

# Achira (*Canna edulis*)

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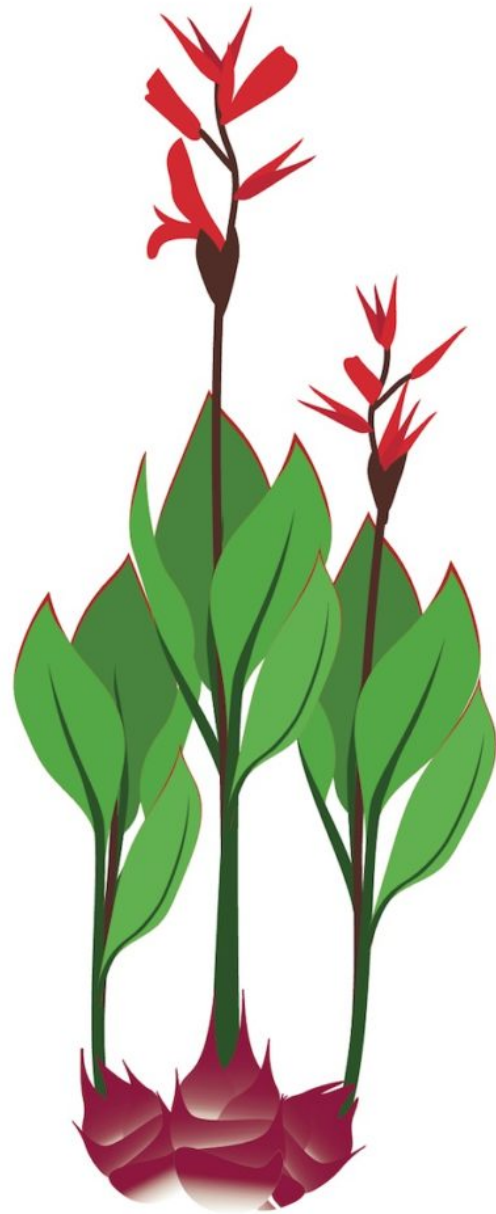
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# Overview

- Achira is a rhizome (root) crop native to the lower elevations of the Andes.
- Achira is related to decorative Cannas and the plants look similar.
- This crop is easy to grow in the Pacific Northwest and generally easy to grow most parts of the US that have at least moderate summer rainfall.
- Achira rhizomes can grow nearly three feet long, particularly if left to grow for more than one year.
- Yields can easily reach ten pounds per plant and yields as high as sixty pounds have been reported.
- The rhizomes are generally white, sometimes with brown or red scale leaves.
- The rhizomes are similar in texture to potatoes, but have a more neutral flavor.
- Where the ground does not freeze significantly, achira can be grown as a perennial.
- The crop is propagated by planting segments of rhizome. Most varieties do not produce seed or grow true from seed if they do.
- Diseases can be transferred to or from ornamental Cannas.

This guide provides information about growing ulluco in North America, and particularly the Pacific Northwest, which is the only place that I have experience growing it. Much of the information will apply anywhere, but considerations about the timing of planting and harvesting, climate, photoperiod, and pests and diseases will vary considerably by location.

## About Achira

### Description

Achira (*Canna discolor*), pronounced ah-CHEER-uh, is a close relative of the common garden canna (*Canna indica*) varieties that are grown for their flowers. It is the only domesticated edible species in the family Cannaceae, although there are other edible species. Achira is an impressive ornamental, growing as tall as eight feet, with large, tropical looking leaves and showy flowers (although not as showy as the flowers of ornamental cannas, which are considerably larger). It also happens to produce large, edible rhizomes that can reach nearly three feet (91 cm) in length. The harvest of a single plant can be as high as sixty pounds (27 kg) (NRC 1989), although I haven't seen a yield even reaching a sixth of that in the Pacific Northwest.

Taxonomy of achira is uncertain and it seems like it might get worse before it gets better. The most recent work indicates that achira is a cultivated form of *Canna discolor*. The better known scientific name for achira, *Canna edulis*, is, therefore, a synonym. Because that is a relatively new development, you will find more information about achira by searching for *C. edulis* than *C. discolor*. Matoba (2011) found evidence that triploid achira is likely a hybrid (allotriploid) of *C. plurituberosa* and *C. indica* (or, less likely, *C. coccinea*). This leaves questions about the identity of diploid achira. Is it a diploid form of *C. discolor* or another species? As far as I know, there is no answer to this question presently. To further confuse the situation, Maas-Van de Kamer (2008) lists *C. plurituberosa* as a synonym of *C. indica*. That would bring us back to the old hypothesis that achira is an autotriploid of *C. indica*. Well, the taxonomists will sort it out eventually. Perhaps it would be best to say for now that any *Canna* with non-fibrous, large, edible rhizomes can be included under achira.

Achira produces a large, starchy rhizome that has long been used as a food in the Andes. It is actually a

widely grown crop, but most is now processed for starch extraction, a use for which it is well suited, as it has the largest known starch units of any plant (NRC 1989). It is only commonly used as a whole food in the Andes. As a starch crop, it is sometimes known as “Queensland arrowroot” because it was once grown in Australia on a large scale. The plant is perennial and can grow for many years, assuming that the climate is not too cold. The yield increases each year, making it a good emergency food, a sort of calorie savings account.

Roots are most commonly white, but can have skin colors partly to fully green, yellow-green, purple, or light brown. Achira is one of the least diverse of the Andean roots and tubers, with less than fifty recognized varieties, many of which are quite similar. However, it crosses readily with other *Canna* species, so there may be an opportunity to introduce new genetics through hybridization.

## **History**

Achira has a fairly wide distribution and a long history of human use. Its native distribution is from Mexico south into Argentina and Brazil. In Peru, it is grown from near sea level to an elevation of 8,500 feet (2,600 m) (Gade 1966). Human use in Peru dates back to roughly 2000 BC (Ugent 1984).

The Incas reportedly grew achira on the banks of irrigation ditches (Gade 1966), which probably served both as a food source and as stabilization for wet ground, given achira’s extensive rhizomes. In Peru, the only Andean country where it is still commonly grown for food, achira is more typically found in small garden plots than as a commercial crop.

Today, most achira intended for use as a whole food, as opposed to processing for starch, is grown in the Apurimac Valley of Peru. This crop is destined for transport to Cusco for the festival of Corpus Christi. It is possible that the crop has been grown there for this purpose continuously since prior to the Spanish conquest (Gade 1966). Achira is grown all over the world today as a starch crop and is particularly widespread in Southeast Asia and Australia.

Following introductions probably in the early 20th century, achira is probably now more widely consumed in southeast Asia than in South America. It has become a common crop in Malaysia, Thailand, Vietnam, and southern China.

## **Nutrition**

Achira rhizome is an easily digestible staple, containing up to 80% starch and up to 14% glucose and sucrose. It is also reported to have a high potassium content (NRC 1989).



Achira rhizome

## **Cooking and Eating**

Achira is generally prepared by baking or boiling. Although it is safe to eat it raw, it is not very appealing; it is like a fibrous, watery potato. The flavor is rather bland and often slightly sweet, roughly similar to potato for lack of a better comparison. Its flavor lacks the complexity of potato because it has no bitterness. That can make it seem insipid in comparison.

Although not the most delicious of the Andean roots, in my opinion, its dual use as an ornamental and its perennial nature makes achira quite appealing as an emergency crop. It will grow in the same ground for many years, beautifying the garden while producing a good store of high calorie rhizomes that can be harvested when needed. The value of emergency crops is debatable in North America under present economic conditions, but one needs only to consider Greece, where pensioners are now foraging for wild foods to supplement their diet, for an example of a country where emergency crops would be better appreciated. The young leaves and shoots can also be eaten. As they grow larger, they become too fibrous to eat, but the large leaves are sometimes used as wraps or plates for other foods, as banana leaves are sometimes used in the lowland tropics (NRC 1989).

Achira seems to work well as a substitution in recipes that call for potato, turnip, or rutabaga.

## **Cultivation**

### **Climate Tolerance**

Achira tolerates a fairly wide range of climate conditions. In the Andes, it is grown from roughly 2,000 to 8,500 foot (600m to 2,400m) elevations, which include subtropical and warm temperate climate zones. It prefers warmer temperatures than many of the Andean root crops, but does best in only moderately hot

summers. Achira tolerates temperatures into the 80s F (26 to 32 C) very well, but it can be damaged by long periods of weather of 90° F (32 C) or higher. It also doesn't like to be cold and grows very slowly below 50° F (10 C). In cool summer climates, consider planting achira against a wall with a southern exposure. Where winds are likely to be strong late in the growing season, it is a good idea to grow achira in a protected area. It lodges fairly easily in high winds. We usually see problems when fall windstorms bring winds of 40 MPH or more.

Achira is slightly resistant to frost, but more than a few hours of exposure to temperatures below freezing will generally kill the tops. It is said to be able to tolerate snow (NRC 1989) but I'm not sure how to square that with our experience. On the rare occasions when it gets cold enough to snow here, achira foliage does not survive. Perhaps there are varieties that are more cold tolerant than those in our collection.

Achira needs regular water. The rhizomes confer some drought tolerance, but the eating quality is poor when the plant has been forced to draw from them in dry conditions. The plants also grow extremely slowly when water is scarce. As long as the soil isn't heavy and sodden, it is hard to overwater achira. The plant can handle some shade. It can be used around the borders of larger plantings where it only receives partial sun. Root yields do suffer, but they are large to start with.

Achira will perform best in the warmer, humid parts of the Pacific Northwest. It is well suited for growing in the Puget Sound region, Southwest Washington, Portland and the Willamette Valley, Southwest Oregon, and the North Coast of California. It will also grow well in Coastal Washington and Oregon, the San Juan and Gulf Islands, Vancouver Island, and Southwest British Columbia, although yields will be lower in these cooler areas. It can be grown east of the Cascades as well, although early frosts may prove to be a problem in some years.

Outside the Pacific Northwest, achira can perform well in many climates, but may be limited in short growing seasons. Rhizomes will need to be dug and stored over winter where the soil freezes, as is true of many root crops. Achira seems particularly well suited for cultivation along the Gulf coast and Florida, where it can continue growing through the typical winter.

Grown as a perennial, achira should be hardy in USDA zone 8a or warmer, although at least some of the rhizome is likely to be damaged during freezes. Harvested annually and replanted in the spring, it can probably perform reasonably well down to zone 6.

## **Photoperiod**

Achira has no photoperiod dependency and will form rhizomes and flower at any time of year, following a sufficient growing period.

## **Soil Requirements**

Soil preferences have not been established for achira, but it performs well here in soils ranging from neutral to extremely acidic. Like most of the Andean roots and tubers, it is very adaptable to different soils and grows well even in poor soils. It can handle wet, swampy conditions, but is more prone to disease and the eating quality of the rhizomes is often worse than those of plants grown in well drained soil.

## Propagule Care

Achira is normally propagated by rhizome, but it is also possible to grow from seed.

### Rhizome

Achira is generally propagated using either the ends of rhizomes or buds excised from the rhizomes. Both are fairly perishable, although they will survive long enough to be mailed. Rhizome ends and buds should be potted until planting time. Placed in damp, cool soil, they will often store over the winter without sprouting.



Achira seeds

### Seeds

Achira seed is quite durable, with a very hard coat. Historically, they were often used as beads or in rattles. Probably owing to this durability, achira seeds will store for a very long time. Seeds as old as 550 years have been successfully germinated (Sivori 1968). Still, it is best to store seeds at low temperatures for the longest storage life. Achira seed may retain good germination for 10 years or more at 50° F (10 C).

### Planting

In row cropping, achira can be spaced on two foot (60 cm) centers with rows three feet (90 cm) apart. It can be planted more densely in small blocks. For example, you can fit sixteen plants in a six by six foot (1.8 m) block. The ultimate yield of each plant will be a little lower due to crowding, but the aggregate yield of such a block can be very high.

Plant rhizome or buds about three inches (7.5 cm) deep in mid to late spring once the soil has warmed up

a bit. Water in well. You should observe sprouting in about two weeks. You can direct sow achira seeds, but germination is poor due to a hard seed coat. Seedlings will germinate over several months. A more consistent result can be achieved by starting seeds indoors.

Start seeds about eight weeks before your last frost. Chip or file the seed coat to improve water penetration. Soak for 48 hours in room temperature water and then sow about one inch (2.5 cm) deep. Apply 70° F (21 C) bottom heat if possible. Germination will mostly take place in the first month. Seedlings are ready to harden off and transplant when they are about six inches (15 cm) tall.

## **Management**

As the rhizomes grow, they often emerge from the soil. They can be surprisingly large and extensive. They benefit from hilling to protect them, but don't go crazy if you live in a cool climate. Too much cover appears to slow rhizome growth.

Regular applications of a high nitrogen fertilizer are helpful for increasing the rate of above ground growth. Once the plant has reached good size, four or five feet (1.2 to 1.5 m) tall depending on variety, it is best to withhold fertilizer for the remainder of the growing season in order to produce larger rhizomes.

## **Companion Planting**

The large rhizomes make achira difficult to grow with other large rooted plants. Shallow rooted leafy greens and herbs can be planted underneath the tall plants, as they can with most tall perennials. I have found that miner's lettuce makes a good ground cover under achira, since it is not bothered by heavy shade. Achira is sometimes cropped with corn in the Andes (Bonete 2016).

## **Growing as a Perennial**

As long as your climate is warm enough that the soil doesn't freeze more than an inch or two (5 cm) deep, it is easy to grow achira as a perennial. It will die back in the winter, but sprout again from the rhizome in spring. You can get a partial harvest in fall without digging the plant by slicing straight down with a shovel about ten inches (25 cm) around the base of the plant. Then you can just pull up the severed ends of the rhizome and the plant will keep on growing.

## **Container Growing**

Achira needs a large container, particularly if you intend to grow it for food, rather than as an ornamental. The rhizomes can be nearly three feet (90 cm) long when grown in the ground. They will be smaller when grown in a container, but if you want a decent yield, use the biggest containers that you can accommodate. In warm climates, shield the containers from direct sun, as achira doesn't like hot soil. Watering with a drip system is highly recommended since achira doesn't like dry soil and it is hard to get a large container wet enough again once it has dried out.

## **Harvest**

In warm climates, achira can be harvested in as little as five months when grown from rhizome. In cooler climates, it can take six to eight months. In our cool summer climate, I find that achira produces the best yields after about eight months. Left in the ground longer, it continues to produce, but the rhizomes

slowly become more fibrous. You will have to do a little experimenting to discover when your achira is at its best.

Unlike many of the other Andean root vegetables, achira rhizome is in peak condition for eating when you harvest it. There is no advantage to waiting. If you live in a mild enough climate, the best place to store achira is in the ground, where you can harvest it as you need it. Mulching heavily over the stumps in fall can help to preserve achira in the ground.

## **Storage**

Achira is relatively perishable. I have found the optimum storage temperature to be about 45° F (7 C). At that temperature, rhizomes remain in good condition for three or four weeks, although the cut end may need to be trimmed back to unspoiled flesh. The ideal storage strategy for achira seems to be leaving it in the ground to harvest as necessary, although this is only possible in climates where the soil doesn't freeze more than an inch or two (5 cm).

## **Preservation**

I am not aware of any traditional or modern methods of preserving achira. It is probably possible to can it, although it is a low acid vegetable and is likely prone to discoloration. It does not dry well.

## **Propagation**

Most achira varieties are sterile and can only be grown from rhizome. Some are fertile, but most of those are still hybrids that will not come true from seed, so the only way to maintain most achira varieties is by vegetative propagation. There is at least one variety, 'Rojo' that does appear to come true from seed.

### **Vegetative Propagation**

As with most of the Andean root crops, vegetative propagation is the standard practice. The tips of achira rhizomes can be cut off and planted. They readily root and sprout new growth. Large pieces of rhizome can easily be direct sown. For the surest results, pot rhizome cuttings indoors, grow them until the plants reach about six inches (15 cm) in height, and then transplant to the field.

### **Sexual Propagation**

Most of the existing varieties are poor seed producers. Many achira varieties are sterile triploids ( $2n=27$ ) but there are also a few fertile diploids ( $2n=18$ ). There may also be some tetraploid varieties (NRC 1989), which is suggested by the existence of triploids. Tetraploid varieties, if they exist, should be fertile, but will not grow true from seed. The diploids will produce seed, although not always easily. In my experience, they will generally set seed if allowed to grow undisturbed through two seasons. True breeding varieties can be grown from seed in order to generate new, disease free stock. With some cross pollination, you can produce new varieties.

Achira pollen is heavy and sticky, so a pollinator is usually required for seed production. Here, I have observed no lack of pollinator interest in achira. Bumble bees, honey bees, and hummingbirds appear to be the most active pollinators in the Pacific Northwest.



# Problems

## Pests

Slugs and voles are the primary pests of achira in our climate. Voles are particularly fond of achira rhizomes and have the annoying habit of eating the buds first. Slugs will tunnel enthusiastically into exposed achira rhizomes.

## Diseases

### Bacteria and Fungi

I have observed very little disease in achira. In the Andes, it is reported to suffer from fungal diseases such as *Fusarium*, *Rhizoctonia*, and *Puccinia cannae*. The last, also known as Canna rust, is probably the most common disease of achira in North America. This disease causes yellow to red spots on the leaves that may become extensive. Prevention is easier than cure. Keep achira leaves dry and exposed to full sun when possible.

### Viruses

Achira is susceptible to Canna yellow streak virus, which is currently a widespread disease of ornamental cannas in North America and Europe. The virus produces yellow spots and streaks in the leaves, sometimes damaging them extensively (Monger 2007). The rhizome is infected and the only way to cure the plant is through meristem culture. If you grow ornamental cannas, it would be best to keep your achira isolated from them.

Achira is probably vulnerable to most or all of the same viruses as ornamental Cannas, the most common and serious of which are Canna Yellow Mottle Virus, Bean Yellow Mosaic Virus, Cucumber Mosaic Virus, and Tomato Aspermy Virus (Rajakaruna 2014). Most of these are aphid transmitted diseases, so they can be transferred over long distances. It isn't clear if all of the viruses listed below infect Cannas naturally or only through experimental inoculation.

Virus	Genus	Endemic in North America	Frequency in Achira	Seed Transmitted
Alfalfa Mosaic Virus (AMV)	Alfamovirus	Yes	Unknown/not detected	Possibly in achira
Arabis Mosaic Virus (ArMV)	Nepovirus	No	Unknown/not detected	Possibly in achira
Bean Yellow Mosaic Virus (BYMV) aka Canna Mosaic Virus	Potyvirus	Yes	Unknown/not detected	Unlikely in achira
Broad Bean Wilt Virus (BBWV1 and BBWV2)	Fabavirus	Yes	Unknown/not detected	Unlikely in achira
Canna Yellow Mottle Virus (CYMV)	Badnavirus	Yes	Infrequent	Possibly in achira

Canna Yellow Streak Virus (CaYSV)	Potyvirus	Yes	Unknown/not detected	Unlikely in achira
Chrysanthemum Virus B (CVB)	Carlavirus	Yes	Unknown/not detected	Unlikely in achira
Cucumber Mosaic Virus (CMV)	Cucumovirus	Yes	Rare	Possibly in achira
Impatiens Necrotic Spot Virus (INSV)	Tospovirus	Yes	Rare	Possibly in achira
Prunus Necrotic Ringspot Virus (PNRSV)	Ilarvirus	Yes	Unknown/not detected	Possibly in achira
Tobacco Mosaic Virus (TMV)	Tobamovirus	Yes	Rare	Unlikely in achira
Tobacco Ringspot Virus (TRSV)	Nepovirus	Yes	Unknown/not detected	Possibly in achira
Tobacco Streak Virus (TSV)	Ilarvirus	Yes	Unknown/not detected	Possibly in achira
Tomato Aspermy Virus (TAV)	Cucumovirus	Yes	Rare	Unlikely in achira
Tomato Mosaic Virus (ToMV)	Tobamovirus	Yes	Unknown/not detected	Unlikely in achira
Tomato Ringspot Virus (ToRSV)	Nepovirus	Yes	Unknown/not detected	Possibly in achira
Tomato Spotted Wilt Virus (TSWV)	Tospovirus	Yes	Rare	Possibly in achira

## Defects

Achira is a robust plant and not prone to mutations to the same degree that most of the Andean roots are. I haven't yet observed any common defects in achira.

## Crop Development

Achira has a lot going for it; it is high yielding, attractive, adaptable to a fairly wide climate range, and resilient overall. The biggest problem with achira seems to be flavor. It doesn't have much of it. So, job number one is to find varieties that have a little more appeal in the kitchen. Although achira makes a lot of rhizome and conveniently stores in the ground for years, the rhizome gets fibrous as the plant ages. That is worth some effort to improve. The rhizomes could be made more visually appealing by finding new colors. The Incas were masters at this, so that may be an indication that breeding for color is difficult. As an edimental, breeding for leaf and flower color would probably also be welcome. Achira will probably see the greatest interest as a dual use plant for home gardeners. Among goals for breeding, we can take for granted the need to develop more fertile varieties. Triploids are a dead end, at least without subjecting them to chromosome doubling, so the development of new diploid and possibly tetraploid varieties should be a priority. Shorter varieties would have improved performance in high winds. Imai (2017) found that a maximum height of about six feet (2 meters) would significantly reduce wind

damage. In the Pacific Northwest, growers would be doing very well to have plants exceeding six feet, but this could be more important in tropical and subtropical climates.

## Relatives

As already noted, many species of *Canna* are edible, maybe even all of them. *Canna discolor*, *C. glauca*, and *C. indica* have some history of human use as edibles, so it is probably best to stick to those unless you have an appetite for risk and your health insurance is paid up. In general, *Canna* species other than achira have pretty fibrous roots.

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