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Shaw et al.

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(54) **STRAWBERRY PLANT NAMED 'BENICIA'**

(50) Latin Name: ***Fragaria×ananassa* Duch.**
Varietal Denomination: **Benicia**

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 269 days.

(21) Appl. No.: **12/657,923**

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(65) **Prior Publication Data**

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

(52) **U.S. Cl.** **Plt./208**

(58) **Field of Classification Search** Plt./208
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

PP4,538	P *	5/1980	Bringhurst et al.	Plt./209
PP5,262	P *	7/1984	Voth et al.	Plt./208
PP8,708	P *	5/1994	Voth et al.	Plt./209
PP13,469	P3 *	1/2003	Larson et al.	Plt./208
PP19,472	P3 *	11/2008	Shaw et al.	Plt./208

OTHER PUBLICATIONS

UPOV ROM GTITM Computer Database, GTI Jouve Retrieval Software 2011/10 Citation for 'Benecia'.*
Anonymous. "Benecia Strawberry Plants & Mojave Strawberry Plants" Strawberry Plants.org Jun. 2, 2010 available at http://strawberryplants.org/2010/06/benicia-strawberry-plants-mojave-starberry-plants/.*

* cited by examiner

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(57) **ABSTRACT**

'Benicia' is a short-day (June bearing) type cultivar that produces fruit over an extended period when treated appropriately in arid, sub-tropical climates. When treated with appropriate planting regimes, 'Benicia' has larger fruit and produces individual-plant yields greater than that of 'Camarosa' (U.S. Plant Pat. No. 8,708). It further produces similar quantities of fruit per plant but develops larger and higher quality fruit than 'Ventana' (U.S. Plant Pat. No. 13,469.

4 Drawing Sheets

Genus and species: The strawberry cultivar of this invention is botanically identified as *Fragaria×ananassa* Duch.

Variety denomination:

The variety denomination is 'Benicia'.

BACKGROUND OF THE INVENTION

This invention relates to a new and distinctive short-day type cultivar designated as 'Benicia'. The new cultivar was the result of a cross performed in 2004 between the cultivar 'Palomar' (U.S. Plant Pat. No. 19,472) and unreleased germplasm accession Cal 0.18-601 (unpatented). Accession Cal 0.18-601 was chosen as a parent due to its large, firm, and high quality fruit and medium plant vigor. 'Benicia' was first fruited at an experimental orchard near Winters, Calif. in 2005, where it was selected, originally designated Cal 4.39-1, and propagated asexually by runners. Following selection and during testing, the plant of this selection was designated 'C225'. It was later designated 'Benicia' for introduction into commerce. Asexual propagules from this original source have been tested in Watsonville, Calif., in Irvine, Calif., and to a limited extent in grower fields starting in 2007. The cultivar is stable and reproduces true to type in successive generations of asexual reproduction.

BRIEF SUMMARY OF THE INVENTION

'Benicia' is a short-day (June bearing) type cultivar that produces fruit over an extended period when treated appropriately in arid, sub-tropical climates. When treated with appropriate planting regimes, 'Benicia' has larger fruit and produces individual-plant yields greater than that of 'Camarosa' (U.S. Plant Pat. No. 8,708). It further produces similar quantities of fruit per plant but develops larger and higher quality fruit than 'Ventana'(U.S. Plant Pat. No. 13,469).

BRIEF DESCRIPTION OF THE DRAWINGS

The figures depict various characteristics of the 'Benicia' cultivar.

FIG. **1** shows the general flowering and fruiting characteristics of the plant in a field planting.

FIG. **2** shows a typical leaf at mid-season.

FIG. **3** shows representative mid-season fruit.

FIG. **4** shows a cross-section of representative mid-season fruit.

DETAILED DESCRIPTION OF THE INVENTION

'Benicia' is typical of short-day strawberry cultivars and produces fruit over an extended period when treated appropriately in arid, subtropical climates. The production pattern for 'Benicia' is similar to that of 'Camarosa' and 'Palomar', although it is somewhat earlier to initiate fruiting with most cultural treatments. 'Benicia' initiates fruiting somewhat later than 'Ventana' when established in very early fall, but has a production pattern similar to 'Ventana' with most cultural treatments. 'Benicia' will be of special interest for winter

plantings, where 'Camarosa', 'Ventana', and 'Palomar' have been successful, and in summer plantings where 'Pajaro' (U.S. Plant Pat. No. 4,538) and 'Chandler' (U.S. Plant Pat. No. 5,262) have been successful. Color references have been made to the Munsell Color Chart.

Plants and foliage:

Fruiting plants of 'Benicia' are similar in morphology to 'Ventana', although slightly more open and erect, and somewhat smaller throughout most of the production season with most cultural treatments. 'Benicia' plants are larger than those of 'Palomar' and similar in size to 'Camarosa' in most production environments. Comparative statistics for foliar characteristics near mid-season are given for 'Benicia' and three comparison cultivars in Table 1. Individual leaflets for 'Benicia' are smaller and less rounded than for 'Camarosa'. Further, the leaflets are similar in shape but smaller than those of 'Ventana' or 'Palomar'. Leaves (including petioles) for 'Benicia' are similar in length to 'Ventana' and 'Camarosa', but shorter than 'Palomar' mostly due to shorter petiole length. Petioles for 'Benicia' are generally longer and thinner than those of the comparison cultivars. The adaxial (upper) and abaxial (lower) surfaces of leaves for 'Benicia' are similar in color to 'Camarosa' and darker than 'Ventana' leaves at mid season. Leaves of 'Benicia' have consistently more concavity than 'Camarosa', less concavity than 'Palomar' and are similar to those for 'Ventana'. Serrations at mid season are more pointed than 'Camarosa', but similar in shape and number to 'Ventana' and 'Palomar'.

TABLE 1

Foliar and plant characteristics for 'Benicia', 'Camarosa', 'Palomar', and 'Ventana'.

	Cultivar			
Foliar Character	'Camarosa'	'Ventana'	'Palomar'	'Benicia'
Plant height (mm)				
mean	299	277	262	304
range	280-320	250-300	250-290	280-370
Plant spread (mm)				
mean	431	432	388	438
range	395-490	370-485	360-455	390-500
Mid-tier leaflet Length (mm)				
mean	100	92	88	98
range	93-105	55-110	76-93	90-120
Width (mm)				
mean	87	79	72	82
range	80-100	73-90	65-80	70-90
Mid-tier leaf Length (mm)				
mean	290	314	244	318
range	267-325	235-350	160-282	290-330
Width (mm)				
mean	178	169	156	167
range	152-210	150-190	128-175	150-187
Leaf components Petiole length (mm)				
mean	194	220	169	224
range	170-220	190-240	150-175	210-230
Petiole diameter (mm)				
mean	5.1	4.9	4.5	4.2
range	4-6	4-6	4-5	3-5
Petiolule length (mm)				
mean	8.5	6.1	5.5	7.0
range	6-10	5-7	4-6	5-8
# leaflets/leaf	3	3	3, rarely 4 or 5	3
Leaf convexity	Some convex, most flat to slight concave	flat to very concave	concave to very concave	
Serrations				
number/leaf	19.5	20.6	20.6	18.9
range	18-21	18-23	18-23	17-20
shape	rounded, some semi-pointed	semi-pointed	semi-pointed	semi-pointed
Leaf pubescence	light-moderate	light-moderate	moderate-light	moderate
Petiole pubescence				
density	heavy	moderate-heavy	heavy	moderate-heavy

TABLE 1-continued

Foliar and plant characteristics for 'Benicia', 'Camarosa', 'Palomar', and 'Ventana'.

	Cultivar			
Foliar Character	'Camarosa'	'Ventana'	'Palomar'	'Benicia'
direction	perpendicular	perpendicular to acropetal	perpendicular	perpendicular
Petiole color (Munsell)	2.5 GY 8/9	2.5 GY 8/9	2.5 GY 8/9	2.5 GY 9/8
Stipule length (mm)				
mean	33.8	31.9	33.3	31.5
range	30-45	25-40	25-41	20-41
Stipule color				
core	7.5 GY 9/4	2.5 GY 9/8	10 Y 9/9	5 GY 8/8
margins	7.5 GY 8/7	10 Y 8/11	2.5 GY 9/8	7.5 GY 9/4
Stolon base diameter (mm)	1.7	1.5	2.3	1.9
Stolons per nursery mother plant	28.0	18.8	25.5	28.2
Venation				
pattern	pinnate	pinnate	pinnate	pinnate
color	10 GY 7/8	5 GY 8/8	2.5 GY 8/9	7.5 GY 9/4

Disease and pest reaction:

'Benicia' is moderately resistant to powdery mildew (*Sphaerotheca macularis*), but is moderately susceptible to Anthracnose crown rot (*Colletotrichum acutatum*), and very susceptible to *Verticillium* wilt (*Verticillium dahliae*). It is moderately susceptible to *Phytophthora* crown rot (*Phytophthora cactorum*) and common leaf spot (*Ramularia tulasnei*) (Table 2). When treated properly, it has tolerance to two-spotted spider mites (*Tetranychus urticae*) equal to that of the comparison cultivars. 'Benicia' is tolerant to strawberry viruses encountered in California.

TABLE 2

Disease resistance scores for 'Benicia' and three comparison cultivars.

Genotype	*Phytophthora* Resistance Score (5 = best)	*Verticillium* Resistance Score (5 = best)	*Colletotrichum* Resistance Score (5 = best)
'Camarosa'	3.06	3.08	3.1
'Ventana'	2.06	2.89	2.7
'Palomar'	2.81	4.14	3.0
'Benicia'	3.50	2.08	2.6

Phytophthora and *Verticillium* scores were obtained in evaluations conducted between 2008-2009;
Colletotrichum was evaluated in 2009.

Flowering, fruiting, fruit, and production characteristics:

'Benicia' is similar to other California short-day strawberry cultivars (e. g. 'Ventana', 'Camarosa', and 'Palomar') in that it will flower over an extended period and into spring or summer, given appropriate local temperature and horticultural conditions. With very early plantation establishment (before October 1 in California), 'Benicia' produces fruit slightly later than 'Ventana' and 'Palomar' but earlier than 'Camarosa'. With later plantation establishment, 'Benicia' initiates fruit as early as 'Ventana' and 'Palomar', with earlier production timing than 'Camarosa'. Comparative statistics for flower and fruit characteristics near mid-season are given for the four cultivars in Table 4. The primary flowers for 'Benicia' are similar in size to 'Ventana', with a calyx that is distinctly larger than the corolla on primary fruit. The sepals are similar in length and shape to 'Camarosa' and 'Ventana'. The calyx for 'Benicia' varies in position but frequently has a slight neck early in the season. Each primary flower has 6-8 petals, slightly more than the comparison cultivars on average. The fruit shape for 'Benicia' can vary, but is typically medium to long conic, which can be flattened or slightly obovate. It is easily distinguished by fruit shape from 'Camarosa' (shortened and flattened conic), or 'Ventana' (medium symmetrical conic), and 'Palomar' (short symmetrical conic). External and internal fruit color for 'Benicia' is similar to that of 'Camarosa' and darker than that of 'Ventana' or 'Palomar' (Table 3). Achenes vary from yellow to dark red, and are even with the fruit surface or slightly indented.

'Benicia' has been tested under a variety of cultural regimes, and optimal performance is obtained when nursery treatments and nutritional programs similar to those of 'Camarosa', 'Ventana', and 'Palomar' are used. In general, plants of 'Benicia' are less vigorous than 'Camarosa' or 'Ventana' with very early season planting, but more vigorous than 'Palomar'. 'Benicia' retains excellent fruit quality in summer planting systems.

When treated with appropriate planting regimes, 'Benicia' has larger fruit and produces individual-plant yields greater than that of 'Camarosa'. It produces similar quantities of fruit per plant but develops larger and higher quality fruit than 'Ventana' (Table 5). Commercial appearance ratings have been equal to or better than those for all of the comparison cultivars, especially 'Camarosa'. Fruit from 'Benicia' is substantially firmer than fruit from 'Ventana', but similar in firmness to the other comparison cultivars. Subjectively, 'Benicia' has outstanding flavor. The fruit will be exceptional for both fresh market and processing, and will be useful for home gardening purposes.

TABLE 3

Foliar and fruit color characteristics for 'Benicia' and three comparison cultivars.

Color	Cultivar			
Character	'Camarosa'	'Ventana'	'Palomar'	'Benicia'
Leaf color (CIELAB) Adaxial L*				
mean	37.1	40.0	35.2	38.2
range	34.8-41.3	33.2-39.2	33.7-37.0	35.0-41.9

TABLE 3-continued

Foliar and fruit color characteristics for 'Benicia' and three comparison cultivars.

Color	Cultivar			
Character	'Camarosa'	'Ventana'	'Palomar'	'Benicia'
a*				
mean	−13.1	−10.8	−8.9	−13.1
range	−11.5--16.8	−9.1--13.3	−7.0--11.9	−7.3--17.3
b*				
mean	16.6	15.5	11.3	17.4
range	15.3-17.7	12.8-19.5	9.1-12.3	9.6-23.9
Munsell	5 GY 5/6	2.5 GY 4/3	5 GY 4/3	2.5 GY 4/3
Abaxial				
L*				
mean	51.5	48.5	49.0	51.2
range	48.8-53.4	45.6-50.2	36.3-50.6	47.9-54.5
a*				
mean	−14.7	−12.3	−12.2	−13.6
range	−13.7--16.5	−11.3--13.3	−11.2--13.3	−11.4--15.9
b*				
mean	22.3	20.7	18.6	20.5
range	19.6-26.2	17.6-22.7	14.7-22.2	17.5-24.5
Munsell	7.5 GY 8/7	7.5 GY 8/7	7.5 GY 9/4	2.5 GY 8/6
Fruit color (CIELAB)				
External				
L*				
mean	36.5	34.4	33.7	33.2
range	33.2-40.0	31.7-36.3	28.9-36.5	31.1-38.6

TABLE 3-continued

Foliar and fruit color characteristics for 'Benicia' and three comparison cultivars.

Color	Cultivar			
Character	'Camarosa'	'Ventana'	'Palomar'	'Benicia'
a*				
mean	33.3	33.6	34.4	33.3
range	28.6-39.3	25.9-38.7	24.3-39.7	31.5-36.6
b*				
mean	17.9	15.8	15.4	14.6
range	10.9-26.2	10.4-20.9	11.5-23.6	10.2-20.2
Munsell	7.5 R 4/11	7.5 R 5/13	5 R 3/7	2.5 R 7/10
Internal				
L*				
mean	53.7	52.4	48.4	49.5
range	44.2-60.9	48.6-57.8	42.1-54.9	42.0-58.5
a*				
mean	29.6	28.8	24.7	29.8
range	24.8-33.8	23.9-33.9	21.1-29.0	20.9-34.9
b*				
mean	26.3	23.7	20.2	23.9
range	21.4-30.1	18.1-27.5	18.2-23.8	19.2-26.7
Munsell	7.5 R 5/13	5 R 5/13	7.5 R 6/12	7.5 R 5/13
Achene color				
Munsell	2.5 Y 7/10	10 Y 8/11	7.5 R 8/12	5 R 3/7

TABLE 4

Flower and fruit characteristics for 'Benicia' and three comparison cultivars.

	Cultivar			
Character	'Camarosa'	'Ventana'	'Palomar'	'Benicia'
Petal number				
mean	5.7	6.2	5.7	6.6
range	5-8	5-8	5-6	6-8
Petal shape				
apex	truncate to slightly obtuse	truncate to slightly obtuse	truncate to slightly obtuse	truncate to slightly obtuse
base margin	attenuate entire	attenuate entire	attenuate entire	attenuate entire
Petal length (mm)				
mean	14.2	15.1	18.3	15.5
range	13-16	14-17	15-21	15-17
Petal width (mm)				
mean	14.8	16.9	18.2	16.7
range	13-16	16-19	15-22	15-18
Flower position (relative to foliage)	most even some exposed	even to exposed	even to exposed	even to exposed
Calyx diam. (mm)				
mean	48.1	45.2	57.5	49.6
range	40-52	42-52	51-61	45-53
Corolla diam. (mm)				
mean	37.4	39.7	44.4	39.6
range	32-44	38-42	42-47	39-41
Sepal length (mm)				
mean	20.6	19.7	23.5	20.1
range	16-25	19-22	19-28	19-21

TABLE 4-continued

Flower and fruit characteristics for 'Benicia' and three comparison cultivars.

	Cultivar			
Character	'Camarosa'	'Ventana'	'Palomar'	'Benicia'
Sepal width (mm)				
mean	11.5	9.8	11.7	11.5
range	10-13	8-11	10-13	11-12
Sepal color (Munsell)	7.5 GY 5/7	2.5 GY 8/9	7.5 GY 7/9	7.5 GY 7/9
Pedicel length (mm)				
mean	229	259	183	238
range	220-240	230-290	150-210	210-290
Pedicel diameter (mm)				
mean	3.1	4.3	3.7	4.2
range	2-4	3-5	3-5	3-5
Pedicel color	2.5 GY 6/8	2.5 GY 9/8	5 GY 8/8	2.5 GY 9/8
Fruit shape				
Fruit length (mm)				
mean	48.7	50.5	49.9	52.0
range	43-53	45-60	43-55	50-58
Fruit width (mm)				
mean	40.7	45.2	44.4	43.4
range	37-51	41-53	38-55	42-48
Length/ width				
ratio	1.21	1.12	1.13	1.20
range	1.0-1.4	1.0-1.2	1.0-1.3	1.0-1.4
subjective	Obovate-flat	Medium conic	Short conic	Medium-long conic
Primary/secondary fruit comparison				
size (subjective)	40-60%	50-60%	50-60%	50-60%
shape	similar shape, more conic	similar shape	similar shape	similar shape
Extent/size of hollow core	small-absent	Small	small-absent	small-absent
Calyx				
position	indented-neck	even-reflexed	even-indented	even-indented
size relative to fruit	equal or less than fruit diameter	equal or less than fruit diameter	equal or greater than fruit diameter	equal or greater than fruit diameter
Seed position	indented-extruded	even-extruded	even-indented	even-indented
Adherence of Calyx to Fruit	Weak	Intermediate	Weak	Weak

Flower and plant measurements obtained on Apr. 3, 2008; fruit measurements obtained between May 10-20, 2008.

TABLE 5

Performance of 'Benicia' and three comparison cultivars evaluated in Watsonville, CA between 2008-9.

Item	Yield (g/plant)	Appearance Score (5 = best)	Fruit Size (g/fruit)	Firmness
'Camarosa'	2,137	2.7	28.6	10.1
'Ventana'	2,616	3.0	33.3	9.8

TABLE 5-continued

Performance of 'Benicia' and three comparison cultivars evaluated in Watsonville, CA between 2008-9.

Item	Yield (g/plant)	Appearance Score (5 = best)	Fruit Size (g/fruit)	Firmness
'Palomar'	2,667	3.7	34.1	10.4
'Benicia'	2,566	3.6	33.7	10.0

All plants for these trials were harvested from a commercial nursery near Macdoel, CA between October 15-16, and transplanted after 6-7 days to supplemental storage. Fruit harvest was initiated in early April and continued through the last week of August. (52" 2-row beds, 17,300 plants/acre).

What is claimed is:

1. A new and distinct cultivar of strawberry plant having the characteristics substantially as described and illustrated herein.

* * * * *

FIG. 1

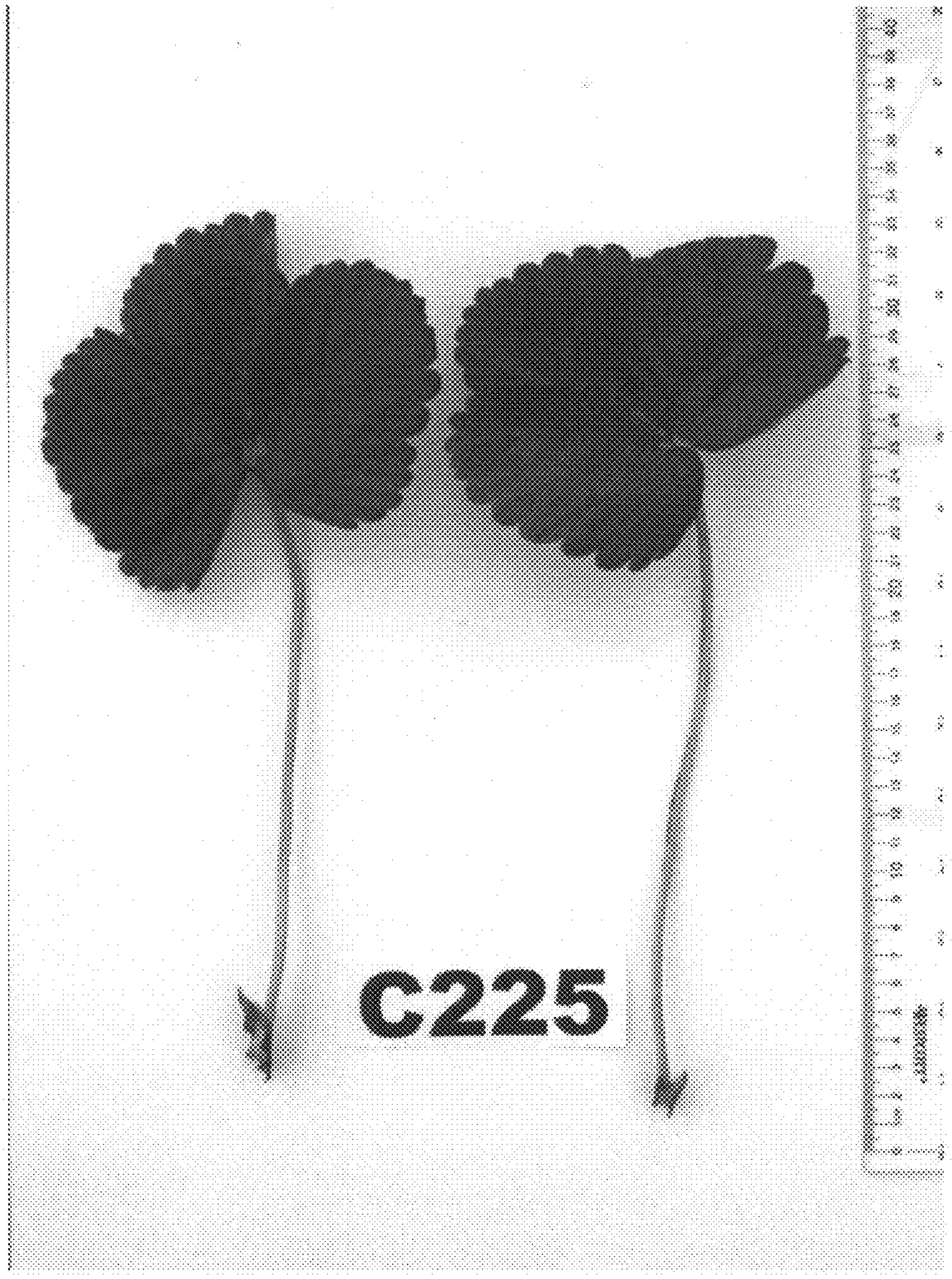

FIG. 2

FIG. 3

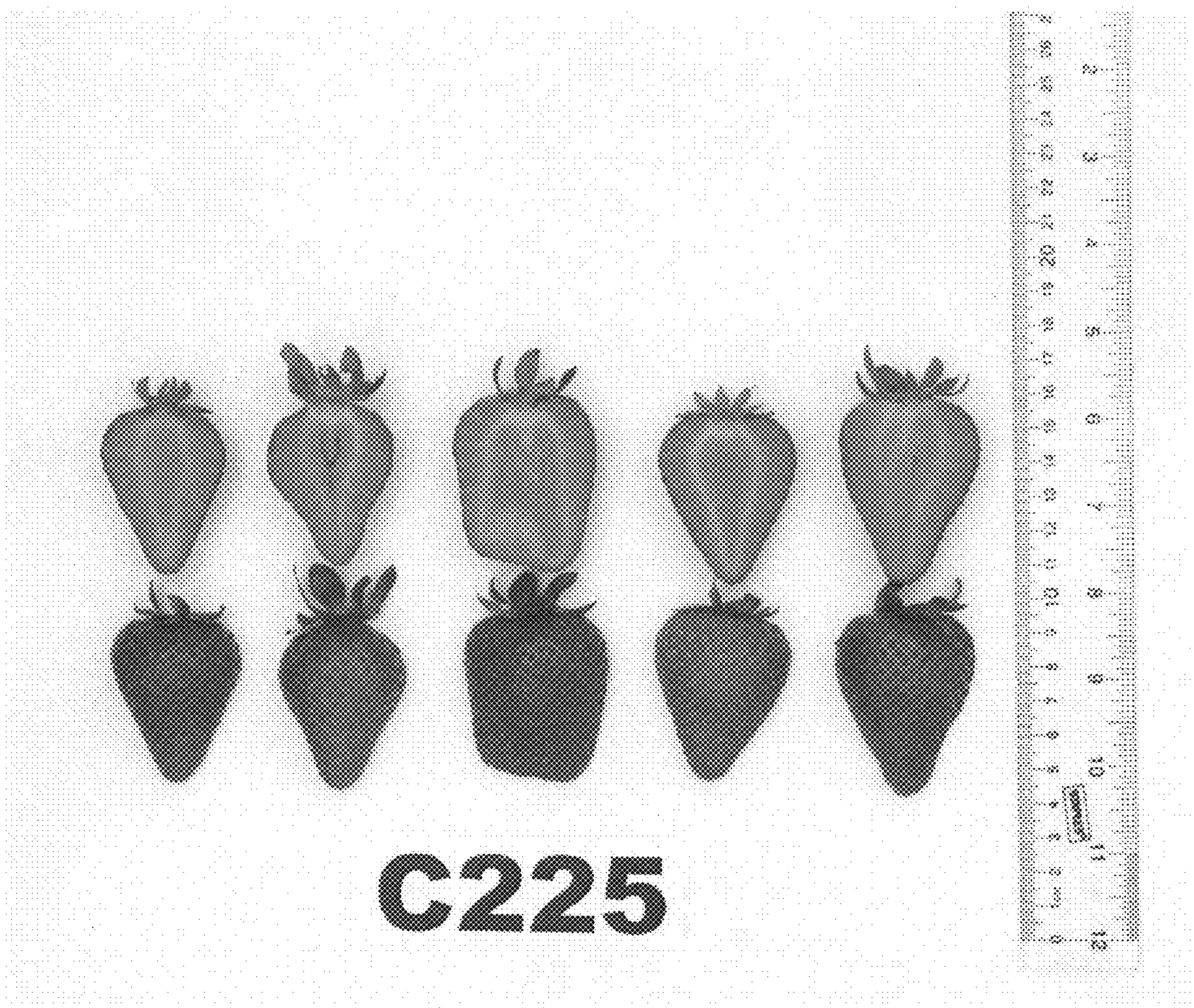

FIG. 4