



(12) **United States Plant Patent**
Dozier, Jr. et al.

(10) **Patent No.:** **US PP22,191 P2**
(45) **Date of Patent:** **Oct. 11, 2011**

(54) **KIWI PLANT NAMED ‘AU GOLDEN DRAGON’**

(50) Latin Name: *Actinidia chinensis* Planch
Varietal Denomination: **AU Golden Dragon**

(75) Inventors: **William Alfred Dozier, Jr.**, Opelika, AL (US); **Bryan Shelton Wilkins**, LaFayette, AL (US); **Jim Pitts**, Clanton, AL (US); **Curtis Jay Hansen**, Opelika, AL (US); **Floyd M. Woods**, Auburn, AL (US); **James D. Spiers**, Auburn, AL (US); **Qinghong Chen**, Wuhan (CN); **Zhongqi Qin**, Wuhan (CN); **Yingchun Jiang**, Wuhan (CN); **Xia Gu**, Wuhan (CN); **Aichun Xu**, Wuhan (CN)

(73) Assignee: **Auburn University**, Auburn, AL (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **12/711,219**

(22) Filed: **Feb. 23, 2010**

(51) **Int. Cl.**
A01H 5/00 (2006.01)

(52) **U.S. Cl.** **Plt./156**

(58) **Field of Classification Search** **Plt./156**
See application file for complete search history.

(56) **References Cited**

OTHER PUBLICATIONS

Wall et al. “Vegetative and Floral Chilling Requirement of Four New Kiwi Cultivars of *Actinidia chinensis* and *A. deliciosa*,” (HortScience 43(3):644-647, Jun. 2008.*

Wall et al. “Determining a Maturity Index and the Effect of Chilling Requirements, and Cytokinin Application on Three New Kiwi Cultivars,” Thesis—Degree of Master of Science, Auburn University, Aug. 2006, 87 pages.*

* cited by examiner

Primary Examiner — Susan McCormick Ewoldt

(74) *Attorney, Agent, or Firm* — Andrus, Scales, Starke & Sawall, LLP

(57) **ABSTRACT**

A new and distinct cultivar of the species *Actinidia chinensis* Planch is described. ‘AU Golden Dragon’ has a low chilling requirement, fruit is very early maturing, excellent flavor with a non acid sweet taste, and high soluble solids and dry matter content. ‘AU Golden Dragon’ matures about 50 days ahead of ‘Hort 16A’ (patented), the industry standard for golden flesh kiwi, therefore, the two cultivars will not compete in the market place. ‘AU Golden Dragon’ fruit quality indices are similar to fruit quality indices of ‘Hort 16A’ (patented). There have been no differences in plant performance and fruit quality of ‘AU Golden Dragon’ plants grown in China and Central Alabama.

6 Drawing Sheets

1

Latin name of the genus and species of the plant claimed:
Actinidia chinensis Planch.

Variety denomination: ‘AU GOLDEN DRAGON’.

RELATED APPLICATIONS

U.S. patent application Ser. No. 12/711,204, filed on Feb. 23, 2010, and entitled “KIWI PLANT NAMED ‘AU GOLDEN TIGER’” and U.S. patent application Ser. No. 12/711,194, filed on Feb. 23, 2010, and entitled “KIWI PLANT NAMED ‘AU GOLDEN SUNSHINE’” are both incorporated by reference herein. ‘AU Golden Tiger’ is the male pollenizer used with ‘AU Golden Sunshine’. ‘AU Golden Sunshine’ is a female variety used as a companion and as a comparison cultivar with ‘AU Golden Dragon’.

BACKGROUND OF THE INVENTION

Seed were collected from fruit produced by open pollinated and unnamed kiwi plants of *Actinidia chinensis* Planch growing in a cultivated area of Fang County Hubei Province of P.R. China. Seedlings developed from the collected seeds were planted and grown in an experimental orchard and evaluated for fruit quality parameters, maturity date, flesh color and appearance. ‘AU Golden Dragon’ was selected as a potential commercial cultivar from this experimental evaluation planting because of its excellent plant performance, earliness of maturity and fruit quality, fragrance and yield.

2

‘AU Golden Dragon’ has the best fruit quality and performance of the very early maturing cultivars of *Actinidia chinensis* Planch. The new cultivar is able to be asexually reproduced by softwood and hardwood rooted cuttings or by budding or grafting onto a seedling or rooted cutting grown rootstock with the unique characteristics being transferred through succeeding asexual propagations. In China ‘AU Golden Dragon’ was vegetatively propagated by grafting and planted for evaluation in experimental plantings in Shanghai, Jiangsu, Fusion and Shanxi provinces. ‘AU Golden Dragon’ was vegetatively propagated by softwood and hardwood cuttings and cleft grafting for evaluation in experimental plantings in Central Alabama. This cultivar has had excellent and equal performance in both China and Alabama test locations. The fruit of ‘AU Golden Dragon’ is elliptical in shape with a brown smooth skin, very early maturity, excellent flavor with a non acid sweet taste, and high soluble solids and percent dry matter content.

SUMMARY OF THE INVENTION

The present invention relates to a new and distinct low chilling requirement yellow fleshed kiwi cultivar of *Actinidia chinensis* Planch that produces elliptical shaped fruit that ripens very early in the kiwi ripening season. The fruit skin is brown with short tomentose hairs. The fruit have high soluble solids and percent dry matter content and the flavor of the fruit is excellent, with a mild non-acid sweet taste.

The new cultivar is able to be asexually reproduced by softwood and hardwood cuttings or by budding or grafting onto a seedling or rooted cutting grown rootstock with stability through succeeding asexual propagations.

'AU Golden Dragon' is early blooming, very early maturing, yellow fleshed cultivar with high soluble solid contents, high percent dry matter and has very fine soft hairs on the brown skin surface.

Vegetative bud break on 'AU Golden Dragon' occurs around March 15-20, and the bloom period begins during the last week of March to the first week of April. The plant blooms over an extended period of about 14 days. 'AU Golden Dragon' average fruit maturity and harvest date is August 15-20, in contrast to 'AU Golden Sunshine' average fruit maturity and harvest date is September 10 and 'Hort 16A' (U.S. Pat. No. 11,066) average fruit maturity and harvest date is October 10. Fruit quality data was collected at harvest and after a 30 day cold treatment and fruit allowed to soften at room temperature (Table 1).

The percent soluble solids and dry matter content and the internal hue angle of the fruit flesh did not vary after the cold storage and softening periods. At harvest 'Hort 16A' (patented) had the highest percent soluble solids and 'AU Golden Dragon' had the lowest percent soluble solids, but there were no differences in percent dry matter content or internal hue angle. 'AU Golden Dragon' fruit has a total acidity (% citric acid) of 1.2.

Kiwi plants are dioecious and have vegetative and compound buds with flower clusters produced in the leaf axils of the first four to six nodes. Male and female flowers are perfect morphologically. The female flower contains some anthers but only the stigma is functional, whereas the flower on a male vine typically produces 125 to 185 large anthers that surround a small, vestigial stigma.

Kiwi buds enter endodormancy during winter, which requires a minimum number of chilling hours for maximum budbreak and bloom. Floral uniformity and density in spring is directly related to the amount of chilling received during winter. It is believed the more accurate measure of chilling hours is Richardson units, which are defined as the accumulated hours between 0° C. and 7° C. For maximum bud break and flowering of 'AU Golden Dragon' to occur, it was determined that 800 hours of chilling were required, and after the chilling requirement was met, 9500 growing degree hours were necessary for bud break. The low growing degree hours necessary for vegetative growth and bloom to occur results in the early growth and flowering of 'AU Golden Dragon' which in some years could result in damage from late spring frost. 'AU Golden Dragon' has performed well in central Alabama, which has an average winter chilling of 800-1200 hours.

'AU Golden Dragon' blooms earlier in the spring and its fruit ripens earlier in the fall than does 'Hort 16A' (patented). The first blooms open on 'AU Golden Dragon' were on March 30 and petal fall occurred about April 16-18. Open blooms were evident on 'Hort 16A' (patented) on April 8, and petal fall occurred about April 17. 'AU Golden Dragon' has an elliptical fruit shape in comparison to the ovoid fruit shape of 'Hort 16A' (patented). The stylar end of 'Hort 16A' (patented) has a much greater protrusion than does 'AU Golden Dragon'. Fruit of 'AU Golden Dragon' matures August 15-20 in comparison to the fruit of 'Hort 16A' (patented) maturing October 10.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a photograph of 'AU Golden Dragon' bloom density on 8 year old plants.

FIG. 2 is a photograph of 'AU Golden Dragon' in full bloom on 8 year old plants.

FIG. 3 is a photograph of 'AU Golden Dragon' vine crop load on 8 year old plants.

FIG. 4 is a photograph of 'AU Golden Dragon' individual fruit on vine on 8 year old plants.

FIG. 5 is a photograph of 'AU Golden Dragon' fruit shape on 8 year old plants.

FIG. 6 is a photograph of 'AU Golden Dragon' flesh color.

DETAILED BOTANICAL DESCRIPTION

Kiwi plants are large deciduous shrubs that originated in China and are dioecious, can climb up to 25 feet, and have alternate, broadly rounded petiolate leaves. The cream colored flowers that grow in axillary cymes mature into ovate to oblong fruits (berries) with brownish, hairy skins. There are over 50 species in the genus *Actinidia*. The two *Actinidia* species of the most commercial importance are *deliciosa* and *chinensis*. 'Hort 16A' (patented) is the most important yellow flesh *chinensis* cultivar in the commercial trade. The kiwi plant is dioecious thereby requiring male pollinizers in the presence of the female plants to ensure fruit production. The male and female plants bloom period has to be at the same time for pollination to occur. The bloom period varies with each cultivar depending upon the chilling requirement and the growing degree hour requirement after the chilling requirement has been met. *Actinidia* are temperate zone plants that prefer well drained moist and rich soil and grows as well in a sunny as in a half-shady position.

The new cultivar 'AU Golden Dragon' is pistillate, with imperfect flowers, e.g. the flowers produce only sterile pollen and thus require a pollinizer for fruit production. The male cultivar 'Hortkiwi Meteor' (not patented) bloom period occurs with 'AU Golden Dragon' bloom period and is the pollinizer used with 'AU Golden Dragon'. The bloom period of 'AU Golden Dragon' begins late March on average about March 28-30 which is 6-8 days before the bloom period of 'Hort 16A' (patented) begins.

The new cultivar is able to be asexually reproduced by softwood and hardwood cuttings or by grafting or budding onto a seedling or cutting grown rootstock with the unique characteristics coming true to form and are established and transmitted through succeeding asexual propagations. 'AU Golden Dragon' has been asexually propagated by rooting softwood and hardwood cuttings and grafting in China and Alabama.

The distinctive characteristics of this new kiwi cultivar described in detail below have been observed in field experiments in central Alabama and China. The 'Hort 16A' (patented) cultivar was evaluated in the same field experiments in Alabama and was used as the standard cultivar for comparison.

The general fruit shape of 'AU Golden Dragon' is elliptical whereas the general shape of 'Hort 16A' (patented) is ovoid. The fruit cross-section at medium is round with 'AU Golden Dragon' and is elliptic with 'Hort 16A' (patented). The general fruit shape at the stylar end is slightly protruding on 'AU Golden Dragon' in comparison to a very pronounced protrusion on 'Hort 16A' (patented). The fruit shape of the shoulder on the stalk end is rounded and flat on 'AU Golden Dragon' and rounded on 'Hort 16A' (patented).

'AU Golden Dragon' is the maternal parent of 'AU Golden Tiger' and is a companion and comparison fruiting cultivar to 'AU Golden Sunshine'. 'AU Golden Dragon' fruit matures 20

days before fruit of ‘AU Golden Sunshine’ and 50 days before fruit of ‘Hort 16A’ (patented). Fruit quality is very similar between the three female cultivars, ‘AU Golden Dragon’, ‘AU Golden Sunshine’ and ‘Hort 16A’ (patented), however they differ in bloom date, fruit maturity date, and fruit shape.

‘AU Golden Dragon’ is a good source of health promoting qualities such as vitamin C, antioxidant capacity, β carotene and total phenolics (Table 2).

Table 3 below illustrates the specific differences between the ‘AU Golden Dragon’ cultivar and the ‘Hort 16A’ (patented) cultivar from vines 6-14 years old.

TABLE 3

	‘AU Golden Dragon’	‘Hort 16A’ (patented)
Plant		
Plant: sex expression	female (flowers imperfect)	
Plant: ploidy	diploid (2n = 2x = 58)	
Plant: vigor	strong	
Young shoot: hairs	present	
Young shoot: density of hairs	medium	
Young shoot: type of hairs	short	
Young shoot: antho- cyanin coloration of growing tip	absent, N199B	
Young shoot: antho- cyanin coloration of leaf axil	absent, N199B	
Plant: average height and spread	plant is a vigorous vine. They are grown on a trellis (either a T-bar or pergola trellis system) in which the plant is allotted a certain space of which it rapidly fills and is maintained in this space by both winter and summer pruning. The trellis is six feet off the ground and the plant is allowed each summer to grow and hang down on each side.	
Stem		
Stem: coloration of leaf axil	absent, N199B	
Stem: diameter		medium
Stem base diameter	mean 12.90 mm (range 10.01-16.46 mm)	mean 11.0 mm (range 8.3-13.3 mm)
Stem mid section diameter	mean 9.36 mm (range 7.26-11 mm)	not available
Stem: dormant bud diameter	3.6 mm (2.8-4.67 mm)	6.9 mm (4.9-8.3 mm)
Stem: color on upper side of shoot	grey brown, N199B	dark brown, 200B- 200C-165A
Stem: character of bark	smooth	
Stem: hairs	present	
Stem: conspicuousness of lenticels	weak	conspicuous
Stem: number of lenticels	few	medium
Stem: color of lenticels	almond/ivory, 199D	brownish-white
Stem: size of bud support	medium	
Stem: visibility of bud (dormant canes)	visible	
Stem: number of hairs visible high on bud (dormant canes)	medium	
Stem: leaf scar	mean length 5.3 mm (3.6- 6.1 mm) mean width 5.4 mm (4.2- 6.5 mm)	medium

TABLE 3-continued

	‘AU Golden Dragon’	‘Hort 16A’ (patented)
5 Leaf (Mature)		
	Leaf shape:	orbicular to broadly ovate
	Leaf base shape:	cordate, lobes large, non- to cordate slightly overlapping
10 Leaf tip shape:		
	Leaf margin:	entire
	Leaf adaxial surface:	medium green; glossy, glabrous except sparse, unbranched hairs along main veins, 147A
15 Leaf abaxial surface:		
		light green; dense, stellate pubescence everywhere except along veins which are densely tomentose with unbranched hairs, 147B
20 Leaf length (cm):		
	18.8 (15.6-24.8)	17 (14.5-19.8)
Leaf width (cm):		
	14.7 (11.9-16.9)	18.6 (15.9-21.7)
Leaf ratio (l/w):		
	1.3 (1.0-1.5)	
Leaf petiole length (cm):		
	5.9 (4.4-8.7)	16.7 (10-25)
Leaf 1° vein organization:		
	pinnate; veins terminating as small extended points or mucros at leaf margins []parallel	
25 Leaf 2° vein organization:		
	Leaf puckering:	weak to moderate
	Leaf variegation:	none
	Leaf spines on lower leaf surface:	none; dense stellate hairs
30 Petiole:		
	147C	
Pedicel:		
	N199A	
Flower		
	Inflorescence:	mean 4 (range 3-5)
	predominate number flower buds/stem	mean 1.0
35 1° Pedicel length (cm):		
	2.91 (2.1-3.4)	4.2 (3.0-4.9)
2° Pedicel length (cm):		
	n/a	n/a
Pedicel pubescence:		
	minutely, densely tomentose, unbranched	
40 Sepal#:		
	6.7 (6-13)	>5
Sepal color:		
	greyed-green to slightly rust colored at margin, 191B	
Sepal pubescence:		
	minutely, densely tomentose, unbranched	
Flower color:		
	creamy white, 155D	White, 155D
45 Flower width (cm):		
	3.1 (2.8-3.5)	1.8 (1.6-1.9)
Petal orientation:		
	distinctly overlapping: sides reflexing	overlapping
Petal #:		
	6.6 (6-8)	8 (6-10)
Petal length (cm):		
	1.6 (1.4-1.8)	2.3 (2.1-2.5)
Petal width (cm):		
	1.2 (1.0-1.5)	1.8 (1.6-1.9)
50 Petal ratio (l/w):		
	1.3 (1.0-1.6)	1.3 (1.1-1.5)
Ovary shape:		
	globose	
Ovary pubescence:		
	short, densely tomentose	strongly expressed
Style#:		
	33 (28-38)	30.85 (26 - 36)
Style orientation:		
	erect to spreading	erect
Stamen#:		
	70.6 (65-78)	
55 Anther length (mm):		
	2.0-2.5	
Filament:		
	155D	
Anther:		
	169D	
Chilling requirement hours:		
	800	
Fruit		
60 Fruit: average weight (g)		
	88.2 (30.5-130.9)	98.3 (43-176)
Fruit: length (mm)		
	61.6 (48.8-73.0)	79.1 (76.0-84.2)
Fruit: width (max) (mm)		
	54.8 (46.3-61.7)	53.1 (55.4-48.1)
65		

TABLE 3-continued

	‘AU Golden Dragon’	‘Hort 16A’ (patented)
Fruit: L/A ratio (max width)	1.12	1.49
Fruit: width (min) (mm)	47.6 (40.8-52.3)	49.1 (47.0-51.2)
Fruit: L/D ratio (min width)	1.29	1.61
Fruit: core diameter (max) (mm)	18.6 (4.9-28.0)	13.1 (9.1-17)
Fruit: core diameter (min) (mm)	5.4 (2.5-15.8)	4.9 (4.1-6.1)
Fruit: locule number	29.7 (26-32)	34.5 (26-37)
Fruit: peduncle length (mm)	27.88 (19.11-33.81)	48.3 (44.7-50.3)
Fruit: peduncle width (mm)	1.95 (12-2.85)	3.57 (3.2-4.3)
Fruit: general shape	elliptical	ovoid
Fruit: cross-section at median	round	elliptic
Fruit: general shape of stylar end	protruding	
Fruit: shape of shoulder on stalk end	rounded, flat	rounded
Fruit: skin color at harvest	Brown, N199A	yellow-brown
Fruit: skin color change during ripening	absent	yellow-brown
Fruit: skin color at maturity for consumption	Brown, N199A	combination of 199A plus 161A
Fruit: hairs	present	medium
Fruit: density of hairs	light	pubescent
Fruit: types of hairs	tomentose	
Fruit: hair length (mm)	short (0.05-0.12)	
Fruit: concentration of hairs	uniform	
Fruit: adherence of hairs to skin (when rubbed)	weak	
Fruit: core diameter (at largest diameter)	large (13.8 mm by 5.6 mm)	small
Fruit: core shape (in cross section)	elliptical	
Fruit: core woody spike	present	
Fruit: prominence of core woody spike	present	weak
Fruit: outer pericarp color at maturity for consumption	yellow green, 152C-152D	golden yellow, 12C-12B
Fruit: inner pericarp color (locules) at maturity for consumption	yellow green, 148A	brownish-yellow, 162A-162C
Fruit: core color at maturity	greyed-yellow, 160C	white, 159C
Fruit: seed color at maturity in flesh	dark brown, 200A	200A
Fruit: seed color when dry	greyed-orange, 165D	brown, 200D

Notes regarding Table 3:
1. Horticulture terminology is used in accordance with revised UPOV guidelines for kiwi.
2. Characters of comparison cultivar ‘Hort 16A’ (patented) are noted opposite that character when significantly different.
3. ‘Hort 16A’ (patented) plants were observed in the same study as the new cultivar.
4. All dimensions are in millimeters unless otherwise stated; weights are in grams.
5. The RHS 1966 color chart was used to determine actual color.

TABLE 1

Fruit Quality at harvest and after 30 days cold storage treatment of three <i>Actinidia chinensis</i> Planch golden kiwi cultivars grown in central Alabama and China.				
Cultivar	Harvest ^z			
	Firmness (Kg)	Soluble Solids (%)	Dry Matter (%)	Internal Hue Angle
‘Au Golden Dragon’	4.4b ^y	6.6c	17.2	104
‘AU Golden Sunshine’	4.7b	8.6b	18.5	100
‘Hort 16A’ (patented)		5.8a	11.7a	21.0
Cultivar	30 Days Cold Storage ^x			
	Firmness (Kg)	Soluble Solids (%)	Dry Matter (%)	Internal Hue Angle
‘Au Golden Dragon’	1.1	15.2	18.0	99
‘AU Golden Sunshine’	0.0	15.7	18.5	94
‘Hort 16A’ (patented)	105	2.0	17.4	21.0

^zMeans derived from data taken in the 2006, 2008, 2009 and 2010 growing seasons. There was not fruit in 2007 due to a late spring frost killing flower buds.
^yMean separation within columns by Duncan’s Multiple Range Test p = 0.05, columns without letters were not significantly different.
^xMeans derived from data taken in 2003, 2004, 2008, 2009 and 2010 for ‘Au Golden Dragon’ and ‘AU Golden Sunshine’ and in 2009 and 2010 for ‘Hort 16A’ (patented).

TABLE 2

Phytochemical properties of ‘AU Golden Dragon’ and ‘AU Golden Sunshine’ cultivars.		
Phytochemical properties	‘AU Golden Dragon’	‘AU Golden Sunshine’
Ascorbic acid (mg/100 g FW)	96.98	94.43
Vitamin C equivalent Antioxidant capacity (VCEA)	161.60	177.90
B carotene (mg/100 g FW)	0.20	0.23
Chlorophyll a (mg/100 g FW)	0.11	0.12
Chlorophyll b (mg/100 g FW)	0.06	0.05
Total Phenolics (mg GAE/100 g FW)	135.70	155.50

What is claimed is:

1. A new and distinct variety of *Actinidia chinensis* Planch plant named ‘AU Golden Dragon’ substantially as described and illustrated herein.



Fig. 1



Fig. 2



Fig. 3



Fig. 4

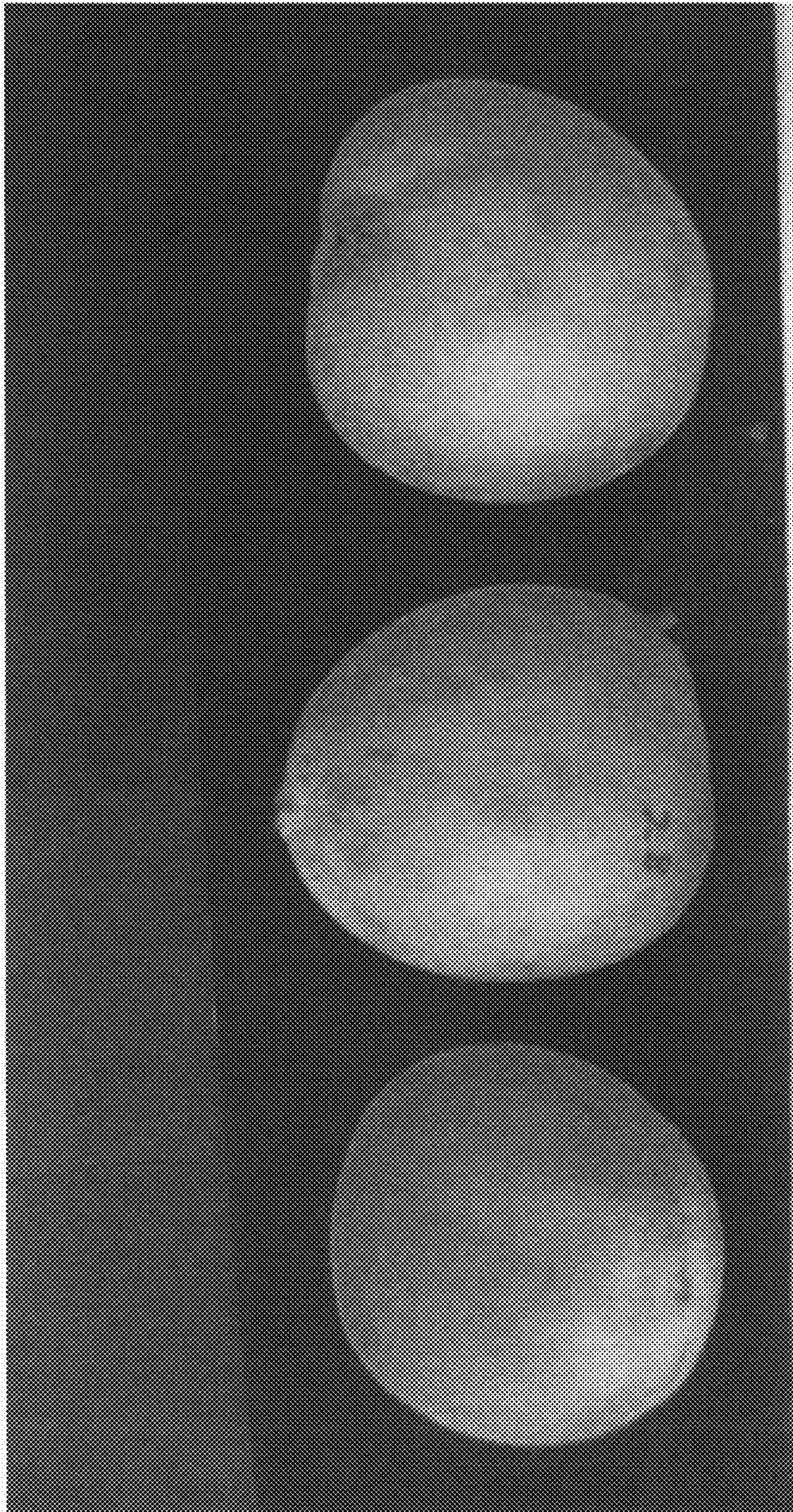


Fig. 5



Fig. 6