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McGranahan et al.

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(54) **WALNUT TREE NAMED 'IVANHOE'**

(50) Latin Name: ***Juglans regia***
Varietal Denomination: **Ivanhoe**

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A01H 5/00 (2006.01)

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(58) **Field of Classification Search** Plt./154
See application file for complete search history.

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(57) **ABSTRACT**

A new and distinct variety of walnut tree denominated 'Ivanhoe' is described. This new variety, 'Ivanhoe', comes into bearing young, with an excellent yield. 'Ivanhoe' forms large-sized walnuts that possess light-colored kernels with little size variation in a given harvest. 'Ivanhoe' bears fruit terminally and laterally and yields a crop that can be harvested approximately 4 weeks before 'Chandler' (U.S. Plant Pat. No. 4,388). 'Ivanhoe' is also protogynous, bearing female flowers before male flowers.

9 Drawing Sheets

Latin name: Botanical/commercial classification: (*Juglans regia*)/new English walnut tree cultivar.

Varietal denomination: The varietal denomination of the claimed walnut is 'Ivanhoe'.

BACKGROUND OF INVENTION

The present invention relates to a new and distinct cultivar of walnut tree (*Juglans regia*) that has been denominated as 'Ivanhoe' and more particularly to a walnut tree that has a harvest date approximately 4 weeks earlier than the walnut tree cultivar 'Chandler' (U.S. Plant Pat. No. 4,388), and that further produces a walnut that is large in size with very light colored kernels.

It has long been recognized as desirable to provide walnut trees bearing large crops that are ripe for commercial harvesting and shipment early in the harvest season. The tree of the present cultivar, 'Ivanhoe' produces a nut that has a quality similar to the highest quality cultivar 'Chandler' (U.S. Plant Pat. No. 4,388), however the new cultivar is ready for harvest approximately 4 weeks before 'Chandler,' about the same time as the reference cultivar 'Payne' (old cultivar; not patented).

The new *Juglans regia* walnut tree of the present invention was created at Davis, Calif. in 1995 by a controlled pollination between the cultivar 'Chico' and 'UC67-13' (neither patented). The pedigree is illustrated (FIG. **1**).

Seeds from the cross were planted and the resulting 27 trees were carefully observed along with other trees in the walnut breeding program. When they began to bear nuts, data were collected annually on leafing date; first, peak, and last female flower bloom; first, peak; and last male bloom; blight severity; and yield (Table 1). Nuts were sampled and cracked, and data were collected on shell appearance, shell thickness, shell integrity, shell strength, nut weight, kernel weight, percent kernel, ease of kernel removal, kernel color, and percent kernel shrivel (Table 1). A single tree was selected from among progeny of this controlled cross based on its superior

attributes. This selection was originally designated 'UC95-11-14' and is now designated as the 'Ivanhoe' cultivar, after the town in California where it performed in a superior manner. Compared to 'Ivanhoe', the parent 'UC67-13' is protandrous, has larger nuts, a slightly later harvesting date, and is susceptible to pistillate flower abscission; the parent 'Chico' has smaller nuts than 'Ivanhoe' with a more difficult to extract kernel.

The new 'Ivanhoe' cultivar of the present invention has been asexually reproduced by grafting at Davis, Calif. on 'Paradox' rootstock. The distinctive characteristics of the new cultivar have been found to be stable and are transmitted to the new trees when asexually propagated.

SUMMARY OF THE INVENTION

It was found that the walnut cultivar 'Ivanhoe' of the present invention exhibits the following combination of characteristics:

a) comes into bearing young, with an excellent yield;
b) forms large-sized walnuts that possess light-colored kernels with little size variation in a given harvest;
c) bears fruit terminally and laterally;
d) yields a crop that can be harvested approximately 4 weeks before 'Chandler' (U.S. Plant Pat. No. 4,388); and
e) is protogynous, bearing female flowers before male flowers.

BRIEF DESCRIPTION OF THE TABLE

Table 1 shows tree and nut evaluations for both parents and the most common walnut cultivar 'Chandler'.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** shows pedigree of the 'Ivanhoe' walnut.
FIG. **2** shows a tree of 'Ivanhoe' walnut at 7 years.
FIG. **3** shows bark of 'Ivanhoe' walnut.
FIG. **4** shows adaxial view of leaf of 'Ivanhoe' walnut.
FIG. **5** shows abaxial view of leaf of 'Ivanhoe' walnut.
FIG. **6** shows female flowers of 'Ivanhoe' walnut.
FIG. **7** shows catkins (male flowers) of 'Ivanhoe' walnut.
FIG. **8** shows hulls of 'Ivanhoe' walnut.
FIG. **9** shows nut and kernel of 'Ivanhoe' walnut.

BOTANICAL DESCRIPTION OF THE PLANT

The description is based on an ungrafted walnut tree on its own roots and trees subsequently grafted on 'Paradox' rootstock growing in an orchard in Davis, Calif., in selection blocks in Chico, Calif., and Parlier, Calif.; as well as in grower trials near Yuba City, Calif., near Madison, Calif., and near Ivanhoe, Calif. The first data were collected on the own rooted tree from 1999 at age 3 years, to 2005, age 9. Data from 2004 to 2008 were collected from grafted trees.

The Munsell Book of Color is used in the identification of color. Also, common color terms are to be accorded their ordinary dictionary significance.

Botanical classification: *Juglans regia.*

Female parent.—'UC67-13'.

Male parent.—'Chico'. The pedigree is shown (FIG. **1**).

Plant: The growth habit of the plant is illustrated in FIG. **2**. This 7 year old tree is approximately 5.2 m in height with a canopy diameter of 6.4 meters. The trunk diameter at 1.2 meters above the ground is approximately 10 cm. The silvery grey bark is typical of *Juglans regia.* The young bark is brown (2.9GY 2.3/3.6) and the older bark is grey (5Y 7.5/2) with raised lighter lenticels (2.5Y 8/2) (FIG. **3**). Lenticels are round to oval in shape, 1-10 mm×1-3 mm in size. 'Ivanhoe' has a vigor similar to 'Chandler'.

Foliage: The dark green foliage is illustrated in FIG. **4** and FIG. **5** and is typical of *Juglans regia.* Leafing out date between 1999 and 2008 has occurred on March 19th on the average. For comparative purposes the 'Chandler' cultivar leaf-out is April 3rd. The typical leaf coloration is green (adaxial 5GY 4/4, abaxial 5GY 8/2) The leaves are pinnately compound with 7-9 leaflets. The full leaf length is approximately 40 cm and width is 29 cm. Leaflets are broadly elliptical and entire. The terminal leaflet averages 16 cm in length and 8 cm in width. The middle leaflets average 15 cm in length and 6 cm in width and the proximal leaflets average 6 cm in length and 3 cm in width. The rachis averages 23 cm in length and 2-4 mm in diameter. Petiole length is 8 cm and is 5GY 7/8 in color.

Inflorescence: The tree is precocious with excellent yield being noted at age 3 years. Male flowers (catkins) were not present until age 5 years. This delay in male maturity is typical of *Juglans regia.* From 1999 to 2008, average first female bloom occurred on March 23, peak bloom on March 28, and last bloom on April 3. From 2001 to 2008, average male flowering (pollen shedding) began April 1, peaked on April 8, and terminated April 15. In this protogynous tree, pollen shedding does not completely cover pistillate bloom suggesting that a pollenizer would be needed for maximum yield in isolated areas. 'Sexton' (U.S. Plant Pat. No. 16,496P3), 'Payne' (unpatented), and 'Serr' (unpatented) would be satisfactory pollenizers. The female flowers are typical of *Juglans regia* (FIG. **6**) with 2-3 flowers per inflorescence borne on 1 cm spike at both terminal and lateral positions on current season's growth. Approximately 100% of the lateral buds contain inflorescences making yields much greater than trees that only bear flowers terminally. A typical female flower is approximately 5 to 7 mm at anthesis and floral organs are typical of *Juglans regia.* The flowers appear vase-shaped when the 2 plumose stigmatic arms are curved outward. There are no petals. The female flowers are green (5GY 7/8) in color. The flower fragrance is typical of *Juglans regia* and is not noticeably different than the foliage fragrance. The male flowers (FIG. **7**) are borne on catkins, between 7 and 13 cm in length and 1.5 cm in diameter, and are green in color (5GY 7/8).

Walnuts: The new cultivar commonly harvests about 4 weeks before 'Chandler' and about 3 days before 'Payne'. The new cultivar has excellent yields of mostly large-sized walnuts. The hull is globose, 4.8 cm×4.5 cm, 3 mm thick and 5GY 6/4 in color with numerous lighter speckles (FIG. **8**). The nut is broadly elliptical, very smooth, tan (7.5YR 8/2) and measures approximately 40 mm in length and 35 mm in width (FIG. **9**). The shell is 1.5 mm thick, relatively strong and well sealed and the kernel is easy to remove. The kernel weight averages 7.7 g and makes up 57% of the total nut weight of 13.5 g. Kernel color is considered excellent and scores mostly in the light to extra light categories of the USDA Standards for Grades of Shelled Walnuts as determined by using the standard Walnut Color Chart for kernels published by the Dried Fruit Association of California. In addition kernels of 'Ivanhoe' scored 53 on the Relative Light Index used by Diamond Foods of Stockton, Calif. It

is typical of commercial walnuts in terms of flavor and firmness, the latter varying according to the percent moisture after drying.

Disease susceptibility: Blight caused by *Xanthomonas campestris* pv. *juglandis* can be a problem on this early leafing cultivar. It may also be susceptible to sunburn if the nuts are in exposed locations. Pistillate flower abscission has not been a problem.

Usage: This new cultivar of the present invention provides an early season walnut with high quality light-colored kernels that can be used cracked or in-shell.

TABLE 1

Performance of 'Ivanhoe' compared to its parents and 'Chandler'

	Variety			
Trait[1]	Ivanhoe[2]	UC67-13[3]	Chico[4]	Chandler[5]
Leafing date	19 Mar.	23 Mar.	22 Mar.	3 Apr.
Pollen shed date				
First	1 Apr.	30 Mar.	6 Apr.	4 Apr.
Peak	8 Apr.	6 Apr.	12 Apr.	11 Apr.
Last	15 Apr.	19 Apr.	20 Apr.	20 Apr.
Female bloom date				
First	23 Mar.	6-Apr.	25 Mar.	15 Apr.
Peak	28 Mar.	11 Apr.	31 Mar.	22 Apr.
Last	3 Apr.	19 Apr.	9 Apr.	29 Apr.
Harvest date	13 Sep.	19 Sep.	17 Sep.	7 Oct.
Catkin abundance	5	6	5	5
Female abundance	7	6	6	6
Flowers/inflorescence	2	2	2	2
Percent lateral bud fruitfulness	100	96	100	95
Yield	7	6	6	6
Shell				
Texture	4	5	4	5
Color	4	5	5	4
Seal	4	5	5	5
Strength	5	5	6	4
Integrity	7	7	7	7
Thickness	1.5	1.5	1.5	1.3
Packing tissue	5	5	6	5
Kernel				
Inshell weight	13.5	15.2	11.4	13.5
Kernel weight	7.7	8.4	5.3	6.7
Percent kernel	57	56	47	50
Fill	5	5	6	5
Plumpness	5	5	5	4
Ease of removal	4	4	6	4
Percent blank	1	2	2	2
Percent extra light	38	21	9	49
Percent light	51	73	76	45

TABLE 1-continued

Performance of 'Ivanhoe' compared to its parents and 'Chandler'

Percent light amber	10	4	12	5
Percent amber	1	2	3	0
Percent tip shrivel	1	0	0	28
Percent veins	10	45	19	18

KEY FOR TABLE 1

Tree evaluation	
Catkin abundance	Male flower abundance: 3 low; 5 intermediate; 7 high
Female abundance	Female flower abundance: 3 low; 5 intermediate; 7 high
Lateral fruitfulness %	Percent of lateral buds with female flowers
Yield	Yield: 3 low; 5 intermediate; 7 high
Nut and kernel traits	
Texture	Shell texture: 3 smooth; 5 medium; 7 rough
Color	Shell color: 3 light; 5 medium; 7 dark
Seal	Shell seal: 3 weak; 5 intermediate; 7 strong
Strength	Shell strength: 3 weak; 5 intermediate; 7 strong
Integrity	Shell integrity: 3 substantial area of shell missing; 5 small area of missing shell; 6 stem end hole; 7 complete shell
Thickness	Shell thickness at mid-cheek in mm
Packing tissue	Inner lining: 3 thin; 5 medium; 7 thick
Inshell weight	g
Kernel weight	g
Kernel %	Kernel wt/inshell wt × 100
Fill	Kernel fill: 3 poor; 5 moderate; 7 well
Plumpness	Kernel plumpness: 3 thin; 5 moderate; 7 plump
Ease of removal	Ease of removal of kernel halves: 3 easy; 5 moderate; 7 difficult
Blanks %	Percent of nuts without a kernel
Extra light %	Percent of kernels in extra light category (DFA)
Light %	Percent of kernels in light category (DFA)
Light amber %	Percent of kernels in light amber category (DFA)
Amber %	Percent of kernels in amber category (DFA)
Tip shrivel %	Percent of kernels with tip shrivel like Chandler
Veins %	Percent of kernels with conspicuous veins

[1]See attached 2 for description of scores
[2]Data 2000-2008
[3]Data 1988-2002
[4]Data 1988-2003
[5]Data 1988-2008
DFA Dried Fruit Association of CA

What we claim is:

1. A new and distinct variety of walnut tree designated 'Ivanhoe' as shown and described herein.

* * * * *

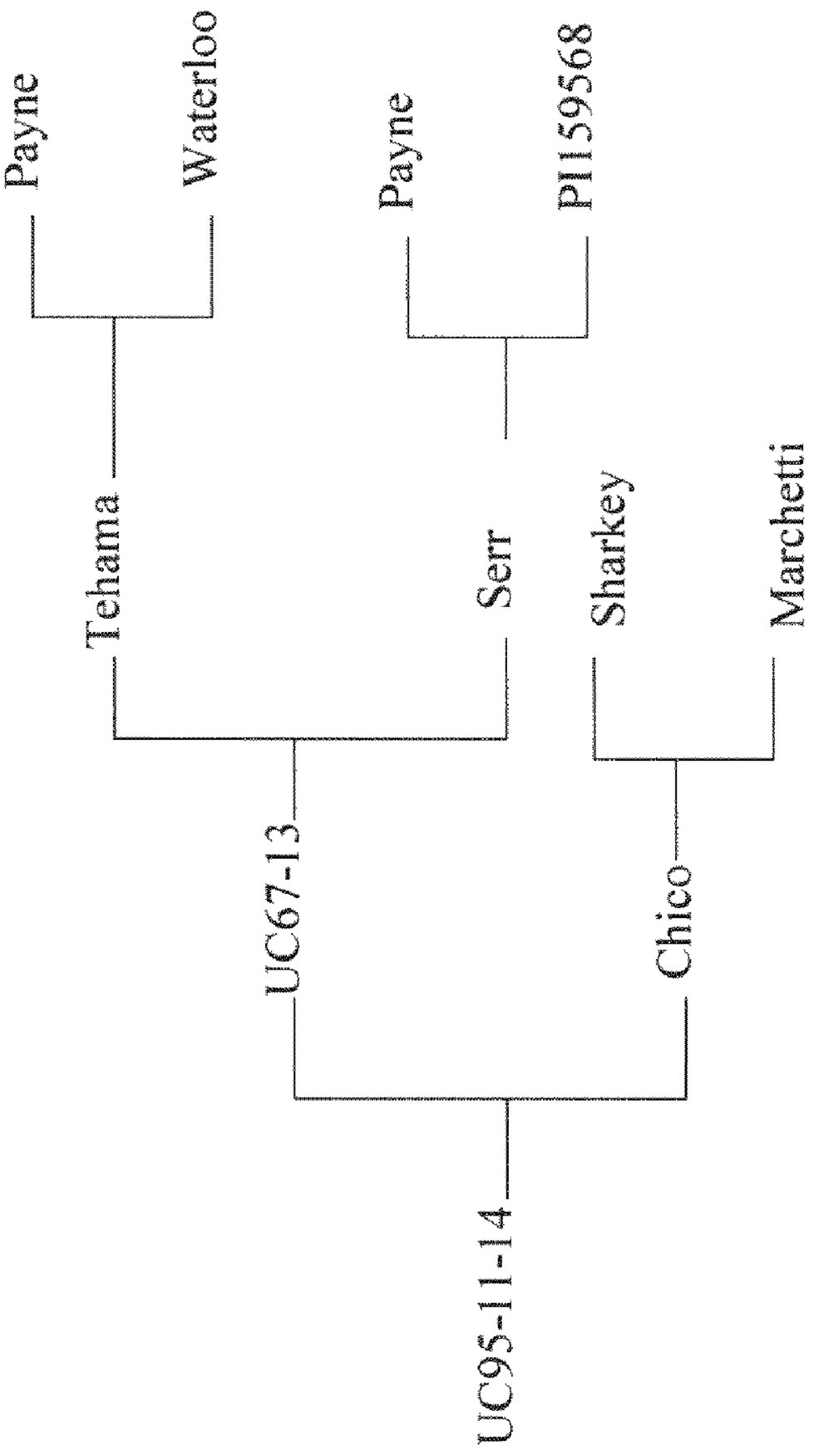
Payne
Waterloo
Payne
PI159568
Tehama
Serr
Sharkey
Marchetti
UC67-13
Chico
UC95-11-14

FIG. 1

FIG. 2

FIG. 3

FIG. 4

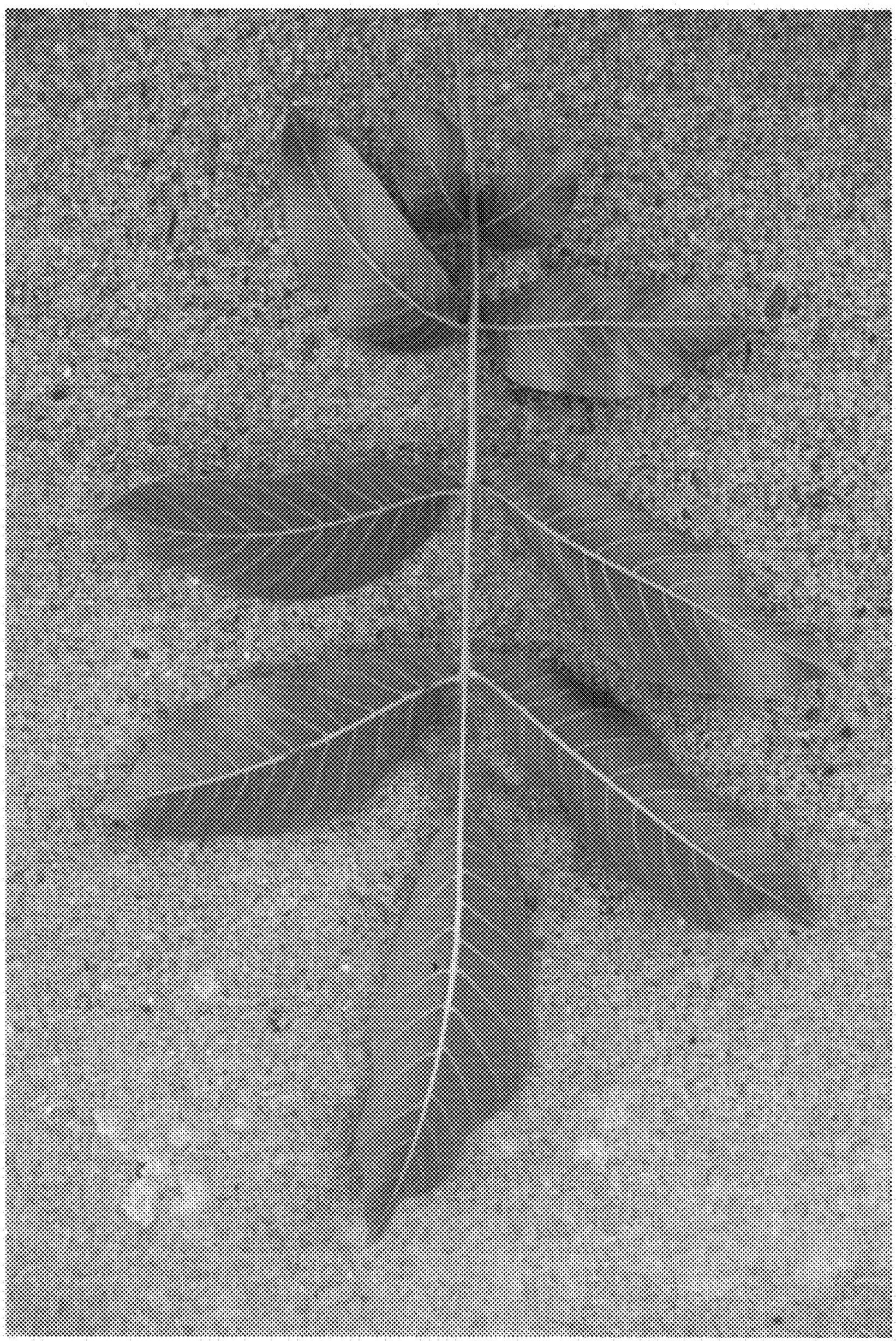

FIG. 5

FIG. 6

FIG. 7

FIG. 8

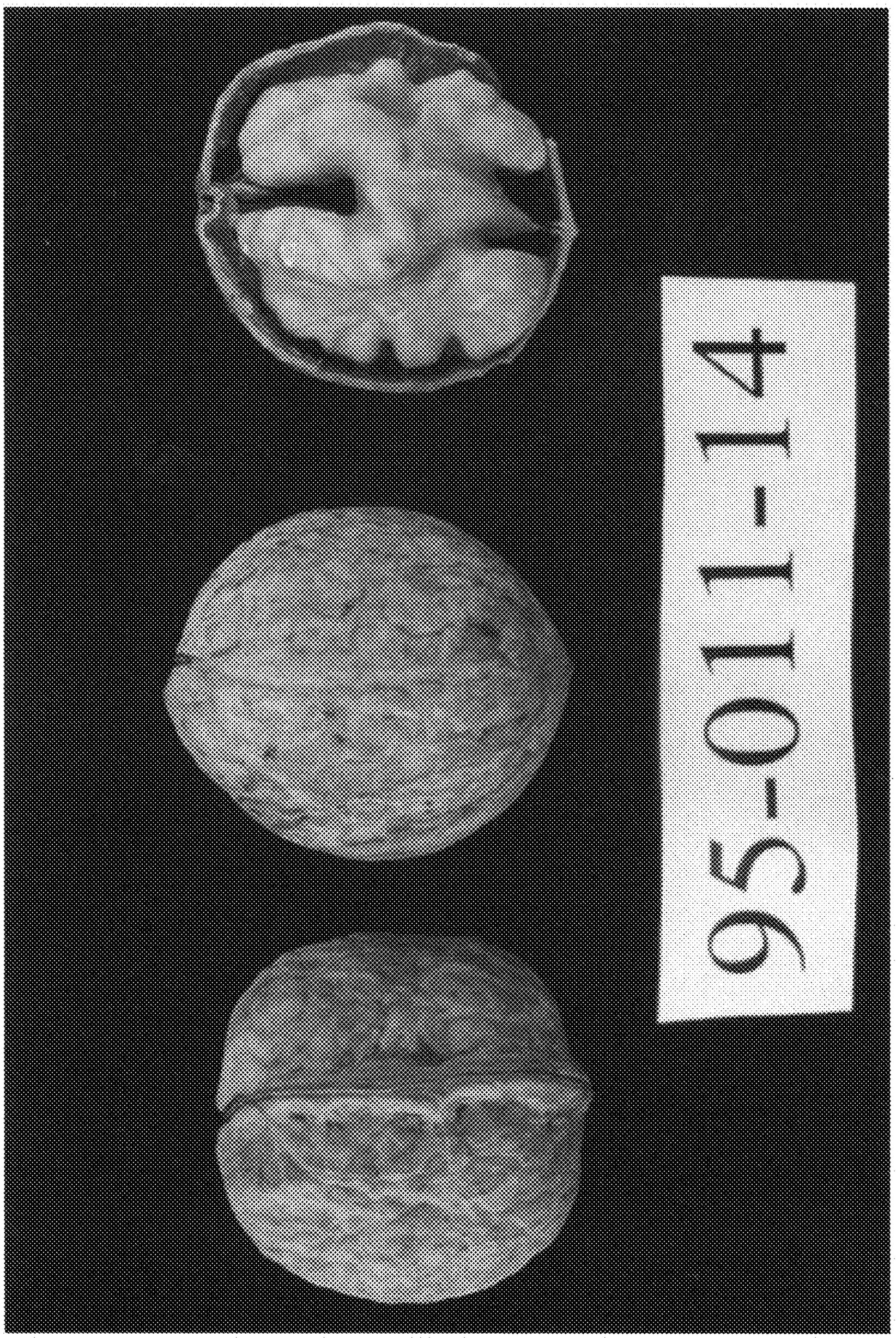

FIG. 9