

Coriander

Coriander (*Coriandrum sativum* L.) is an annual herb that belongs to the carrot family (*Umbelliferae*). The plant is named after koris, the Greek word for bug, as the unripe fruits have a smell that has been compared to that of bedbugs. However, when ripe, the seeds have a distinctive sweet citrus/mint/musty aroma that has been valued over the centuries.

Green coriander (also called cilantro or Chinese, Mexican or Japanese parsley) has been called the most commonly used flavouring in the world due to its usage across the Middle East into all of southern Asia as well as in most parts of Latin America.

Description

The bright green plant is erect and glabrous (hairless), reaching heights of 16 to 24 in. (40 - 60 cm). The compound lower leaves are roundish and lobed, while the upper leaves are finely divided into very narrow, lacy segments. The small white or pink flowers are borne in compound umbels that measure approximately 1.6 in. (4 cm) across (Figure 1).



Figure 1. Coriander has small white or pink flowers

The fruits are nearly globular and consist of two, single-seeded mericarp (segment of a fruit that breaks at maturity, see Figure 2). The fruits often separate to consist of a concave inner surface and the ridged outer pericarp.



Figure 2. The fruits are nearly globular

Adaptation

Coriander is well suited to growing on a range of soils, but it performs best on well-drained loam and sandy-loam soils. Suitable pH ranges are from 4.5 to 8.0, with an optimum of 6.3. Although the crop is heat loving, it has an optimum growing temperature of 18° C.

Two varieties of coriander have been released from the Crop Development Centre (CDC) at the University of Saskatchewan. CDC Major is medium-large seeded, with a 1,000-fruit weight of around 9 grams. The essential oil content is 0.91 per cent, with linalool making up 65.6 per cent of the essential oils. CDC Minor is small seeded, with a 1,000-fruit weight around 7 grams. The essential oil content is higher than CDC Major, at 1.22 per cent, with 68.4 per cent linalool. Autumn and Suzanne are two other varieties of coriander that have been tested in western Canada in the past.

The large-seeded coriander (typically grown on the Canadian prairies) requires a shorter time to maturity than the small-seeded cilantro (typically grown in Mediterranean regions).

Hot, dry winds during flowering (anthesis) can lead to the dropping of flowers, resulting in substantial yield reduction. Researchers in Europe have noted that the quantity of oil increases as production occurs farther north in the northern hemisphere. It has also been noted that volatile oil content increases during cool, moist summers.

The use of honeybees as pollinators can improve coriander seed yield.

Properties and uses

The coriander plant yields both the fresh green herb and the spice seed and has been used since ancient times. The small, woody root is used as a vegetable in some parts of China, but this use is not significant in international trade. The green herb is used very widely in several cuisines. The leaf is available in markets from Beirut to Beijing, as well as Japan and both Mexico and South America. The herb is a key component to curries, and when ground with green chilies, coconut, salt and a squeeze of lemon, it makes delicious common Indian chutney.

Bunches of green coriander can be distinguished in the market not only for their aroma (which has been labelled “unpleasant” by some not familiar with its uses), but also for the bundles of lower, fan-like leaves and upper feathery greens. The leaves are not suitable to be dried for culinary use.

The spice is an important item of international trade. Coriander is widely used in whole or ground forms for flavouring purposes. In India, coriander goes into curry powders (25 to 40 per cent of world production) and is used to flavour liqueurs in Russia and Scandinavia, as well as being an important flavouring agent in gin production. The fruits are also used (both whole and ground) in baking, sausages, pickles, candies, sauces and soups.

The spice is also employed for the preparation of either the steam-distilled essential oil or the solvent-extracted oleoresin. Both products can be used in the flavouring and aroma industries. Essential oils can be fractionated to provide linalool (usually 60 to 70 per cent), which can be used as a starting material for synthetic production of other flavouring agents, such as citral and ionone.

The seeds have been used medicinally since ancient times. One pharmaceutical use of coriander seed is to mask or disguise the tastes of other medicinal compounds (active purgatives) or to calm the irritating effects on the stomach that some medicines cause, such as their tendency to cause gastric or intestinal pain.

Coriander is a commonly used domestic remedy, valued especially for its effect on the digestive system, treating flatulence, diarrhoea and colic. It settles spasms in the gut and counters the effects of nervous tension. The raw seed is chewed to stimulate the flow of gastric juices and to cure foul breath, and it will sweeten the breath after garlic has been eaten. Some caution is advised, however, because if used too freely, the seeds can have a narcotic effect.

Used externally, the seeds have been applied as a lotion or have been bruised and used as a poultice to treat rheumatic pains. The seed essential oil is used in aromatherapy, perfumery, soap making and food flavouring. The oil is also fungicidal and bactericidal.

The seed contains about 20 per cent fixed oil, thus creating the potential to become an alternative to oilseed rape, although the oil content is somewhat low in present varieties. The oil can be split into two basic types: one is used in making soaps, etc. while the other can be used in making plastics.

The growing plant repels aphids. A spray made by boiling one-part coriander leaves and one-part anise seeds in two parts water is said to be very effective against red spider mites and woolly aphids.

The dried stems are used as a fuel.

Agronomy

Seeding

The seeding rate for coriander production on the prairies is generally 30 lb./ac (33 kg/ha). Although seeds should be intact, Saskatchewan research has indicated there is no difference in germination between whole and split seed, provided germination levels are confirmed to be high (>80 per cent). Some farmers clean their coriander to market specifications and keep the splits for seed.

Row spacing can be 6 to 12 in. (15 - 30 cm) with a seeding depth of 1 to 1.5 in. (2.5 - 4.0 cm). Time of sowing can vary between late April and mid-May. Sowing can be done with conventional equipment, but press drills appear to produce the best results on a firm, moist seedbed when the danger of frost is over. It is critical that seeding be done on a clean field because the crop may take a long time to emerge and the canopy closes very slowly.

Fertilization

Very little work has been done regarding the fertilization of coriander. Research in Saskatchewan indicates that increasing nitrogen from 27 to 80 lb./ac (30 - 90 kg/ha) did not improve seed yield or essential oil content, especially if soil nitrogen exceeds 36 lb./ac (40 kg/ha). Most production occurs with 27 to 54 lb./ac

(30 - 60 kg/ha) nitrogen and 36 lb./ac (40 kg/ha) phosphorus.

Some producers in Alberta and Saskatchewan use cereal/oilseeds fertilization recommendations for the crop. The seed-placed phosphate fertilizer rate should not exceed 20 lb./ac (22 kg/ha) actual P₂O₅ with a 1 in. spread using 6 to 7 in. (15 - 18 cm) row spacing under good to excellent soil moisture conditions.

Harvest and storage

Straight combining coriander when it is fully mature is preferred over swathing and combining, as coriander is prone to shattering.

If not straight combining, coriander should be swathed when 80 per cent of the seeds turn purple-brown. Swathes should not be left out too long due to the potential for shattering. Swathing when there is dew or high humidity will reduce shattering losses.

Combining is usually done when seed moisture content is less than 15 per cent. At 10 per cent moisture, coriander is considered dry, but buyers prefer 9 per cent. Cylinder/rotor speeds should be set at approximately 500 rpm under dry conditions. An initial setting of 0.5 in. (12 mm) at the front and 0.25 in. (6 mm) at the back is suggested. Wind speed should be enough to reduce dockage, return speed should be reduced to the minimum and ground speed should be slowed.

Coriander oil is very volatile, so the seed must be dried gently; avoid hot air drying. Aeration is useful for reducing moisture content; however, coriander seed readily takes up other odours, so store away from gasoline, herbicides, etc. Remove green material such as weed seeds as quickly as possible, since aeration will be diverted around these areas in the storage bin, resulting in the potential for spoilage.

Crop samples must be free of rodent droppings and have very low foreign material (2 per cent). If samples have greater than 5 per cent split fruit, the shipment is usually discounted by the buyer.

Pest management

Weeds

Producers find weed control is a serious limitation to coriander production. Because of coriander's slow emergence, weed competition may be a serious problem. The control of perennial weeds is very difficult.

Diseases

Diseases can also be a serious problem in a coriander crop. Seedling rot and damping-off can reduce emergence of the new crop. There are registered seed treatments for the

control of seed and soil-borne diseases caused by *Fusarium spp.* and *Rhizoctonia* (but not *Pythium* or *Phytophthora*). Crop rotations out of the carrot family for several years can help reduce disease problems.

Aster yellows is a virus-like disease that occurs in many crops, including many other members of the carrot family. Aster yellows-infected plants may be yellowed and may have malformed floral parts. Infected plants are often rendered sterile and may be taller than healthy plants. The disease results in the discolouration of the plant's reproductive organs and results in severely reduced seed set.

This disease is spread by leafhoppers, which feed on infected plants. This disease overwinters in the crowns of biennial or perennial crops or weeds. No chemicals are registered for the control of this disease. Rotating to other non-host crops and avoiding planting near perennial crops, which may harbour the disease, can help to reduce incidence.

Coriander is also affected by a blossom blight (caraway is also affected), which can cause severe losses. Emerging blossoms turn brown and black and continue to die as they emerge. Plants appear healthy other than the blossoms. Very little seed is produced. Fields with infection may have small patches of brown, or the entire field may be brown.

In coriander, blossom blight is caused primarily by *Aureobasidium* sp.; however, it may also be caused by *Ascochyta* sp. (the primary cause of blossom blight in caraway), various *Fusarium* species, *Botrytis cinerea* and *Sclerotinia sclerotiorum*. This disease is most prevalent when wet conditions persist during flowering.

There are no varieties resistant to blossom blight. Rotating out of susceptible crops can help reduce the severity of this disease; however, once the disease is established in a field, it will likely be present for a long time. A minimum four-year rotation between crops is suggested. The presence of volunteers can allow the disease to persist between rotations. The other pathogens that can cause this disease should also be considered when setting rotations (e.g. *Fusarium spp.*), as they can cause other diseases in other crops, perpetuating the disease cycle.

Using clean seed can help prevent the introduction of disease into new fields or areas.

Sclerotinia or white mould can cause stem rot, resulting in broken stems and yield loss. Sclerotinia can also cause blossom blight. Ensure plants have sufficient fertility and are free from weed competition. Not planting in fields with canola stubble can reduce disease incidence and severity. Maintain at least a one-year rotation between coriander and canola.

A number of fungicides are registered for the control of various pathogens in coriander. In some cases, the foliage

from treated plants cannot be consumed, so it is important to check and follow product label instructions.

Coriander may be affected by other pathogens if the plants are damaged or weakened at later growth stages by hail, high winds or heavy rains. Plants should be harvested before rapid deterioration in seed quality.

Insects

Grasshoppers can seriously damage a coriander crop, and their presence may result in downgrading the crop price because body parts in the sample are hard to remove when cleaning. Leafhoppers may also cause problems as the vector for aster yellows. No insecticides are registered for use on the crop to control leafhoppers.

Dipel 2X DF and Bioprotec CAF are registered for the control of cabbage loopers in coriander.

Marketing

Coriander yields in western Canada range from 700 to 900 lb./ac (800 - 1,000 kg/ha). Estimated on-farm market price is approximately 32 cents/pound (70 cents/kg), although prices can be much lower. Prices are usually quoted as cleaned and bagged. The bushel weight of large-seeded coriander is 22 to 25 lb. (10 - 11.4 kg).

Although there are no set grade standards for coriander, general grade standards are very specific. Buyers grade coriander based on aroma and appearance. The seed colour should be as light as possible; darker seed will be discounted. The size and shape of the seed is also observed. More than 5 per cent splits will lead to price discounting. There should be no more than 2 per cent foreign material and insect-damaged seed. If grasshopper heads are included in the sample, price discounting will occur.

Coriander seed should be graded in accordance with the standards set by the American Spice Trade Association. Several firms in western Canada offer coriander production contracts.

World production and consumption

The key to making sense of the coriander market is to realize the capacity of specific producer countries to market. India is a significant producer of coriander, but almost all the production stays in the country for domestic consumption. The same is true of Pakistan. Production in Eastern Europe is also known to be substantial, but very little information is available.

Major producers are Morocco, Canada, India, Pakistan, Romania and the former Soviet Union. Other producers include Iran, Turkey, Egypt and Israel in the Middle East; China, Burma and Thailand in Asia; and Poland, Bulgaria, Hungary, France and the Netherlands in Europe. The United States, Canada, Argentina and Mexico are producers in the Americas.

The United States is the primary export market for Canadian coriander seed where the Canadian market share has gone from 0.001 per cent in 1986 to approximately 65 per cent of all coriander imports in recent years. Secondary export markets include Sri Lanka, Trinidad and Tobago, the United Kingdom, Mexico and Guatemala.

Brokers look for minimal stem and chaff content, uniform light brown colour and a mildly sweet and spicy flavour and aroma. Canadian coriander appears to have a distinct flavour profile that buyers like. In Canada, approximately 23,000 ac (9,300 ha) were grown in 2005, with close to 9,000 tonnes produced.

Canadian production is mostly of the large-seeded coriander. The days-to-maturity requirement is approximately 100 days. The smaller-seeded coriander requires a longer growing period of approximately 120 days.

Producers thinking about growing coriander should investigate current pricing of the crop as prices can vary. Due to global competition, the Canadian advantage seems to be in producing a product with high quality and consistent seed size to compete in export markets.

Originally prepared by

Dr. Stan Blade with contributions from Dr. Manjula Bandara and Shenjie Hu, Alberta Agriculture and Rural Development

Revised by

Robert Spencer
Alberta Agriculture and Forestry

More information, contact

Alberta Ag-Info Centre
Call toll free 310-FARM (3276)
Website: agriculture.alberta.ca