

AGRI-FACTS

Practical Information for Alberta's Agriculture Industry

September 2002

Agdex 254/20-2

White Asparagus Production in Alberta

Asparagus is a perennial of the lily family and can survive for 20 years or more on the prairies in a cultivated field or along the roadside as a weed.

Asparagus is dioecious, meaning that plants are either male or female. An almost equal number of male and female plants are produced when grown from seeds, and each seedling differs significantly in growth habit and productivity.

Only through hybridization have these extreme differences been modified, enabling growers to have plantings in which yield and spear quality are more uniform and predictable.

Description

The asparagus crown is an underground, rhizome-like structure. Buds on the crown give rise to a spear. The largest buds are found near the center of the crown, with a decreasing bud size gradient away from the center of the crown.

Each new bud arises from the basal internode of the previous bud, which is the reason for a crown's upward movement in the soil as the plant ages. After a bud sends up a spear, there is a rapid formation of a new bud at its base from which another spear will form.

The interval between cuttings of a spear and the beginning of the growth of the next bud is greater in female than male plants. The sooner a spear is removed, the sooner a new spear will emerge. If not harvested, a spear forms a fern with photosynthetic ability. Fern is allowed to develop at the end of each harvest season.

Storage roots form only if buds become photosynthetically active shoots called fern. Storage roots act as storage organs and absorb little or

no moisture or nutrients from the soil. These photosynthetically active shoots have needle-like leaves that are not true leaves, but are modified stems that are the principle food manufacturing organs. True leaves arise only at the nodes of the fern.

Surplus photosynthates are stored in the roots. When these food reserves are low, spear diameter will be smaller, as will spear buds that give rise to the spears. The production and harvesting of spears depletes food reserves; therefore, the length of the harvest season has a direct bearing on spear production the following year.

Food reserves are generally at the lowest level three to four weeks after harvest is over. Overcutting can deplete food reserves and weaken the plant, which means that buds decrease in size and spears are small. There is a significant relationship between stalk index per plant when in fern and spear diameter the following spring. This relationship reinforces the theory of a positive link between spear diameter and carbohydrate reserves.

Asparagus can survive for 20 or more years on the prairies

Varieties

Plant breeders have successfully produced hybrid varieties of asparagus. These hybrids are higher yielding and more vigorous, with greater photosynthate accumulation capability, than open-pollinated plants. These hybrid varieties have two distinct features:

1. Greater partitioning of dry matter into the root system early in the growth of the seedling produces an enlarged root system. This distinction allows plants to produce a larger fern biomass because of the greater absorptive area and storage of carbohydrates.

2. More total dry weight produced through a more efficient respiration rate, greater photosynthetic efficiency, better leaf canopy architecture and a better quality of storage carbohydrates.

A more recent development has been the cloning of asparagus plants, which has allowed for the production of all-male hybrids. Male plants have been shown to be more productive than females, producing a higher percentage of #1 grade spears. The fact that male plants do not expend food reserves on the production of seed may be the cause of this greater productivity.

Seedling production

It is best to use field-grown or imported asparagus seedlings. When producing field crowns, seed is planted outdoors in early May, and crowns are lifted the following April before new growth emerges. Crowns are washed and sorted according to size. Crowns must be stored at 5 to 7°C and planted out in mid to late May, after the risk of frost is over.

Imported root stock from Holland, where production of white asparagus is well established, is cost-effective considering the time and labor costs associated with growing crowns in the field. Whether field-grown or imported seedlings are used, two full growing seasons are required after field planting before harvesting can begin.

Site selection/planting

For white asparagus production, deep sandy soil is required because extensive hilling of the soil is needed each season. The soil must also have three characteristics: contain a high percentage of organic matter, be free of rocks and have no perennial weeds.

Some 10 to 20 tons per acre of clean manure can be incorporated before planting. Access to irrigation water is also advised. Asparagus production can be expected to occur for 10 or more years.

Crowns are planted by hand in mid-May in trenches about 10 to 12 inches deep. These trenches are two feet wide at the top and taper to a point at the bottom. A ditcher device can be built at home.

Seedling (1-year-old) crowns must be properly positioned in the same direction as the row to control crown spreading. Crowns are placed at the furrow bottom on a small mound of soil made by hand, with roots spread over the mound surface. Crowns are spaced 10 to 12 inches apart in the trench, with roots on each crown carefully covered and firmed by patting down only a few inches of soil.

Row spacing must account for a large area from which soil must be moved to create and maintain hills once production begins. Rows are usually spaced a maximum of 6 feet apart. Approximately 6,000 crowns are required to plant one acre.

Irrigation should follow planting. Trenches are gradually filled in as small fern growth from the crowns emerges and elongates. Always maintain 3 to 4 inches of exposed fern when backfilling.

At the end of the first season, the soil throughout the planting should be level. Actual hill construction begins early in the second season of growth.

Hilling

Proper hilling is crucial to ensure quality white asparagus production. Hilling begins in the second year of growth and must be maintained annually throughout the life of the planting.

A hilling machine can create a hill about 14 inches high (above crown surface), narrow at the top and very wide at the base. Narrower hills damage crowns. The center of the hill must align perfectly with the crowns so that emerging spears appear on the hill crown. This alignment means straight rows are a must.

Weed control

Other than manual and tillage methods of weed control, there are a number of herbicides registered for weed control in asparagus. Check the availability and always follow label directions.

Harvesting

Harvest begins in early May, depending on weather conditions. Timing is critical to quality control when harvesting white asparagus.

Maintaining a soft soil hill over the crowns facilitates spear harvest. Emerging spears are hand harvested just as the spear cracks the soil surface. The soil is removed gently by hand down to the base of the hill, where the spear is cut using a hand-held cutter tool. The spear must be at least 9 inches long. Care must be taken not to damage shorter developing spears. The soil is then pushed back in place, by hand, to reshape the hill.

This process re-establishes the light blotting effect that maintains the white spear color. Exposure to light causes the spear to turn color; therefore, during harvest in the

field, pickers must place spears in a covered box to block out light. Spears exposed to light turn pink and are not acceptable for market.

Soil hilling is used effectively to blanch spears. A new system developed in Holland uses black polyethylene that is dropped over the hill. Special pockets in the poly are filled with soil to keep it in place. For harvest, the poly is removed and then replaced after the harvest is complete. This method permits greater freedom for the grower when it comes to spear harvest because emerged spears are not exposed to light.

During the first season, harvesting is possible for 10 to 15 days. The harvest period extends to 6 to 8 weeks (approximately June 24, weather dependent) in mature plantings, at which time spears are allowed to develop into fern. Spear production occurs in growth spurts, two to three per season. Harvesting should stop in a growth spurt on or near June 24. The fern growth period allows plants to rebuild food reserves for production the following year.

After several hard frosts, the fern is cut off using an undercutter blade that runs about 6 inches under the hill surface, usually a tractor-drawn unit. Dry fern is best burned to reduce overwintering disease.

Marketing and storage

Harvested spears must be submerged immediately in cold, 2 to 4°C, water for 5 to 6 hours. Spears can then be graded for uniformity of diameter and shape. All spears are trimmed to an 9 inch length.

Harvested spears should be stored near 1°C at 85 to 90 per cent relative humidity. At higher temperatures, spears start to elongate as storage sugars break down. Field heat must also be removed quickly as lignification (toughening) proceeds very rapidly due to elevated respiration rates at high temperatures.

Equipment recommendations

- row crop, 3-point hitch high, clearance 60 to 80 hp tractor with narrow gauge tires
- modified potato planting plow
- hilling (ridging) plow
- fern (foliage) undercutting machine
- washing/grading equipment
- refrigerated cold room

Most of this specialized equipment is built by the Ideaal Machine Company in Holland and can be imported into Canada.