

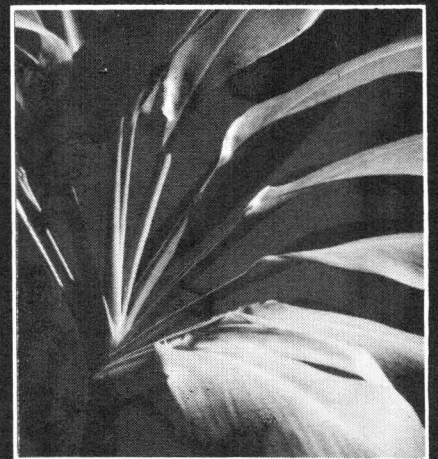
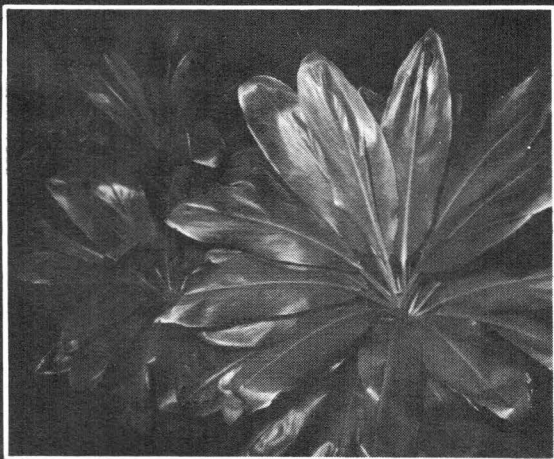
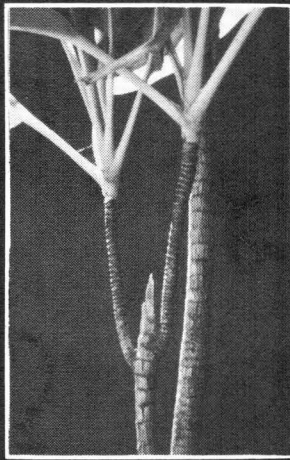
Hawaiian Ti

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Hawaiian Ti

Donald P. Watson and Warren W. J. Yee

DESCRIPTION

Ti (Ki) is the common Hawaiian name for the many variations of a member of the lily family from tropical Asia, Australia and the Pacific islands, *Cordyline terminalis*. While a few other species of Cordylines are grown locally, they are not as common and are not usually referred to as ti.

Ti is a leafy shrub from 1 to 12 feet high with single or branched stems. New leaves attached in spirals form in clusters at the tip of the stem and branches to replace older leaves that fall from the base of the stem leaving rings of leaf scars. The leaf stems (petioles) are grooved.

Many small, one-half inch long, white and lavender tinted flowers are borne on a drooping branched stem that grows from the tip of the plant. As the 6 petals open they expose 6 yellow stamens and one white pistil. These flowers are sometimes followed by small, many-seeded, red or scarlet berries.

Although growing new cultivars from seed was a popular hobby 40 years ago, not as many gardens have large collections today. The green ti 'L'ai' has always been grown to use for luaus (Hawaiian feasts) as a garnish for food and by florists as cut foliage.

Both green and some of the other colored leaved cultivars are exported as cut foliage. They are frequently packed with mixed tropical flowers for shipment directly to consumers on the mainland and to other countries.



Figure 1. *Cordyline terminalis* 'Peter Buck'



Figure 2. Inflorescence of ti plant

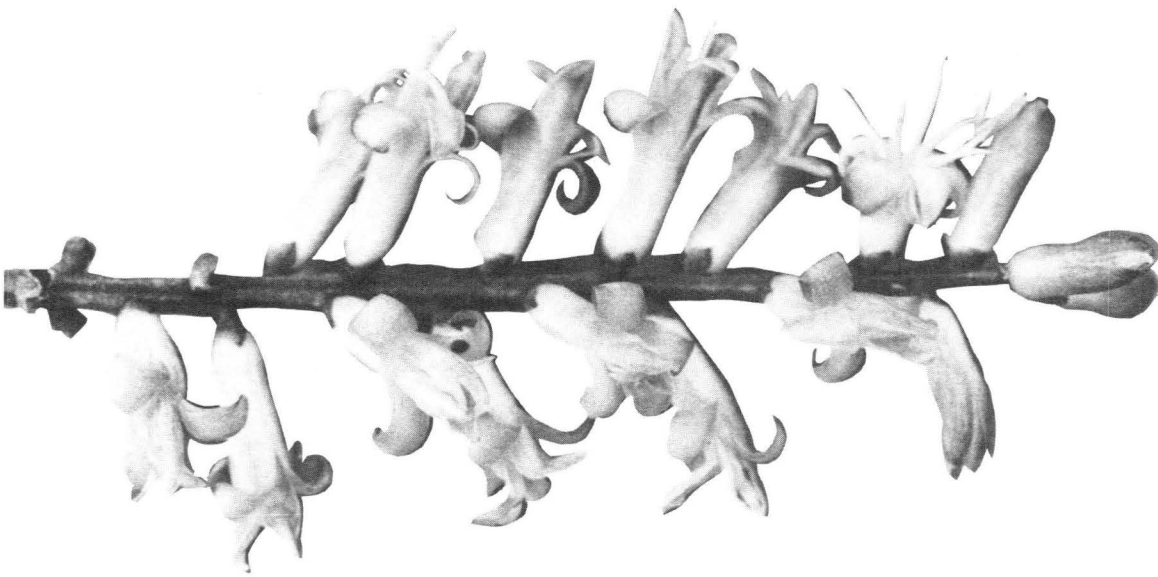


Figure 3. Detail of inflorescence

USES

Early Polynesians believed that the ti had divine power. Fresh leaves were worn around the neck, the waist, and the ankles and hung around the house to dispel evil. The feather kahili, a sign of royalty, was fashioned in the form of a tall ti plant. The stalk was also used as a sign of surrender. Masses of plants were planted around homes to ward off misfortune.

Roots were steamed in imus (ovens in the ground) and eaten as a sweet. One section of Honolulu, Kaimuki (the ti oven), is named after a large oven in that area. The root was boiled and used as a laxative, fermented and made into beer, as well as distilled to make okolehao, a beverage of higher alcoholic content.

Fresh leaves were used to wrap food and packages, as well as to enclose food that was to be roasted in the imu. The ti leaf skirts worn for the hula were patterned after grass skirts from the Gilbert Islands. Leaves were used as thatch for houses, raincoats, sandals, plates, and food for horses and cattle.

Today fresh leaves are still used to make hula skirts, as wrappers for food, as sleds to slide down hills, while dry leaves are used to chase fish into nets at a hukilau.

Many kinds of decorations are made from ti. Stems are cut into 6- to 8-inch sections and rooted in water while producing new leaves for table decoration. Cut leaves are used to garnish food or to cover floats in a parade, a stage, or a table at a luau. Large numbers of leaves are used by florists, green as a basic foliage and other colored types to complement all kinds of tropical flowers. Attractive designs are fashioned by florists by cutting, trimming, rolling and folding ti leaves.

SOME COMMON CULTIVARS

Plants grown from seed have provided hundreds of variations in leaf size, shape, and color. These cultivars are in turn propagated vegetatively. Since leaf color often alters under varying growing conditions and since new seedlings often exhibit only slight difference from existing plants, great confusion in nomenclature exists. An attempt is being made, however, to describe some of the more commonly recognized kinds that are now grown in Hawaiian gardens.

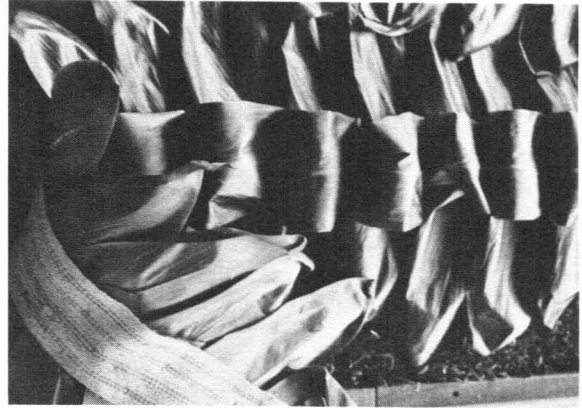


Figure 4. Ti leaves stapled to cloth tape for decorative use



Figure 5. Kahili type

'Baby Doll'—leaves 6 x 1¼ inches, margins flat, leaf width uniform to pointed tip; dull green color with bright cerise strips especially a leaf margin.

'Hawaiian Flag' (*McInerny)—leaves 10½ x 3 inches, margins undulating and conspicuously incurving; center of leaf yellow with green or maroon stripes; margins green or yellow striped.

'Hilo Rainbow' (Imperialis)—leaves 20 x 4 inches, spaced far apart and folded backward; few brown streaks between mid-rib and narrow, red margin.

'John Cummins'—leaves 11 x 3½ inches, thick with undulating edges; burnt orange color first appearing on leaf margins and later spreading toward mid-rib.

'Johnny Noble'—leaves 26 x 5½ inches, tending to be firm and curved; entire blade rich ruby red.

'Juno'—leaves 9½ x 5 inches, undulating with tip curved down; pale yellow in center of blade, pink at apex, lower half may remain green.

'Kahuna'—leaves 10 x 2½ inches, undulating; pale to dark green.

'L'ai' (common green ti)—leaves 30 x 4½ inches, pliable but firm; clear glossy green.

'Maui Beauty'—leaves 8½ x 3½ inches, medium texture, slightly incurving; rose to purple.

'Menehune'—leaves 6 x 1 inches, lightly arranged in Kahili fashions at tip of stem; pale green, pink and red blends.

'Onomea'—leaves 20 x 4½ inches, larger under ideal conditions; immature leaves pink; at maturity maroon stripes on green background, rose-colored border and rose-colored stripes toward tip.

'Peter Buck' (Kauka Wilder)—leaves 21 x 5 inches, larger under ideal conditions, strong grower in full sunlight, light to dark red.

'Pele's Smoke' (Chocolate Baby)—leaves 21 x 4½ inches, folded backward; black or purple gray streaks on green.

'Purple Prince'—leaves 12 x 2¾ inches; leaves violet at first, mature leaves green with violet margins.

'Rosebud'—leaves 8½ x 5 inches, thick, arranged in compact whorl; ruby red, pink to rose green near mid-rib.

'Schubertii' (Kaupo Beauty)—leaves 14 x 5½ inches, flat, thin, widely spaced; green to brown, broad streaks near margin.

*Names in parentheses are less commonly used synonyms.



Figure 6. Narrow leaved red ti.



Figure 7. 'Menehune'

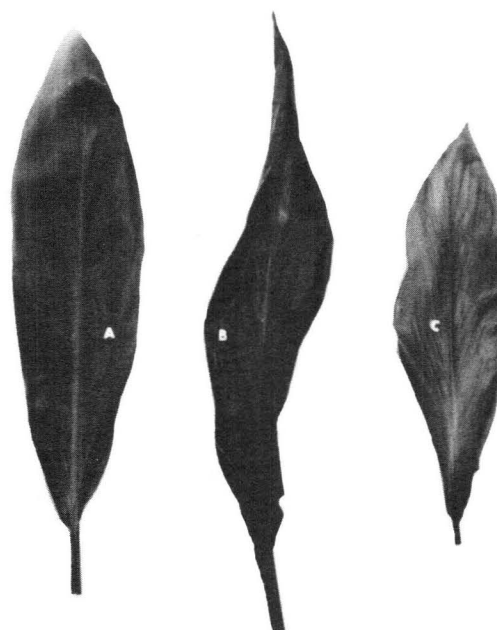


Figure 8. *Cordyline terminalis*
a. 'L'ai'; b. 'Johnny Noble'; c. 'Peter Buck'

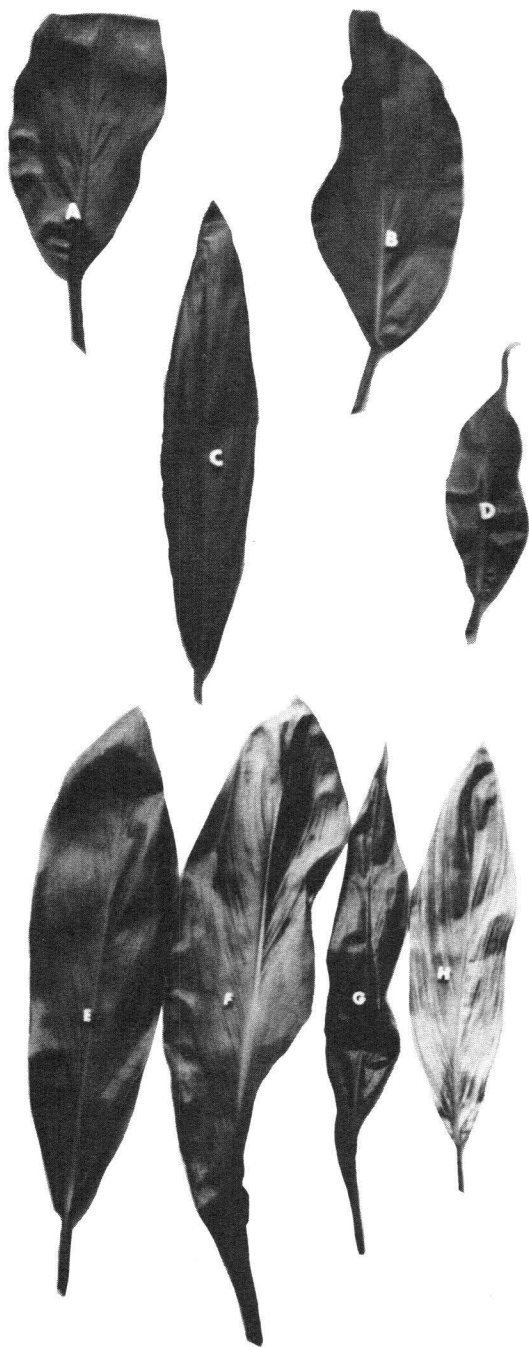


Figure 9. *Cordyline terminalis*
 a. 'Maui Beauty'; b. 'Juno'; c. 'Pele's Smoke';
 d. 'Kahuna' (medium leaves); e. 'L'ai';
 f. 'Peter Buck'; g. 'Johnny Noble';
 h. 'Rainbow' (large leaved)



Figure 10. Ti leaf used to cover frame of kahili

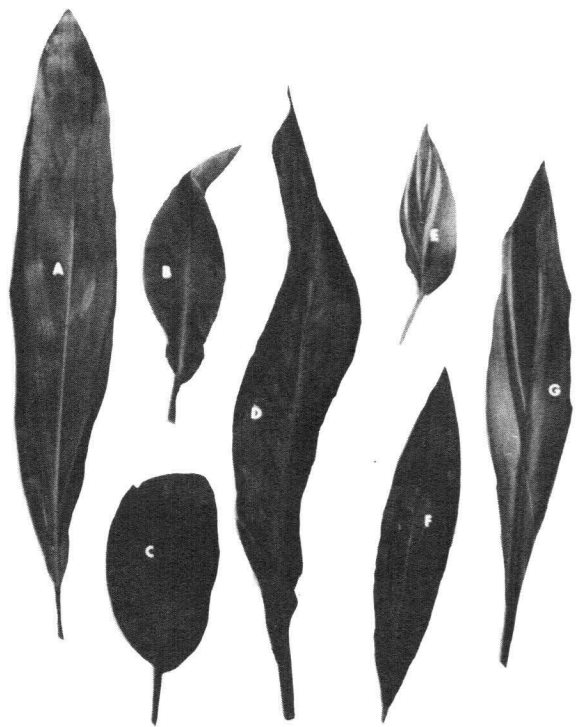


Figure 11. *Cordyline terminalis*
 a. 'Schubertii'; b. 'Kahuna'; c. 'Rosebud';
 d. 'Johnny Noble'; e. 'Tricolor';
 f. 'Pele's Smoke'; g. 'Hilo Rainbow'

'Tricolor' (Venustus)—leaves 14 x 5½ inches; purple to brown stripes extending to margin (similar to Hawaiian flag but less pronounced).

'White Fish Bone'—leaves 10 x 3½ inches, apex twisting, leaf recurved, mid-rib protrudes as leaf matures; green with rose near margins, and yellow at margins, or lemon yellow tinged with rose.

OTHER CULTIVARS

<i>China Boy</i> (Dillingham)	<i>Lovely Hula Hands</i>
<i>Eugene André</i> (Alaska)	<i>Madam Pele</i>
<i>Finger Tip</i> (Robins' Red Breast)	<i>Manoa Beauty</i>
<i>Haole Boy</i>	<i>Mary E. Foster</i>
<i>Ikemau</i>	<i>Maunakea Snow</i>
<i>Jack's Red</i>	<i>Nani Haia</i>
<i>Kahana Gardens</i>	<i>Pele</i>
<i>Kalakaua</i>	<i>Pele's Flame</i>
<i>Kalapana</i>	<i>Purple Princess</i>
<i>Kauai Rose</i>	<i>Queen Elizabeth</i>
<i>Keana Purple</i>	<i>Queen Emma</i>
<i>Kilauea</i> (Negri)	<i>Rainbow</i>
<i>Laukini</i>	<i>Rooster's Tail</i>
<i>Lipstick</i>	<i>Wahine O' Hilo</i>

CULTURE

The relative ease with which ti is propagated and its rapid growth make it a most desirable garden plant.

Ti is propagated from seeds, from stem sections, terminal stem cuttings, and air layers. Up to 16 seeds are enclosed in ripe, red berries of the red ti ('Johnny Noble') or in the ripe, yellow berries of the variegated, yellow-striped ti ('Hawaiian Flag'). Seed sown when fresh germinate rapidly and give rise to great variation in size of plants, color and shape of leaves.

To root the woody stems, cut them in pieces 1 or more inches long. Place them vertically or horizontally into a rooting medium (sponge rock or vermiculite) so that ¾ of the length of the vertical section is buried, or ¼ inch of the diameter of the horizontal section is covered. Keep the cuttings moist and in a partially shaded location so that roots and leaves will be produced in a few months.

A terminal cluster of leaves with 6 inches of stem will root quickly and make a well-shaped plant in 6 months.

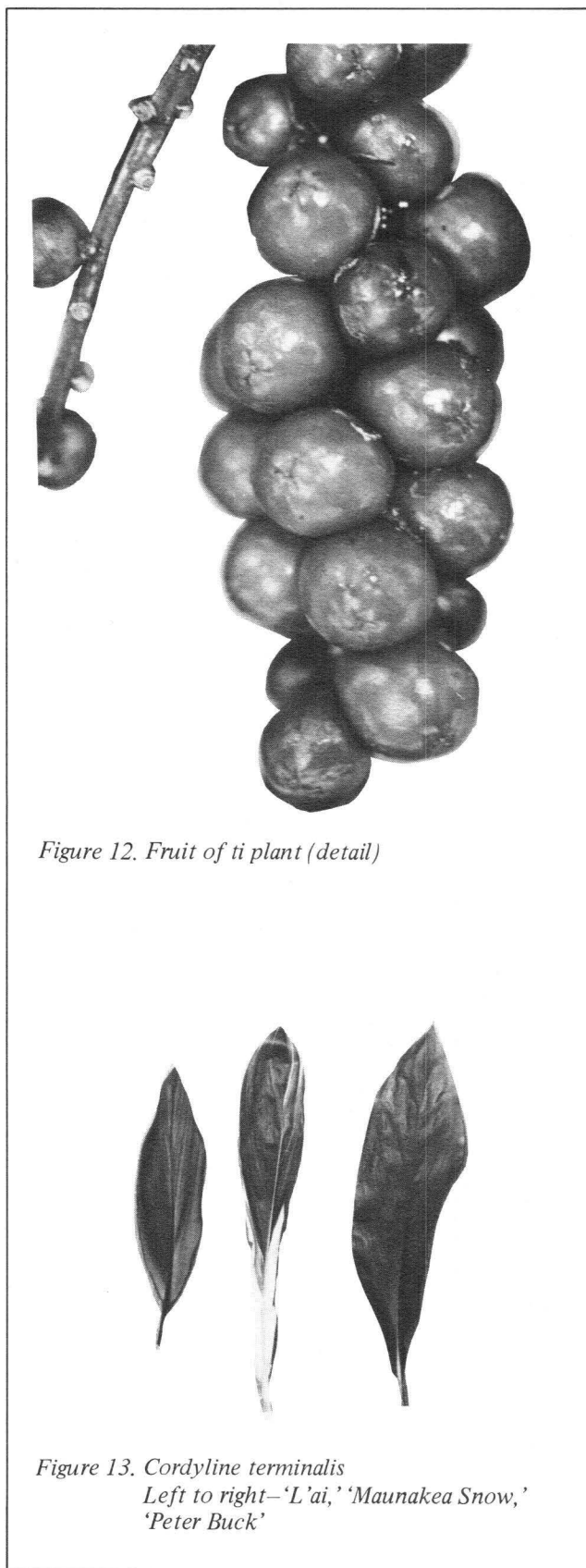


Figure 12. Fruit of ti plant (detail)

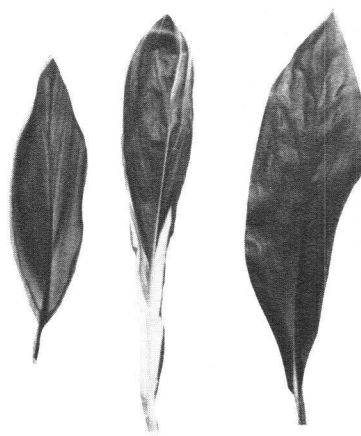


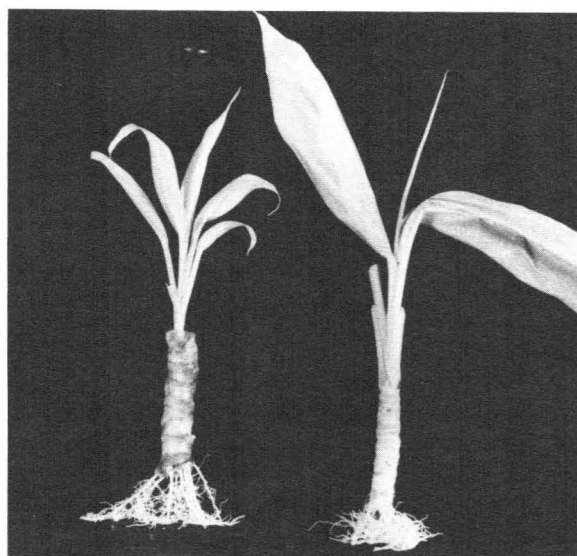
Figure 13. *Cordyline terminalis*
Left to right—'L'ai,' 'Maunakea Snow,'
'Peter Buck'



Figure 14. Fruit of ti plant



Figure 15. Well-branched green ti



*Figure 16. Rooted cuttings
(left) stem cutting; (right) terminal cutting*

Air layering will produce new plants in even less time. Figure 17 illustrates how to propagate ti by this method.

Ti plants grow luxuriantly in open forests of valleys where there is plenty of rain. In other locations unless heavily irrigated growth is less rapid; many leaves turn yellow and fall off.

Size and color variation, even within the same cultivars, is common. Leaf quality is probably a function of the amount of fertilizer, the quantity of water, temperature and the amount of sunlight. Some confusion exists in the optimum intensity of light required for the most luxuriant growth and best leaf color.

To produce the best plants in areas of high rainfall, more sunlight would be suitable than in areas where the amount of water is a limiting factor. Red cultivars like 'Peter Buck' tend to produce leaves with more green color when grown in heavy shade.

Brightly colored cultivars, as well as those with white-striped leaves, are easily burned when grown in full sunlight. The color of leaves is more intense during the cooler weather in the winter and spring. Young seedlings and small, recently propagated cuttings do not exhibit their true color until they begin to produce mature leaves.

Deep rich soil, high in organic matter, is ideal for growing ti. Plant the rooted cuttings 3 feet apart. Supply $\frac{1}{2}$ cupful of balanced fertilizer (10-30-10) per plant twice a year. Overfertilization may cause leaf injury. Supplement natural rainfall with enough irrigation to supply at least one inch of water per week.

As leaves are harvested and plants become tall, cut the stems one foot above the soil to induce the formation of branches and rejuvenation of the plant.

AS A HOUSE PLANT

Plant newly rooted stem cuttings in potting soil deep enough to cover the original cutting. Use a 4-inch pot for a small plant, a 6-inch pot if the roots of your plant are too large to fit conveniently into a smaller container. The plant will grow more rapidly if it is placed in indirect sunlight than if it is in heavy shade.

As the plant grows and produces new leaves at the tip, cut off the lower leaves if they turn yellow

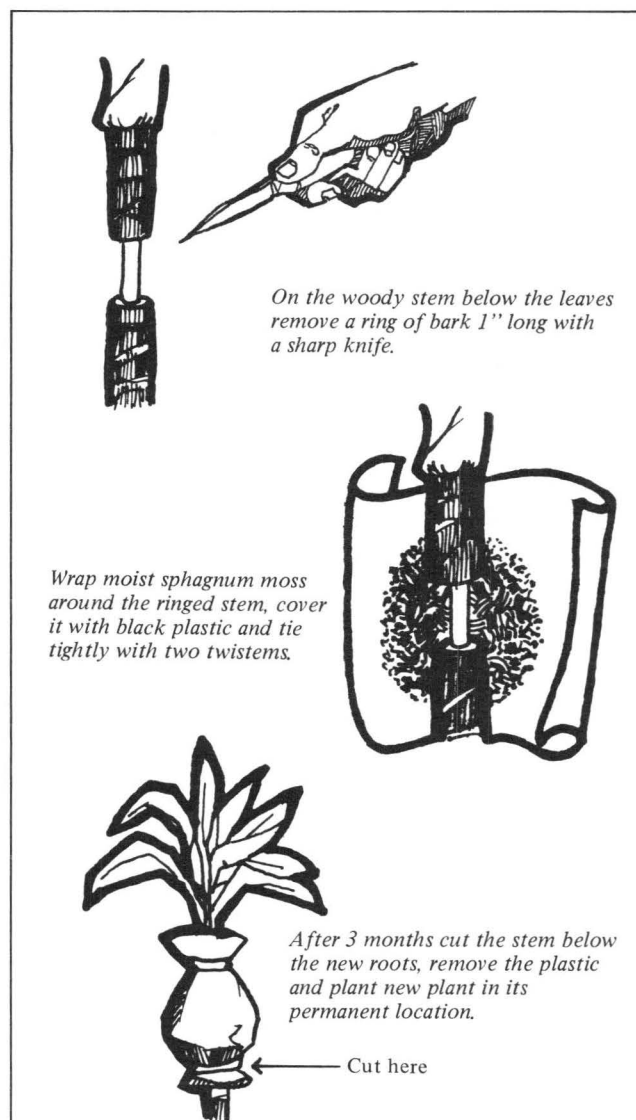


Figure 17. Air layering

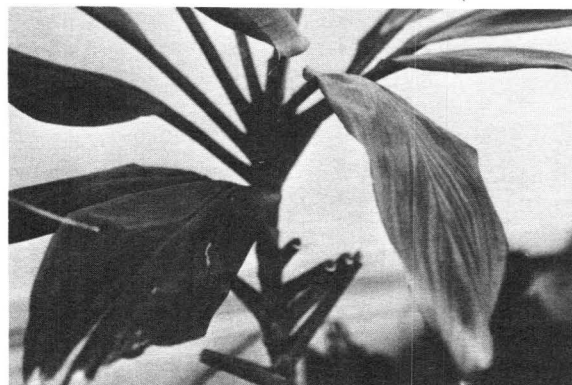


Figure 18. Ti plant with lower leaves removed

or brown. Ti plants will respond to plenty of water plus a liquid fertilizer (as recommended on the bottle) every two months.

Large plants may be repotted into larger containers. They may be rejuvenated every few years by cutting the stems back to 6 inches above the level of the soil in the pot so that new shoots will arise at a lower location on the stem.

COMMERCIAL PRODUCTION

Although commercial growing of ti is primarily for cut foliage, cane (stem pieces) and potted plants are also marketed. The cut foliage business is based on the common green ti '*L'ai*' and to some extent on the variegated red cultivar '*Onomea*.' A few other colored seedling selections are being cultivated for cut foliage, but the market is limited because of an insufficient supply. The principal market for the foliage is Honolulu, but since florists throughout mainland United States are becoming familiar with ti, exports are increasing.

To be desirable for cut foliage, plants must be vigorous enough to produce 4 leaves per month per terminal. Other desirable characteristics are good leaf color, resistance to disease, and leaves that can withstand shredding from strong winds, discoloration from sunlight, and post-harvest handling.

Present commercial production areas are scattered on southeast Oahu from Waiahole to Manoa Valley and on East Hawaii from Honoumuli to Pahoehoe. Many of the larger growers on Oahu are former banana producers who have interplanted banana orchards with green ti. The banana trees serve as a windbreak as well as shade for the ti. There is little colored ti produced on Oahu.

Both green and colored ti are grown commercially on Hawaii. Hilo and Pahoehoe where there is frequent rain and often heavy cloud cover are the principal areas of production. Unlike Oahu, most of the ti on Hawaii is planted in the open with little protection against wind and sun.

In commercial planting, ti plants are spaced in and between rows at 1½ to 2 feet. There may be 2 or more rows per bed with 3 feet spacing between the beds. Greater distance between plants is not considered desirable for green ti because the leaves may become too large. Fertilizer applications vary

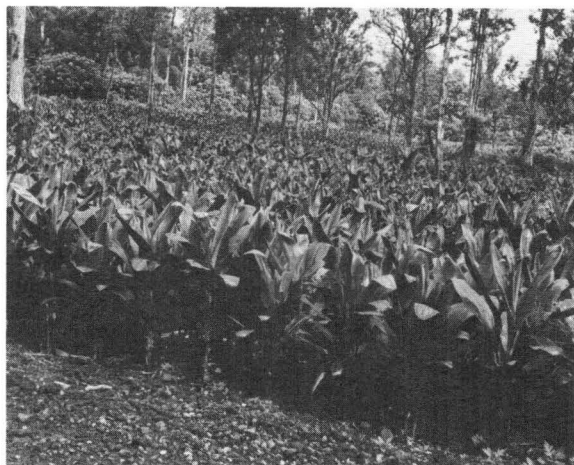


Figure 19. Commercial planting



Figure 20. Mature plants of '*Onomea*'

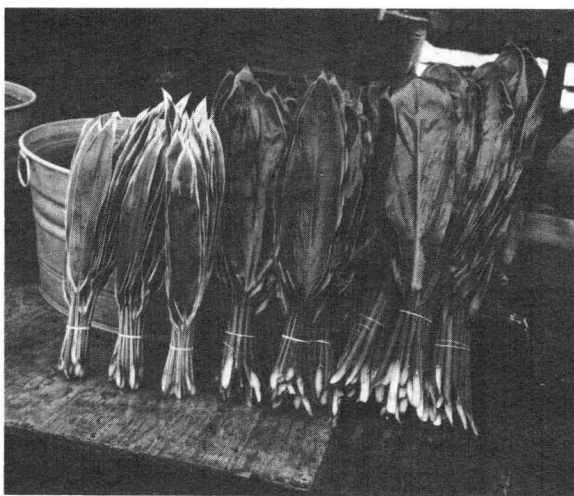


Figure 21. Leaves graded and bundled

from urea to formulations such as 16-16-16, 10-10-10, 8-12.5-6 or 10-30-10. Every second month an application of 2 ounces per plant of one of these balanced fertilizers should improve the growth of new leaves. On Oahu, supplementary irrigation is used wherever necessary to maintain leaf production during dry periods.

Leaves are harvested as soon as the plant produces leaves that are 12 inches long, usually 10 months from the time terminal cuttings are planted. When plants grow too tall, the stems are cut back to 3 feet above the soil level. Harvesting leaves can begin again from these topped plants in 8-9 months.

Harvesting is accomplished by cutting or pulling the lower leaves off the cane. Only the top 3 or 4 leaves are left to support plant growth. A few growers break the terminal off completely. The period between harvests of leaves from each terminal may be as long as a month. The leaves are graded according to small, medium, and large, 12, 18, and 24 inches long respectively. Then they are tied into bundles of 25 leaves, or fewer per bundle for larger leaves. The most popular size is medium. Twelve hundred to 1500 leaves are packed for shipment in a corrugated flower box. The present price to growers varies from 1 to 3 cents per leaf.

DISORDERS*

Leaves to be used with food should not be sprayed in the two weeks before harvesting.

Description of Injury	Cause	Control
Graying and discoloration of leaves, especially on the undersides.	Broad mites or carmine spider mites, <i>Tetranychus cinnabarinus</i> , feed on underside of leaves.	Practice sanitation, remove and destroy injured leaves and plants. Consult county agents for serious infections.
Holes in leaves.	Dark brown Chinese rose beetles, <i>Adoretus sinicus</i> , riddle leaves at night.	Practice sanitation, etc.
Leaves chewed up.	Garden loopers, <i>Trichoplusia ni</i> , feed on leaves.	Practice sanitation, etc.
Soft insects with white fuzzy coats.	Mealy bugs, <i>Dysicoccus neobrevipes</i> , suck on leaves.	Practice sanitation, etc.
Rectangular yellow to brown spots between veins on both surfaces of leaves.	<i>Cercospora</i> leaf spot, a fungus that attacks during wet periods without drying winds.	Practice sanitation, etc.
Watersoaked, slender, long stripes between veins, becoming darker as disease progresses until tissue falls out.	<i>Pseudomonas</i> bacterial stripe serious during prolonged wet periods without wind.	Practice sanitation, etc.
Russetting, greying of leaves, stunting of leaves when severe.	<i>Parthenothrips dracaena</i> thrips suck the sap from leaves.	Practice sanitation, etc.
Scales, small sucking insects covered with a hard shell or waxy secretion.	Primarily armored scale.	Practice sanitation, etc.
Yellow or pale leaves.	Insufficient water, or fertilizer, strong sunlight, overage leaves.	Increase water supply, light application of 10-30-10 fertilizer monthly, remove overage leaves.

*Information on pest control was contributed by Albert A. LaPlante, specialist in Entomology, and Albert Martinez, specialist in Plant Pathology.



Figure 22. Injury by Chinese Beetle

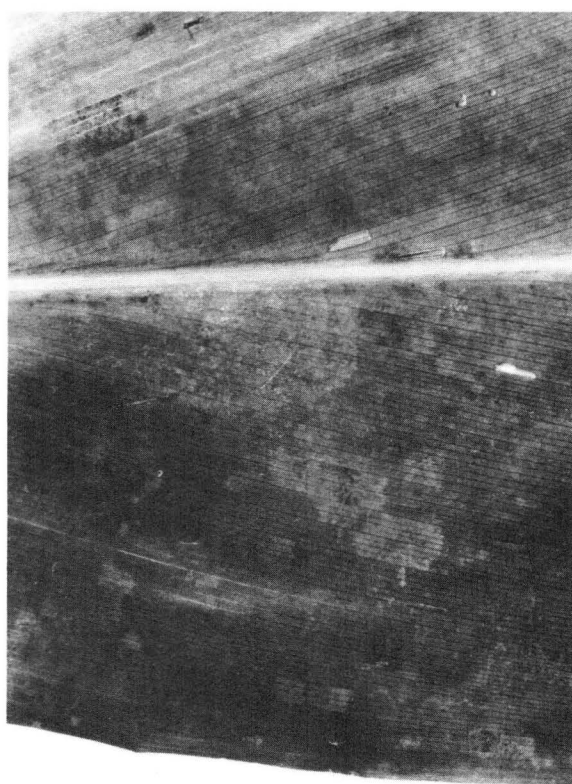


Figure 23. Cercospora leaf spot

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