

Figs as a Niche Crop in Northern Ohio SARE Research Field Day

21 September, 2019

Hearthstone Berry Farm, 1064 Twp Rd 126, Nova OH 44859

Project Description

Figs (*Ficus carica*) are a subtropical shrub grown by gardeners in many parts of the country. Figs fruit on the current year's wood of a mature shrub with some fruit produced on two year old wood. Yearly dieback of growth will significantly delay or even eliminate the crop. Home production of figs outside of their temperate zone involves cultivar selection, placement in an appropriate microclimate and/or winter insulation. Commercial production requires reliable and affordable methods of providing the same protection.

Some operations have begun to grow figs in high tunnels to produce a niche crop for their market. Production of figs with winter protection needs to be quantified for return on investment under various overwintering conditions. A comparison of methods with a control group will be needed. Figs will be grown in high tunnels, under low tunnels and with no protection. Four varieties of hardy figs will be used. The crop will be irrigated. Data collected will include: harvest dates and quantities; annual growth (caliper and length); insect and disease problems; and, sales. Successful establishment of a fig planting for research could lead to new information regarding fig production such as pruning and pest problems in this region.

Previous Research Review

The species *Ficus carica* is the most cold tolerant of the figs but it is still only hardy to 15F.⁴ Winter temperatures in Northern Ohio have varied greatly over the last 5 years but generally the average annual extreme low temperatures are 0 to -5F along Lake Erie and -5 to -10F six to ten miles inland.⁶ However, temperatures in 2013 and 2014 have dropped as low as -20F. Even under these extreme conditions the figs will regrow from the crown but new shoots may be unable to produce a crop in time to ripen before onset of cold weather.

Fig fruit is produced as a main crop on wood that has grown the same season. In other words the current season shoots will usually produce the main crop of figs if the bush is "mature", i.e. not overly vegetative.¹ The importance of having a mature bush is key for crop production in short season areas.

High tunnels provide season extension (earlier growth, longer frost free days and later ripening weeks) in a structure that allows for full height growth of the crop, and access for equipment and staff to manage the crop.⁷ The structures are unvented but can keep average daily temperature around 8F warmer⁸ which is especially important for early shoot emergence and late season ripening. However, the expense of a high tunnel is not always in the budget for the small grower.

Low tunnels are 15-30% the cost of high tunnels. They still provide temperatures 20F to greater than 40F higher than the outside temperatures.⁸ Low tunnels lack the height for seasonal growth or late season ripening but at 4' high, would still provide overwintering temperatures for above ground wood and early shoot emergence; growth needed to produce a figs main crop.²

Early spring warming¹⁰ with subsequent frosts have also created a dynamic leading to early shoot growth followed by cold damage. Season extension with figs could take advantage of the earlier season without the damage from a later frost or freeze.

Several figs are marketed as hardy ('Brown Turkey', 'Chicago Hardy', 'Olympian')⁹ but that marketing is based on the dieback and reemergence of the crop, container production, or labor-intensive insulation. Overwintering structures should allow for production of less hardy varieties as well; this might apply to both low and high tunnels.

A grower in the St. Louis, Missouri area is currently growing several varieties of figs (Byers, personal communication) for a specialty market. Similarly, an organic grower in Northern Ohio has grown figs successfully for several years in the greenhouse for their farm market (Malinich, personal communication). Yet, a search for information regarding growing figs in the North leads to information about home production and associated methods.

References:

- ¹ Figs, <https://aggie-horticulture.tamu.edu/archives/parsons/fruit/figs.html>
- ² Fig Culture in Northern Climates, Cornell University Fact Sheet, B-1-5
- ³ How to Grow Figs in Wisconsin, http://journaltimes.com/lifestyles/relationships-and-special-occasions/the-root-of-it-all-how-to-successfully-grow-figs/article_1eaae018-43d5-11e2-8b5d-0019bb2963f4.html
- ⁴ Fig Production Guide ANR-1145, Himelrick, 1999.
- ⁵ USDA Plant Hardiness Zone Map
- ⁶ Temperature Moderating Effects of Low Tunnels Over Winter In Cool Climates, Sideman, Brown, Martin, *et. al.*, 2010
- ⁷ Introduction to High Tunnels, eXtension Publication, Pool, Stone, 2014
- ⁸ Extending the Garden Season With High Tunnels, Penn State Extension, 2017
- ⁹ Various catalogs, Stark, Raintree Nursery, One Green World, *et. al.*
- ¹⁰ Record-Breaking Early flowering in the Eastern United States, PLOS|ONE, Ellwood, Temple, *et al.* 2013

Interim Report

Year 1, 2018

Plants ordered after grant was awarded and received May and June.

Figs were grown on in a nursery to provide more size—to bring them all up to a 1 gallon transplant size.

The supplier of 'Brown Turkey' had a crop failure and this variety was removed from the trial. High tunnel was constructed around the research block in August; low tunnels were constructed over the research block after frost and full dormancy of the figs.

Low tunnel figs were reduced in size; rodent bait stations were installed under the low tunnels and in the high tunnels an control block.

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Elderberries were chosen as a model for fertilization; fruiting on new growth, lush foliage, fast growth: 10#N/A/yr or 4 oz per fig per year.

Observations year 1

Year one figs stalled after transplanting (normal) and were unable to reach a mature size by frost.

There was no deer damage in the control or low tunnel blocks

Rabbit damage to high tunnel plants was significant

The high tunnel ends were torn off during a late winter storm (reportedly winds reaching 70mph in the area).

Observations year 2

All figs were frozen to the ground.

Only one fig in the control block 'Chicago' emerged, but very late spring (June)

All trial varieties in the low tunnel block eventually regrew from the roots, emerging late May through June.

All varieties (guard and trial plants) regrew from the roots, emerging late April, 'Marseilles', through May, 'Chicago'.

Only 'Celeste' and 'Negrone' (not hardy) are without fruit.

Hardy types, 'Chicago' & 'Olympian', are bearing fruit earlier (lower) while less the less hardy 'Marseilles' is still bearing fruit, but higher on the plant.

A single irrigation line was unable to provide enough water to the maturing figs—a double line is marginally better.

Cercospora leaf spot (*Cercospora fici*) is the only significant disease problem.

Two spotted spider mite has been a problem on some plants.

Discussion

The focus of this research is on whether the fig can be feasibly adopted as a high tunnel crop in Northern Ohio. At the close of the second year of growth, a canopy reaching 6-8' with a high potential for overwintering could provide a commercially harvestable crop. However, if the plants must regrow from the base each year and reach only the 4-5' mark, that type of crop is questionable.

The near-total loss of the control block was expected and supports even the low tunnel as a viable alternative for overwintering hardy figs in Northern Ohio. Earlier emergence and survival of even more subtropical fig varieties in the high tunnel supports the possibility of high tunnels (by definition, unheated) for growing a fig crop. But, the financial inputs needed to do so are still questionable.

Extra protection, such as the methods used by hobbyists, to better overwinter mature fig wood could be used in tandem with the tunnels. This not it the experimental design of this project. Since the control block was lost and will no longer be used for data, the one surviving plant will be insulated this winter. After the conclusion of this project in 2021 extra insulation will be added to the experimental blocks.

Figs would make a good niche crop for small growers in Northern Ohio. They could demand a premium price. But, can they be produced profitably, taking into account the overwintering methods needed to produce that premium, niche crop?

Growing Figs at Home

<https://extension.umd.edu/hgic/topics/figs>

Fig trees (*Ficus carica*) make nice additions to Maryland landscapes. They can be pruned to a shrub or tree form, grown in containers or in-ground, are virtually pest-free, and can produce abundant crops when the proper cultivars are selected and carefully managed. Gardeners in warmer areas (Eastern Shore, Southern Maryland, and Baltimore City) tend to have the least difficulty over-wintering plants and harvesting figs before the first frost.

Celeste, Brown Turkey, Hardy Chicago, Brunswick, Marseilles, and Osborne are some of the most winter hardy cultivars which perform well in Maryland. All are seedless, producing their fruits parthenocarpically (without pollination or fertilization).

Purchase plants from a reputable nursery or propagate from spring divisions or summer cuttings from mature plants. Root suckers from established trees can also be pulled and planted in the spring. Pliable branches can also be pegged to the ground and tip rooted or layered. Once rooted, sever the new plant from the mother plant and transplant into a container or into the ground.

Site Selection and Planting

Select a sunny, protected location for planting in the ground. Next to a south-facing wall is ideal. Figs need full sun and do very well on a wide range of soils. Soil pH should be in the 6.0 to 6.5 range. Figs are usually planted in the spring after danger of frost but can be planted in the early fall. Space plants 6-8 feet apart. Cut back the top of your new plant to force lateral growth.

Figs benefit from the incorporation of compost or well-rotted manure prior to planting. Confining or pruning the root system can invigorate the plant and hasten the harvest. Do not cultivate the soil under your plant because much of the extensive root system is directly beneath the soil surface.

Fruits form in the leaf axils of the current year's wood. The fruits form from the shoot base towards the tip. Fig plants usually begin to bear in the second or third year after planting.

Overwintering Ground-grown Plants

Unprotected fig plants are often winter killed back to the crown in Maryland. Sustained temperatures below 10° to 15°F kill above-ground wood. New shoots will spring readily from the roots. In some cases, a plant killed back in the winter will still produce a modest crop the following summer. In most cases, however, the plant will require 2 to 3 good growing seasons to return to normal production. Here are suggestions for winter protection:

- >Figs grown to a bush or shrub habit are easier to protect than those in a tree form;
- >Pliable branches can be pinned to the ground and covered with burlap, old blankets or tarps;
- >Some growers encircle their fig plant with chicken wire and fill in with insulating leaves, and straw. The top of the plant can be covered with a plastic tarp to shed rain, sleet, and snow; and
- >In the spring, remove the winter protection after all danger of frost.

Each spring, prune out ground suckers and remove all dead or weak wood. Mature plants usually have 3 to 8 main stems. Your skin may become irritated from contact with the milky, latex plant sap.

Container Fig Culture

You can achieve satisfactory production in small spaces by growing fig plants in half whiskey barrels or other large, suitable containers of about 30-gallon size. Casters on the containers greatly increase convenience, because your figs should be moved into a protected area, such as a garage, for the winter. The root restriction resulting from this type of culture may improve yields and reduce the days to

harvest. Most cultivars will perform well in containers, and anecdotal reports suggest that the cultivar 'Petite Negri' may be particularly well-suited.

Potting into a container

>Your growing mix should be loamy and well-drained with lots of compost or well-rotted manure; >You can lighten heavy soils by incorporating a soil-less growing mixture containing peat moss, perlite, and vermiculite;

>Keep fig containers in full sun and water regularly; and

>When fruits begin to form apply 2 to 3 gallons of water each day.

After fig leaves drop in the fall

>Shape your plant by removing suckers and heading back long branches; and

>Move to a protected area, such as a garage.

Harvesting

Figs are adored by many animals, not just people. Without netting to throw over your bush, you may find that squirrels and birds will dine first on your crop. Figs ripen from mid-September through frost. They do not ripen off the plant and so should not be picked until fully-colored and slightly soft.

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[<https://hort.purdue.edu/newcrop/morton/fig.html>]

While the ancient history of the fig centers around the Mediterranean region, and it is most commonly cultivated in mild-temperate climates, it nevertheless has its place in tropical and subtropical horticulture. Botanically identified as *Ficus carica* L. (family Moraceae), it is unique in a genus embracing perhaps over 1,000 species, mostly giant "rubber trees", and mostly tropical.

Description

The fig is a tree of small dimensions, 10 to 30 ft (3-9 m) high, with numerous spreading branches and a trunk rarely more than 7 in (17.5 cm) in diameter. It contains copious milky latex. The root system is typically shallow and spreading, sometimes covering 50 ft (15 m) of ground, but in permeable soil some of the roots may descend to 20 ft (6 m). What is commonly accepted as a "fruit" is technically a synconium, that is, a fleshy, hollow receptacle with a small opening at the apex partly closed by small scales. Tiny flowers are massed on the inside wall. In the case of the common fig discussed here, the flowers are all female and need no pollination. There are other types, the "Caprifig" which has male and female flowers requiring visits by a tiny wasp, *Blastophaga grossorum*; the "Smyrna" fig, needing crosspollination by Caprifigs in order to develop normally. Seeds may be large, medium, small or minute and range in number from 30 to 1,600 per fruit.

Origin and Distribution

The fig is believed to be indigenous to Western Asia and to have been distributed by man throughout the Mediterranean area. It has been cultivated for thousands of years, remnants of figs having been found in excavations of Neolithic sites traced to at least 5,000 B.C. As time went on, the fig-growing territory stretched from Afghanistan to southern Germany and the Canary Islands. Pliny was aware of 29 types. Figs were introduced into England some time between 1525 and 1548. It is not clear when the common fig entered China but by 1550 it was reliably reported to be in Chinese gardens. European types were taken to China, Japan, India, South Africa and Australia.

The first figs in the New World were planted in Mexico in 1560. Figs were introduced into California when the San Diego Mission was established in 1769. Later, many special varieties were received from Europe and the eastern United States where the fig reached Virginia in 1669. The Smyrna fig was brought to California in 1881-82 but it was not until 1900 that the wasp was introduced to serve as the pollinating agent and make commercial fig culture possible. From Virginia, fig culture spread to the Carolinas, Georgia, Florida, Alabama, Mississippi, Louisiana and Texas. The tree was planted in Bermuda in early times and was common around Bahamian plantations in Colonial days. It became a familiar dooryard plant in the West Indies, and at medium and low altitudes in Central America and northern South America. There are fair-sized plantations on mountainsides of Honduras and at low elevations on the Pacific side of Costa Rica. From Florida to northern South America and in India only the common fig is grown. Chile and Argentina grow the types suited to cooler zones.

In Venezuela, the fig is one of the fruits in greatest demand by fruit processors. Because of the inadequate supply, a program was launched in 1960 to encourage commercial plantings. In 1976, fresh figs were regarded as highly desirable luxuries and were selling for \$6.35 to \$7.25 per lb (\$14-\$16/kg) in Colombia. The Instituto Colombiano Agropecuario had realized some years earlier that fig growing should be encouraged and had established an experimental plantation in 1973. The results were so favorable that they circulated an advisory bulletin to farmers in 1977, including improved methods of cultivation, costs of production and potential revenue.

Varieties

There are many cultivated varieties in each class of figs. In fact, over 700 varietal names are in use but many are synonyms. Here we need only present those that are suited to warm areas and do not require

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pollination. Most popular among these are 'Celeste' and 'Brown Turkey', followed by 'Brunswick' and 'Marseilles', described as follows:

'Celeste'—pear-shaped, ribbed, sometimes with a short neck and slender stalk to 3/4 in (2 cm) long; the eye (opening at apex) is closed; the fruit is small to medium; the skin purplish-brown or bronze tinged with purple and covered with bloom; the pulp whitish or pinkish amber, of rich flavor and good quality; almost seedless. Main crop is heavy but of short duration. There is rarely an early, "breba", crop.

'Brown Turkey'—broad-pyriform, usually without neck; medium to large; copper-colored; pulp is whitish shading to pink or light red; of good to very good quality; with few seeds. The tree is prolific. The main crop, beginning in mid-July, is large; the early, breba, crop is small. This cultivar is well adapted to warm climates. It is grown on all the islands of Hawaii.

'Brunswick' ('Magnolia')—leaves narrow-lobed; fruits of main crop are oblique-turbinate, mostly without neck; fruit stalk thick, often swollen; fruit of medium size; bronze or purple-brown; pulp whitish near skin, shading to pink or amber; hollow in center; of fair to good quality; nearly seedless. Ripens over a long season. Breba crop poor; large, bronze-skinned; flesh light-red; coarse.

'Marseilles' ('White Marseilles', or 'Lemon')—fruits of main crop round to oblate without neck; on slender stalks to 1/4 in (6 mm) long; of medium size. Those of breba crop, turbinate with short, thick neck and short stalk; yellow-green with small green flecks; pulp white, sweet; seeds large, conspicuous. Of fair quality.

'Adriatic' ('White Adriatic', or 'Grosse Verte')—turbinate with short, thick neck and short stalk; above medium size; green to yellowish-green with red pulp; of distinctive flavor and very good quality. In early, minor, breba crop the fruits are oblique-pyriform, large, green, often tinged with purplish-red with dark-red pulp and strong flavor.

'Genoa' ('White Genoa')—pyriform or turbinate, very faintly ribbed; neck thick and short, or absent; above medium in size; skin downy, greenish-yellow; pulp greenish-white near skin, mostly amber tinged with red; hollow; of fair quality. Fruits of breba crop oblique-obovate with thick neck and short stalk; yellowish-green externally; pulp light-red; of fair to good quality.

'Purple Genca' ('Black Genoa'; 'Black Spanish') oblong, broad at apex, narrow at base; large; very dark-purple with thick blue bloom; pulp yellowish becoming reddish to red at the center; juicy, with sweet, rich flavor.

'Black Ischia' ('Blue Ischia')—an Italian variety; main crop is elongated pear shaped with many noticeable ribs; short neck and short to medium stalk; large, 2 1/2 in (6.35 cm) long and 1 1/2 in (3.8 cm) wide; dark purple-black except at the apex where it is lighter and greenish; there are many golden flecks; skin is wholly coated with thin, dark-blue bloom; eye open, with red-violet scales; pulp is violet-red, of good quality. In the breba crop, there are few ribs and mostly indistinct; the fruit is small, about 1 1/2 in (3.8 cm) long and of the same width at the apex; the pulp is red to greenish-amber; of poor flavor. The tree is particularly ornamental and the leaves are glossy, only shallowly 3 lobed. A heavy bearer.

Climate

In southern India, 'Marseilles' flourishes on hills above 5,000 ft (1,525 m). In tropical areas generally, figs thrive between 2,600 and 5,900 ft (800-1,800 m). The tree can tolerate 10° to 20° of frost in favorable sites. It should have a dry climate with light early spring rains if it is intended for the production of fresh fruit. Rains during fruit development and ripening are detrimental to the crop, causing the fruits to split. The semi arid tropical and subtropical regions of the world are ideal for fig-growing if means of irrigation are available. But very hot, dry spells will cause fruit-drop even if the trees are irrigated.

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Soil

The fig can be grown on a wide range of soils; light sand, rich loam, heavy clay or limestone, providing there is sufficient depth and good drainage. Sandy soil that is medium-dry and contains a good deal of lime is preferred when the crop is intended for drying. Highly acid soils are unsuitable. The pH should be between 6.0 and 6.5. The tree is fairly tolerant of moderate salinity.

Propagation

Fig trees have been raised from seed, even seed extracted from commercial dried fruits. Ground- or air-layering can be done satisfactorily, and rapid mass multiplication by tissue culture has been achieved in Greece, but the tree is commonly propagated by cuttings of mature wood 2 to 3 years of age, 1/2 to 3/4 in (1.25-2 cm) thick and 8 to 12 in (20-30 cm) long. Planting must be done within 24 hours but, first, the upper, slanting end of the cutting should be treated with a sealant to protect it from disease, and the lower, flat, end with a root-promoting hormone. Trees of unsatisfactory varieties can be topworked by shield- or patch-budding, or cleft- or bark-grafting.

Culture

Cuttings are raised in nursery beds and are set out in the field after 12 or 15 months. They may be spaced from 6 to 25 ft (1.8-7.5 m) apart depending on the cultivar and the fertility of the soil. A spacing of 13 x 13 ft (4x4 m) allows 260 trees/acre (625 trees/ha). In Colombia, growers are advised to set the trees at 10 x 10 ft (3x3 m) on level land, 10 x 13 ft (3x4 m) on slopes. Fruiting will commence in less than a year from planting out. Young plants will benefit from shading with palm fronds or other material until they are well established. A fertilizer formula of 10-30-10 or 10-20-20 NPK is recommended 2 oz (about 60 g) each for young plants and 1/5 lb (100 g) each for adults, plus minor elements at the rate of 1 oz (30 g) per tree every 6 months.

Fig trees are cut back severely in fall or winter, depending on whether the crop is desired the following summer or fall. Branches are often notched to induce lateral branching and increase the yield. If there are heavy rains, drainage ditches should be dug to prevent water-logging. Fig trees remain productive up to 12 or 15 years of age and thereafter the crop declines though the trees may live to a very advanced age.

Season

Fig trees usually bear 2 crops a year, the early season ("breba") fruits being inferior and frequently too acid, and only those of the second, or main, crop of actual value.

In Colombia and Venezuela, some fruits are borne throughout the year but there are 2 principal crops, one in May and June and the other in December and January.

Large-scale fig producers in California spray ethephon to speed up ripening and then wind-machines are drawn past the trees or helicopter overflights are made to hasten fruit drop, thus shortening the harvest period by as much as 10 days in order to avoid impending rain and insect attack. Proper timing of the growth regulator is crucial to fruit quality.

Harvesting and Yield

The fruits may be picked from the tree or gathered normally or by mechanical sweepers after they fall to the ground. 'Brunswick' is so tender it must be picked when slightly unripe in order to be firm enough for processing. Workers must wear gloves and protective clothing because of the latex. Harvested fruits are spread out in the shade for a day so that the latex will dry a little. Then they are transported to

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processing plants in wooden boxes holding 22 to 33 lbs (10-15 kg). In India, a fig tree bears 180 to 360 fruits per year. Venezuelan growers expect 132 to 176 lbs (6-8 kg) per tree.

Keeping Quality

Fresh figs are very perishable. At 40° to 43°F (4.44°-6.11°C) and 75% relative humidity, figs remain in good condition for 8 days but have a shelf life of only 1 to 2 days when removed from storage. At 50°F (10°C) and relative humidity of 85%, figs can be kept no longer than 21 days. They remain in good condition for 30 days when stored at 32° to 35° F (0°-1.67° C). If frozen whole, they can be maintained for several months.

Pests and Diseases

Fig trees are prone to attack by nematodes (especially *Meloidogyne* spp.) and, in the tropics, have been traditionally planted close to a wall or building so that the roots can go underneath and escape damage. A heavy mulch will serve equally well. Today, control is possible with proper application of nematicides.

In India, a stem-borer, *Batocera rufomaculata*, feeds on the branches and may kill the tree. Lepidopterous pests in Venezuela include the fig borer, *Azochis gripusalis*, the larvae of which feed on the new growth, tunnel down through the trees to the roots and kill the tree. Another, called *cachudo de la higuera*, has prominently horned larvae up to 3 1/8 in (8 cm) long that can destroy a fig tree in a few days. There are also coleopterous insects of the genera *Epitrix* and *Colaspis* that perforate and severely damage the leaves and shoots. Scale insects include *Asterolecanium* sp. which attacks the bark of trees weakened by excessive humidity or prolonged drought, and the lesser enemy, *Saissetia haemispherica*.

A common and widespread problem is leaf rust caused by *Cerotelium fici*; bringing about premature leaf fall and reducing yields. It is most prevalent in rainy seasons. Leaf spot results from infection by *Cylindrocladium scoparium* or *Cercospora fici*. Fig mosaic is caused by a virus and is incurable. Affected trees must be destroyed.

The dried fruit beetle, or sour bug, *Carpophilus* spp., enters the fruit through the eye and leads to souring and smut caused by *Aspergillus niger*. This fungus may attack ripening fruits.

Food Uses

Some people peel the skin back from the stem end to expose the flesh for eating out of-hand. The more fastidious eater holds the fruit by the stem end, cuts the fruit into quarters from the apex, spreads the sections apart and lifts the flesh from the skin with a knife blade, discarding the stem and skin. Commercially, figs are peeled by immersion for 1 minute in boiling lye water or a boiling solution of sodium bicarbonate. In warm, humid climates, figs are generally eaten fresh and raw without peeling, and they are often served with cream and sugar. Peeled or unpeeled, the fruits may be merely stewed or cooked in various ways, as in pies, puddings, cakes, bread or other bakery products, or added to ice cream mix. Home owners preserve the whole fruits in sugar sirup or prepare them as jam, marmalade, or paste. Fig paste (with added wheat and corn flour, whey, sirup, oils and other ingredients) forms the filling for the well known bakery product, "Fig Newton". The fruits are sometimes candied whole commercially. In Europe; western Asia, northern Africa and California, commercial canning and drying of figs are industries of great importance.

Some drying is done in Poona, India, and there is currently interest in solar-drying in Guatemala. Usually, the fruits are allowed to fully ripen and partially dehydrate on the tree, then are exposed to sulphur fumes for about a half hour, placed out in the sun and turned daily to achieve uniform drying,

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and pressed flat during the 5- to 7-day process. 'Black Mission' and 'Kadota' figs are suitable for freezing whole in sirup, or sliced and layered with sugar.

Dried cull figs have been roasted and ground as a coffee substitute. In Mediterranean countries, low-grade figs are converted into alcohol. An alcoholic extract of dried figs has been used as a flavoring for liqueurs and tobacco.