



Kiwifruit Production in Oklahoma

The Oklahoma Cooperative Extension Service Bringing the University to You!

The Cooperative Extension Service is the largest, most successful informal educational organization in the world. It is a nationwide system funded and guided by a partnership of federal, state and local governments that delivers information to help people help themselves through the land-grant university system.

Extension carries out programs in the broad categories of agriculture, natural resources and environment; home economics; 4-H and other youth; and community resource development. Extension staff members live and work among the people they serve to help stimulate and educate Americans to plan ahead and cope with their problems.

Some characteristics of the Cooperative Extension system are:

- The federal, state and local governments cooperatively share in its financial support and program direction.
- It is administered by the land-grant university as designated by the state legislature through an Extension director.
- Extension programs are nonpolitical, objective and based on factual information.
- It provides practical, problem-oriented education for people of all ages. It is designated to take the knowledge of the university to those persons who do not or cannot participate in the formal classroom instruction of the university.
- It utilizes research from university, government and other sources to help people make their own decisions.
- More than a million volunteers help multiply the impact of the Extension professional staff.
- It dispenses no funds to the public.
- It is not a regulatory agency, but it does inform people of regulations and of their options in meeting them.
- Local programs are developed and carried out in full recognition of national problems and goals.
- The Extension staff educates people through personal contacts, meetings, demonstrations and the mass media.
- Extension has the built-in flexibility to adjust its programs and subject matter to meet new needs. Activities shift from year to year as citizen groups and Extension workers close to the problems advise changes.

Julia Whitworth

Extension Small Fruits Specialist

Kiwifruit are also known as "Chinese gooseberries." There are approximately 50 species of kiwifruit.

Site Location

Kiwifruit need a site in full sun, and they should also be protected from wind. Areas prone to frost (frost pockets) should be avoided. A site with a slight slope to the north is preferred, to help prevent spring frost injury and to protect plants from southwest winds in summer.

Deep, well-drained sandy loam soils with added organic matter are ideal. The soil pH's of 5.0 to 6.5 are best. Raised beds (6 to 10 inches high) may help with soil drainage problems as good soil drainage is essential. Because kiwifruit are susceptible to heat injury, some artificial shading may be necessary. The soil should be deeply cultivated the year before planting as this will greatly help with weed control. Irrigation water should be available. A site with easy access for honeybees is very desirable.

Soil Preparation

Have a soil test made several months in advance. Prepare the soil by tillage to give a weed-free planting area. Two to three weeks before planting, mix in the recommended fertilizer and lime. Add organic matter such as peat moss or composted cow manure to the top 3 to 6 inches of soil. Allow rainfall to settle the beds, or use sprinklers.

Plant Selection

Kiwifruit have separate male and female plants. They must be growing near each other for fruit production. They should also belong to the same species to ensure that they bloom at the same time. In order to get more, larger fruit, it is often better to have male plants that are a different variety from the female plants.

Purchase plants from a reputable nursery. Upon their arrival, use a magnifying glass to check the plants for evidence of disease and insects.

Variety Selection

Choose varieties that you like and that are winter hardy in your area. It is often difficult to get fruiting, but the vines may cover a house in a summer if conditions are right. Fortunately, they do not spread like kudzu.

There are four species of kiwifruit that are commonly cultivated for fruit:

Oklahoma Cooperative Extension Fact Sheets are also available on our website at:
<http://osufacts.okstate.edu>

Actinidia deliciosa is a grocery-store kiwi. It requires a very long growing season, and it is not hardy in Oklahoma. It keeps up to 6 months in storage.

Actinidia chinensis is closely related to *A. Deliciosa*. Selections are being made for hairlessness, fragrance, flavor, and red or yellow flesh. It is a small fruit and is suitable for southern Oklahoma (U.S.D.A. hardiness zone 7).

Actinidia arguta is a hardy kiwi. Small fruit with smooth skin. Keeps 2 to 3 months in storage. Produces for 60 years. Bears in 3 to 4 years. Plant 6 to 8 females per male. No disease or insect problems. It ripens in late summer.

Actinidia kolomikta is an Arctic kiwi. The male is often used as an ornamental because of the pink and white variegation of its younger leaves. The fruit is small, very sweet, and very cold hardy (-30° F). It has up to 16 times as much vitamin C per unit weight as oranges. The ripe fruit often fall off the vine.

Propagation and Planting

Kiwifruit may be propagated from softwood cuttings taken in June, July, or August. All but the top two leaves are removed. These two leaves are cut in half, the cutting is dipped in rooting hormone, and they are stuck in moist media such as a mist bed. Young plants from these cuttings may be planted in a nursery row outside the next spring, and planted in their permanent location in late winter or early spring the year after.

Planting. In late winter or early spring (February or March), space plants 18 to 20 feet apart in rows that are 15 to 16 feet apart. Male plants should be planted so that honeybees will have access to them among several female plants. Kiwifruit plants should be set at the same depth or slightly deeper than they grew in the nursery row. Do not allow the plants to dry out during planting. Unless rain is likely, water the newly set plants.

Nurturing

Mulching. Kiwifruit are perennial woody vines (lianas). Kiwifruit may be permanently mulched with about 4 inches of organic material such as pine bark or sawdust. Replenish this each fall after the first killing frost. If voles or mice are a problem, it may be necessary to remove mulch around the plant stems. Because no cultivation is needed, mulch helps

Table 1. Kiwifruit varieties and appropriate pollinators.

<i>Species</i>	<i>Variety</i>	<i>Sex</i>	<i>Notes</i>
<i>Actinidia arguta</i>	74-8	female	excellent flavor
<i>Actinidia arguta</i>	74-32	male	pollinator for 74 series
<i>Actinidia arguta</i>	74-46	male	pollinator for 74 series
<i>Actinidia arguta</i>	74-49	female	large fruit
<i>Actinidia arguta</i>	74-52	male	pollinator for 74 series
<i>Actinidia arguta</i>	Ananasnaja	male, female (separate)	lime shaped, 3/4 inch to 1 inch long fruit
<i>Actinidia arguta</i>	Issai	male & female	self-pollinating
<i>Actinidia arguta</i>	Meader	male, female (separate)	male and female plants, pollinator for Ananasnaja
<i>Actinidia chinensis</i>	California	male	may freeze to ground some years
<i>Actinidia chinensis</i>	Saanichton 12	female	may freeze to ground some years, has large fuzzy fruit
<i>Actinidia chinensis</i>	Tropical	female	hardy in zone 7 fuzzy fruit, heavy crops
<i>Actinidia kolomikta</i>	Arctic Beauty	male, female (separate)	males variegated, confined growth
<i>Actinidia kolomikta</i>	Pavlovskaya	female	large fruit
<i>Actinidia kolomikta</i>	Ranjaja	male	pollinator for Pavlovskaya

control weeds, conserves soil and moisture, shades the soil to keep it cooler during the summer, helps prevent winter injury to crowns, promotes growth of the extensive fibrous kiwifruit root system, and helps control unwanted suckers.

Irrigation is necessary to provide for good plant establishment and production. Mature kiwifruit vines may use 25 gallons of water per vine per day in summer. Water the kiwifruit whenever the soil under the mulch feels dry, or if plants appear to be wilting. Wet the soil to a depth of about six to ten inches without soaking the ground. Excess watering can cause the roots of the kiwifruit to die.

Winter Protection

Choose species that are winter hardy in your area. Kiwifruit flower about 60 days after the vegetative buds burst, so the flowers will not be exposed to freezing temperatures. If spring frost threatens swelling leaf buds, some frost protection may be desirable. Because of the large size of the plants, covering them is often impractical. However, if water is continuously sprayed on them during the entire time the temperature is below freezing, it may provide some frost protection. There may be some breakage of the vines due to ice accumulation.

Harvesting

Kiwifruit should be picked before first frost. They will ripen on or off the vine. Mature green fruit will store longer than soft, ripe fruit. However, if the fruit are picked too early, they will

not ripen correctly and will be poor quality. To pick kiwifruit, snap them off the plant, leaving the fruit stalks on the vine. Handle the fruit gently. Wear gloves to prevent damage to their skin. Mature green kiwifruit are hard and tart, with good green color inside. Fruit which ripen on the vine are good to eat, but will not store as long as fruit picked earlier.

Harvest fruit during the cooler part of the day and plan to refrigerate the fruit soon after harvest. These berries will usually remain in good condition for three to six months if they are stored at 29° F in a plastic bag with a few small holes in it.

Fertilizing

Very little commercial fertilizer is needed during the first year of kiwifruit establishment. In the second year, apply fertilizer to the kiwifruit plants soon after budbreak (about 5 ounces of 10-20-10 or 13-13-13 per plant). In subsequent years, apply about 11 ounces of ammonium nitrate, 1 ounce of 0-46-0, and 1 pound of potassium sulfate per plant. Periodic applications of dolomitic limestone may be needed to maintain pH in the proper range (5.0-6.5) and to supply magnesium to the plants. Kiwifruit need the equivalent of about 1 1/2 ounces of magnesium sulfate per plant per year after they begin fruiting.

It is best to fertilize the plants in a split application, with one-half of the nitrogen and potassium applied just after budbreak in the spring, and one-half applied just after flowering. The magnesium (or dolomitic limestone) and phosphorus may all be applied just after budbreak. Proper fertilization

stimulates plant growth, increases fruit size, and boosts total production. Too much nitrogen causes excess vegetative growth, poor yields, and increased winter injury.

Pruning and Training

Kiwifruit must have very strong, permanent trellises to hold up the vines. T-bar trellises are best for disease control and ease of handling, but plants on pergola trellises often have larger fruit, fewer sunburned fruits, and less wind damage. In either case, kiwifruit should be planted in rows, on center between the posts. Young plants should be trained up on small stakes until they reach the first wire. Female plants should be pruned in late winter (February). Male plants should be pruned after flowering, to decrease their vigor (which is usually desirable) while allowing for much pollen production.

T-bar trellises have 4-inch diameter posts set in the ground 2 to 3 feet deep and spaced 16 to 20 feet apart. The crossbar is made of 2" by 4" treated lumber, 5 feet long. A notch is cut into the post, and the narrow side of the 2" by 4" board is fitted into the notch. The crossbar is fastened with a bolt, and the ends are braced to the post with wire or wood. Three high-tensile wires are fastened to the crossbar — one near each end and one in the center.

Female plants trained to a t-bar trellis should have permanent canes (trunks) which extend from the ground to the center of the trellis, and along the center of the trellis in both directions. Canes that fruited the previous year should be removed. Replacement canes and canes that will fruit during the coming summer should be trained across (perpendicular to) the outer wires of the trellis, and allowed to droop over. They should be tipped about 1/2 feet above the ground. This forms a drooping “T” shape when viewed from the end of the trellis. Also remove dead, diseased, deranged, and dying wood at this time. Leave one cane about every 6 inches, alternating them between the left and right sides of the trellis. Leave a reasonable number of round, fat flower buds for fruit production the next year. Remove all shoots from the lower part of the trunk.

First-year plants are allowed to produce as much growth as possible without pruning. Male plants are often more vigorous than female plants, and may require more pruning (removing up to 70% of the previous year's growth). Otherwise, they are trained the same as female plants.

Kiwifruit may flower in their second year, but should not be allowed to bear fruit until they are well established. It may be necessary to thin the fruit load about 2 weeks after flowering, especially on young or weak vines. Leave about 40 to 45 fruit per square meter of canopy on small-fruited types, and proportionately less with larger-fruited types. Selective thinning to remove oddly shaped and damaged fruit is a good idea. A mature female kiwifruit may produce over two hundred pounds of fruit. To keep from being inundated with kiwifruit, prune adequately and plant sparingly.

Pergola trellises allow the vines to form a solid canopy about 8 feet off the ground, with the fruit hanging on the bottom. Pergolas have posts the same size and set in the same way as t-bar trellises. Two 1" by 4" boards are laid side by side for the crossbars, which extend from post to post. Wires

are run on top of them down the rows of posts. Additional wires are spaced 18 to 25 inches apart, perpendicular to the crossbars. This makes a grid of wire on which to train the kiwifruit vines.

Female plants trained to a pergola trellis should have permanent canes that extend from the ground to the center of the trellis, and along the center of the trellis in both directions (just like a t-bar). Replacement canes and canes that will fruit during the coming summer should be trained across (perpendicular to) the outer wires of the trellis all the way to the center of the row. They should be tipped about 6 inches farther out than the last wire. Plants will almost meet in the middle of the rows. The remainder of the pruning is the same as for the t-bar trellis.

Pest Control

Kiwifruit are susceptible to scale insects, leaf rollers, Japanese beetles, *Botrytis*, nematodes, *Phytophthora* root rot, and *Armillaria mellea* (oak root fungus). Spraying for insect, disease, and weed control may be necessary. However, there are few pesticides registered for use on kiwifruit. Cats may react to kiwifruit vines as they do to catnip. Chicken-wire cylinders may help protect young plants if this is a problem.

Commercial Production

Commercial kiwifruit production should be approached with extreme caution in Oklahoma. Some home garden plantings in the state have not produced any fruit after more than 5 years. In addition, no established market exists for the Arctic, hardy, or Chinese kiwifruit. The trellis required is expensive to construct and maintain. New commercial plantings should probably be less than 1 acre and should be planted only after a market is obtained for the fruit. A successful planting can always be increased later.

Other Information Sources

Free publications:

BAE-1511 Trickle Irrigation for Lawns, Gardens, and Small Orchards
BAE-1655 Lawn, Garden and Small Plot Irrigation
PSS-2207 How to Get a Good Soil Sample
PSS-2236 Knowing When to Fertilize
PSS-2750 Guide to Effective Weed Control
HLA-6005 Mulching Garden Soils
HLA-6007 Improving Garden Soil Fertility
HLA-7450 Safe Use of Pesticides in the Home and Garden
EPP-7612 Plant Disease Diagnostic Services

Books:

Galletta, G.J., and D.G. Himelrick, (eds.). (1990). *Small fruit crop management*. New Jersey: Prentice-Hall, Inc. About \$55.
Reich, Lee. (1991). *Uncommon fruits worthy of attention*. New York: Addison-Wesley Publishing Company. About \$25.
Whealy, K., (ed.). (1989). *Fruit, berry, and nut inventory*. Decorah, IA: Seed Saver Publications. About \$18.