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United States Patent [19]

Anderson et al.

[11] **Patent Number:** Plant 8,488[45] **Date of Patent:** Dec. 7, 1993[54] **CANKER-RESISTANT ASPEN TREE**
70-144-30-68-1[75] Inventors: Neil A. Anderson, Roseville; Michael
E. Ostry, Blaine, both of Minn.[73] Assignee: Regents of the University of
Minnesota, Minneapolis, Minn.

[21] Appl. No.: 675,502

[22] Filed: Mar. 25, 1991

[51] Int. Cl.⁵ A01H 5/00

[52] U.S. Cl. Plt./53

[58] Field of Search Plt./53

[56] **References Cited****PUBLICATIONS**Anderson, N. A., et al., (1979) "Insect Wounds as Infec-
tion Sites for *Hypoxylon mammatum* on Trembling As-
pen". *Phytopathology* 69:476-479.Einspahr, D. W., et al., (1977) *Genetics of Quaking Aspen*
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Aspen by *Hypoxylon mammatum* through Cicada Ovipos-
ition Wounds" *Phytopathology* 73:1092-1096.Ostray, M. E., et al., (1990) "Development of Tissue
Culture Systems for Increasing the Disease Resistance
of Aspen" In: *USDA FS Gen. Tech. Rep. NC-140*.
237-241.Strothman, R. O., et al., (1957), "Silvical Characteristics
of Quaking Aspen" Lakes States Stn. Pap. No. 49. 26
pages.*Primary Examiner*—James R. Feyrer*Attorney, Agent, or Firm*—Merchant, Gould, Smith,
Edell, Welter & Schmidt[57] **ABSTRACT**An aspen tree having rapid growth, good form, aes-
thetic appearance, and resistance to *Hypoxylon* canker
caused by the fungus *Hypoxylon mammatum*.**4 Drawing Sheets****1****STATEMENT REGARDING FEDERALLY
SPONSORED RESEARCH**This invention was made with government support
from a grant funded by the United States Department of
Agriculture (U.S.D.A.), U.S. Forest Service, North
Central Forest Experiment Station Cooperative Agree-
ment No. 13-80-23. The government may have certain
rights in the invention.This invention is a new and distinct variety of Aspen
tree of the species known botanically as *Populus tremu-
loides* (Michx.) The variety has been identified by the
number 70-144-30-68-1.**BACKGROUND INFORMATION**The genus *Populus* includes various species of trem-
bling aspen, cottonwood, big tooth aspen, balm-of-
gilead, white poplar and lombardy poplar. Many aspen
trees are grown as forest trees, but aspen trees are also
frequently planted in windbreaks, parks, and home land-
scapes.This variety of *Populus tremuloides* (Michx.) has been
selected because of a combination of several desirable
characteristics, including rapid growth, good tree form,
aesthetic qualities, and resistance to *Hypoxylon* canker
caused by the fungus *Hypoxylon mammatum*.All known varieties of aspen are quite susceptible to
canker disease caused by infection with the fungus
Hypoxylon mammatum. However, the cultivar de-
scribed herein has exhibited good resistance to *Hypoxy-
lon mammatum*, with calluses forming at the margins of
cankers which slow or completely stop the canker
growth.This variety was selected as a ramet from a superior
aspen clone growing in an aspen stand in Block 70 of the
Pike Bay Experimental Forest on the Chippewa Na-
tional Forest, near Cass Lake, Cass County, Minn. Root
cuttings were taken in 1965 and individual trees were
planted at the Rosemount Agricultural Experiment**2**Station, Rosemount, Minn. in 1968 and at the Oconto
Seed Orchard on the Nicollet National Forest, Lan-
glade, Wis. in 1971. The trees were planted at a spacing
of 10×10 meters which enhances canker infection and
provides greater selection pressure to identify resistant
trees. Several times each growing season, observations
have been made of these plantings of the variety with
respect to growth, form, resistance to disease and resis-
tance to insects.The variety described herein has continued to exhibit
a novel combination of characteristics, including rapid
growth, good form and aesthetic appearance, and most
notably a good resistance to canker disease caused by
infection from the fungus *Hypoxylon mammatum*.**Asexual Propagation**This variety has been asexually or vegetatively prop-
agated from root cuttings collected in the field, from
single node explants in tissue culture, and from invitro-
grown sterile root cultures. Plants have been grown
from all of such methods of propagation and have been
planted in the field at the Pike Bay Experimental Forest
on the Chippewa National Forest, near Cass Lake,
Minn., at the Rosemount Agricultural Experiment Sta-
tion, Rosemount, Minn., and at the Oconto Seed Or-
chard on the Nicollet National Forest, Langlade, Wis.Asexual propagation of this variety may be easily
accomplished by use of root suckers, under greenhouse
conditions. It has also been determined that the tree of
this variety may be vegetatively propagated by tissue
culture techniques, whereas most other clones of aspen
trees have not yet been successfully propagated by
tissue culture.It has been determined from observation of the nu-
merous plantings, asexually propagated from this vari-
ety, that the characteristics described herein are firmly
fixed through successive generations and that the distin-

guishing characteristics hold true to form through succeeding propagations.

DESCRIPTION OF THE DRAWINGS

This new variety of aspen tree is illustrated by the accompanying photographic drawings, with colors therein being exhibited as nearly true as is reasonably possible with color illustrations of this character.

FIG. 1 is a color photograph of a branch of a ramet of the cultivar showing typical leaves, (photo taken August of 1990, Chippewa National Forest);

FIG. 2 is a color photograph showing this cultivar at 20 years of age and in the center row of plantings, as compared with other plantings of aspen trees of the same age, and illustrating the more vigorous growth habit of this variety, (FIG. 2 being taken in the late autumn of 1988, Rosemount, Minn.).

FIG. 3 is a color photograph of the trunk of a mature ramet of this variety shown in a stand of aspen in the Chippewa National Forest, Cass Lake, Minn. (photo taken in December of 1988);

FIG. 4 is a composite photograph taken in August of 1990, and showing an individual ramet of the mature clone as photographed in the Chippewa National Forest, Cass Lake, Minn., and illustrating the mature shape and form when grown in such forest location;

FIG. 5 shows a cross-section of a mature ramet of the cultivar, illustrating the sound wood at 76 years of age;

FIG. 6 is a color photograph (taken in July of 1989) of a 24 year old ramet of the variety growing in a planting of the variety at the Rosemount Agricultural Experiment Station, Rosemount, Minn. and illustrating the callus which inhibits the extension of Hypoxylon canker;

FIG. 7 is a mature ramet of the variety growing in a planting at the Chippewa National Forest, Cass Lake, Minn. and also illustrating the callus growth which has prevented further expansion of the canker (photo taken in June of 1990); and

FIG. 8 is a photograph of plantlets of the variety generated by means of tissue culture (photo taken in June of 1990).

DESCRIPTION OF THE VARIETY

The following traits or characteristics have been repeatedly observed and are believed to be characteristics of this cultivar which, in combination, distinguish this variety of aspen tree as a new and distinct cultivar.

No references to color are included in this description since all parts of the tree apparatus to be indistinguishable in color from the species and are typical thereof.

The ploidy of this *Populus tremuloides* has been determined to be a normal diploid, by means of chromosome counts and DNA measurements using flow cytometry.

At the two above-noted plantations at the Rosemount Agricultural Experiment Station and the Oconto seed orchard, the tree of this variety was grown from asexually reproduced sprouts as clonal trees. The trees were grown at a spacing of 3 meters \times 3 meters. The height and diameter growth of the trees of this variety averaged 20% greater than any of the other *Populus tremuloides* selections grown at such plantations, over a period of 27 years at the Rosemount Plantation and for 22 years at the Oconto Plantation.

The tree of this variety was selected because of its superior growth rate and aesthetic appearance. This selection develops uniformly spaced, strong lateral or scaffold branches, which arise from the trunk at uni-

form angles, while the central leader is distinctly straighter, as compared to over 600 other clones or varieties of aspen trees. The faster growth rate and large vigorous canopy of this tree results in shading of the lower branches and thus the shedding or natural pruning of such lower branches. The result is a straight stem or trunk and a vigorous crown, which makes the tree of this variety a dominant tree when competing against other clones or varieties of aspen trees of its own age. The vigorous growth rate of the tree of this variety also makes the tree a good competitor in forest sites, as well as gardens and parks. Root suckering of the three of this variety is particularly vigorous as compared to other varieties or selections of aspen trees.

THE TREE

The variety has a form typical of aspen trees, but with a more vigorous and rapid growth than is typical of the species and other varieties of aspen trees.

In other respects, the variety is also typical of the species. The bark color; tree shape and habit; the leaf size, shape and color; buds; and flowers are not distinctive and are typical of the species, when grown in the same areas.

The parent ramet of the variety had a diameter at breast height of 55.5 cm and was 33.84 m tall at 76 years of age.

Bark: The bark is smooth, gray-green on young trees, later becoming deeply fissured and gray to black on the lower portions of the trunk of older trees, as illustrated in FIGS. 2, 3 and 4. The bark color is not distinct from other members of species.

Leaf: Light green and glabrous above, duller green and glabrous below during growing season, and turning yellow in autumn.

Shape: Nearly orbicular, truncate or rarely subcordate at the base; short acuminate apex; evenly crenate-serulate margin.

Aspect: Entirely glabrous when mature.

Size: Length from 2.5 cm to 5.0 cm; width from 2.3 cm to 5.00 cm.

Petioles: Length from 2.5 cm to 5.3 cm, approximately equal in length to the leaf blades, slender and laterally flattened.

FLOWER

The variety produces deep red staminate flowers only, in catkins 3-6 cm long, and pollen from the variety has provided vigorous progeny in crosses made over the past five years.

The tree of this variety has male flowers only, and staminate catkins appear in advance of the leaves and are 3 to 6 cm long and less than 1 cm thick. Stamens number 6 to 12 and deep red pollen sacs are born on a disk that is subtended by a 3 to 5 cleft, silky-hairy bract. Pollen from this tree has been used in a number of crosses, resulting in seedling progeny which are being evaluated in a genetic study on *Populus tremuloides*.

FRUIT

None, since the variety produces pollen only.

BUDS

Bud scales are smooth, shiny, and deep brown in color. Terminal buds are conical, sharp pointed, slightly resinous, covered by 6-7 imbricated scales.

HARDINESS

The cultivar is hardy and resistant to winter die-back.

DISEASE AND INSECT RESISTANCE

The cultivar has good resistance to *Hypoxylon mam-*
matum. Calluses usually form at the margins of the
 cankers and slow or completely stop canker growths, as
 illustrated in FIGS. 6 and 7. All known varieties of
 aspen trees are very susceptible to infection by such
 fungus. However, this variety exhibits more resistance
 to *Hypoxylon mammatum* by developing the noted cal-
 luses which slow or completely stop the canker
 growths. In a 20-year test at Rosemount, Minn. the
 other 574 aspen in the experiment averaged 2.9 cankers
 per tree. Members of this clone averaged 1.8 cankers
 per tree and callus tissue on the margins of these cankers
 slowed canker growth.

In the juvenile stage, the cultivar is susceptible to
 powdery mildew caused by *Uncinula salicis* and shoot
 blight caused by *Venturia macularis*.

A cutting of the parent ramet at 76 years of age pro-
 duced a diameter of 55.5 cm at breast height, and there
 was little white trunk decay caused by the fungus *Phel-*
linus tremulae, as noted in FIG. 5.

Insect Resistance

The cultivar has good resistance to wounding insects
 by rapidly forming callus tissue to seal the wound.

WOOD

Wood produced by the tree of this variety is of high
 quality and generally free of stain and decay, as com-
 pared to wood from other known varieties of aspen
 trees. The rapid growth rate and natural pruning habit
 with respect to the lower branches produces wood
 which is generally free of knots, as compared to other
 known varieties of aspen trees. The ability of this tree to
 form callus tissue in response to wounds limits the
 amount of stain and decay fungi that enter the tree. The
 result is wood which is generally clean and of high
 quality, compared to the wood from most other known
 varieties of aspen trees. It is therefore believed that the
 wood from trees of this variety will be in demand for
 pulp and fiber use.

We claim:

1. A new and distinct variety of aspen tree, substan-
 tially as shown and described herein, characterized
 particularly as to novelty by rapid growth, good form,
 aesthetic appearance, and resistance to *Hypoxylon can-*
ker.

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FIG. 1



FIG. 2



FIG. 3



FIG. 4

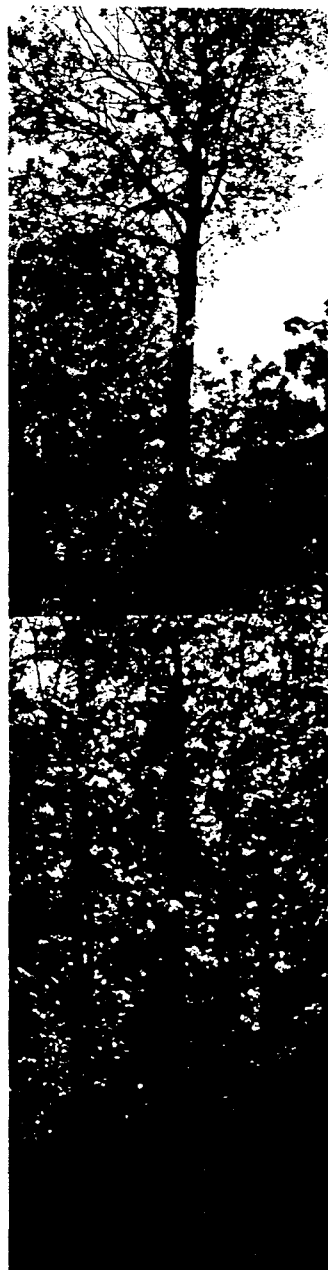


FIG. 5



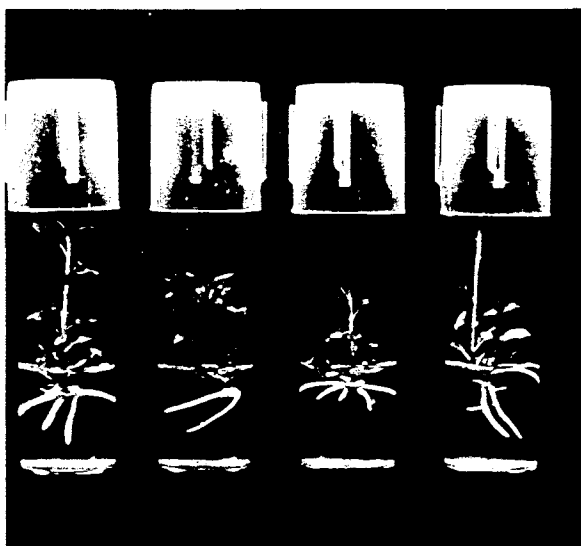
FIG. 6



FIG. 7



FIG. 8



UNITED STATES PATENT AND TRADEMARK OFFICE
CERTIFICATE OF CORRECTION

PATENT NO. : Plant 8,488
DATED : December 7, 1993
INVENTOR(S) : Neil A. Anderson, et al.

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

On the title page, at Assignee [73], after
"Regents of the University of Minnesota, Minneapolis,
Minn." insert --U.S. Department of Agriculture-
Agricultural Research Service, Beltsville, MD--.

Signed and Sealed this
Sixth Day of December, 1994

Attest:



BRUCE LEHMAN

Attesting Officer

Commissioner of Patents and Trademarks