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Park et al.
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(54) **CITRUS RETICULATA BLANCO PLANT NAMED ‘TAMNANEUNBONG’**
(50) Latin Name: *Citrus reticulata* Blanco
Varietal Denomination: **Tamnaneunbong**
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A01H 6/78 (2018.01)

(52) **U.S. Cl.**
USPC **Plt./201**
(58) **Field of Classification Search**
USPC Plt./156, 201
See application file for complete search history.

(56) **References Cited**

PUBLICATIONS

Korea Seed & Variety Service website—citation for registration No. 5070. http://www.seed.go.kr/english/function/system_06_view.jsp?appl_idty=84400. Accessed May 1, 2017. 1 page.*

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(57) **ABSTRACT**
A new and distinct *Citrus reticulata* Blanco plant named Tamnaneunbong, characterized by its upright plant type and strong vigor, short oval ovary shape, germination state in middle of April, blooming state in late May, fruits start coloring in late October, mature state in late March, acidity of the fruit juice at about 1.51%, leaf length at about 10.1 cm and leaf width at about 4.3 cm, and length of leaf petiole at about 3.6 cm.

2 Drawing Sheets

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Latin name of the genus and species of the plant claimed:
Citrus reticulata Blanco.
Variety denomination: ‘Tamnaneunbong’.

BACKGROUND OF THE INVENTION

The new and distinct cultivar is a product of a breeding program by the inventors. This cultivar was developed by embryo sac culture. The embryo sac culture of ‘Shiranui’ (not patented) was carried out in 2000. The characteristic investigation of these nucellar seedlings was done from 2007 to 2010 in a greenhouse. The first screening was carried out in 2007, and the last screening was carried out in 2010. One new variety was picked and named ‘Tamnaneunbong’.
The somatic cells of the nucellar tissue can also develop into embryos, called nucellar embryos, and then germinated into a plurality of nucellar seedlings. The candidate variety is developed from the nucellar embryos of the female parent. The variety was asexually propagated by grafting onto ‘Satsuma’ rootstock (or trifoliate orange rootstock) in Jeju-do, Korea for three generations and there was no genetic variation. The observed plant retains its distinctive characteristics and reproduces true to type in successive generations. Therefore, its traits are stable. The rootstock of ‘Satsuma’ is the tangerine tree and tangerine has no patent status.
The fruit characteristics of ‘Tamnaneunbong’ are in the table below. The test carried out from 2007 to 2010. ‘Shi-

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ranui’ was 5 years old in 2007. The ‘Tamnaneunbong’ was the nucellar seedling in this table.

TABLE 1

Fruit Characteristics						
Survey date (yy.mm.dd)	Variety	Fruit weight (g)	Flesh rate (%)	Fruit shape index	Peak height (mm)	
10	Tamnaneunbong	268.4	77.5	94	15.6	
	Shiranui	315.2	69.4	100	13.8	
	Tamnaneunbong	254.8	75.7	89	12.8	
	Shiranui	172.4	72.4	98	4.5	
15	Tamnaneunbong	364.8	72.6	93	17.0	
	Shiranui	322.4	75.6	92	15.1	
	Tamnaneunbong	240.3	—	—	—	
	Shiranui	157.0	—	—	—	
Survey date (yy.mm.dd)	Variety	Thickness of the skin (mm)	Seed grain number	Sugar (°Bx)	Acidity (%)	Sugar acid ratio
20	Tamnaneunbong	2.9	0	14.4	1.28	11.24
	Shiranui	5.3	0	12.4	1.14	10.92
	Tamnaneunbong	3.7	0	13.6	1.44	9.43
	Shiranui	4.3	0	12.8	1.32	9.71
25	Tamnaneunbong	4.2	0	15.3	1.28	11.97
	Shiranui	4.1	0	13.7	1.14	11.98

TABLE 1-continued

Fruit Characteristics						
10.2.24	Tamnaneun- bong	—	0	15.3	1.46	10.47
	Shiranui	—	0	12.2	1.46	8.35

Fruit shape index = The transverse diameter ÷ The longitudinal diameter × 100

Additional fruit characteristics of ‘Tamnaneunbong’ are in the table below. ‘Shiranui’ was 8 years old in 2010. The ‘Tamnaneunbong’ was grafted onto five years old ‘Shiranui’ three years ago.

TABLE 2

Additional Fruit Characteristics					
Survey date (yy.mm.dd)	Variety	Fruit weight (g)	Flesh rate (%)	Fruit shape index	Peak height (mm)
10.1.27	Tamnaneunbong	280.9	77.7	95	10.7
	Shiranui	255.6	77.0	97	9.2
10.3.4	Tamnaneunbong	237.7	76.5	93	—
	Shiranui	258.8	73.0	93	—

Survey date (yy.mm.dd)	Variety	Thickness of the skin (mm)	Seed grain number	Sugar (°Bx)	Acidity (%)	Sugar acid ratio
10.1.27	Tamnaneun- bong	3.6	0	15.3	1.45	10.67
	Shiranui	3.8	0	14.5	1.20	12.08
10.3.4	Tamnaneun- bong	3.8	0	17.5	1.51	11.74
	Shiranui	4.1	0	16.0	1.22	13.17

SUMMARY OF THE INVENTION

The cultivar ‘Tamnaneunbong’ has not been observed under every possible environmental conditions. Therefore, there may be variations in the phenotype due to varying environmental conditions such as temperature, day length and light intensity. However, the genotype will not vary.

The following traits have been repeatedly observed and are determined to be the characteristics of the new cultivar of *Citrus reticulata* Blanco. These attributes in combination distinguish ‘Tamnaneunbong’ from and all other varieties of *Citrus reticulata* Blanco known to Inventors.

1. The plant type of ‘Tamnaneunbong’ is upright and the tree vigor is strong.
2. Ovary shape of ‘Tamnaneunbong’ is short oval.
3. The fruit color is orange.
4. Germination stage is in the middle of April.
5. Blooming stage is in late May.
6. Fruits start coloring in late October.
7. The mature stage is in late March.
8. Acidity of the fruit juice is about 1.51%.
9. The leaf length is about 10.1 cm and the leaf width is about 4.3 cm.
10. The length of leaf petiole is about 3.6 cm.

Plants of the new cultivar ‘Tamnaneunbong’ are similar to plants of the seed parent ‘Shiranui’ in most horticultural characteristics, however, the plants of the new cultivar ‘Tamnaneunbong’ produce fruit that are more acidic than the

parent. The fruit produced by ‘Tamnaeunbong’ start coloring in late October and mature in late March.

The new cultivar differs from the closest comparable plants as shown in the tables below:

TABLE 3

Comparison With Closest Variety			
Denomination of similar variety	Characteristic in which the similar variety is different	The expression of the characteristic	Candidate variety
Shiranui	Plant: type Plant: tree vigor Ovary: shape Fruit juice: acidity Leaf: leaf length Leaf: leaf width Leaf petiole: length Fruits start coloring Mature stage	medium medium depressed globose 1.22% 8.0 cm 3.0 cm 4.1 mm in early October in early March	upright strong short oval 1.51% 10.1 cm 4.3 cm 3.6 mm in late October in late March

TABLE 4

Comparison With Closest Variety						
Forms of Expression						
NO	Characteristics	1	2	3	4	5
1	Plant: Type	upright				medium
2	Young shoot: thickness	thin				medium
3	Young shoot: length	very short		short		medium
4	Stem: internode length	very short		short		medium
5	leaf: color	light green				green
6	leaf: length	very short		short		medium
7	leaf: width	very narrow		narrow		medium
8	leaf: length/width ratio	small				medium
9	leaf: thickness	thin				medium
10	Leaf petiole: length	very short		short		medium
11	Leaf petiole: thickness	thin				medium
12	Flower: petal length	very short		short		medium
13	Flower: petal width	very narrow		narrow		medium
14	Ovary: shape	Long oval	globose	depressed globose	ap-planate	cylinder
15	Flower: activity pollen	absent				
16	Fruit: length/width ratio	small				medium
17	Fruit: surface color	green	yellowish green	light yellow	medium yellow	yellowish orange
18	Fruit: surface roughness	smooth				
19	Fruit: fresh color	with white	light green	light yellow	medium yellow	light orange
20	Fruit: skin thickness	thin				medium
21	Fruit juice: total soluble solids	low				medium
22	Fruit juice: acidity	low				medium

TABLE 4-continued

Comparison With Closest Variety					
23	Mature stage	very early	early		medium
24	Parthenocarpy	absent			
25	Self-in-compatibility	absent			
26	Tree vigor	weak			medium
		Forms of Expression			
NO	Characteristics	6	7	8	9
1	Plant: Type				pendulous
2	Young shoot: thickness				thick
3	Young shoot: length	long			very long
4	Stem: internode length	long			very long
5	leaf: color				dark green
6	leaf: length	long			very long
7	leaf: width	broad			very broad
8	leaf: length/width ratio				large
9	leaf: thickness				thick
10	Leaf petiole: length	long			very long
11	Leaf petiole: thickness				thick
12	Flower: petal length	long			very long
13	Flower: petal width	broad			very broad
14	Ovary: shape	short oval	gourd		
15	Flower: activity pollen				present
16	Fruit: length/width ratio				large
17	Fruit: surface color	medium orange	dark orange	red with orange	red
18	Fruit: surface roughness				rough
19	Fruit: fresh color	medium orange	dark orange	red	purple
20	Fruit: skin thickness				thick
21	Fruit juice: total soluble solids				high
22	Fruit juice: acidity				high
23	Mature stage	late			very late
24	Parthenocarpy				present
25	Self-incompatibility				present
26	Tree vigor				strong

		Application variety: Tamnaneunbong		Similar variety: Shiranui	
NO	Characteristics	No	Data	No	Data
1	Plant: Type	1		5	
2	Young shoot: thickness	5	2.6 mm	1	1.9 mm
3	Young shoot: length	7	20.0 cm	7	15.9 cm
4	Stem: internode length	5	1.9 cm	5	1.5 cm
5	leaf: color	5		5	
6	leaf: length	7	10.1 cm	5	8.0 cm
7	leaf: width	5	4.3 cm	3	3.2 cm
8	leaf: length/width ratio	7	2.4	7	2.5
9	leaf: thickness	5	0.032 mm	5	0.031 mm
10	Leaf petiole: length	3	3.6 mm	5	4.1 mm
11	Leaf petiole: thickness	5	1.9 mm	5	1.7 mm
12	Flower: petal length	5	16.3 mm	5	15.0 mm
13	Flower: petal width	7	8.1 mm	7	6.7 mm
14	Ovary: shape	6		3	
15	Flower: activity pollen	1		1	

TABLE 4-continued

Comparison With Closest Variety				
16	Fruit: length/width ratio	3	0.95	3 0.95
17	Fruit: surface color	4		4
18	Fruit: surface roughness	9		9
19	Fruit: fresh color	5		5
20	Fruit: skin thickness	5	3.7 mm	5 3.9 mm
21	Fruit juice: total soluble solids	5	17.5°Bx	5 16.0°Bx
22	Fruit juice: acidity	7	1.51%	5 1.22%
23	Mature stage	7		7
24	Parthenocarpy	9		9
25	Self-incompatibility	9		9
26	Tree vigor	9		5 30

BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying colored photographs illustrate the overall appearance and distinct characteristics of the new *Citrus reticulata* Blanco ‘Tamnaneunbong’ showing colors as true as is reasonably possible with colored reproduction of this type. These photos were taken in 2010 in Korea. Colors in the photographs may differ slightly from the color values cited in the detailed botanical description which accurately describes the color of the ‘Tamnaneunbong’.

FIG. 1 provides multiple views of the ovaries of the fruits harvested from ‘Tamnaneunbong’ and ‘Shiranui’. The four ovaries on the left of the photograph are ovaries of the fruit harvested from ‘Shiranui’ while the four ovaries on the right of the photograph are ovaries of the fruit harvested from ‘Tamnaneunbong’. All are from ten years old plants.

FIG. 2 provides multiple views of typical fruits harvested from ten years old ‘Tamnaneunbong’ plants. Top, bottom and side views of the whole, unpeeled fruit is shown as well as two cross-sectional views of the inside of the fruit.

FIG. 3 provides multiple views of typical fruits harvested from ten years old ‘Shiranui’ plants. Top, bottom and side views of the whole, unpeeled fruit is shown as well as two cross-sectional views of the inside of the fruit

FIG. 4 illustrates in full color typical foliage and fruits of ‘Tamnaneunbong’ on the ten years old tree.

FIG. 5 illustrates in full color typical foliage and fruits of ‘Shiranui’ on the ten years old tree.

DETAILED BOTANICAL DESCRIPTION

In the following description of the new cultivar ‘Tamnaneunbong’ as taken from tests carried from 2007 to 2010. The characteristics of the overall ‘Tamnaneunbong’ plant include strong tree vigor, erect-type tree form, fruit shape which is oblate, orange pericarp color, orange flesh color, strong fragrance and moderate oil glands. The following observations and measurements describe ‘Tamnaneunbong’ plants grown in Korea.

The Colour Chart used in the identification of colors described herein is The R.H.S. Colour Chart of The Royal Horticultural Society, 2007, Fifth edition, except where general color terms of ordinary significance are used.

TABLE 5

Color of ‘Tamnaneunbong’ and ‘Shiranui’				
	Tamnaneunbong		Shiranui	
	COLOR		COLOR	
Fruit: surface color	Yellow orange	Yellow orange RHS 25A	Yellow orange	Yellow orange RHS 25A
Fruit: flesh color	Light orange	RHS orange 26B	Light orange	RHS orange 26B
leaf: upper surface color of mature leaves	Green	RHS green 137A	Green	RHS green 137A
leaf: lower surface color of mature leaves	Green	RHS green 137A	Green	RHS green 137A
Leaf: upper surface color of young leaves	Green	RHS green 143A		
Leaf: lower surface color of young leaves	Green	RHS 144A		
Stem: bark color	Greyed-Green	RHS Greyed-Green 197A		
Flower: color of opened flower	White	RHS NN 155 White C		
Petal: upper surface color	White	RHS NN 155 White C		
Petal: lower surface color	White	RHS NN 155 White C		
Seed: seed color	No Seed			

Propagation: ‘Tamnaneunbong’ is typically grafted onto rootstock of ‘Shiranui’.

Plant:

Age of plant described.—Approximately 3 years old.
Vigor.—Strong.
Plant posture.—Upright.

Foliage:

Young shoot thickness.—2.6 mm.
Young shoot length.—20.0 cm.
Stem internode length.—1.9 cm.
Leaf color.—Green.
Leaf length.—10.1 cm.
Leaf width.—4.3 cm.
Leaf length/width ratio.—2.4.
Leaf thickness.—0.032 mm.
Leaf petiole length.—3.6 mm.
Leaf petiole thickness.—1.9 mm.
Leaf arrangement.—Alternate.
Venation pattern.—Pinnate.
Leaf margins.—Crenate.
Texture of the leaf.—Smooth.
Length and color of stipules.—Absent of stipules.

Flower:

Flower petal length.—16.3 mm.
Flower petal width.—8.1 mm.
Ovary shape.—Short oval.
Flower.—Pollen absent.
Flower diameter.—About 2.3 cm to about 2.6 cm when fully opened.
Petal length.—About 1.58 cm to about 1.85 cm.
Petal width.—About 0.76 cm to about 0.95 cm.
Petal texture.—Smooth.
Petal margin.—Smooth.
Petal color upper and lower surfaces.—RHS NN 155 White C.
Flower bud color.—RHS NN 155 White C.
Flower bud shape.—Oval.

Flower bud size.—Medium.
Flower fragrance.—Present.
Average number of flowers per panicle.—About 5.
Ovary shape.—Short oval.
Style length.—About 14.5 mm to about 17.5 mm.
Stamen number.—About 15 to about 21, with complete style development.
Stamen length.—About 9.5 mm to about 14.5 mm.
Anther color.—White (RHS White NN155A).
Pollinator.—Not required.
Parthenocarpy trait.—Present.
Pedicle length.—1.1 cm.
Pedicle color.—RHS Yellow-Green Group 144M. In Jeju-do, Korea, the time for the first bloom is approximately March 15th, the end of bloom is approximately April 25th.

Fruit:

Fruit shape index.—89 to 95.
Fruit length/width ratio.—0.95.
Fruit weight.—237 g to 365 g.
Fruit surface color.—Medium yellow.
Fruit surface roughness.—Rough.
Fruit fresh color.—Light orange.
Fruit flesh rate.—72.6% to 77.7%.
Fruit skin thickness.—3.7 mm.
Fruit juice total soluble solids.—17.5° Bx.
Fruit juice acidity.—1.51%.
Seed grain number.—0.
Mature stage.—Late.
Parthenocarpy.—Present.
Self-incompatibility.—Present.
Productivity of fruit.—About 2500 kg/10 acre to about 3000 kg/10 acre.
Market use of the fruit of the observed plant.—Fresh fruit.
Other fruit features.—‘Tamnaneunbong’ is intermediate resistant to *citrus* scab disease and *citrus* canker, but susceptible to melanose. For the very early mature stage, ‘Tamnaneunbong’ should be protected when cultured. Since the fruit would be matured in the cold season, the cold season may reduce the quality of the fruit if the fruit is planted in an open field. Therefore, ‘Tamnaneunbong’ needs to be planted under a protected environment. Pruning on ‘Tamnaneunbong’ is the same as ‘Shiranui’. Fruit and plant are damaged when the temperature is below −7° C.

TABLE 5

A descriptive comparison between ‘Tamnaneunbong’ and another known Citrus reticulate cultivar ‘Setoka’(not patented).					
Variety Denomination	Harvest time	Shape Index	Sugar degree ("BX)	Acidity/%	Fruit weight/g
Setoka	Early-Late February	129.6	13	1.0	200
Tamnaneunbong	Late March	92.8	15.2	1.51	274.5

TABLE 6

The characteristic and observed dates of first and last pick in the specified location of culture as observed in Jeju-do, Korea.					
Time	Variety Denomination	Fruit weight/g	Flesh rate/%	Shape Index	Peak height/mm
7.1.24	Tamnaneunbong	268.4	77.5	94	15.6
8.2.14	Tamnaneunbong	254.8	75.7	89	12.8
9.2.17	Tamnaneunbong	364.8	72.6	93	17.0
10.2.24	Tamnaneunbong	240.3	—	—	—
10.3.4	Tamnaneunbong	237.7	76.5	93	—
Time	Pericarp thickness/mm	Seed number	Sugar degree ("BX)	Acidity/%	Acid-sugar ratio
7.1.24	2.9	0	14.4	1.28	11.24
8.2.14	3.7	0	13.6	1.44	9.43

TABLE 6-continued

The characteristic and observed dates of first and last pick in the specified location of culture as observed in Jeju-do, Korea.					
5	9.2.17	4.2	0	15.3	1.28
	10.2.24	—	0	15.3	1.46
	10.3.4	3.8	0	17.5	1.51

Regarding the observed plant’s drought/heat tolerance, although the variety has not been tested for drought and heat resistance, it can grow at a temperature of about 40° C. and without irrigation for about 45 days. Such conditions do not have much effect on the growth of the variety.

What is claimed is:

1. A new and distinct cultivar of *Citrus reticulate* Blanco plant named ‘Tamnaneunbong’ as herein illustrated and described.

* * * * *

Fig.1

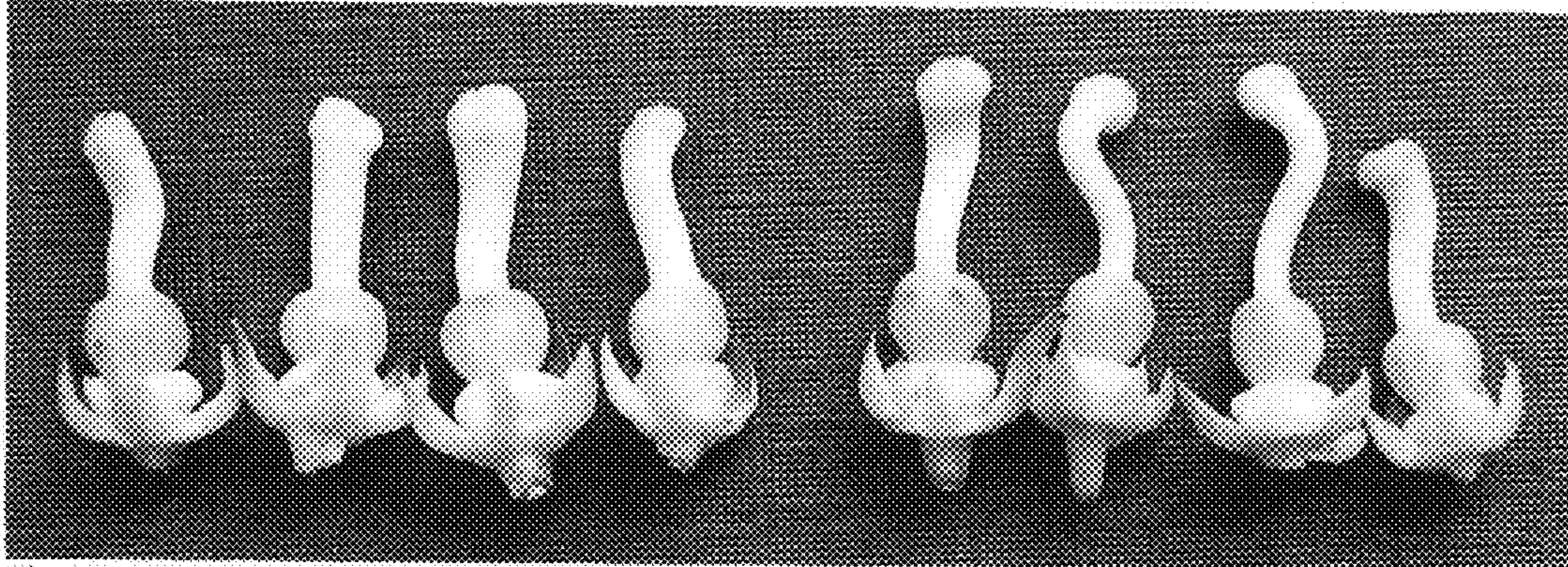


Fig.2

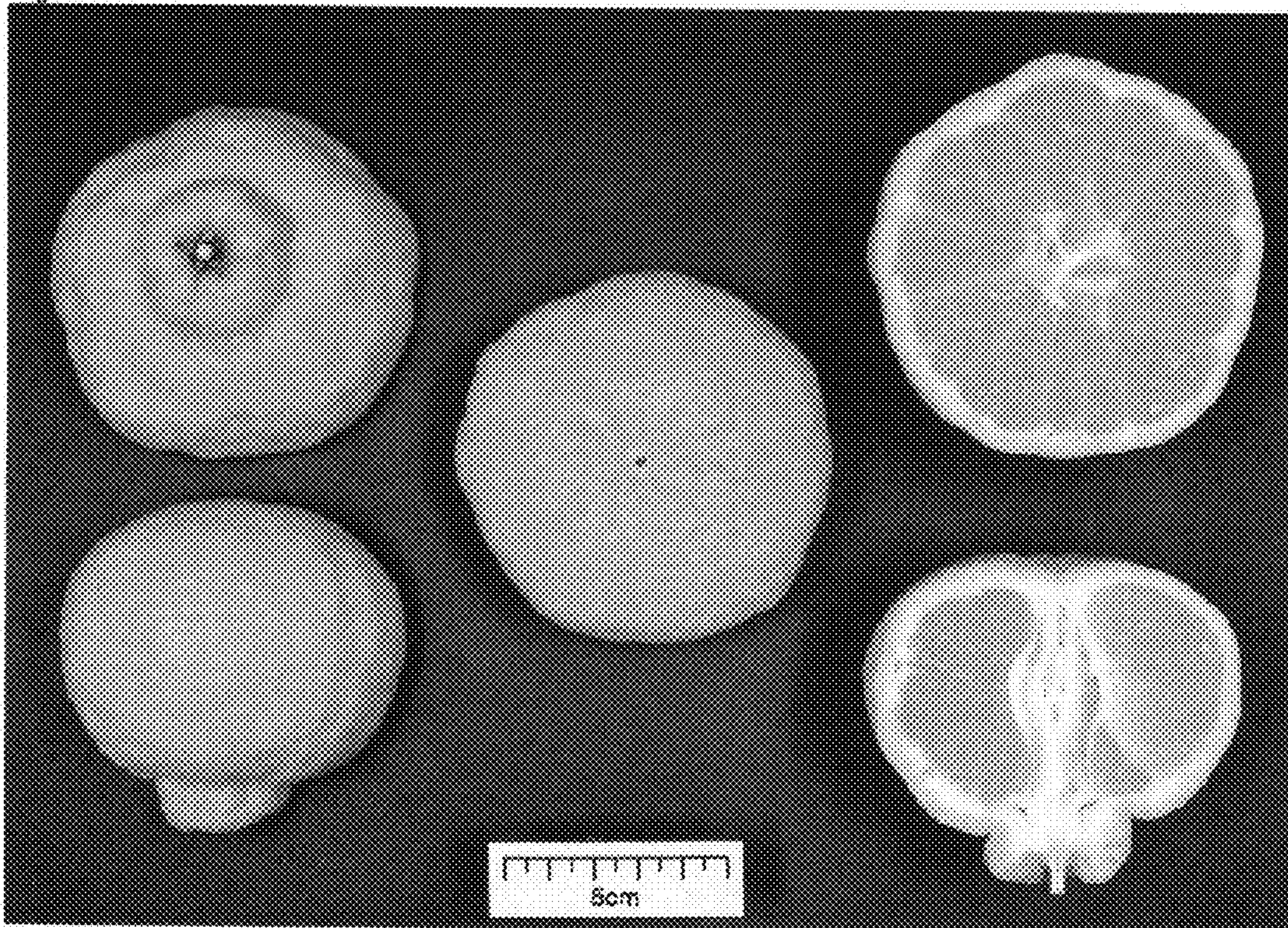


Fig.3

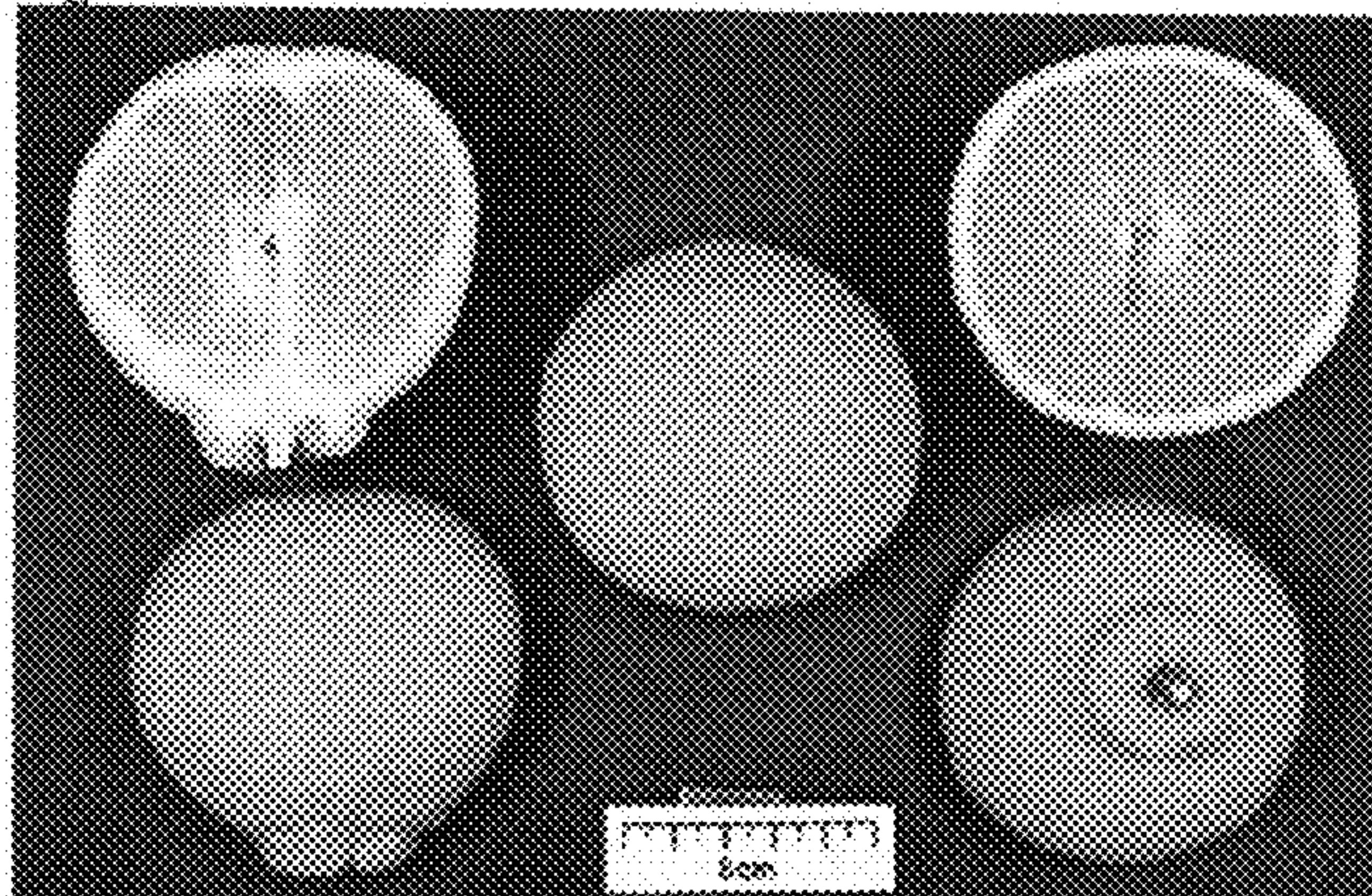


Fig.4



Fig.5

