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## **How to Grow Belgian Endive in Connecticut**

Witloof chicory, known in the United States as Belgian endive, is grown extensively in Western Europe where great quantities are consumed. It was discovered in the late 1800's by a Belgian farmer who stored a pile of chicory roots in darkness over winter to use as a coffee substitute. He found that the roots, whose tops were severed, began to regrow a small head whose pale yellowish-white leaves were mild tasting. Consumers discovered that the pale yellow head, called a chicon, had great culinary diversity. It could be cooked as an entrée, in soups, eaten raw in a salad, or served as a hors d'oeuvre with a dip. Belgian endive is nutritious and rich in fiber. It is a good source of potassium, calcium, vitamins A, B, C, and E, and very low in calories.

Witloof chicory is grown in two stages. The roots are grown in the summer, lifted from the soil, and the tops severed and discarded. After a cold treatment (vernalization) either in the field or in cold storage, the roots are then replanted and the regrowth forms the chicon that is eaten. Traditionally, the roots are forced in winter in darkened sand-peat covered beds at a constant temperature and humidity. Three weeks after planting the roots, the chicons are exhumed from the sand-peat overburden, cleaned, and shipped to market. The weight of the sand-peat

overburden compresses the leaves into a tightly-furled head. However, the sand-peat adheres to the leaves and the chicons must be trimmed at considerable cost of labor and wasted trimmings. We developed a method to produce marketable chicons in an unheated barn, using a sand-peat mixture for planting the roots and weighted insulation to maintain heat in the forcing bed and envelop the chicons as they grow under pressure. Both methods of forcing will be described later in this fact sheet.

### **Production of roots for forcing.**

**Field Management.** Witloof chicory requires adequate phosphorus, potassium, and magnesium to produce quality roots. Accordingly, the soil is fertilized with 150 lb/A  $P_2O_5$  (supplied as triple superphosphate at 570 lb/A), 300 lb/A  $K_2O$  (supplied as muriate of potash at 445 lb/A) supplemented with 140 lb/A MgO (supplied as magnesium sulfate (Epsom salt) at 860 lb/A). Nitrogen fertilizer is generally excluded to prevent excessive top growth in the field and to discourage unfurling of the outer leaves of the chicon during forcing. Nitrogen supplied by decaying organic matter in the soil is usually sufficient for field growth.

Seeds are planted by hand in the first week of July. This ensures that the roots will

mature in late fall and allow sufficient cool treatment (vernalization) of the roots for direct forcing without placing them in cold storage. If seeds are planted too early in the spring, the seeds will vernalize in the cool soil and the plant will bolt in the field. Once a plant has bolted, its root can not be forced. The rows are placed 36 inches apart to allow cultivation by a rototiller. If hand cultivation is used, row spacing can be reduced to 24 inches. Plants are thinned 4 inches apart within the rows. Ensure that the soil does not dry out during germination.

In late September, roots of witloof chicory are sampled for maturity. Sample roots are split in half lengthwise and the fingernail-size white patch just below the crown is examined. At maturity, the white tissue is 1/4 to 3/8 inch thick. Roots with patches thinner than 1/4 inch are immature and will not produce tightly furled chicons. Roots with patches thicker than 3/8 inch are overmature and produce chicons of poor quality with numerous subsidiary crown shoots. The optimum root diameter is 1-1/4 to 2-1/4 inches.

Roots are usually harvested mid-October to mid-November. Small amounts can be harvested with a digging fork. For mechanical harvest, use root-crop or modified potato harvesting equipment. The leaves are severed about 1 inch above the root crown and the roots trimmed to 8 inches. Roots less than 1 inch diameter are generally discarded. Roots that branch into two or three forks can be trimmed to one dominant branch.

Immediate forcing is possible if the roots were exposed to low temperatures in the field. If roots must be stored, ideal storage conditions are 32-34°F with 96-98% humidity. A cool garage can be used with

the roots draped loosely with tarps or burlap sacks to prevent them from drying.

### **Commercial Forcing of roots.**

**Temperature.** The optimum forcing temperature is 65°F. Since our forcing was done in winter in the basement of an unheated barn, electric heating cables were buried in the sand-peat mixture beneath the roots to maintain the optimum temperature in the bed. Bed heat is unnecessary if the forcing is done in a heated environment.

**Forcing media.** The planting media is 6-10 inches of unfertilized 1:1 sand:peat mixture. If a heating coil is necessary to supply bed heat, it is placed in the planting media in a serpentine fashion about 2 inches from the bottom of the bed.

**Planting roots.** Roots are planted to their crowns using a dibble to make the holes. They are planted at a close spacing, providing a density of about 25 roots/ft<sup>2</sup>. After planting the roots, the sand-peat mixture is watered thoroughly until water drips from the cell. In the traditional European method, another 4 inches of 1:2 sand:peat mixture is added above the root crowns. This overburden is also watered thoroughly. In the new method, the root crowns are covered with a sheet of Reemay to form a permeable barrier above the root crowns and then 6-inch batts of insulation to provide heat retention and a cushion for the growing chicons. Next, a sheet of plywood is placed over the insulation batts to support bags of sand that applies 1 pound of pressure/root. In both methods, the forcing bed is draped with 4-mil black plastic to exclude light. Nothing else is done until harvest about 3 weeks later.

**Harvesting chicons.** Chicons from roots replanted directly from the field can be

harvested in 18-21 days. Chicons from roots stored 3-7 weeks can be harvested after 28-30 days. Stored roots partially wither if the humidity in storage is lower than 95%. After replanting the roots in the forcing bed, turgor is regained in several days before the chicons begin to grow. In the traditional method, whole plants are exhumed and the chicons cut from the roots. The chicons are trimmed to remove unfurled leaves and those outer leaves with sand and peat particles adhering. In the new method with weighted insulation, the chicons are cut directly from the roots in the bed and unfurled leaves trimmed. Protect the heads from light even after harvest to keep them white and refrigerate in loosely closed plastic bags. The chicons should not be washed. Roots kept in the bed may produce new growth around the crown. These small “chiclets” are also edible, mostly in salads.

### **Home Forcing.**

Home gardeners not concerned with commercial quality chicons (tight heads) can force the roots with no overburden. Eating quality is not affected as long as forcing is done in complete darkness. Roots can be forced in wooden crates, recycling bins, waxed cartons, garbage cans, or large nursery pots with sides at least 9-10” deep in a soilless mix such as sand or a sand-peat mixture. The root tops can extend above the container, but should be of relatively even height. The soilless mix does not have to entirely cover the roots but should cover at least two-thirds of the root. Water so that the mix is completely moistened. Place the container draped in black trash bags (double thickness) in a dark space at approximately 65°F. Potential areas include a basement (near the furnace), a closet, or under a tent made of black plastic. Harvest in 3 to 4 weeks.

### **Summary**

Belgian endive is a form of chicory whose roots are grown in the summer and then forced in winter darkness, to produce a tight white, non-bitter head. Used in specialty salads or gently steamed as a vegetable, Belgian endive is a pricey vegetable in the supermarket, but one easy to grow. Although the instructions may seem long and the process intimidating, raising Belgian endive a rewarding experience. In winter and early spring, you can enjoy one of the world’s “luxury” vegetables, immaculately fresh and inexpensively produced.