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Lowe et al.

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[54] **KIWI PLANT NAMED 'TOMUA'**

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[51] **Int. Cl.**[6] **A01H 5/00**

[52] **U.S. Cl.** **Plt./156**

[58] **Field of Search** Plt./33.1, 156

[56] **References Cited**

PUBLICATIONS

UPOV CD–ROM Kiwi plant named 'Tomua', PBR KIW009, New Zealand, May 1995.

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[57] **ABSTRACT**

A new and distinct kiwi plant of the species *Actinidia deliciosa* (A.Chev.) C.F. Liang et A.R. Ferguson is described. The cultivar results from a controlled pollination of *A. deliciosa* DA02_03, a male selection of unknown parentage, and the female *A. deliciosa* 'Hayward', the most widely grown cultivar of kiwi worldwide. Both named parents (DA02_03 and 'Hayward') are unpatented cultivars. The new cultivar is distinguished by its early harvest time (about 4 weeks ahead of 'Hayward' in NZ), fruit appearance similar to 'Hayward', and moderate plant vigor.

5 Drawing Sheets

BACKGROUND TO THE INVENTION

Kiwi plants in cultivation are deciduous vines of *A. deliciosa.* There are more than 60 species in the genus Actinidia originating in China and parts of Asia. The kiwi cultivar 'Hayward', developed in New Zealand, is the most widely grown cultivar because of its distinctive green flesh, good flavor and long storage life. Plants are dioecious, so male pollinizers are required as well as female plants to ensure fruit production.

Kiwi plants grow vigorously in spring, and rapidly develop a canopy of canes up to 6 m long if not managed correctly. Plants require a mild, warm-temperate climate, free from late spring and early autumn frosts, and need well-drained soils to produce consistent, heavy crops of fruit. Regular irrigation is necessary in dry spells. Flowering occurs in late spring (mid-late November in New Zealand). The distinctive, green-fleshed fruit develop rapidly after pollination and reach 90% of their harvest weight after 3 months. Fruit from the cultivar 'Tomua' is harvested in early April in New Zealand, while 'Hayward' is normally harvested during May.

SUMMARY OF THE INVENTION

The present invention relates to a new and distinctive kiwi plant having an ovoid shaped fruit. More particularly, the new cultivar is designated 'Tomua', and is derived from a controlled pollination of *A. deliciosa* DA02_03, an unpatented male selection of unknown parentage, and 'Hayward', also unpatented. The male parent, which originated from seeds introduced from China in 1975, was selected as the pollen parent for the crosses because of its very early-flowering characteristics. The seed parent 'Hayward' was selected for its large size, good flavor and good storage life.

The new cultivar of kiwi was created in the course of a plant breeding program which was initiated in 1983 at Hort Research in Te Puke, New Zealand. An early-flowering unpatented *A. deliciosa* male, DA02_03, was crossed on to the unpatented seed parent 'Hayward' by Russell Lowe in November 1983. 59 seedlings from this cross were planted out in the field in April 1986. By December 1990 most plants

had flowered and 'Tomua' was selected by Russell Lowe and Hinga Marsh from 19 female seedlings in this population. 'Tomua' fruit matured 4 weeks ahead of 'Hayward' and had acceptable fruit size, a good flavor and appeared to have commercial potential.

The new cultivar can be asexually reproduced as cuttings or by grafting or budding on to seedling or cutting-grown rootstocks of *A. deliciosa.* Trial plantings, established in 1989 at Te Puke, with plants grafted on to clonal 'Hayward' rootstocks, have shown that the unique combination of characteristics come true to form and are established and transmitted through succeeding asexual propagations. 'Tomua' flowers two weeks ahead of 'Hayward', so the usual pollinizers used for 'Hayward' are ineffective. Two new and unpatented early-flowering pollinizers designated Hortkiwi 'Ranger' and Hortkiwi 'King' have been selected as males for use in new plantings of 'Tomua'.

BRIEF DESCRIPTION OF THE ILLUSTRATIONS

FIG. **1** shows typical fruit on the vine of the cultivar 'Tomua'.

FIG. **2** shows typical fruit on the cultivar 'Tomua'. Note pointed stylar end.

FIG. **3** shows 'Tomua' fruit in cross-section and profile.

FIG. **4** shows 'Hayward' fruit in cross-section and profile.

FIG. **5** shows 'Tomua' fruit in close up. Note overall similarity to 'Hayward'

FIG. **6** shows 'Hayward' fruit in close up.

FIG. **7** shows flowers of the cultivar 'Tomua' on the vine. Note petals cupped around the ovary.

FIG. **8** shows flowers of the cultivar 'Hayward' on the vine. Note petals in horizontal alignment.

FIG. **9** shows mature leaves of the 'Tomua' vine.

FIG. **10** shows mature leaves of the 'Hayward' vine.

Photographs of fruit on the vine were taken just prior to the harvest date. Colors may vary depending upon growing conditions under different climate, soil, and cultivation

conditions and the fruit skin color may vary depending upon extent of exposure to direct sunlight.

The fruit of 'Tomua' are ovoid in shape, tapering towards the stylar end, generally circular in cross-section although slightly flattened (FIG. **3**). The flesh of 'Tomua' fruit is medium green like 'Hayward' with a columella similar to 'Hayward' (FIG. **4**). The hairs on the skin of the fruit of 'Tomua' are slightly stiffer than those of 'Hayward' and slightly prickly to the touch, but are very easily removed by rubbing or brushing to reveal a rather shiny skin (FIG. **2**). The skin color of 'Tomua' fruit is a reddish-brown in contrast to that of 'Hayward' which is a medium brown color. 'Tomua' fruit are slightly longer than those of 'Hayward' for an equivalent weight. The length to (maximum) width ratio for Tomua fruit is 7:5 while that of Hayward fruit is 6:5. 'Tomua' fruit have a higher dry matter content at harvest and are sweeter tasting than 'Hayward' fruit when ripe. The storage life of 'Tomua' fruit when held at 0° C. is about 12 weeks while that of 'Hayward' is up to 25 weeks under ideal conditions.

BOTANICAL DESCRIPTION OF THE PLANT

The new cultivar 'Tomua' is pistillate with imperfect flowers, i.e., only sterile pollen is produced and thus flowers require a pollinizer for fruit production. Two specific pollinizers have been developed for 'Tomua' and they are named Hortkiwi 'Ranger' and Hortkiwi 'King'. Characteristics of the new cultivar by which it differs from the common 'Hayward' cultivar include earlier flowering and harvest times, longer fruit shape, more easily removed hairs on the skin, more pointed shape at the stylar end (FIG. **2**) and reddish-brown colored skin. Horticultural terminology is used in accordance with revised UPOV guidelines for kiwi.

TABLE OF CHARACTERISITCS
Characters of the 'Hayward' comparison cultivar are noted in [bracket] opposite that character only when significantly different.
All dimensions in millimeters, weights in grams.

	Tomua	Hayward
PLANT		
Plant: sex expression	female	
Plant: ploidy	hexaploid (2n = 6x = 174)	
Plant: vigor	medium	
Young shoot: hairs	present	
Young shoot: density of hairs	medium	
Young shoot: type of hairs	velutinous	
Young shoot: anthocyanin coloration of growing tip	medium	
young shoot: anthocyanin coloration of leaf axil	weak	
STEM		
Stem: diameter	medium - Mean 10.8 mm (Range 10.2–12.3)	
Stem: dormant bud diameter	2.55 mm (1.7–3.1)	
Stem: color on upper side of shoot	red-brown	
Stem: hairs	present	
Stem: conspicuousness of lenticels	conspicuous	
Stem: number of lenticels	medium	
Stem: color of lenticels	brownish-white	
Stem: size of bud support	medium	
Stem: visibility of bud (dormant canes)	inconspicuous	
Stem: number of hairs visible on bud (dormant canes)	few	
Stem: leaf scar	medium	
LEAF		
Leaf: general shape of blade	round	[very broadly ovate]
Leaf: length	140 mm (120–160 mm)	
Leaf: width	149 mm (100–170 mm)	
Leaf: shape of tip of blade	mucronate	
Leaf: shape of base of blade	cordate	
Leaf: arrangement of leaf bases	overlapping	
Leaf: puckering/blistering on upper side of blade	medium	
Leaf: margin	ciliate	
Leaf: green color of upper side of blade	medium	
Leaf: glossiness of upper surface of blade	medium	
Leaf: color of lower side of blade	light green	
Leaf: glaucousness (lower side of blade)	absent	
Leaf: petiole length	87 mm (52–150 mm)	
Leaf: hears on petiole	present	
Leaf: density of hairs on petiole	medium	
Leaf: anthocyanin coloration on upper side of petiole	weak	[medium]
FLOWER (Measurements taken from a sample of 20 flowers)		
Inflorescence: predominant number of flowers	one	
Pedicel: length	medium - 36.9 mm (31.0–43.0 mm)	
Pedicel: hairs	present	
Pedicel: length of hairs	medium	
Flower: number of sepals	>5	
Flower: color of sepals	brown	
Flower: diameter (terminal or king flower when fully open)	large - 63.3 mm (47.8–70.6 mm)	
Flower: petal length	30.0 mm (25.3–34.3 mm)	
Flower: petal width	22.7 mm (18.5–29.6 mm)	
Flower: petal length/ width ratio	1.33 mm (1.11–1.48 mm)	
Flower: mean number of petals per flower	7 (6–8)	
Flower: number of flowers with more than six petals	15 out of 20 flowers	
Flower: arrangement of petals	overlapping	
Flower: petal shoulder	present	
Flower: primary color of petals on upper side (when fully open)	white	
Flower: type of coloration	uniform color,	

-continued

TABLE OF CHARACTERISITCS
Characters of the 'Hayward' comparison cultivar are noted in [bracket] opposite that character only when significantly different.
All dimensions in millimeters, weights in grams.

	Tomua	Hayward
of petals	i.e., not bi-colored	
Flower: number of styles	37.3 (31–43)	
Flower: attitude of styles	semi-erect	
Flower: amount of hair on ovary	strongly expressed	
FRUIT Measurements are from 10 fruit sampes		
Fruit: overall size	medium 91 g	[large]
Fruit: mean length	73.9 mm (69.1–79.1 mm)	
Fruit: width (max.)	51.56 mm (47.4–55.0 mm)	
Fruit: width (min.)	44.9 mm 42.8–47.3 mm)	
Fruit: locule number	36.9 (33–40)	
Fruit: general shape	ovoid (tapers toward stylar end)	
Fruit: cross-section at median	elliptical	[oblate]
Fruit: general shape of stylar end	raised	[flat]
Fruit: shape of shoulder on salk end	rounded	[almost square]
Fruit: skin color at harvest (fruit still hard)	reddish-brown	[brown]
Fruit: skin color change during ripening	absent	
Fruit: skin color at maturity for consumption	reddish-brown	[brown]
Fruit: hairs	present	
Fruit: density of hairs	medium	
Fruit: type of hair	bristly	[hirsute]
Fruit: concentration of hairs	uniform	
Fruit: adherenece of hairs to skin (when rubbed)	weak	[strong]
Fruit: core (columella) diameter (at largest dia.)	medium to large	[large]
Fruit: core shape (in cross section)	elliptical	
Fruit: core woody spike	present	
Fruit: prominence of core woody spike	medium	
Fruit: outer pericarp color at maturity for consumption	light green	
Fruit: inner pericarp color (locules) at maturity for consumption	green	
Fruit: core color at maturity	greenish white	
Fruit: soluble solids concentration SSC (Brix level) at maturity for consumption	medium - 14.3% (13.5–15.1%)	
Fruit: Vitamin C content at harvest	medium (100–125 mg/100 g fresh weight)	
Fruit: seed color at maturity	dark brown	
Fruit: seed color when dry	brown	

-continued

TABLE OF CHARACTERISITCS
Characters of the 'Hayward' comparison cultivar are noted in [bracket] opposite that character only when significantly different.
All dimensions in millimeters, weights in grams.

	Tomua	Hayward
EVENTS (at Te Puke, New Zealand)		
Time of vegetative budbreak	early (late August to first week of Sept.)	
Time of beginning of flowering	medium (second) to third week of Sept.)	[two weeks later]
Time of harvest at 6.2% SSC	medium (first weak of April)	[four weeks later]

HORTICULTURAL CHARACTERISTICS

Details below relate to observations made on plants grafted on 'Hayward' clonal rootstocks (rooted cuttings) growing at Te Puke Research Centre, New Zealand.

'Tomua' vines can be grown on the same rootstocks as can 'Hayward' vines. Rootstocks currently used in New Zealand include *A. deliciosa* seedlings, 'Hayward' rooted cuttings and Hortkiwi 'Kaimai'. 'Tomua' can also be grown as self-rooted cutting grown plants.

In Te Puke, from 1993–1997 the 'Tomua' harvest time has been consistently 4–5 weeks ahead of 'Hayward' using the criteria of a Soluble Solids Concentration (SSC) of 6.2% to begin harvest.

The storage life of 'Tomua' fruit is about half of that of 'Hayward' fruit under cool storage temperatures of 0° C., but this is not considered a disadvantage as 'Tomua' fruit can be sold before the main 'Hayward' crop is harvested.

'Tomua' fruit soften more rapidly than 'Hayward' fruit so the consumer can more readily obtain fruit that is in a "ready-to-eat" condition at the start of the kiwi fruit harvest season. 'Tomua' fruit are sweeter tasting than 'Hayward' with a tangy balance of sweetness and acidity.

Yield data: 'Tomua' vines carry lower yields of Class 1 (export grade) fruit than 'Hayward' when plants of equivalent ages are compared, mainly because fruit of 'Tomua' are smaller on average than those of 'Hayward'.

Three years of data from a replicated trial planting containing 'Tomua' and 'Hayward', planted in 1989 at Te Puke is presented below in Table 1.

TABLE 1

TOMUA AND HAYWARD YIELDS

	Fruit number		Trays (3.6 kg)		Size (grams)	
Year	Tomua	Hayward	Tomua	Hayward	Tomua	Hayward
1996	938	708	23	22	92	117
1997	909	1331	23	35	93	96
1998	1149	1020	24	30	89	111
Means	999	1020	23	29	91	108

Fruit flesh and skin color measurement.
RHS Colour Chart, the Royal Horticultural Society, London 1966.

TABLE 1-continued

Flesh Color at maturity:		
Outer pericarp Tomua	138B–138D	[Hayward 138B–138C]
Fruit core:		
Tomua	155–155B	[Hayward 155A]
Seed color (in fruit):	200A	
Seed color (dry seed):	165A–165B	
Fruit skin at maturity:		
Tomua	165B	[Hayward 164B]
Leaf color: mature leaf after petal fall		
Upper side of leaf Tomua	137A or 147A	
Lower side of leaf	147B–147C	

TABLE 1-continued

Tomua	
Petiole color:	
exposed side	178B
Flower petals:	
main body	155D
base	154C–154D
Plant Stem:	
exposed side:	165A
Lenticel color:	164B–164C.

We claim:

1. A new and distinct kiwi plant of the species *A. deliciosa* substantially as described and illustrated in the specification above, characterised by early harvest date compared to 'Hayward', medium green flesh, reddish-brown skin, easily removable hairs, and a slight pointed stylar end.

* * * * *

FIG. 1

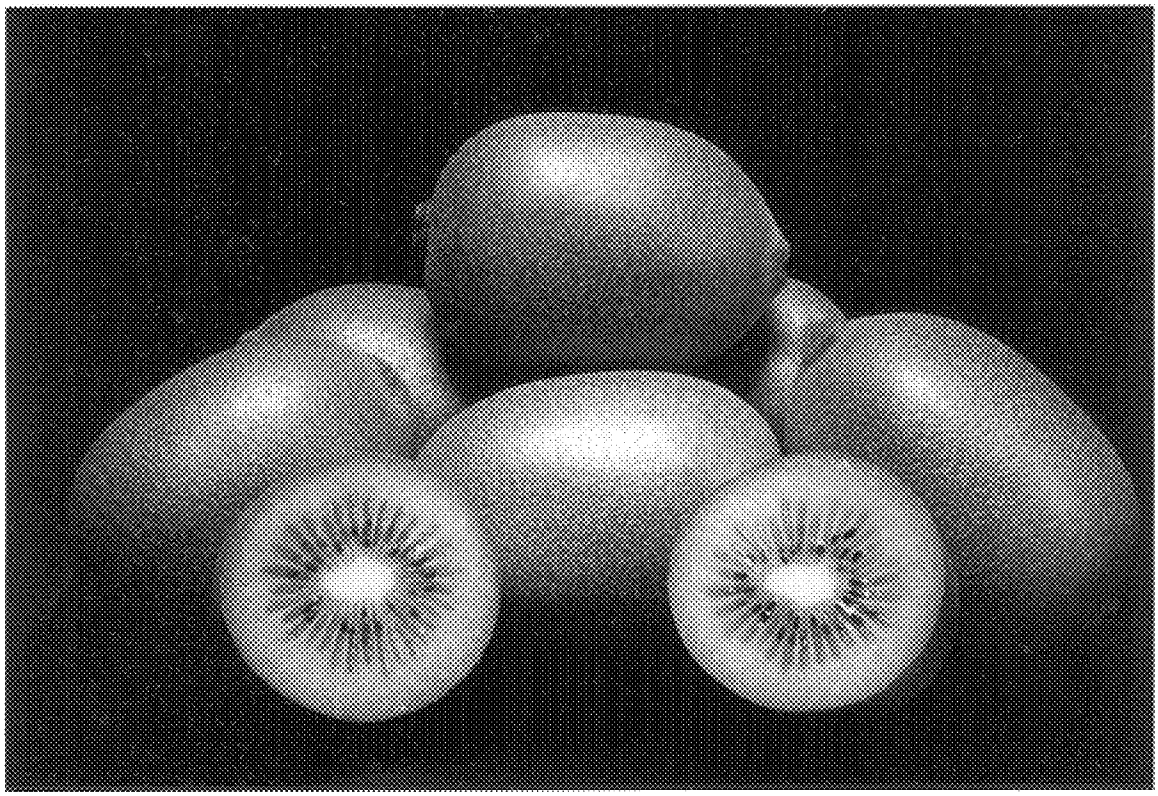

FIG. 2

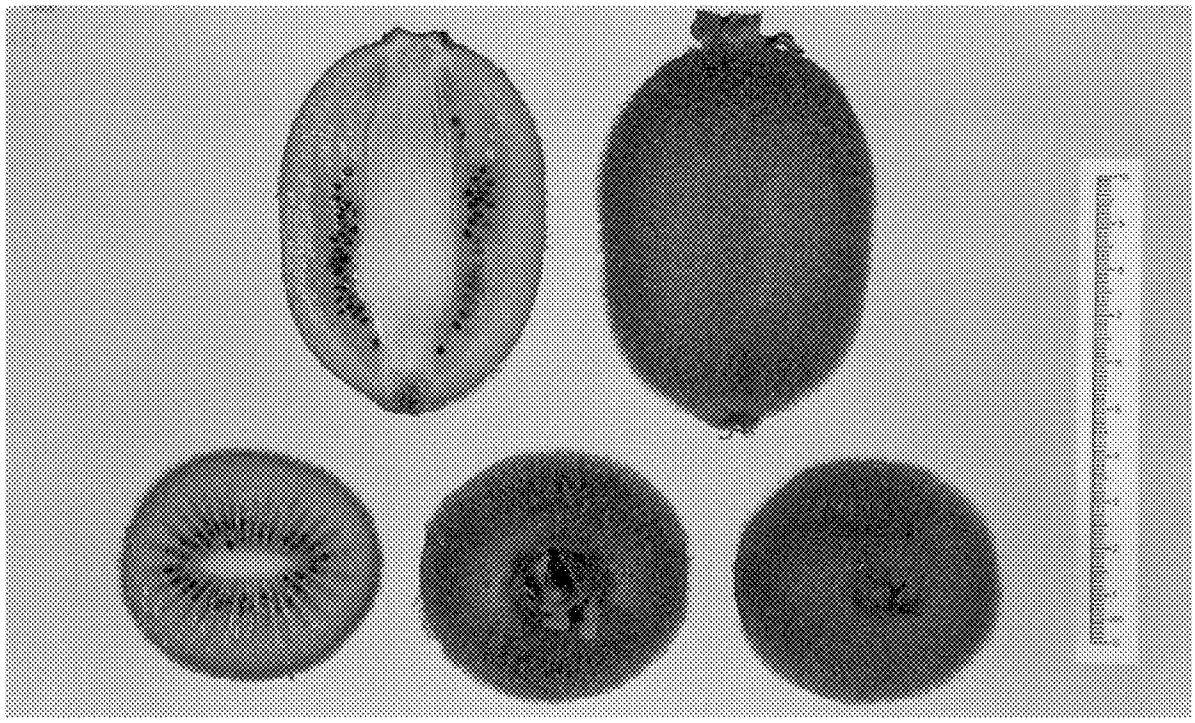

FIG. 3

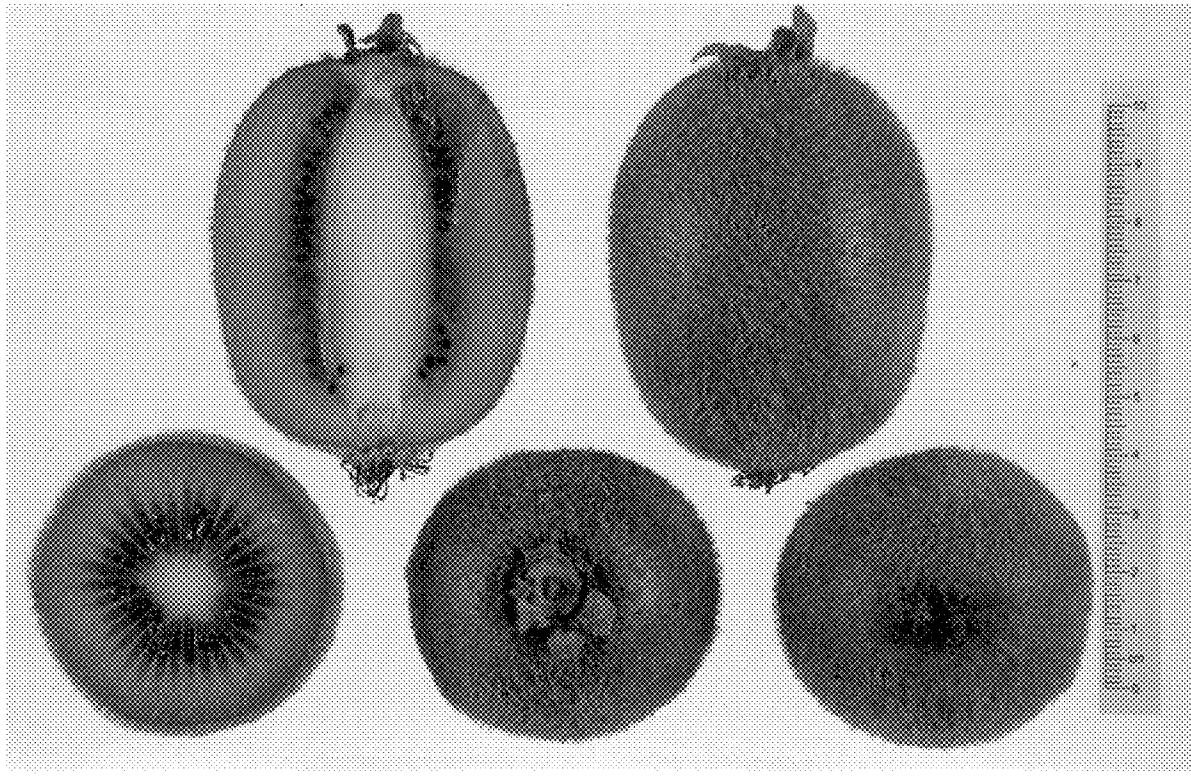

FIG. 4

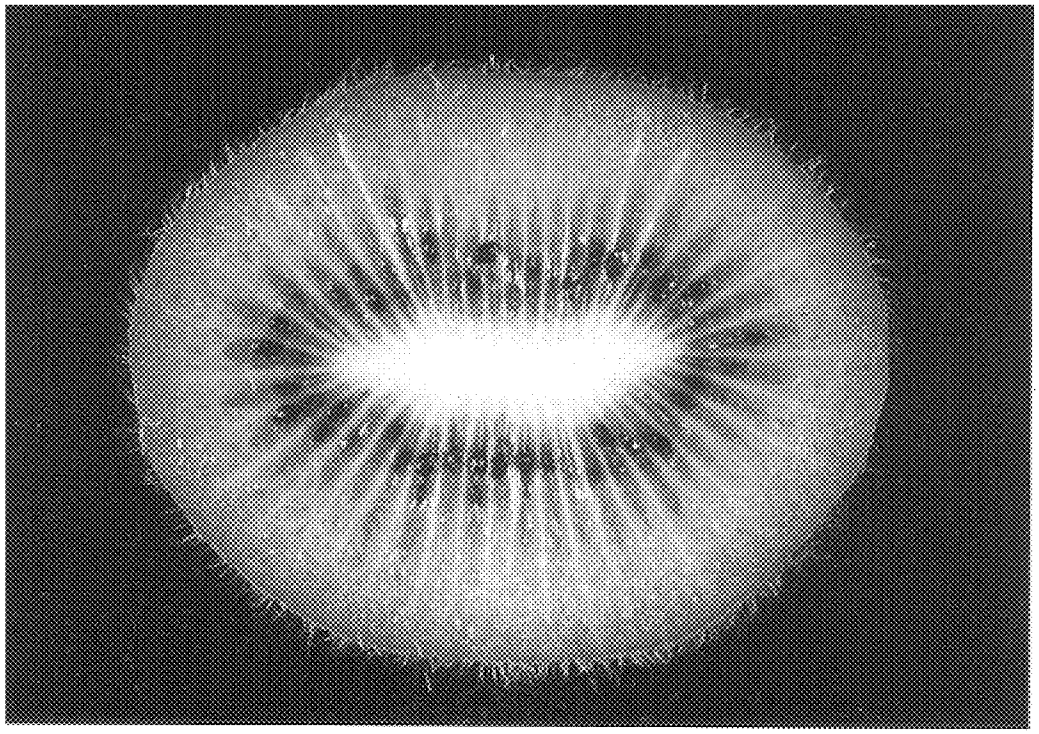

FIG. 5

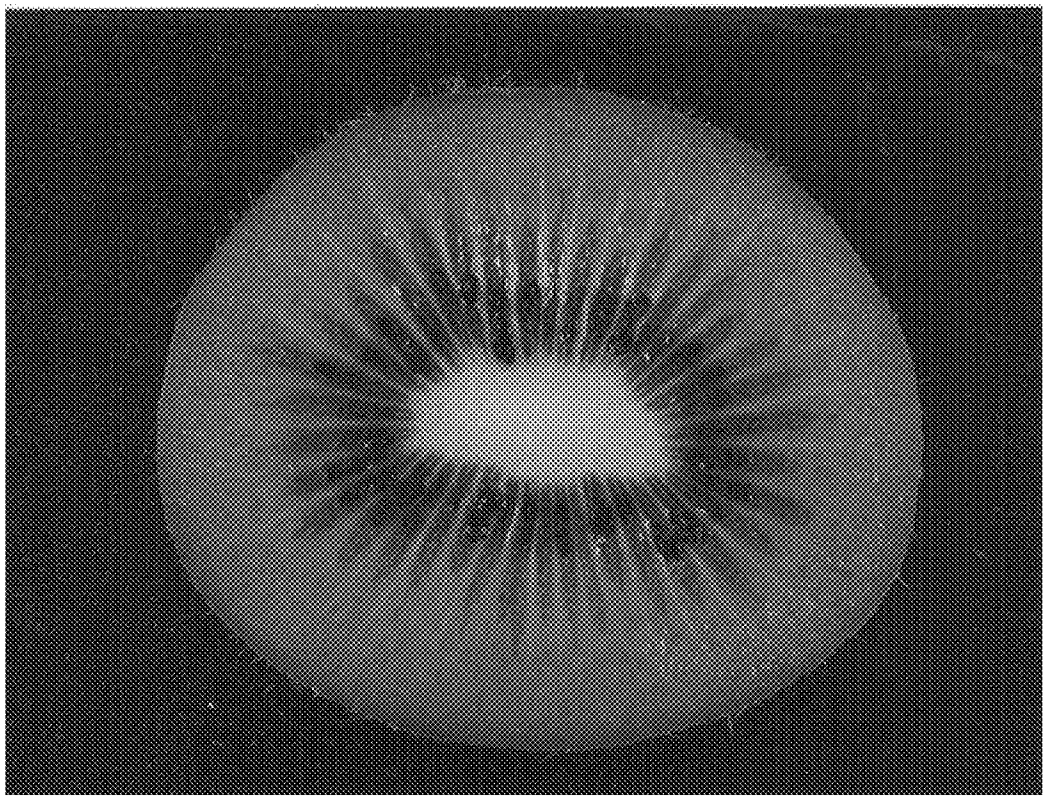

FIG. 6

FIG. 7

FIG. 8

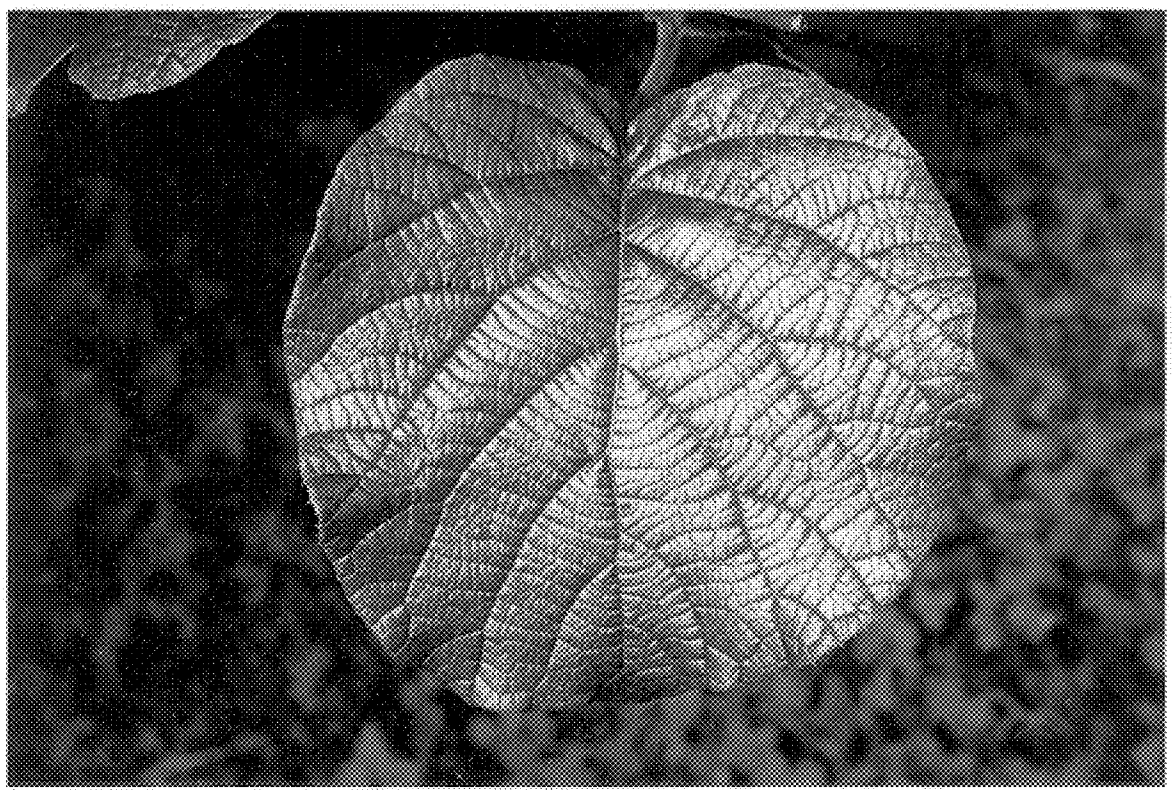

FIG. 9

FIG. 10