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

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(54) **MAHALEB ROOTSTOCK NAMED ‘UCMH 56’**

(50) Latin Name: *Prunus mahaleb*
Varietal Denomination: **UCMH 56**

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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 0 days.

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(51) **Int. Cl.**⁷ **A01H 5/00**

(52) **U.S. Cl.** **Plt./180**

(58) **Field of Search** Plt./183, 180

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(57) **ABSTRACT**

A new and distinct cultivar of *Prunus mahaleb* is provided. The new cultivar is particularly well suited for serving as an understock during cherry production. A number of advantages are provided when compared to the standard Mahaleb rootstock. The cultivar is readily amenable to vegetative propagation (e.g., by the use of softwood cuttings), and exhibits improved resistance to *Phytophthora* spp. When used with a ‘Bing’ cherry scion, increased yields and yield efficiency have been observed without reduced fruit size. Improved precocity in bearing is displayed when compared to the standard Mahaleb rootstock. The new cultivar when grown without use as an understock forms a smaller tree than the ‘UCMH 55’ cultivar and the standard Mahaleb rootstock. Few suckers are produced.

5 Drawing Sheets

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Botanical/commercial classification: *Prunus mahaleb*/Mahaleb Rootstock.
Varietal denomination: cv. ‘UCMH 56’.

SUMMARY OF THE INVENTION

Mahaleb rootstocks (i.e., *Prunus mahaleb* rootstocks) are widely used during both sweet and sour cherry production throughout the world. It has been the common practice to form such rootstock plants from seed following the random outcrossing of parent plants. Accordingly, cherry production encountered when using such plants as an understock has tended to be somewhat variable due to differences in the genotype of the understock. Such variation often has led to reduced field performance on some cherry trees on a random and unpredictable basis. Mahaleb rootstocks in the past have generally been found to be incapable of vegetative propagation on a reliable basis, such as through the use of softwood and hardwood cuttings. Also, such rootstocks in the past have been susceptible to root and crown fungal diseases generally known as *Phytophthora* spp.

SUMMARY OF THE NEW CULTIVAR

It was an object of my research to provide *Prunus mahaleb* rootstocks that possess characteristics that overcome shortcomings of the Mahaleb rootstock presently being used during cherry production. More specifically, it was my goal to provide cherry rootstocks that could be vegetatively propagated in an expeditious and reliable manner so that cherry growers can eliminate crop variation that can be traced to lack of uniformity in the rootstock. Also, it was a goal of my research to provide new Mahaleb rootstocks that inherently display needed resistance to disease and thereby make possible a satisfactory cherry crop on a

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more consistent basis combined with a reduction in the need to replant because of tree loss that is traceable to disease.

The original tree of the new *Prunus mahaleb* cultivar of the present invention was discovered through detailed evaluation and selection while growing in a cultivated area at the Experimental Orchards at the University of California located at Davis, Calif., U.S.A. The exact parentage of the new cultivar is unknown. The seeds used to form the planting where the discovery took place came from a random collection of wild *Prunus mahaleb* germplasm that had been collected from around the world. The large number of seedlings present in the planting were carefully studied and evaluated and a single plant possessing the combination of characteristics of the new cultivar of the present invention was selected and was preserved. Had this plant not been discovered and preserved, it would have been lost to mankind.

Other *Prunus mahaleb* cultivars resulting from the same research are ‘UCMH 55’ (U.S. Plant patent application Ser. No. 10/028,771, filed concurrently herewith), and ‘UCMH 59’ (U.S. Plant patent application Ser. No. 10/029,284, filed concurrently herewith).

It was found that the new *Prunus mahaleb* cultivar of the present invention exhibits the following combination of characteristics:

- (a) readily is amenable to vegetative propagation,
- (b) performs well as an understock for cherry production,
- (c) forms a smaller tree than the ‘UCMH 55’ cultivar and the standard Mahaleb rootstock,
- (d) displays improved resistance to *Phytophthora* spp.
- (e) makes possible increased ‘Bing’ sweet cherry scion yield and yield efficiency when compared to the standard Mahaleb rootstock without reduced fruit size,

(f) demonstrates improved precocity in bearing when compared to the standard Mahaleb rootstock, and

(g) produces few suckers.

In view of the above combination of characteristics, the new cultivar of the present invention well meets the needs of cherry producers for use as an improved rootstock. Cherry scion characteristics are no longer influenced by variation in the Mahaleb rootstock resulting from the random outcrossing of parental plants. Also, the disease resistance made possible by the new cultivar is a major advantage for cherry producers.

The new cultivar of the present invention has been repeatedly reproduced through the use of softwood, semi-hardwood, and hardwood cuttings at Davis, Calif., U.S.A. Such propagation has confirmed that the characteristics of the new cultivar are stable and are firmly fixed and are transmitted to subsequent generations on a reliable basis.

The new cultivar of the present invention initially was designated 'UC MAHALEB 156-5', and subsequently has been named 'UCMH 56'.

BRIEF DESCRIPTION OF THE PHOTOGRAPHS

The accompanying photographs show specimens of the plant and plant parts, and also provide DNA information concerning the new cultivar of the present invention. Color is shown as nearly true as is possible to make the same in color illustrations of this character. The trees of the new cultivar were grown at the Experimental Orchards of the University of California located at Davis, Calif., U.S.A.

FIG. 1 shows a tree of approximately 5 to 7 years of age during December. The tree is a mother plant that was being used to make propagules for additional testing and evaluation. Most of the leaves had dropped by the end of the preceding October.

FIG. 2 shows a specimen of a current season's shoot with leaves collected during mid-October. Such shoot was suitable for use to make a hardwood or semi-hardwood cutting.

FIG. 3 shows specimens of typical branches with buds of the new cultivar during the winter. Dimensions in inches and centimeters are included at the left.

FIG. 4 shows specimens of typical stones of the new cultivar during the winter. Dimensions in centimeters and inches are included.

FIG. 5 shows the DNA fingerprint of the new cultivar of the present invention as well as that of the 'UCMH 55' and 'UCMH 59' cultivars for comparative purposes. Three microsatellite markers were used during the DNA determinations (i.e., PMS30, PMS40 and PMS15). Data with respect to the plants of the new cultivar of the present invention is designated "156-5". Data with respect to the plants of the 'UCMH 55' cultivar is designated "155-1", and data with respect to the 'UCMH 59' cultivar is designated "159-5".

FIG. 6 shows typical inflorescences of the new cultivar.

The primer Sequences (SEQ ID NOS: 1-6) used in this determination are as follows:

PMS 30	Forward	CTG TCG AAA TGC CTA TGC
	Reverse	ATG AAT GCT GTG TAC ATG AGGC
PMS 40	Forward	TCA CTT TCG TCC ATT TTC CC
	Reverse	TCA TTT TGG TCT TTG AGC TCG
PMS 15	Forward	TCC GCT TCT CTG TGA GTG TG
	Reverse	CGA TAG TTT CCT TCC CAG ACC.

When preparing the DNA fingerprints, a total of six leaf samples were randomly collected from two different but

replicate trees. Accordingly, each genotype was sampled and replicated twice. The two samples are distinguished during the presentation of data by the final digit shown in FIG. 5 (i.e., by "-1" or by "-2"). DNA was extracted using Dneasy Plant Kit from Qiagene, Inc. (Valencia, Calif., U.S.A.) following the manufacturer's protocol. The extracted DNA was purified by adding $\frac{1}{10}$ volume 3M sodium acetate and 2 volumes 100 percent ethanol and subsequent storage at -20° C. for an hour. The samples were centrifuged at 13,000 rpm for 15 minutes and the pellets were washed two times with 70 percent ethanol. The pellets were air dried and resolved in 50 μ l TE buffer. Quantification of DNA was performed with ethidium bromide agarose gel plates. PCR was carried out under the following conditions: 100-150 ng of template DNA, 250 nM of each primer, 200 μ M of dNTPs, 0.5 U of Taq Polymerase, and 1.5 mM of $MgCl_2$. The reaction was run for 45 cycles (denaturing at 94° C. for 1 minute, annealing at 60° C. for 1 minute, with a two minute extension at 72° C.), followed by a single extension at 72° C. for 60 minutes. The amplification products were detected on 5.5 percent polyacrylamide gels using a Li-Cor IR² 4200 DNA sequencer (Li-Cor, Nebr., U.S.A.). The three microsatellite markers clearly distinguished the three cultivars. Both repeats of each rootstock showed identical fingerprints. The marker PMS30 produced two bands for rootstock 'UCHM 55' at 132 bp (base pair) and 159 bp, two bands for 'UCMH 56' at 132 bp and 168 bp, and one band for 'UCMH 59' at 142 bp. Marker PMS40 produced two bands for 'UCMH 55' at 92 bp and 111 bp, and one band for 'UCMH 56' at 92 bp, and two bands for 'UCMH 59' at 92 bp and 129 bp. Marker PMS15 produced two bands for 'UCMH 55' at 118 bp and 128 bp, two bands for 'UCMH 56' at 112 bp and 123 bp, and two bands for 'UCMH 59' at 105 bp and 115 bp.

FIG. 6 shows a typical inflorescence.

DETAILED DESCRIPTION

The following is a detailed description of the new cultivar. The tree was grown at the Experimental Orchards of the University of California at Davis, Calif., U.S.A. Color designations are presented with reference to the "Dictionary of Color" by Maerz and Paul, First Edition (1930).

Tree:

Size.—Smaller than the 'UCMH 55' and 'UCMH 59' cultivars. An eight year-old tree of the 'UCMH 56' cultivar that has undergone some pruning commonly will display a height of approximately 4 meters and a width of approximately 3 meters. Trunk girth at 30 cm above the soil line commonly will possess a cross-sectional area of approximately 400 cm².

Growth.—Highly branched, the upper canopy is very upright, and two-year-old wood in the lower canopy is pendulous.

Wood.—The wood is fine to intermediate and commonly ranges from less than 1 cm to 3 cm in diameter.

Bark.—Possesses a rough raised surface and an Iron Grey (24 A 2) coloration.

Branches:

Shoot growth form.—Straight in the upper canopy and pendulous in the lower canopy with one leaf per node in a spiral pattern around the shoot, and laterals arise at approximately 90 degrees from the point of origin on the main scaffold and are branched at approximately 75 to 90 degrees.

Size.—Both current and previous season wood is fine to intermediate and varies in diameter less than 1 cm.

Spurs.—Commonly 1 to 4 spurs are present per 85 cm of previous season shoot that measure approximately 1 to 5 cm in length. The coloration is Chickadee gray (47 A 1) underlaid with Burnt umber (15 A 12).

Internode length.—On mixed shoots approximately 1 to 4 cm in length and increasing in length basipetally, and approximately 2 mm to 2.5 cm in length between reproductive nodes.

Shoot bark.—Smooth in texture, and the coloration is Burnt umber (15 A 12), and Arabian brown (14 A 11) to Madura (14 I 8).

Main scaffold bark.—Platinum (45 A 3) in coloration with an underlay of Rubient (55 L 8).

Lenticels.—Prominent, densely distributed, and under magnification are raised. The size on subsidiary shoots commonly ranges from 2 to 5 mm in length with approximately 15 lenticels being present per square inch. The coloration is Parchment (12 B 3).

Axillary buds.—Vegetative buds are borne in the axils of every leaf along the shoot, and are single. The buds are imbricate and sessile. The bud tips are pointed and the bud pose is adpressed on dormant new wood. The bud support is small.

Leaves:

Bearing.—Simple, spiraled around the shoot, and petiolate.

Pose.—Curved outward and downward, and often curve under slightly at the apex.

Length.—Approximately 3 to 5 cm in length and approximately 2.5 to 3.5 cm in width on the upper canopy and on the lower canopy.

Width.—Approximately 2.5 to 3.5 cm on the upper canopy and on the lower canopy.

Form.—Oval-elliptic to oval with an acuminate tip and a truncate base on the upper canopy and on the lower canopy

Margins.—Crenate and glandular between rounded teeth.

Surfaces.—Glabrous on the dorsal and ventral surfaces with short stiff hairs along the midrib of the ventral surface that are visible with magnification.

Petiole.—Commonly with glands that are dark Russet brown (14 I 12) in coloration at the leaf-petiole juncture, approximately 1 to 1.5 cm in length, and Russet Green (20 K 1) in coloration. Such glands commonly are less than 1 mm in length and less than 0.5 mm in width.

Venation.—Pinnate, with the midrib and other venation being Russet green (20 K 1) in coloration.

Color.—21 L 6 (Parrot Green) to 21 L 9 on the upper surface and Piquant green (20 K 6) on the under surface.

Leaf drop.—On Dec. 11, 2000 there was approximately 1 to 5 percent leaf fall.

Flowers:

Bloom time.—Full bloom on Apr. 4, 2002.

Floral buds.—Approximately 2 mm in length and approximately 1 mm in width, and Burmese ruby (7 H 6) in coloration.

Type.—Primarily inflorescent in panicles, but occasionally found as singles.

Form.—The paniculate inflorescence has 5 to 10 flowers and commonly 3 to 5 flowers with a peduncle including the rachis of approximately 1 to 1.5 cm in

length and a pedicel of approximately 0.7 to 1.2 cm in length. The peduncles and pedicels are Cossak green (23 L 11) in coloration.

Bearing.—Directly on previous season's laterals in mixed shoots of 50 to 90 cm in length on average without spurs. Inflorescences are single at each node and whorled along the upper one-half of one year-old wood up to the apex of the previous season's growth. Five to ten lateral shoot buds are proximal to the reproductive portion and commonly 12 to 15 floral buds are present within the reproductive portion. Axillary buds on one year-old wood break after the floral buds and grow out to vegetative laterals during fruit development. The current season portion of the shoot is vegetative and few of the axillary buds on this portion break in the current year.

Pollination required.—Any Mahaleb rootstock that is producing flowers which overlap with the bloom period.

Color.—White.

Petal number.—Five.

Petal size.—Approximately 7 mm in length and approximately 6 mm in width at the widest point.

Carpel.—Single.

Pistil.—Approximately 6 to 7 mm in length with the stigma and style being Marguerite Yellow (10 C 1) in coloration.

Stamen.—Commonly approximately 10 to 14 per flower, and approximately 5 to 7 mm in length.

Anthers.—Sulphur Yellow (10 J 1) in coloration when indehiscent.

Filaments.—Marguerite Yellow (10 C 1) in coloration.

Pollen.—Sulphur Yellow (10 J 1) in coloration.

Scent.—Mildly fragrant and similar to that of almond flowers.

Fruit:

Chilling requirement.—Approximately 750 to 1,000 hours less than or equal to 45° F.

Bearing.—Drupe.

Fruit shape.—Substantially round.

Fruit size.—Approximately 0.8 to 1.2 cm in diameter.

Maturity date.—Late June to early July.

Skin color.—Dark purple-mahogany (56 A 12) to near black (48 A 12).

Fresh color.—Dark purple-mahogany (56 A 12) to near black (48 A 12).

Flesh firmness.—Soft when fully ripe and juicy.

Fruit juice color.—Dark purple-mahogany (56 A 12) to near black (48 A 12).

Cracking susceptibility.—None observed during observations to date.

Eating quality.—Astringent and bitter taste renders unsuitable for eating.

Fruit drop.—Susceptibility is low (approximately 10 to 40 percent).

Fruit stalk.—Short, and approximately 0.7 to 1.5 cm when pedicel alone is measured. Very small bracts may persist and leaves commonly are absent on the stalk.

Leaves on fruit stalk.—None, however, very small bracts occasionally persist that are Paradise green (22 L 11) in coloration.

Susceptibility to pre-harvest fruit drop.—Low (approximately 10 to 40 percent).

Stone shape.—Substantially spherical (as illustrated in FIG. 4).

Stone size.—Very small and approximately 3 to 4 mm in diameter.

Seed color.—Oyster white (10 B 1).

Disease resistance: The new cultivar has shown over a 90 percent survival rate in field trials at sites that are heavily infested with *Phytophthora* spp. and stem pitting virus. At the same sites, approximately 50 percent of the standard Mahaleb plants died.

Vegetative propagation: The new cultivar asexually reproduces well through the rooting of softwood and hardwood cuttings. The use of softwood cuttings is preferred.

Use as a scion rootstock: Field testing has been conducted using a scion of 'Bing' cherry following budding. Full bloom appeared slightly earlier than when utilizing a standard Mahaleb rootstock. This may lead to earlier ripening fruit or suggest a lower chill requirement for the rootstock compared to standard Mahaleb. The new culti-

var has been found to yield a slightly smaller scion tree than that formed on the standard Mahaleb rootstock; however, the resulting tree nevertheless is considered to be vigorous. Precocious flowering and cropping are facilitated when using the new cultivar as a rootstock. For instance, flower and fruit production can begin easily in the 4th or 5th growing season with the flowers opening earlier in the season. 'Bing' cherry yield was approximately 1.6 times that of comparable trees where the rootstock was standard Mahaleb. There also was a higher yield efficiency when using the new cultivar as a rootstock. Accordingly, the new variety has been found to provide greater productivity per unit of land occupied. The fruit size has been found to be comparable to that formed with standard Mahaleb rootstock even with the higher yield per tree. To date the new cultivar produced low numbers of root and crown suckers.

 SEQUENCE LISTING

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<210> SEQ ID NO 1
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 <212> TYPE: DNA
 <213> ORGANISM: Artificial Sequence
 <220> FEATURE:
 <223> OTHER INFORMATION: PMS 30 forward primer

<400> SEQUENCE: 1

ctgtcgaaat gcctatgc 18

<210> SEQ ID NO 2
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 <212> TYPE: DNA
 <213> ORGANISM: Artificial Sequence
 <220> FEATURE:
 <223> OTHER INFORMATION: PMS 30 reverse primer

<400> SEQUENCE: 2

atgaatgctg tgtacatgag gc 22

<210> SEQ ID NO 3
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 <212> TYPE: DNA
 <213> ORGANISM: Artificial Sequence
 <220> FEATURE:
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<400> SEQUENCE: 3

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<210> SEQ ID NO 4
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 <212> TYPE: DNA
 <213> ORGANISM: Artificial Sequence
 <220> FEATURE:
 <223> OTHER INFORMATION: PMS 40 reverse primer

<400> SEQUENCE: 4

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<210> SEQ ID NO 5
 <211> LENGTH: 20
 <212> TYPE: DNA

-continued

<213> ORGANISM: Artificial Sequence
 <220> FEATURE:
 <223> OTHER INFORMATION: PMS 15 forward primer

<400> SEQUENCE: 5

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20

<210> SEQ ID NO 6
 <211> LENGTH: 21
 <212> TYPE: DNA
 <213> ORGANISM: Artificial Sequence
 <220> FEATURE:
 <223> OTHER INFORMATION: PMS 15 reverse primer

<400> SEQUENCE: 6

cgatagtttc cttcccagac c

21

I claim:

1. A new and distinct cultivar of *Prunus mahaleb* plant that exhibits the following combination of characteristics:

- (a) readily is amenable to vegetative propagation,
- (b) performs well as an understock for cherry production,
- (c) forms a smaller tree than the 'UCMH 55' cultivar and the standard Mahaleb rootstock,
- (d) displays improved resistance to *Phytophthora* spp.,

- (e) makes possible increased 'Bing' sweet cherry scion yield and yield efficiency without reduced fruit size when compared to the standard Mahaleb rootstock,
 - (f) demonstrates improved precocity in bearing when compared to the standard Mahaleb rootstock, and
 - (g) produces few suckers;
- substantially as illustrated and described.

* * * * *



FIG. 1

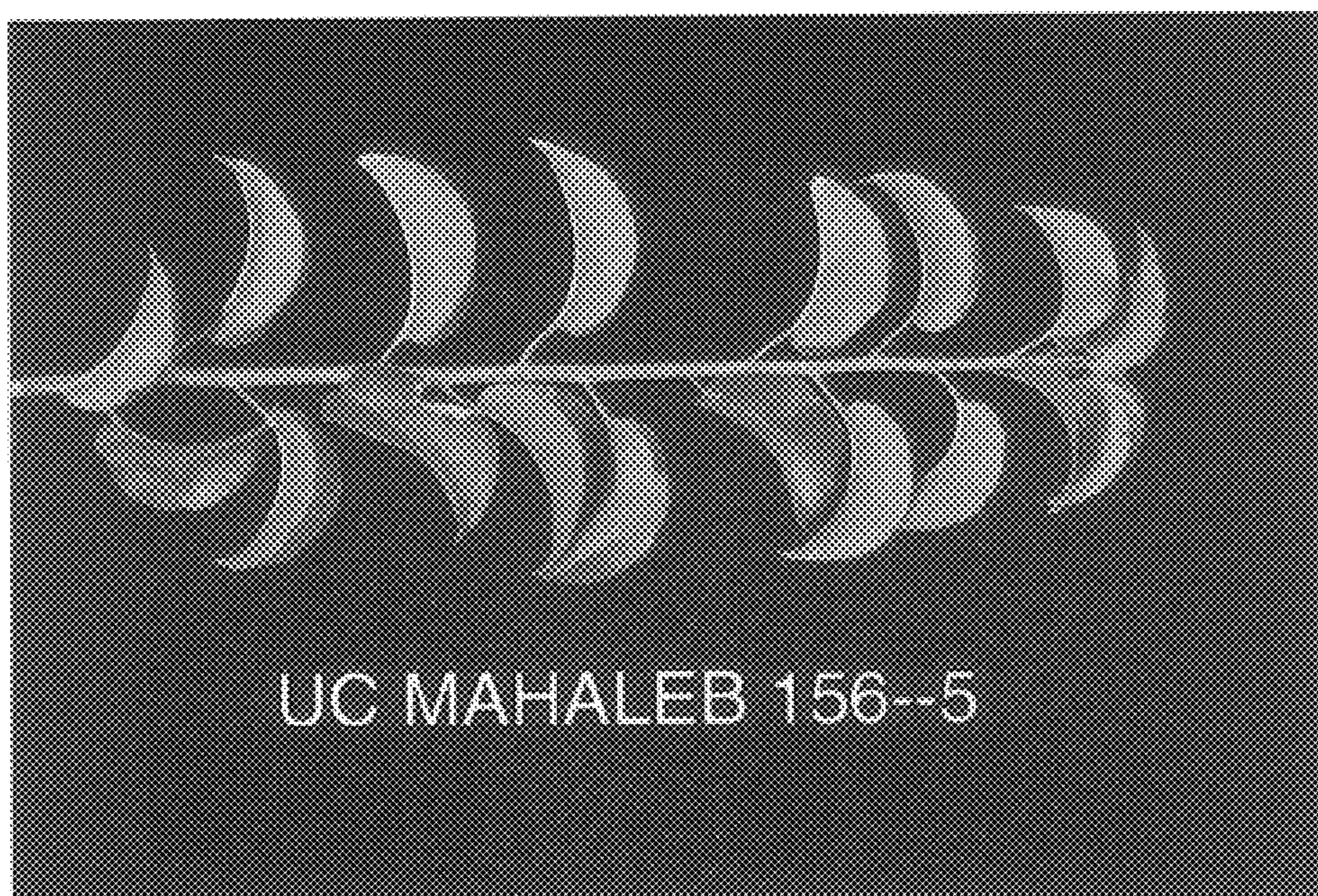


FIG. 2

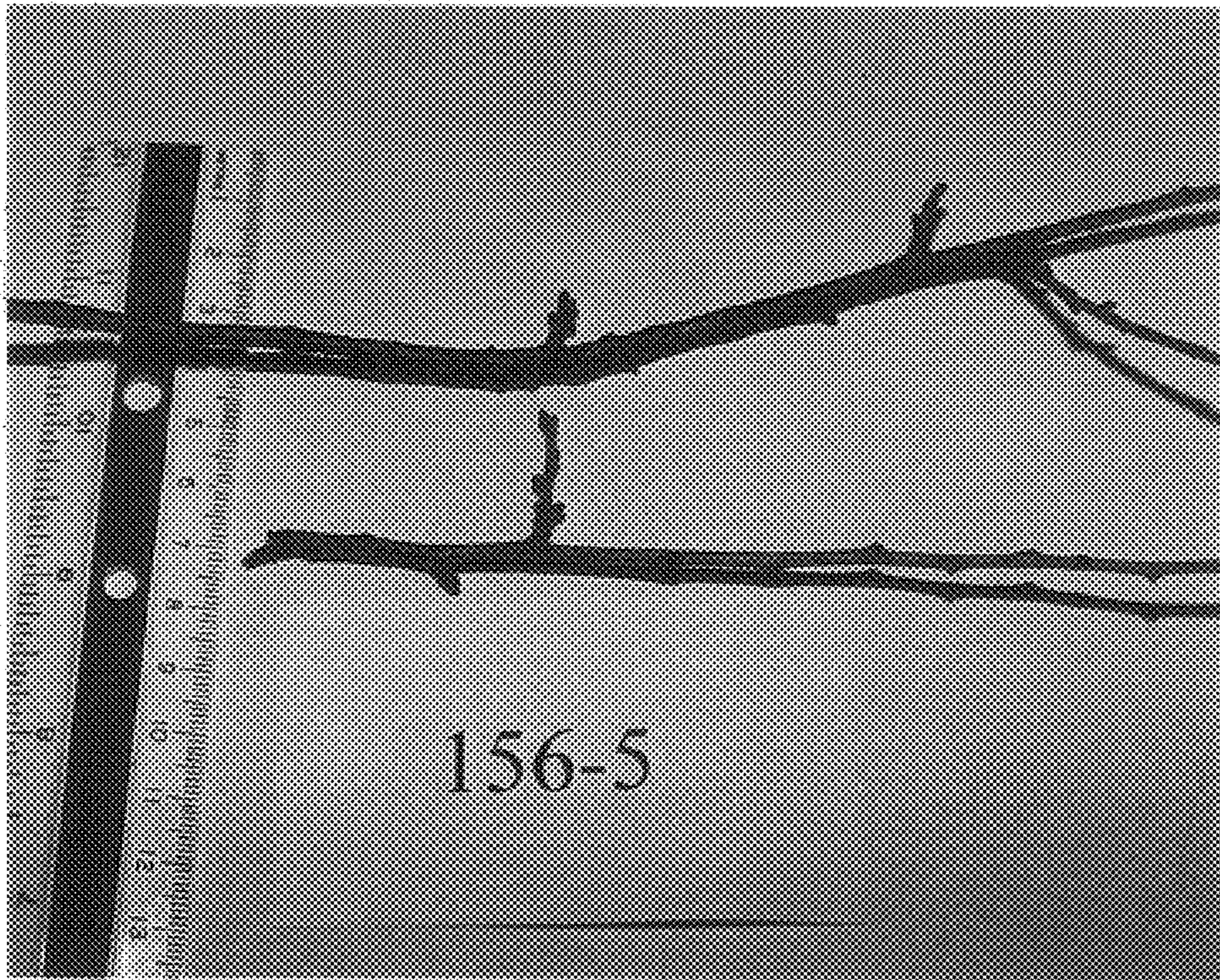


FIG. 3

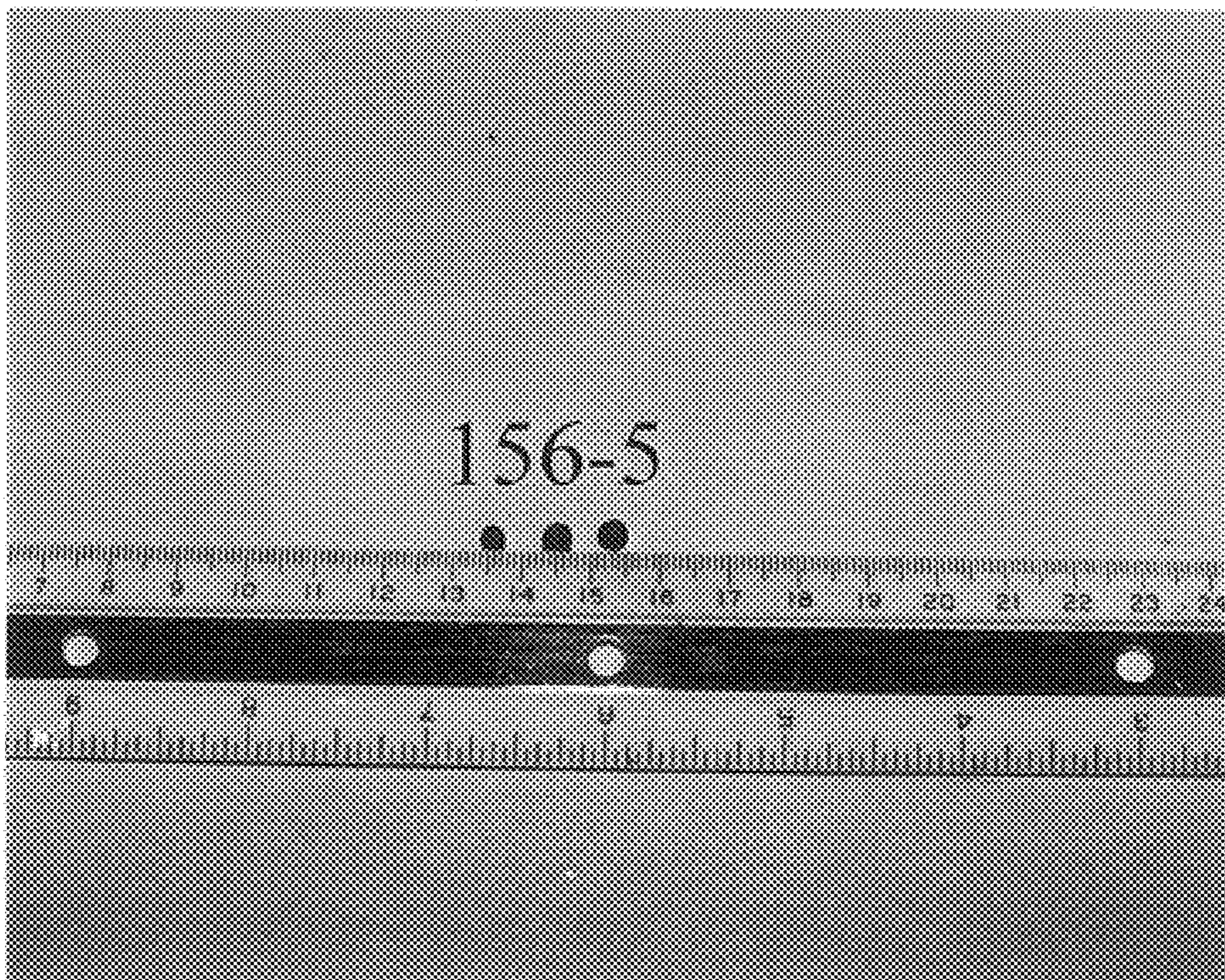


FIG. 4

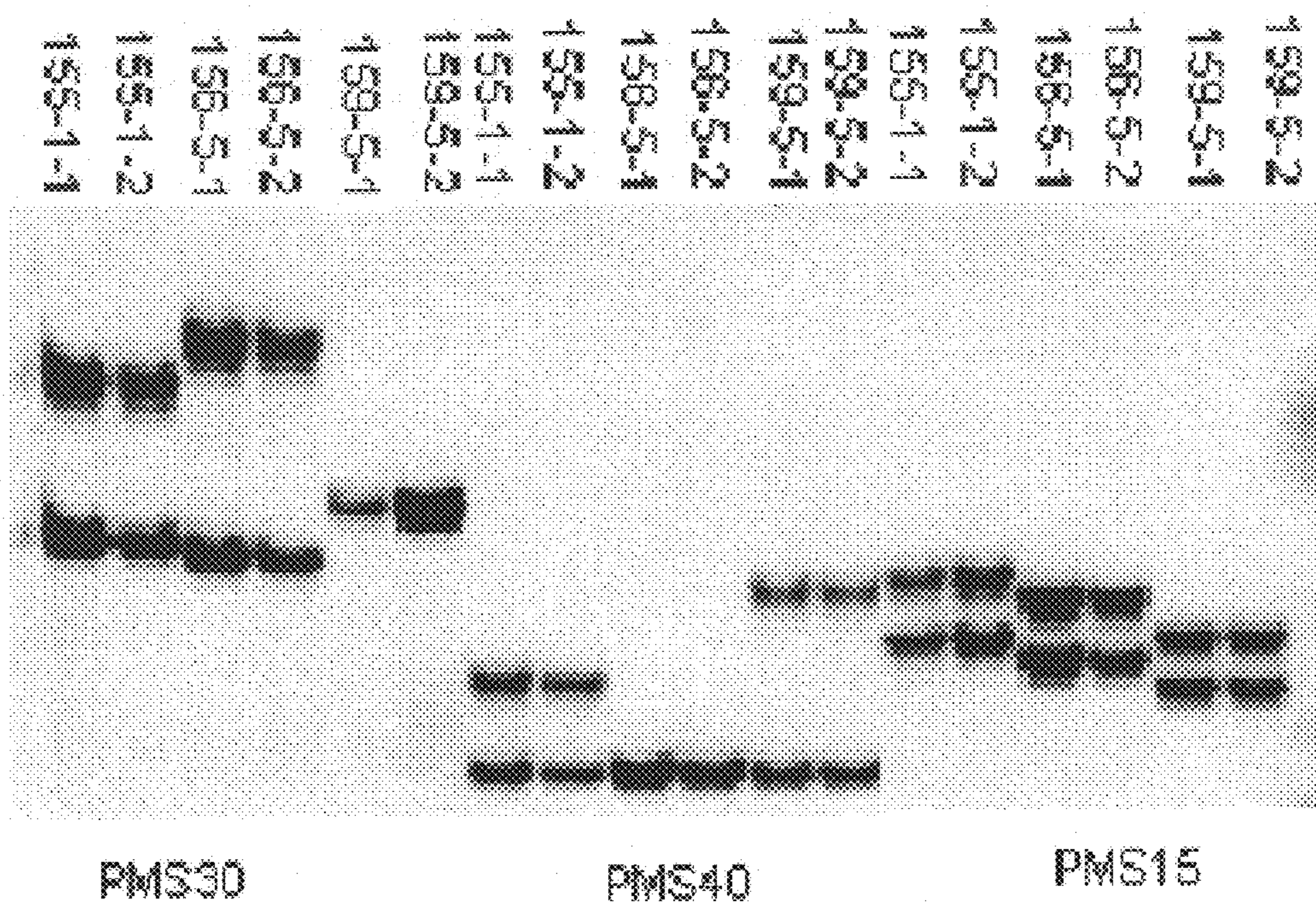


FIG. 5

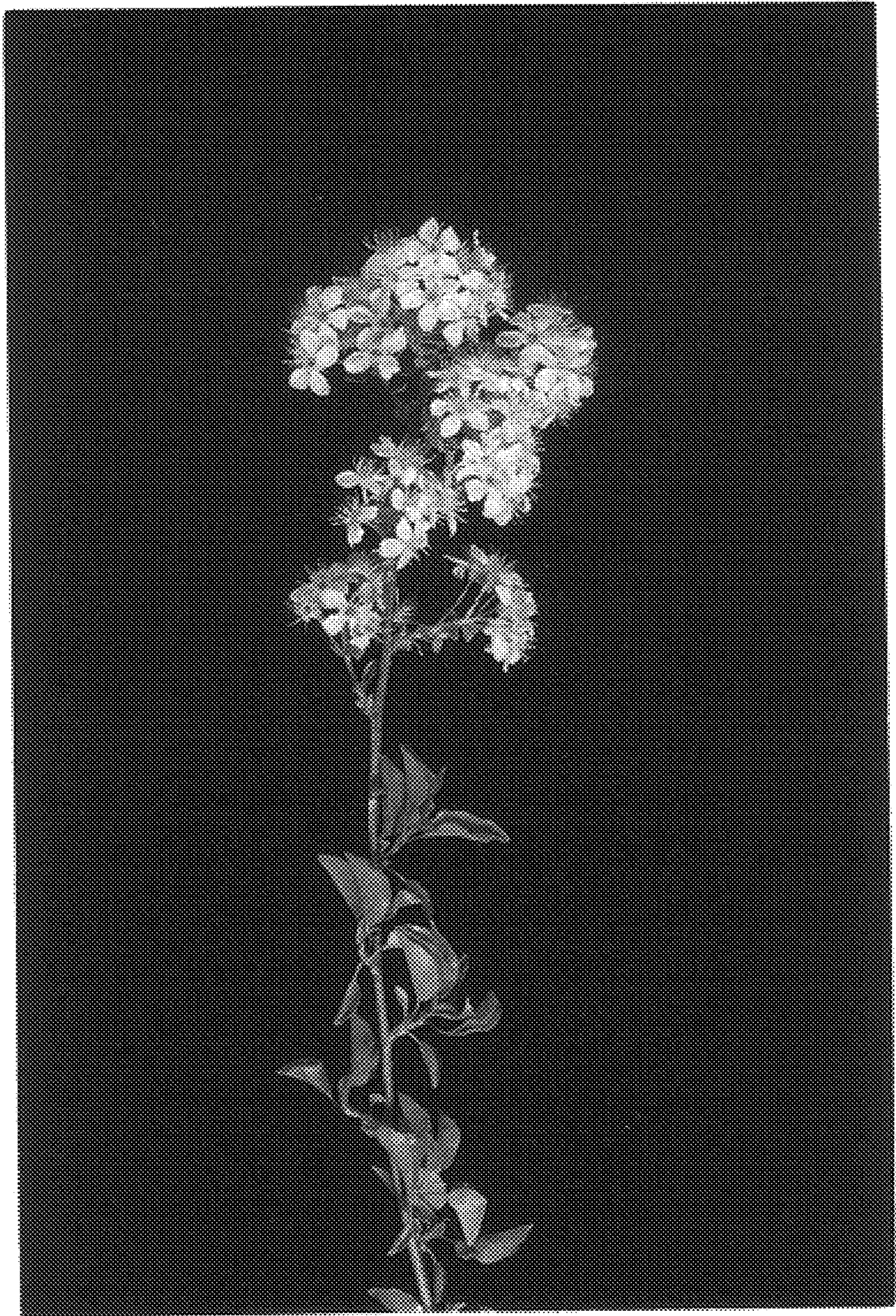


FIG. 6

Disclaimer & Dedication

PP. 14,271 P3— Stephen M. Southwick, Davis, CA (US). MAHALEB ROOTSTOCK NAMED 'UCMH 56'. Patent dated Nov. 4, 2003. Disclaimer filed September 29, 2009, by the assignee, The Regents of the University of California.

Hereby disclaims and dedicates to the Public, all claims and the entire term of said patent.

(Official Gazette, January 26, 2010)