Ca) and 31 lbs magnesium (Mg). Supplemental fertilizer needs should be based on recommendations from the MSU soil testing laboratory after a complete soil test.

Celery demand for nitrogen is low during the first 25 days in the field; after 25 days, demand increases rapidly. Thus, it is important to apply most of the nitrogen by sidedressing. Dip celery roots in a high phosphate starter solution before transplanting. Change the starter solution dip water at least once a week. Potassium is often the limiting nutrient for celery growth, so it is important to maintain potash levels of 500 lbs. or more in the soil.

Calcium (Ca) deficiency results in a physiological disorder known as blackheart, in which the celery heart turns black while outer leaves are unaffected. Calcium deficiency occurs most frequently during periods of moisture stress, usually during hot, dry periods in July and August. It also occurs as a result of rapid top growth. If temporary wilting occurs (evidence of moisture stress) irrigate and spray (direct into the heart of the plant) with 10 lbs calcium chloride or 15 lbs calcium nitrate per acre. If moisture stress continues, reapply calcium chloride or calcium nitrate once per week.

Some celery varieties are inefficient in taking up magnesium (Mg) from the soil. Magnesium deficiency causes chlorosis (yellowing) on the tips of the older leaves that progresses around the leaf margins and inward between the veins. If magnesium deficiency occurs, apply as a foliar spray 20 lbs Epsom salts (magnesium sulfate) per acre (2 lbs actual magnesium). If deficiency symptoms persist beyond 10 to 14 days, reapply 20 lbs Epsom salts per acre. Two applications should be sufficient.

Manganese (Mn) deficiency often occurs in celery. It appears as chlorosis between the dark green veins. Chlorosis is general over the whole plant. Six to eight weeks after transplanting, apply as a foliar spray 4 to 6 lbs manganese sulfate per acre (1 to 2 lbs actual manganese). Use the higher rate on larger plants. Repeat after 10 to 14 days, if needed.

Boron (B) deficiency results in a physiological disease known as cracked stem. The first symptoms are brownish mottling along the margins of the bud leaves. Stems become brittle with brown strips along the ribs. Crosswise cracks later appear on the stems. To avoid boron deficiency, apply 10 lbs of borax per acre (1 lb actual boron) in the broadcast fertilizer before planting.

Supplemental nutrients can be applied in different combinations of preplant, sidedress, and topdress applications. Some possible combinations for use on muck soils are:

A. Broadcast and disc in 600 lbs of 0-0-60. When marking rows, apply (under the row) 500 lbs of 8-32-16, 40 lbs of manganese sulfate, and 10 lbs of borax per acre (40 lbs N, 160 lbs  $P_2O_5$ , 440 lbs  $K_2O$ , 10 lbs manganese, and 1 lb boron). Sidedress two or three times with 120 lbs 45-0-0 or 160 lbs of 34-0-0 per acre (54 lbs N each time).

B. Broadcast and disc in 700 lbs 0-0-60, 450 lbs of 8-32-16, and 10 lbs of borax per acre (36 lbs N, 150 lbs  $P_2O_5$ , 492 lbs  $K_2O$ , and 1 lb boron). After transplanting, sidedress with 400 lbs of 12-12-12 and 40 lbs manganese sulfate per acre (48 lbs N, 48 lbs  $P_2O_5$ , 48 lbs  $K_2O$ , and 10 lbs manganese). Sidedress twice with 150 lbs 45-0-0 or 200 lbs 34-0-0 (68 lbs N per acre each time).

C. Broadcast and disc in 700 lbs of 0-0-60, 500 lbs of 12-12-12, and 10 lbs of borax per acre (60 lbs N, 60 lbs  $P_2O_5$ , 480 lbs  $K_2O$ , and 1 lb boron). Sidedress four times with 200 lbs 20-10-10 per acre (40 lbs N, 20 lbs  $P_2O_5$ , and 20 lbs  $K_2O$  each time). Add 40 lbs manganese sulfate per acre in the first sidedressing.

### Spacing and Planting

Celery plants are transplanted into the field from about April 1 through July 30. All celery is transplanted in Michigan.

For crate-pack celery, plant populations should be 30,000 to 35,000 plants per acre. For celery heart production, populations should approximate 40,000 plants per acre. Plant celery in 24 to 34 inch rows, with 4 to 7 inches between plants.

### Harvest and Postharvest

About 95% of celery for crate-pack or processing is harvested by machine. About 75% of celery for hearts is cut by hand. Celery harvested by machine is brought to packing sheds in bulk trailers, where it is trimmed, washed and packed into crates or cardboard cartons. Celery is packed by number, depending on the size of the stalks. The most common packs are 2, 2½, 3, 4, or 6 dozen per crate. When the celery has been packed, it should be vacuum or hydrocooled. Celery should store well for 2 to 3 months at 32°F and 95% relative humidity. It is important to maintain good air circulation during storage.

### Pests

Annual grasses and broadleaved weeds create the major weed problems for celery production. It is important to control weeds in seedbeds and throughout the life of the crop in the field. Weeds left in the crop serve as reservoirs for insect and disease pests and compete with celery for nutrients and water. Weeds also interfere with harvesting operations.

Celery fields usually are not fumigated for nematode control unless increased yields justify the cost. It is usually possible to produce a celery crop with nematodes present by use of sufficient irrigation and extra fertilizer to compensate for the reduced root system. Fumigation will also control wireworms and cutworms.

Celery is subject to several insect and disease pests. Insect pests that commonly cause problems in Michigan are cutworms, aphids, carrot weevils, aster leafhoppers, and loopers. Common diseases are damping off (*Pythium*, *Sclerotinia*, *Rhizoctonia*) in the seedbed, and early blight (*Cercospora*), late blight (*Septoria*), pink rot, bacterial blight, and aster yellows in the field.

A regular spray program is necessary to maintain control of pests to produce an undamaged crop. Since pesticide registrations and regulations are constantly changing, check the latest editions of MSU Extension Bulletins E-433 "Weed Control Guide for Vegetable Crops" and E-312 "Control of Insects, Diseases and Nematodes on Commercial Vegetables" for current pest control recommendations.