

AGRI-FACTS

Practical Information for Alberta's Agriculture Industry

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Caraway

Caraway (*Carum carvi L.*) is native to Europe, western Asia and northern Africa where people have used it as a spice for thousands of years. Europe continues to be the largest producer and exporter of caraway seed.

According to the 2006 Canadian census, the area seeded to caraway in western Canada was over 7,500 hectares (18,600 acres), which was a drop in acreage from prior years. At present, the United States is the main market for Canadian caraway; however, production and exports vary greatly from year to year.

Description

Caraway can be either an annual or biennial plant. Biennial caraway is the type grown commercially in Alberta and requires a second growing season to produce seed. Although the plant is considered a biennial, it often produces seed in the third year.

Annual caraway requires a long growing season to mature and is considered too risky to grow in Alberta.

In the seedling year, biennial plants resemble carrots, growing about 20 cm (8 in.) tall, with finely divided leaves and a long taproot. By the second year, 60 to 90 cm (2 - 3 ft.) stalks develop (Figure 1), topped by umbels with pink or white flowers (Figure 2). These produce the seed, which is used as a spice. Plants that produce flowers and seed in the same year will die. Only plants that have not yet flowered will produce seed the following year.

Caraway plants with small roots (less than 13 mm (1/2 in.) in diameter) at the start of the second growing season usually do not produce seed. They remain vegetative throughout the growing season and produce seed the following year. Caraway plants with larger roots (greater than 13 mm (1/2 in.) in diameter) at the start of the growing season will usually flower and produce seed.

The crescent-shaped seeds are about 2 mm long, curved and tapered at each end, and they have 5 pale ridges. Buyers look for a dark brown colour in the valley between each ridge.



Figure 1. Caraway stalks develop



Figure 2. Umbels have pink or white flowers

The crop flowers in mid-June and is often harvested in August. It is slow to mature under Alberta conditions.

The yield of caraway can be increased by using honeybees as pollinators. One hive per acre is usually recommended.

Adaptation

Caraway is a biennial crop that can be grown throughout Alberta. It prefers a well-drained soil high in organic matter but will grow well in many soil types.

Caraway responds well to irrigation and can stand some light flooding. Under drought conditions, it will not die, but yields will be severely reduced. For this reason, shallow, sandy soils with low moisture-holding capacity should be avoided. Select fields that keep their snow cover over winter as winterkill can be a problem. Because the crop is a poor competitor with weeds, caraway needs to be grown on clean land to increase the chance of success.

Caraway is adapted to temperate or subtropical dry summer climates. It has an optimum growing temperature of 13° C with a minimum growing temperature of 4° C. It is day-neutral, so the length of daylight has no effect on maturity or yield. It will grow on a wide range of soil textures but prefers well-drained soils with an optimum pH of 6.5 (range 5.8 - 7.5). A high level of fertility is required, and caraway's tolerance to salinity is relatively low.

Properties and uses

Some seed is used whole as a spice, and some is used to produce caraway oil. Future growth in the caraway industry may well depend on expanded oil extraction.

Caraway seeds are the main part of the plant used although the entire plant is edible. The roots can be cooked like carrots or parsnips. Caraway leaves are much less spicy than the seed, and the young leaves can be used in salads, as a seasoning or can be cooked.

Caraway seed has a spicy flavour. Licorice-flavoured caraway seeds give rye bread its characteristic taste. The seeds are also used in soups, cheeses and cheese spreads, sauerkraut and salad dressings. Liqueurs, such as Kummel and some schnapps, use caraway seed for their unique flavour. Caraway seeds are also high in protein and fat.

The seeds and their oils also have a long history of use as herbal and household remedies for treating disorders such as rheumatism, eye infections, toothaches and digestive complaints. The seed and teas made from the seed have an anti-spasmodic action, which soothes the digestive tract and its carminative (gas relieving) action relieves bloating caused by wind and improves the appetite. Caraway is often added to laxative medicines to prevent gastric and intestinal pain.

The seed is often chewed after a meal to sweeten the breath and also to relieve heartburn after a rich meal. The seed is also used in the treatment of bronchitis and is an ingredient of cough remedies, especially useful for children. The seed is also said to increase the production of breast milk in nursing mothers.

The essential oil can be extracted from the seeds and has similar properties to the seed. Caraway seed oil is used as a

fragrance component in soaps, lotions, and perfumes. Caraway oil is extracted from the seed by steam distillation, and seeds contain 3 to 5 per cent oil. Oil quality is important although highly variable. As more seed goes into the oil trade, the oil quality will become a more significant factor.

Caraway oil averages 55 per cent carvone and 44 per cent limonene, and a carvone content of 50 to 60 per cent is desired by processors. Factors such as weather and the stage of plant maturity determine the amount of carvone in the oil. Hot, dry weather during seed maturation can result in an increase in carvone, but a decrease in overall oil content. The maximum level of carvone is only reached in fully mature seeds. For this reason, it is important not to swath the crop too early.

Agronomy

Varieties

Registered caraway varieties are not available. Common biennial seed is available from contractors and seed houses. Annual caraway is not recommended for growing in Alberta because of its long growing season requirement.

Seeding

Caraway is generally seeded with a nurse crop. In Alberta, field pea, lentil, flax, canola and mustard have been used successfully as nurse crops. Planting with coriander is also practiced in different areas.

To reduce competition with the caraway crop, the nurse crop should be seeded at half to two thirds the normal rate. If there is too much competition, the caraway plant may not have enough growth to flower and set seed. Crops that produce heavy vegetative growth should not be used as nurse crops.

The seeding rate for caraway is 6 kg (12 lb.) per acre (13 kg/ha). Seeding depth should be from 1.3 to 2.5 cm (1/2 - 1 in.). Caraway seed can be broadcast and then harrowed in, or a grain drill with a grass seeder attachment can be used. An air seeder with good depth control will also work well for seeding.

Because caraway is slow to germinate (two to three weeks), good weed management is important. Seeding is usually done from late April to mid-May, and seedlings can tolerate a light frost.

Fertilization

Caraway does not require special fertilizing in the seedling year; however, a highly fertile soil will result in better yields. A balanced fertility program including nitrogen,

phosphate, potassium, sulphur and micronutrients is recommended. This program should be implemented on the basis of a soil test.

In the seedling year, use the regular fertilizer program on the nurse crop, making sure there are sufficient nutrients for the caraway crop as well as for the cover crop. An application of nitrogen, 18 to 27 kg (40 - 60 lb.) per acre (45 - 67 kg/ha), after the nurse crop has been harvested or early in the spring of the following year is essential for continued good yields.

Harvesting

Caraway shatters very easily when fully ripe. To reduce shattering, swath in the early morning when dew is still on the plants.

Seed can be harvested with a regular field swather and combine. The crop should be swathed when three quarters of the seeds have turned dark brown. Some producers leave a high swath stubble and use a swath roller to anchor the swath.

Caraway threshes easily. Combine when seed moisture content is 10 per cent or less. Adjust the combine to keep seed loss to a minimum and prevent damage to the seed. Cylinder speed and concave clearance should be similar to settings used for canola and mustard.

Seed moisture for storage should be below 10 per cent, or bin aeration will be required. Many buyers demand that seed be at 9 per cent before they will take delivery. Seed yields range from a 100 or so kilograms per acre the first year to over 500 kg (1,000 lb) per acre (1,120 kg/ha) for the next year or two over all the growing areas of Alberta.

Storage

Since caraway oil is very volatile, the seed needs to cure during storage. Natural air drying (aeration) is necessary for curing. Hot air drying should be avoided if possible.

Seed needs to be checked regularly during storage. Storing for longer than a year is not recommended. Buyers prefer a fresh product as carvone levels decrease with age.

Weed seeds and other foreign material should be cleaned from the sample as soon as possible to facilitate bin aeration.

Pest management

Weeds

Since caraway is a poor weed competitor, seeding into a clean field is essential. Currently, Edge Granular, Lorox L, Lorox DF and Poast Ultra are registered herbicides for caraway.

Edge, a pre-emergent herbicide, can be applied in fall or spring to provide control or suppression of some grassy weeds and a number of broadleaf weeds. Lorox L and Lorox DF are post-emergent broadleaf herbicides while Poast Ultra is registered for post-emergence control of annual grassy weeds. Using pre-harvest glyphosate the year before seeding caraway will lessen weed competition from perennial weeds such as Canada thistle and quackgrass.

Check with potential buyers of the crop before using chemical control for pests. Some buyers will only purchase “organically grown” or “pesticide-free” seed, produced without chemicals, and may pay a premium for these products.

Diseases

Aster yellows is a common disease of caraway. Symptoms include premature yellowing of individual stems and flower heads. Yellowing symptoms can be quite striking. Leaves may be reduced in size and have reddish or purple margins. Sometimes plants may have many small axillary shoots, giving plants a bushy or witches’ broom appearance.

Infected plants may also have floral parts that change into malformed, leaf-like structures (virescence and phyllody). Infected plants do not set seed and are more susceptible to winterkill.

This disease is spread by leafhoppers feeding on infected plants. Controlling the spread of leafhoppers will reduce the spread of aster yellows. The disease also occurs on many other types of plants, mainly of the carrot family (*Umbelliferae*).

Sclerotinia stem rot (*Sclerotinia sclerotiorum*), common in canola crops, can also affect caraway. It is best to avoid seeding caraway into canola stubble if Sclerotinia was present in the canola the previous year.

A flower blight affecting caraway has become a major issue in recent years. Caused by an *Ascochyta* species, this disease occurs most commonly when conditions during flowering are persistently wet. Other fungal pathogens (*Fusarium*, *Botrytis* and *Sclerotinia*) can also cause this same disease on caraway.

Flowers turn brownish-black as they emerge, although the rest of the plant appears healthy. Flowers continue to die as they emerge, and little seed is produced. Fields with infection may have brown patches, with the difference between infected and healthy areas obvious. The level of severity and the amount of browning will vary. In severe infections, fields may turn brown within days.

The pathogen is introduced on infected seed or plant residue. There are no caraway varieties resistant to this disease. Producers are advised to use a four-year rotation

away from caraway and coriander to reduce disease development. As this disease can be caused by other pathogens that have a wide host range, consideration should be given to what other crops are being grown in the rotation and the diseases found in those crops. Using clean, disease-free seed can help to prevent introduction.

Caraway can be affected by a number of root rot diseases, including damping off and crown rots, caused by *Fusarium* species and other soil-borne pathogens. Excessively wet conditions, waterlogged soils and winter injury can contribute to the development of these diseases.

Powdery mildew can be found on caraway, especially under warm and humid conditions. Powdery white mycelium can cover leaves, stems and flower stalks. Infection can reduce seed yields, depending on severity and timing of infection. Ensuring plants are not stressed or overly succulent (excess nitrogen) can be effective at reducing the effect of this disease.

Phoma blight may occur on caraway. This disease is seed borne. Infection at flowering may result in no seeds being formed. Phoma may affect all above ground parts of caraway. Small, grey to black, raised lesions may form on stems and flowering structures with later infections. To prevent the introduction of this disease to the caraway crop, producers should not use seed from infected plants.

No fungicides are presently registered for use in caraway, other than Maxim 480FS, which is registered as a seed treatment for the management of seed and soil-borne diseases caused by *Fusarium spp.* and *Rhizoctonia*.

Insects

Insect problems in caraway include grasshoppers, leafhoppers and storage insects. Grasshopper body parts in the seed sample can cause downgrading or rejection. Leafhoppers may also be of economic importance as they transmit aster yellows disease. Attempts should be made to prevent the spread of leafhoppers into the caraway crop.

Dipel 2X DF and Bioprotec CAF are currently registered for use in caraway. Refer to the product label for pests controlled. Follow current recommended practices for the control of other pests in adjacent crops.

Marketing

Marketing caraway is very different from selling grain. It is important to study the market in detail. There are no marketing boards, quotas or stabilization programs, and there is little advice available as to market prospects and when to sell.

The Netherlands is the largest producer of caraway seed and provides strong competition in the North American market. In spite of this competition, Canadian brokers and millers are showing an interest in steady supplies of clean, good quality caraway seed produced in Canada. Be aware that stinkweed seed cannot be cleaned out of caraway seed, and seed should be cleaned to the standards set by the American Spice Trade Association.

Because of the limited markets for caraway seed, potential growers should obtain a contract with a broker or marketing company before putting seed in the ground. Some local end user markets exist and should not be overlooked. Experienced brokers buy according to the characteristics of aroma and the appearance of an individual sample.

Produce a high quality product, and keep representative samples of the crop to show to potential buyers. Do not store the crop for more than a year before marketing. When marketing caraway, payment is usually made on the net weight after cleaning, and dockage levels up to 20 per cent are common.

Production economics

Caraway production can be risky and costly. There may be potential losses from poor emergence, weed competition, shattering and severe weather conditions, i.e. drought, winterkill.

Start with a few acres. Investigate contracts and markets first, and know that prices are extremely variable from year to year.

In recent years, local prices for cleaned caraway seed have been around 45 cents per pound (99 cents per kilogram) although prices will vary. Take the time to check with seed contractors as to market outlook.

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