

The Australian Proteaceae in production are:

<i>Banksia ashbyii</i>	<i>B. occidentalis</i>
<i>B. baxterii</i>	<i>B. prionotes</i>
<i>B. burdetti</i>	<i>B. speciosa</i>
<i>B. coccinea</i>	<i>B. victoriae</i>
<i>B. integrifolia</i>	<i>Dryandra formosa</i>
<i>B. media</i>	<i>Isopogon formosum</i>
<i>B. menziesii</i>	<i>I. anethifolius</i>

On our acreage in Vista, most species of *Proteaceae* will start flowering from 18 months to 3 years from seed or cutting, being somewhat faster to production from cutting-grown stock. *Protea neriifolia* 'Pink Mink' and *P. eximia*, which are two good commercial varieties, can average 50 or more flowers per year on plants that are 7-8 ft. tall and 5-6 ft. in width.

Most all of the proteas and *Proteaceae* seem to be very suitable for drying. Some of the species we grow are used almost entirely for drying and others are sold both fresh and dried.

MODERATOR CLAY: Our next speaker will speak on "Ornamental Citrus." He is a graduate of UCLA with a degree in Subtropical Horticulture. He began teaching at Cal Poly in 1948, working principally with citrus. He is a Vice-Chairman of the Valencia and Naval Orange Committees of the California Citrus Industries. I would now like to call on Prof. Albert Canham.

## ORNAMENTAL CITRUS

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The glossy green, waxy foliage of citrus, and the symmetry of the natural shape of the tree is pleasant to behold. Add to this the fragrant, exotic perfume of the blossoms, the color and taste of the fruit produced by the citrus tree and there is no dispute that it has a natural ornamental value difficult to match. Yet, citrus does not commonly find its way into landscape design. The fact that it is an attractive evergreen, it produces blossoms and fruit over long periods during the year and that it is not a massive tree should make this group of plants sought after for any garden scheme.

Perhaps citrus is too commonly thought of as an economic crop. It is, for orchards, planted in large blocks in neat, regularly spaced, rows; planted in this manner, the trees are very attractive.

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Drive through any citrus growing area in California, Arizona, Florida or Texas and, depending on the season of the year, one is pleased by the perfume of the blossoms, or the contrast of various colors of the fruit against the rich foliage green, or by the ever-changing geometric patterns created by the planting designs used in the orchards.

The citrus tree, in its variety of types and forms, together with its many relatives offers fascinating possibilities as an ornamental plant in home yards, parks, courtyard and patio plantings and in numerous other areas. Citrus species belong to the family *Rutaceae* and to the orange subfamily *Aurantioideae* (4). This subfamily contains 33 genera with well over 200 species and this number varies with the taxonomist followed (3). There are three genera in the citrus group which represent the principally grown types — *Citrus*, *Fortunella*, and *Poncirus*. This latter is used primarily as a rootstock. It must be apparent then, that the remaining 30 genera contain many different kinds of citrus-like plants, many of which could be considered for ornamental candidates.

The citrus plant can be trained to grow in a variety of forms, shapes and systems. It espaliers reasonably easily; with care it can be formed into a cordon system, or into a hedge or grown along a wall. The Sunset House of Sunset Magazine in Menlo Park, California has an attractive patio where citrus trees make up hedges, living fences, and other attractive ornamental adaptations. At the University of California's Citrus Research Station, Riverside, California, a 40-year-old 'Bouquet de Fleur' citrus hedge lines a campus roadway, providing an excellent example of the use of a non-commercial citrus type. In Phoenix, Arizona, and in Claremont, California, the sour orange has been planted as a street tree where it has been trained to various shapes from round to square to pyramid and is a most enjoyable display of citrus tree beauty.

There are four principal ways that citrus is used in "non-orchard" plantings. These are: (a) single tree planting in the yard for the fruit it will produce; (b) container trees used for patio or restricted planting areas; (c) special effects such as hedges, espaliers, living fences and; (d) specimen trees to create certain accents, borders, color, texture or contrasts (2).

Single tree plantings for fruit production may be incidentally ornamental. Generally the tree is planted just to have citrus growing, such as a lemon, orange or a tangerine. The type of tree planted in this case often times is one which has been in a three or five gallon container for two to three years, has some fruit on it so the buyer knows it will produce. This type may inadvertently provide the nurseryman with a repeat sale since it will probably

be root bound and have problems surviving when it is planted. A good quality one-year citrus tree that has been grown under careful nursery conditions is a much better type of tree for this purpose than one which has been containerized for a few years. Table 1 lists those citrus cultivars which are commonly used in garden and ornamental plantings today. Several nurseries are now producing citrus trees on dwarfing rootstocks which create healthy, productive trees but grow only about one half the normal size of a regular tree (1). These lend themselves quite readily to situations where the planting area is limited. By careful planning, more than twice the number of these trees can be planted in place of full-

**Table 1.** Citrus types commonly used in ornamental plantings.

Common Name	Botanical Name	Principal Value	Type of Training
Oranges Washington Navel Valencia Hamlin Sour	<i>Citrus sinensis</i>	Fruit	Individual tree Normal & dwarf
Lemons Lisbon Eureka Ponderosa Meyer	<i>Citrus aurantium</i> <i>Citrus limon</i>	Fruit Accent Fruit	Individual tree Normal & dwarf Espalier Container
Grapefruits Marsh seedless Ruby Red	<i>C. limon</i> <i>x C. sinensis</i> <i>Citrus paradisi</i>		Individual tree Normal & dwarf
Tangerines & Mandarins Dancy Satsuma Kara Kinnow	<i>Citrus reticulata</i>	Fruit	Individual tree Normal & dwarf Espalier & container
Limes Bearss (Tahiti) Mexican Rangpur Calamondin	<i>Citrus aurantifolia</i> <i>Citrus mitis</i>	Fruit Ornamental Ornamental & Fruit	Individual tree Specimen tree
Kumquats Nagami Meiwa	<i>Fortunella sp.</i> <i>F. margarita</i> <i>F. margarita x F.</i> <i>japonica</i>	Ornamental	Individual tree Dwarf principally Container Specimen
Citrus hybrids Tangelo-Minneola, Sampson Tangor-Temple Limequat		Fruit Fruit Ornamental	Individual tree

sized trees. In this instance a pleasing ornamental effect can also be created.

Container-grown citrus will do well for three to four years and then become root-bound and the health and performance of the tree deteriorates unless remedies are taken to correct it. Many citrus species, however, make excellent container specimens — kumquats, calamondins, tangerine and mandarins and similar types are very attractive when grown this way. Root pruning, judicious top pruning, plus special nutritional practices can prolong the useful life of this type of tree. Thousands of small trees of calamondin, Meyer lemon, and kumquats are annually propagated and sold as household plants. These have a built-in obsolescence where the climatic conditions are too severe, but as young potted trees in one gallon containers, they are very attractive.

Growing citrus trees for special effects, such as espalier, hedges and living fences can be done, but it takes considerable skill and considerable effort to change the growth behavior of the tree. The citrus tree will resist efforts to change its growth pattern. Often times fruiting will be eliminated or greatly reduced depending on the degree that pruning has to be done to achieve the special effect. Fruiting cultivars of lemon, grapefruit, or orange should not be used for this practice if good fruiting plus the special effect is desired. Slower-growing citrus types which lend themselves more to this kind of training should be selected. Examples would be the kumquat, 'Chinotto' orange, 'Bouquet de Fleur,' and others.

The use of citrus in ornamental schemes as specimen trees to create certain effects in color, texture, shape and accent does provide for considerable choice. All citrus cultivars and their close relatives will fit into this category. In addition to those citrus species and cultivars given in Table 1, Table 2 describes less commonly used citrus types, including some that belong to other genera. These are not regularly propagated or found in retail nurseries, but should be considered in any discussion of citrus for ornamentals. The fruit from most of these has delightful eating qualities while others add nothing other than the added effect it gives to the tree. This effect can be quite spectacular and will add handsomely to a landscaped area. The bright orange or yellow of the fruit of the kumquat, the 'Shekwasha' mandarin or the limequat is very striking against the dark green foliage of a healthy tree. The Australian finger lime (*Microcitrus australasica*) has a fine textured foliage which gives the tree a feathery appearance and is very pleasant to view. The hybrid of *Eremocitrus glauca*, the citrus olive has a grey-green foliage and fruit not unlike the olive. It grows well under dry conditions and develops a columnar shaped tree with good accent qualities.

**Table 2.** Citrus species and citrus relatives recommended for use as ornamentals.

Common Name	Botanical Name	Description
Chinotto orange	<i>Citrus myrtifolia</i> Raf. ( <i>C. aurantium</i> var. <i>myrtifolia</i> )	(Also <i>C. myrtifolia</i> Tanaka) May be known as Myrtleleaf orange. Small shrub, compact growth. Small pointed dark green leaves on short internode thornless branches. Reddish orange small fruit borne singly and in clusters along branches giving tree a beauty which persists for several weeks. Slow grower, easily trained to various forms. Propagation: Cuttings and seeds
'Bouquet' ('Boquet de Fleur')	<i>Citrus aurantium</i>	A variant of sour orange, slow grower, large, cupped leaves giving the plant an interesting texture. Fruit sour, but not prominent. Trains well as a hedge. Propagation: Cuttings or budding
Shekwasha	<i>Citrus tachibana</i> hybrid (? x <i>C. reticulata</i> )	A hybrid of this species. Dark green medium size leaves, tree medium size. Fruit small 1-1½" diameter, bright orange, profusely borne over tree giving it a Christmas tree effect. Fruit sweet and tasty. Makes excellent specimen tree for accent. Propagation: Budding
Khasi papeda Mauritus papeda	<i>Citrus latipes</i> <i>Citrus hystrix</i>	Both species have interesting leaves with large petiole wings equal in size to leaf blade giving tree a double leaf effect. <i>C. latipes</i> produces a compact very uniformly round tree with appearance of just been trimmed. <i>C. hystrix</i> is more open and has a lighter green leaves. Its fruit is not edible, but does have a large amount of fragrant oil in the rind. Propagation: Budding

**Table 2.** (cont.)

'Tavares' limequat	Hybrid of <i>C. aurantifolia</i> x <i>Fortunella margarita</i>	Profuse fruiting of small lime-like fruits. Tree small, compact, dark green leaves, favoring kumquat, minimum thorns. Appears to be fruitful all year.
Orangequat	<i>C. reticulata</i> , Satsuma x ( <i>Fortunella japonica</i> x <i>F. margarita</i> )	Well formed, rounded tree, small size, dense dark green foliage, leaves rounded and similar to kumquat. Profuse fruiting, bright orange col- ors, fine flavor when eaten whole. Striking color con- trast between fruit and foliage. Propagation: Budding
Kumquat Golden Bean	<i>Fortunella hindsii</i> var. <i>chintou</i>	Strictly ornamental. Stems thorny, fruiting in axils of leaves on new growth. Bloss- om very attractive — starlike with 6-7 white petals. Fruit small, orange bean-like and inedible. Slow grower. Propagation: Budding
'Meiwa'	<i>F. japonica</i> x <i>F. margarita</i>	Round fruited, larger than either parent; small tree suit- able for container growth or dwarf tree. Fruit thick peel, sweet taste.
Changshou	<i>F. obovata</i> Tanaka	Larger fruit, round. Larger leaves than <i>F. japonica</i> or <i>margarita</i> . Tree more vigor- ous makes good tree speci- men.
Chinese box orange	<i>Severinia buxifolia</i>	Trees small, variable in growth habit from rounded flat shape to well rounded bush type form. Moderate to heavy thorniness. Drought & salt tolerant. Leaves small, rounded, color light green, some new growth brownish color; flowers small, white producing small black berry- like fruits lends itself easily to shaping, hedges or indi- vidual trees. Varies in height from 5 ft. to 12 ft. Propagation: Seeds, Cuttings, Budding

**Table 2 (cont.)**

Australian finger-lime	<i>Microcitrus australasica</i>	Close relative of citrus; many small pointed leaves closely spaced on fine twigs giving the tree a lace-like texture. Small spiny thorns found on stems at each leaf axil. Fruit is 3-3½" long, with round juice vesicles containing acid juice. Will grow to 20 ft. and makes a very attractive accent tree for landscaping.
New Guinea wild lime	<i>Microcitrus warburgiana</i>	Leaves elongated, margins serrated, and appear crenulated. Slower growing and not as large or upright as <i>M. australasica</i> . Can be grown as small tree specimen for particular accents. Propagation: Budding. Cuttings appear weak.
Australian desert lime	<i>Eremocitrus glauca</i>	Medium height tree, 15-20 ft., upright growth small, narrow, elongated leaves of grey-green color giving the tree a smoky appearance. Leaf twigs soft and creates a droopy willow-like appearance. Is one of the true xerophytes of this family, flowers small 1/4-5/16" in diameter, fruit is small, green and inconspicuous often abscising before maturity. Propagation: Cuttings & budding
Citrus Olive	<i>Eremocitrus glauca hybrid</i>	Leaves narrow, elongated, dark grey green similar to olive leaf. Tree growth upright, foliage dense creating a wide pillar effect. Fruit ¾-1" in diameter grey green color, pubescent. Very attractive with disciplined growth. Propagation: Cuttings and budded tree.
Wampee	<i>Clausena lansium</i>	Distant relative of citrus, but shows some graft compatibility. Author has budded it into sour orange and Troyer citrange. More commonly propagated by seeds and cuttings. Produces a large robust tree

**Table 2 (cont.)**

Limeberry	<i>Triphasia</i> sp.	<p>with large compound leaves similar in size to walnut. Spring and summer panicle blossom produces clusters of brown, round, edible, tasty fruit. Will make an excellent shade tree and a fine background for smaller plants and trees.</p> <p>Propagation: Seed, cutting, budding.</p> <p>Widely grown in tropical and subtropical regions as an ornamental for trees and hedges. Foliage handsome fine bladed compound leaf with a shiny dark green color. Fruit is a small reddish berry borne in leaf axils. Plant forms a small rounded bush suitable for dooryard planting.</p> <p>Propagation: Cuttings, seed.</p>
Murraya or orange jessamine	<i>Murraya</i> sp.	<p>Very widely used ornamental familiar to all nurserymen. Mentioned here only to point out its botanical relation to citrus. Belongs to the same subtribe as <i>C. lansium</i> and therefore is distantly related to citrus. Used as a single shrub or in hedges in ornamental plantings.</p> <p>Propagation: Cuttings, seed occasionally</p>
Indian Bael Fruit	<i>Aegle marmelos</i>	<p>A member of the hard shell citroid fruit trees. The most interesting feature of this tree is its fruit which is round, 3-4", green, and has a thick, hard shell surrounding an inedible pulp. The tree will grow to medium height 18-20 ft., leaves similar to citrus, trifoliate but are not waxy. Growth pattern is open and spreading.</p> <p>Propagation: Cuttings, budding.</p>
Atalantia	<i>Atalantia</i> sp.	<p>Similar in appearance to some <i>Severinia</i> types but leaves have a darker green color and it is not as densely foliated. No thorns are present. Small shrub-like bush suitable for containers, as a border plant or a hedge.</p> <p>Propagation: Cuttings</p>



One desirable feature of citrus trees as ornamentals is their growth habit of developing a natural tree form without any special training. This shape is predictable for a particular cultivar or species.

Special efforts may be needed to propagate and produce quality citrus trees for ornamental use. Much of the material now available comes from nurseries that are producing trees primarily for commercial planting. This restricts the number of cultivars and types of citrus available for the retail trade. Rootstocks used for commercial trees may not be suitable for ornamental planting. Scion cultivars may be too vigorous for the yard type situation. For example, sour orange is no longer used in California as rootstocks for commercial trees because of its susceptibility to some virus diseases (tristeza) but it still has value for many cultivars propagated for ornamental use. Special training could be given to trees at the nursery if they are to be sold for particular systems of planting. At the present time, most trees are trained to the tree form when they might best be trained in a bush-like conformity or to some specific shape more adaptable for ornamental use.

Since citrus is affected by the same growth and disease problems regardless of whether it is in an orchard or in a park or a yard, the selection of propagation material for ornamentals should be done with the same care and the same precautions used as in commercial citrus tree production. The principal reason for this is the effort the citrus industry is making through the Citrus Variety Improvement Program (5) to prevent the spread of serious virus diseases and to improve the performance of citrus trees. Citrus species and their relatives propagated for ornamental purposes can be the source and reservoir for serious diseases which could spread a potential damaging virus problem to commercial orchards. Examples of viruses now under surveillance by state and federal agencies and the University of California are Tristeza, Exocortis, Psorosis, Cachexia and Xyloporosis. Quarantine laws now prohibit the transport of trees grown in a Tristeza-infected area to a non-infected area.

Locating a source of propagating material of specific types for citrus and related species can be difficult. Many of these types exist only in collections of research agencies such as the U.S.D.A. and the University of California where they are used in genetic studies, hybridization, the development of new rootstocks and scion cultivars and for other scientific or horticultural projects. Generally, trees of all types can be seen and studied in such collections at these various institutions. State universities like Cal Poly, Pomona, that have teaching programs in citrus production have small collections of citrus types which are used in study of the botany of these species.

An inconsistent source of "new" citrus types can often be found in the commercial orchards themselves. Citrus trees have the characteristic of producing vegetative mutations called "bud sports". These may occur as growth modifications in tree form or in leaf form such as narrow, willow-like leaves, wavy leaf margins, etc. Many of these somatic variations have ornamental value where the fruit characteristic remains true to type or, as in the variegated types, the fruit and leaves take on yellow and green mosaic patterns. Some recent introductions of new strains of citrus have occurred this way and are now in production.

In areas where the environmental conditions — climate and soil are suitable for citrus, there exists fine opportunities to make full use of the citrus plant in ornamental schemes. Whether it is grown for its fruit, its appearance, or both, it has a utility in landscape design and garden planning that is unsurpassed.

### LITERATURE CITED

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MODERATOR CLAY: Our next speaker is Fritz Toohey. Fritz has had 16 years experience with the Orange County Nursery engaged in wholesale sales of deciduous fruits and shade trees. Prior to this, he had 12 years experience in retail sales of nursery stock, as owner and as a landscape contractor. Fritz, would you come up here please?