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(12) **United States Plant Patent**
Moore

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(54) **RED RASPBERRY PLANT NAMED**
‘CASCADE HARVEST’

(50) Latin Name: *Rubus idaeus* L.
Varietal Denomination: **Cascade Harvest**

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patent is extended or adjusted under 35
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A01H 5/00 (2006.01)

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USPC **Plt./204**

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(57) **ABSTRACT**

This invention relates to a new and distinct variety of red
raspberry plant (*Rubus idaeus* L.) named ‘Cascade Harvest’
adapted to the raspberry production area of the Pacific North-
west. ‘Cascade Harvest’ is primarily characterized by suit-
ability for machine harvestability, tolerance to root rot, resis-
tance to raspberry bushy dwarf virus and large, conical fruit
that is longer than it is broad.

5 Drawing Sheets

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STATEMENT REGARDING
FEDERALLY-SPONSORED RESEARCH

This invention was made with government support under
Grant number 58-5358-9-440 awarded by the United States
Department of Agriculture. The government has certain
rights in the invention.

Latin name: Botanical/commercial classification: *Rubus*
idaeus L.

Varietal denomination: The varietal denomination of the
claimed raspberry variety is ‘Cascade Harvest’.

FIELD OF THE INVENTION

This invention concerns a new and distinct cultivar of red
raspberry plant having a varietal denomination of ‘Cascade
Harvest’ with a botanical name of *Rubus idaeus* L.

BACKGROUND OF THE INVENTION

Raspberries are an economically important crop in the
United States. Accordingly, there exists a need to develop new
raspberry varieties with improved characteristics, such as
disease resistance.

SUMMARY OF THE INVENTION

The present invention relates to a new and distinct florican
bearing (summer fruiting on second year canes) red raspberry
variety designated as ‘Cascade Harvest’. The variety is
botanically known as *Rubus idaeus* L. The new and distinct
variety of red raspberry originated from a hand-pollinated
cross of the patented variety ‘Cascade Dawn’ (U.S. Plant Pat.
No. 17,985) (used as the female parent) and Washington State
University selection ‘WSU 1145’ (unpatented) (used as the

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male parent), which cross was made in Year 1 at the Wash-
ington State University Puyallup Research and Extension
Center. Seeds were germinated in the winter of Year 1-Year 2
and the resulting seedlings planted in Year 2. ‘WSU 1507’,
which is presently designated as ‘Cascade Harvest’, was
selected in Year 4 and asexually propagated in tissue culture
using meristem cultures from axillary buds of primocanes.
This selection was planted in non-replicated plots with coop-
erating growers in Year 5, Year 6, Year 8 and Year 13. The
plantings were maintained by growers using typical commer-
cial methods and fruit machine harvested. The plantings were
subjectively evaluated weekly for adaptation to machine har-
vesting for two fruiting seasons. In all harvest seasons this
selection machine harvested well and was productive with
large fruit size. This selection was tested for tolerance to root
rot and resistance to raspberry bushy dwarf virus. Plants and
fruit of this new variety have remained true to type through
successive generations of asexual propagation. ‘WSU 1507’
is being named and released as ‘Cascade Harvest’ and is the
subject of this invention.

‘Cascade Harvest’ is adapted to raspberry production areas
of the Pacific Northwest. There have been no observed winter
damage in our tests, therefore winter hardiness is unknown.

The following traits have been repeatedly observed and are
determined to be unique characteristics of ‘Cascade Harvest,’
which in combination distinguish this raspberry plant as a
new and distinct variety:

1. Large fruit size
2. Conic fruit shape, with fruit longer than broad
3. Tolerance to root rot
4. Resistance to raspberry bushy dwarf virus
5. Suitability for machine harvesting

‘Cascade Harvest’ is distinguished from its parent, ‘Cas-
cade Dawn’, by having smaller drupelets, lighter fruit color
and suitability for machine harvesting.

'Cascade Harvest' is distinguished from its parent, 'WSU 1145', by having longer fruit, a greater fruit length to width ratio, superior fruit flavor and resistance to raspberry bushy dwarf virus.

'Cascade Harvest' is distinguished from the most commonly grown red raspberry in the Pacific Northwest, 'Meeker' (unpatented), by having more drupelets per fruit, smaller drupelets and smaller seed weights, earlier bud break, tolerance to root rot and resistance to raspberry bushy dwarf virus.

'Cascade Harvest' is distinguished from 'Willamette' (unpatented) by its larger, lighter colored fruit, greater fruit length to width ratio, later harvest season, greater yield, and tolerance to root rot.

BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying figures illustrate typical characteristics of the new variety 'Cascade Harvest' and are true to color as it is reasonably possible with color reproductions of this type. Color in the photographs may differ slightly from the color value cited in the detailed botanical description, which accurately describes the color of 'Cascade Harvest'. When objects could be accurately measured with an 8 mm diameter measuring opening (leaves, fruit and some canes), color was measured with a Minolta CR-400 Colorimeter, which measures color in L*, a*, b* color coordinates. Calibration was performed using a standard white plate supplied by the manufacturer. These L*, a*, b* coordinates were converted and are presented in Munsell color notation. For all other color measurements, color was compared with Royal Horticultural Society Colour Chart color plates and presented using Royal Horticultural Society Colour Chart designations.

FIG. 1 illustrates the plant of 'Cascade Harvest', showing the growth habit of the plant and display of the fruit on 27 June, Year 15.

FIG. 2 illustrates the primocane leaves of 'Cascade Harvest' on 21 July, Year 13. The upper, adaxial and lower, abaxial surfaces are shown on the right and left sides of the figure, respectively.

FIG. 3 illustrates the basal portion of a young primocane of 'Cascade Harvest' on 31 July, Year 15, showing the frequency and shape of the spines and spine base.

FIG. 4 illustrates the fruit and receptacle of 'Cascade Harvest' on 9 July, Year 15.

FIG. 5 illustrates the machine harvested fruit of 'Cascade Harvest' on 1 July, Year 16.

DETAILED BOTANICAL DESCRIPTION

'Cascade Harvest' has not been observed under all possible environmental conditions and as such the characteristics may vary in detail depending on weather conditions, day length, soil type and location. The description is based on observations taken during Year 15 (except as noted) in Puyallup, Wash.

A comparison of fruit of 'Cascade Harvest' with its parents is given in Table 1. Fruit of 'Cascade Harvest' were longer in length and had a greater length to width ratio than 'WSU 1145' and the drupelets of 'Cascade Harvest' were smaller than 'Cascade Dawn'.

TABLE 1

Fruit morphological measurements for raspberry fruit harvested in Year 15 at Puyallup, WA, comparing 'Cascade Harvest' with its parents ^z .			
	'Cascade Harvest'	'WSU 1145'	'Cascade Dawn'
Fruit			
Weight (g)	5.1 ab ^y	4.5 b	6.0 a
Length (mm)	26.6 a	20.8 b	27.5 a
Width (mm)	20.5 a	22.2 a	22.2 a
Length/width	1.30 a	0.94 b	1.24 a
Fruit opening			
Length (mm)	22.2 a	14.9 b	21.7 a
Width (mm)	8.8 a	10.0 a	9.7 a
Length/width	2.52 a	1.48 b	2.27 a
Drupelet			
Length (mm)	4.7 b	5.5 a	5.7 a
Width (mm)	3.6 a	4.0 a	4.2 a
Color			
Munsell Color	5.2R3.0/6.0	5.2R3.1/6.6	5.4R2.5/4.8

^zFive fruit of each cultivar were measured.

^yMeans within a row followed by the same letter are not significantly different at P < 0.05, by Tukey's Studentized Range Test (HSD).

The field performance of 'Cascade Harvest' is compared to 'Meeker' and 'Willamette' in Table 2. 'Cascade Harvest' had greater cumulative yield than 'Meeker' and 'Willamette', but was not statistically significant. Fruit weight averaged over the season of 'Cascade Harvest' was greater than 'Meeker' and 'Willamette' but not statistically different from 'Willamette' in Year 15. The harvest season for 'Cascade Harvest' was later than 'Willamette' and slightly earlier than 'Meeker'.

TABLE 2

Year 14 and Year 15 harvest data from Year 12 planted raspberries, Puyallup, WA.				
		Cascade Harvest'	'Meeker'	'Willamette'
Yield (t/a)	Year 15	8.0 a ^y	8.9 a	6.9 a
	Year 14	5.2 a	3.3 a	4.0 a
Fruit weight (g)	Total	13.1 a	12.2 a	10.8 a
	Year 15	3.7 a	3.1 b	3.5 ab
Fruit rot (%)	Year 14	3.8 a	2.8 b	2.9 b
	Year 15	3.8 a	4.5 a	4.9 a
Fruit firmness (g)	Year 14	11.8 a	7.0 a	7.2 a
	Year 15	70 b	71 b	83 a
Dates for percentage cumulative yield	Year 14	90 a	65 a	72 a
	Year 15	5% Jul. 2 a	Jul. 4 a	Jun. 25 b
Length of harvest season (days)	Year 15	50% Jul. 14 a	Jul. 16 a	Jul. 5 b
	Year 14	95% Jul. 28 a	Jul. 30 a	Jul. 20 b
Length of harvest season (days)	Year 14	5% Jul. 6 ab	Jul. 8 a	Jul. 4 b
	Year 15	50% Jul. 18 a	Jul. 20 a	Jul. 15 a
Length of harvest season (days)	Year 15	95% Aug. 1 a	Aug. 2 a	Jul. 27 b
	Year 14	26 a	27 a	25 a
Length of harvest season (days)	Year 14	26 a	25 a	23 a

^yMeans based on three replications of three plants.

^zMeans within a row followed by the same letter are not significantly different at P < 0.05, by Tukey's Studentized Range Test (HSD).

Table 3 provides information on the plant and fruit characteristics of the new variety 'Cascade Harvest'. The table compares 'Cascade Harvest' with 'Meeker', the most widely planted raspberry variety in Washington.

TABLE 3

Plant and fruit characteristics of 'Cascade Harvest' and 'Meeker'		
	'Cascade Harvest'	'Meeker'
General (31 Jul., Year 15)		
Plant height (m)	1.57	1.65
Plant width (m)	1.27	1.32
Self-fruitfulness	self	self
Time of bud break	7 Feb., Year 15	22 Feb., Year 15
Time of primocane emergence	5 Apr., Year 15	5 Apr., Year 15
Primocanes		
Dormant (20 Feb., Year 15)		
Length (m)	2.72	3.11
Cane diameter at ground (mm)	15.2	11.6
Cane diameter at 1.5 m from ground (mm)	10.7	9.0
Number of nodes	63	66
Internode length at 1.5 m from ground (mm)	44	41
Cane color (Munsell)	5.1YR 4.0/5.2	8.2YR 4.3/3.4
Immature canes (31 Jul., Year 15)		
Number of canes/hill	17	22
Length (m)	1.73	2.27
Cane diameter at ground (mm)	12.9	11.9
Cane diameter at 1.2 m from ground (mm)	7.3	9.9
Number of nodes	37.3	46.7
Internode length at 1.2 m from ground (mm)	62	64
Immature cane color (RHS)		
Predominant Color	145C Yellow Green	145B Yellow Green
Secondary Color	60C Red Purple	60A Red Purple
Primocane fruiting	none	none
Pubescence on canes	absent	slight
Floricanes (31 Jul., Year 15)		
Diameter at base (mm)	14.7	13.5
Diameter at 1.2 m from ground (mm)	9.4	9.8
Internode length at 1.2 m from ground (mm)	44	61
Spines (31 Jul., Year 15)		
Density at base of young shoots	dense	dense
Density at 1.2 m from ground	few or none	few
Color (RHS)	187A Greyed Purple	59B Red Purple
Length of spine	2.0 mm	not measured
Length of spine base	2.1 mm	not measured
Width of spine base	1.7 mm	not measured
Color of spine base (RHS)	187A Greyed Purple	not measured
Leaves (1 Aug., Year 15)		
Primocane leaves		
Number of leaflets	5	5
Petiole length (mm)	65	57
Rachis length (mm)	39	36
Stipule length (mm)	8.1	8.7
Leaflet margins	doubly serrated	doubly serrated
Leaflet overlap	occasionally overlap	commonly overlap
Terminal leaflet		
Length (mm)	105	105
Width (mm)	69	70
Length/width	1.52	1.50
Petiolule length (mm)	21	12
Leaflet tip	cuspidate	cuspidate
Leaflet base	rounded to cordate	cunate
Distal Lateral Leaflet		
Length(mm)	90	78
Width (mm)	46	37
Length/width	1.96	2.11

TABLE 3-continued

Plant and fruit characteristics of 'Cascade Harvest' and 'Meeker'		
	'Cascade Harvest'	'Meeker'
5		
Petiolule length (mm)	0	0
Leaflet tip	cuspidate	cuspidate
Leaflet base	obtuse to oblique	oblique
10		
Length (mm)	100	94
Width (mm)	60	54
Length/width	1.67	1.74
Petiolule length (mm)	3.3	2.8
Leaflet tip	cuspidate	cuspidate
Leaflet base	obtuse to oblique	obtuse to oblique
15		
Color (Munsell)		
Upper surface	5.9GY 3.1/3.5	6.2GY 3.4/4.0
Lower surface	5.1GY 5.1/2.0	5.4GY 5.7/1.6
20		
Number of leaflets	3	3
Petiole length (mm)	43	44
Leaflet margins	doubly serrated	doubly serrated
25		
Terminal leaflet		
Length (mm)	87	95
Width (mm)	68	49
Length/width	1.28	1.94
30		
Basal lateral leaflet		
Length (mm)	77	80
Width (mm)	48	43
Length/width	1.60	1.86
35		
Color (Munsell)		
Upper surface of leaflet	5.7GY 3.4/4.1	6.1GY 3.4/3.7
Lower surface of leaflet	4.7GY 5.5/1.9	5.3GY 5.2/2.2
40		
Flower and fruiting lateral (3 Jul., Year 15)		
Number of petals	5	5
Number of sepals	5	5
Petal color	white 155D	white 155D
Number of anthers	87	76
Flower diameter petal-petal (mm)	10.3	9.3
Flower diameter sepal-sepal (mm)	20.7	20.0
Flower fragrance	none noted	none noted
Pedicel length (mm)	18.0	18.0
Lateral length (cm)	69	64
Number of nodes/lateral	16.7	17.0
45		
Number of fruiting nodes/lateral	9.0	11.3
Number of fruit/lateral	24.0	33.0
Number of fruit/fruiting node	2.7	2.9
50		
Fruit measurements (July, Year 16)		
Fruit weight (g)	3.61	3.65
Drupelet number	122	91
Drupelet weight (mg)	30	40
Individual seed weight (mg)	1.37	1.76

55 Machine harvested fruit was collected on five dates during the Year 8 harvest season from a test planting established in Year 6 at Burlington, Wash. (Table 4). 'Cascade Harvest' had slightly less total anthocyanins than 'Meeker' and was similar to 'Meeker' for soluble solids, pH and titratable acidity. 'Cascade Harvest' had less anthocyanins and less titratable acidity than 'Willamette'.

TABLE 4

Anthocyanin content, soluble solids, pH and titratable acidity of raspberry fruit machine harvested in Year 8 at Burlington, WA ^z			
Cultivar	'Cascade Harvest'	'Meeker'	'Wil- lamette'
Anthocyanin content (mg/g fruit) ^y	52.8 c ^w	60.8 b	91.6 a
Soluble solids (%)	8.1 ab	9.3 a	7.3 b
pH	3.27 ab	3.35 a	3.08 b
Titratable acidity ^x	0.93 b	0.99 b	1.33 a

^zFruit samples of approximately 300 g collected on each harvest date.

Raspberry plots were machine harvested on 20 and 28 Jun. and 6, 11 and 18 Jul., Year 8.

^yTotal anthocyanins determined spectrophotometrically from acidified ethanol extracts and expressed as cyanidin 3-galactoside.

^xAcidity expressed as % citric acid.

^wMeans within a row followed by the same letter are not significantly different at $P < 0.05$, by Tukey's Studentized Range Test (HSD).

'Cascade Harvest' was planted in non-replicated plots with cooperating growers in Year 5, Year 6, Year 8 and Year 13. The plantings were maintained by growers using typical commercial methods and the fruit machine harvested. The plantings were subjectively evaluated for adaptation to machine harvesting weekly during the harvest season for two fruiting seasons. In all harvest seasons 'Cascade Harvest' machine harvested well and was productive with large fruit size. Based on these evaluations, fruit of 'Cascade Harvest' is suitable for machine harvesting.

'Cascade Harvest' was evaluated for susceptibility to root rot in plots in Puyallup, Washington, in plantings established in Year 8. The presence of *Phytophthora fragariae* var *rubi* ([W. F. Wilcox & J. M. Duncan] W. A. Man in't Veld,) in these root rot plots was verified via PCR. Four plants of each clone were planted in this area. Plants were subjectively rated for vigor in the fall of each year from 0 to 5, with 0 being dead and 5 a healthy and vigorous plant. In the fall of Year 11, 'Cascade Harvest' had a rating of 5.0 for all four plants, while 'Wil-lamette' averaged 1.75 and 'Meeker' averaged 0.5. Based on this trial, 'Cascade Harvest' has a very good level of root rot tolerance.

'Cascade Harvest' tested virus negative after graft inoculation using leaflets from a field grown plant naturally infected with raspberry bushy dwarf virus. Plants of 'Cascade Harvest' that have been exposed to virus infected pollen in the field for over five years have continued to test negative for raspberry bushy dwarf virus. Based on this testing, 'Cascade Harvest' appears to be resistant to raspberry bushy dwarf virus common in Puyallup, Wash.

The intended market use of fruit from the 'Cascade Harvest' plant is as fresh or frozen.

What is claimed:

1. A new and distinct variety of raspberry plant designated as 'Cascade Harvest', as illustrated and described herein.

* * * * *



Figure 1.

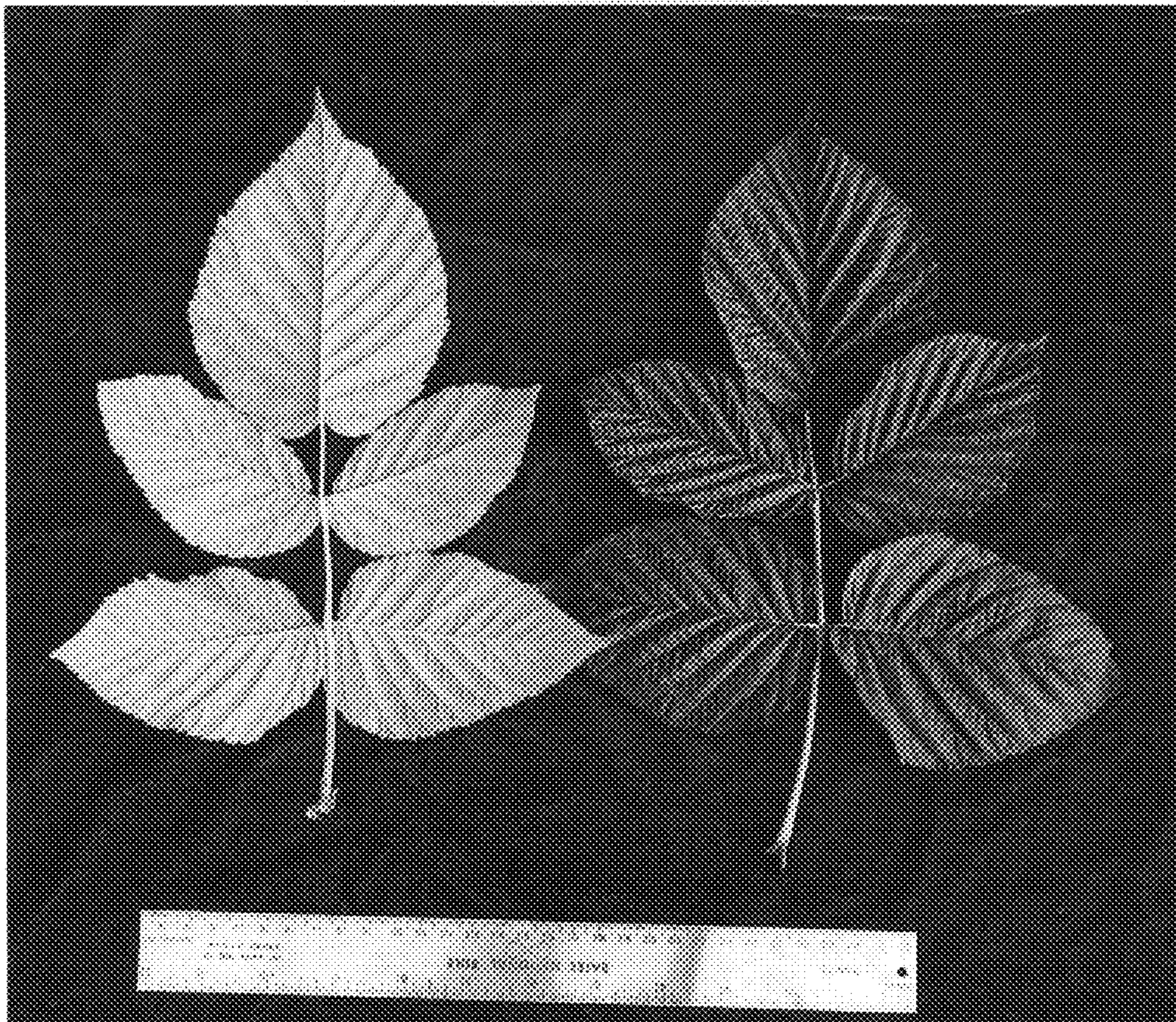


Figure 2



Figure 3

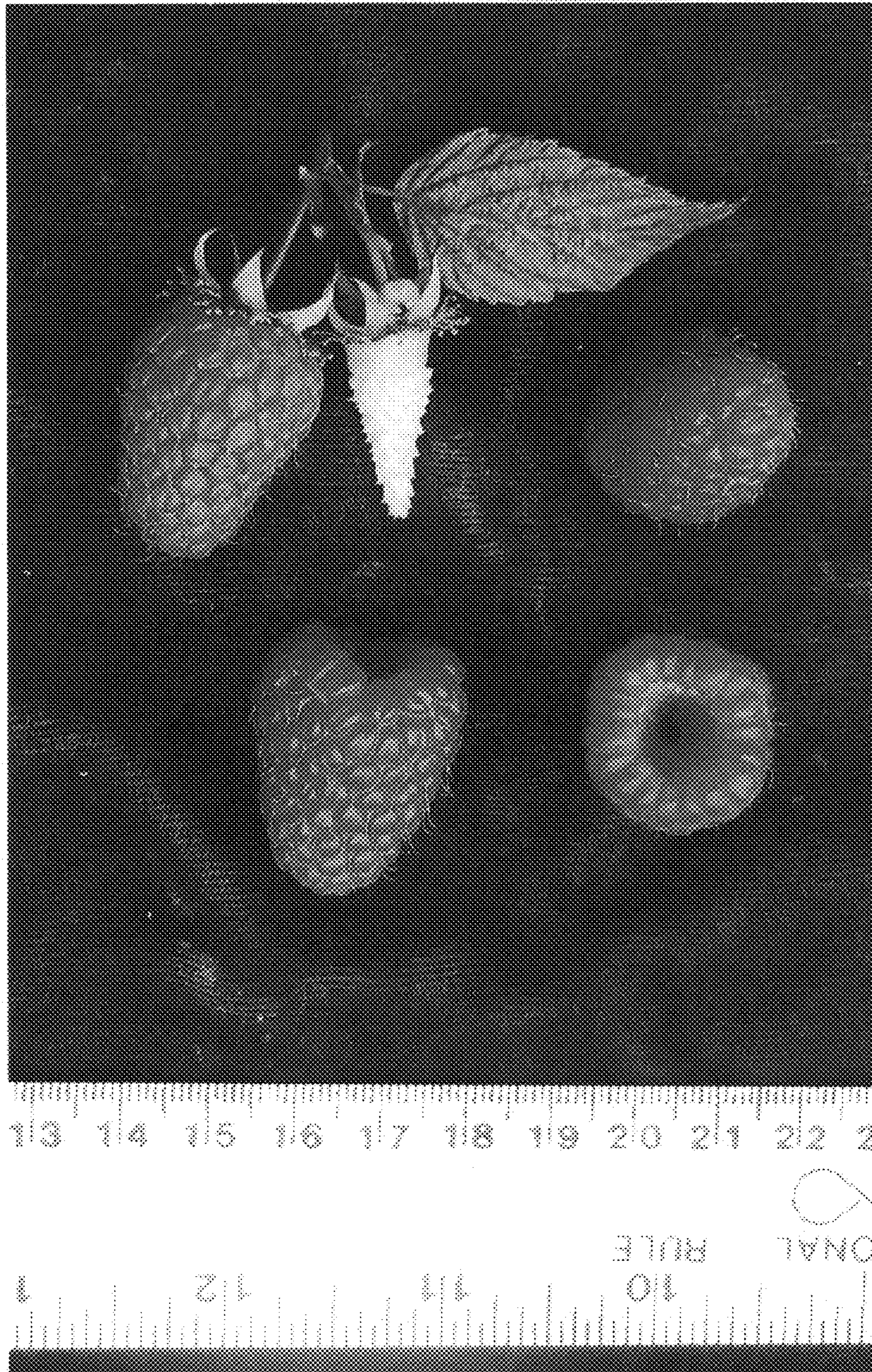


Figure 4



Figure 5