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BARBERRIES IMMUNE OR HIGHLY RESISTANT
TO BLACK STEM RUST OF CEREALS

THE family Berberidaceae contains a great number of ornamental flowering shrubs which are at once pleasing and useful. Bright red persistent berries enrich the beauty of many of the species; and the foliage, which colors brilliantly in the fall, aids considerably in causing the plants to merit the praise of exacting gardeners. Various immune species of *Berberis* and *Mahonia* are worthy of wider use than they now enjoy and should be better known to the general public.

Approximately 140 different species, forms, and hybrids of *Berberis* (including our two native species) have been found to be susceptible to *Puccinia graminis*, a parasitic fungus which in the spring and summer causes the devastating stem rust of cereals.

LIFE HISTORY OF THE STEM RUST FUNGUS

In the fall this fungus forms its thick-walled overwintering spores on the grain stems and stubble, and is often called "black rust" because of the spore color. In spring, the comparatively large and heavy black rust spores germinate and produce much smaller ones, known as sporidia, which are easily carried by air currents. Of the countless numbers of sporidia produced only a comparatively few are by mere chance transported to susceptible hosts. If these tiny sporidia fail to fall on susceptible species of *Berberis* or *Mahonia*, they die and the life cycle of the rust is terminated; but if they fall on susceptible host species, only favorable weather is necessary to produce infection. Following infection small flask-shaped bodies, containing minute spores, first make their appearance just beneath the surface of the upper epidermis of the leaves. Soon after their formation orange cluster cups are formed on the under surfaces of the leaves, within which are pro-

duced chains of large aeciospores ; an average-sized barberry bush can produce more than 64,000,000,000 of these spores at one time. Only these aeciospores can effect initial spring infection on the cereals in the northern States. We have here a fungus that has five distinct spore forms during a complete life cycle. In addition, it has an interesting requirement involving alternate hosts ; the barberry is necessary for one stage, while the important cereals, such as wheat, oats, barley, and rye, must be present for another stage.

HISTORY OF BARBERRY ERADICATION

The barberry-cereal relationship of the fungus that causes stem rust was first demonstrated on a scientific basis in 1865 by the celebrated German scientist Anton de Bary. More than a hundred years earlier New England farmers observed that rust was more severe on grains growing near barberry bushes, and they voluntarily eradicated their barberries for the specific purpose of protecting grains from the damaging effects of the disease. About this time many laws were passed, both in this country and in Europe, condemning barberry bushes because they caused "blasting" of the grains. The earliest recorded legislation of this kind was enacted in Rouen, France in 1660. In 1726 Connecticut passed a law requiring that all barberry bushes growing in the vicinity of grain fields be destroyed, and similar action was taken by the Massachusetts legislature in 1754. Unquestionably the empirical knowledge of the barberry-rust relationship expressed both by New England farmers and by husbandmen on the Continent led de Bary to make his study. It is this destructive disease of wheat and other cereals that makes current knowledge of the rust-immune species of the Berberidaceae so important from a horticultural standpoint.

In 1918, when nearly 200 years had elapsed after the first laws were passed condemning barberries in the United States, the first organized eradication program was undertaken. During this period certain species of barberry, particularly *Berberis vulgaris* L., became firmly established throughout the northern part of the United States. As the number of these bushes increased in the important grain growing areas there was a corresponding increase in the number and severity of stem rust epidemics.

With the beginning of the cooperative barberry eradication program nearly 20 years ago, thirteen of the north central States, namely, Colorado, Illinois, Indiana, Iowa, Michigan, Minnesota, Montana, Nebraska, North Dakota, Ohio, South Dakota, Wisconsin, and Wy-

oming, passed laws restricting the propagation and distribution of rust-susceptible species. These States were further protected by a Federal quarantine (No. 38 revised) which provides that no plants, cuttings, stocks, scions, buds, fruits, seeds, or other plant parts capable of propagation, of the genera *Berberis*, *Mahonia*, or *Mahoberberis* shall be moved or allowed to be moved interstate from any State of the continental United States or from the District of Columbia into any of the protected states, "unless a permit shall have been issued therefor by the United States Department of Agriculture, except that no restrictions are placed by these regulations on the interstate movement either of Japanese barberry (*Berberis Thunbergii*) or any of its horticultural varieties, or of cuttings (without roots) of *Mahonia* shipped for decorative purposes and not for propagation." In addition to the above named states, Missouri, Pennsylvania, Virginia, and West Virginia are now actively engaged in an eradication program.

IMMUNE TYPES

Fortunately, there are twenty-seven species of *Berberis* and three species of *Mahonia* which have been found to be either immune or of such a high degree of resistance to rust that they can be grown anywhere without endangering our cereal crops. Indeed, the choice of species is so ample and of such quality that the immune species will fulfill most of the purposes for which barberries are used in ornamental plantings.

The following barberries can be grown anywhere in the United States without restriction.¹

B. Thunbergii

B. Thunbergii var. *purpurea*

B. Thunbergii var. *Maximowiczii*

B. Thunbergii f. *minor*

B. Thunbergii var. *pluriflora*

B. Thunbergii f. *erecta*

Permits are required under the regulations of the black stem rust quarantine (No. 38 revised) for interstate movement of the following immune or highly resistant species or varieties into any protected State, and for such movement from any protected State into any protected State. Application for such permits should be addressed to the Division of Domestic Plant Quarantines, Bureau of Entomology and Plant Quarantine, U.S. Department of Agriculture, Washington, D.C.

¹ The six forms listed here all have conspicuous fruit, and are winter hardy in the Arnold Arboretum.

Evergreen

*B. buxifolia*³
*B. candidula*³
*B. Chenaultii*³
B. Darwinii^{1,3}
*B. Gagnepainii*³
*B. Juliana*³
*B. sanguinea*³
*B. Sargentiana*³
*B. stenophylla*³
*B. triacanthophora*³
*B. verruculosa*³
M. Aquifolium^{1,2}
M. nervosa^{1,3}
M. repens^{1,2}

Deciduous

*B. aemulans*²
B. Beaniana^{1,2}
B. circumserrata^{1,2}
B. concinna^{1,2}
B. dictyophylla f. *albicaulis*³
*B. Edgeworthiana*²
B. Gilgiana^{1,2}
B. koreana^{1,2}
*B. mentorensis*²
B. Potanini^{1,3}

¹ Bearing conspicuous fruit.

² Winter hardy in the Arnold Arboretum.

³ Require winter protection at the Arboretum and in northern States.

All species, varieties, and hybrids of *Berberis* or *Mahonia* not listed in the foregoing groups are prohibited shipment into the protected States or from any protected State into any protected State, and permits will not be issued for such shipment.

DECIDUOUS SPECIES

***Berberis Thunbergii* and varieties.** This species has long been a favorite and is found in nearly every lawn and garden. It is also extensively used for hedge plantings. Thunberg, sometime previous to 1784, was the first European to notice this barberry in Japan, erroneously referring to it as *B. cretica* L. In 1821 A. P. DeCandolle assigned the currently used binomial *B. Thunbergii* to it. It was introduced to Russia sometime before 1874 by E. von Regel, who received seeds from Japan at the Imperial Garden at St. Petersburg. These plants grown in Russia by E. von Regel eventually produced seed and from this source seeds were received at the Arboretum on January 14, 1875.

A compact form of the species originated at the Arnold Arboretum as a chance seedling sometime before 1900. It has smaller leaves, shorter internodes, more slender and delicate branches, a better rounded growth habit, and more dwarfed stature. This form is now known as *Berberis Thunbergii* f. *minor*. Although not cultivated extensively as yet, it does, however, hold a well-deserved position in many shrub plantings; its leaves color well in the fall and the red berries remain attached during the winter.



PLATE XIV

Berberis koreana a hardy barberry already available from some nurseries
and a worthy successor to the old-fashioned *B. vulgaris*.

The form *B. Thunbergii* var. *purpurea*, very widely known, differs from the type principally in the purplish to reddish color of the leaves; the fullest and most brilliant color develops on plants grown in full exposure to the sun.

Berberis Thunbergii var. *Maximowiczii* is characterized chiefly by more twiggy branches, purple bark, and acute leaves which are green beneath. Seed of this variety was sent by the Imperial Botanic Garden, Tokyo, Japan, to the Arboretum in March 1901.

The name of the form called *B. Thunbergii* var. *pluriflora* is somewhat confused. The varietal name *pluriflora* should be applied to *B. Thunbergii* plants which bear three or four flowers and fruits at the end of a short peduncle. Unfortunately, this name has often been applied to the hybrid *B. ottawensis* (*B. Thunbergii* $\times$ *B. vulgaris*), having *B. Thunbergii*-like leaves and bearing flowers and fruits in racemes and umbels. This hybrid is equally as undesirable as *B. vulgaris*.

A new and superior selection of *B. Thunbergii* has recently made its appearance. Mr. M. Horvath of Mentor, Ohio, during his work on one of the large estates in the city of Cleveland, discovered a plant of *B. Thunbergii* with a strong tendency toward erect growth. He gathered the seeds from this plant and from their progeny selected seed from the most upright type. This process was repeated until the fifth generation, wherein Mr. Horvath found what he considered the perfect spire-like plant that he was seeking, properly called *Berberis Thunbergii* f. *erecta*. Unfortunately, this plant has had the erroneous polynomial *B. Thunbergii* var. *pluriflora erecta* applied to it. It is not a selection from a *pluriflora* type, but is a derivative of the typical form of *B. Thunbergii*. This selection is upright in growth and is admirably adapted for formal hedge plantings. It is propagated vegetatively and produces abundant red berries; the foliage changes to a brilliant red in the fall.

B. mentorensis. Through the hybridizing efforts of Mr. Horvath another barberry was introduced to the trade in 1934. *Berberis mentorensis* is the result of crossing *B. Thunbergii* with *B. Julianae*. The cross was made in 1924, and the hybrid which appeared in 1925 is propagated vegetatively. This hardy, three-fourths evergreen plant shows strong resemblance to both parents. The young branches are at first purplish to light brown, angled and strongly grooved; the elliptic-ovate leaves which cover the bush to the ground are coriaceous in texture, dark green above and pale beneath; the margins are sparsely spinulose-dentate, and the apex of the leaf is tipped with a little spine. The plants in the Arboretum are apparently becoming

well established, and this year for the first time are covered with flowers; one fascicle examined contained over forty blossoms. In size and color the flowers closely resemble those of *B. Thunbergii*. When established, the strong growth of this distinctive shrub, armed with stiff spines, is very suitable for protective and ornamental hedges, while it may also be used as a specimen or in natural growing group plantings. In the autumn many leaves assume a pinkish to reddish tinge, later becoming somewhat bronzed. A few leaves remained attached and green during the entire past winter in the Arboretum. Where evergreen barberies fail to withstand rigorous winters, this plant will usually survive, for during the unusually cold winter of 1933-34 it withstood temperatures greater than -20° F. in Ohio without any apparent injury.

B. Gilgiana. Several outstanding barberies which have been growing for many years in the Arboretum will very probably become well known within the next few years. The silky-leaved *Berberis Gilgiana* is one of these. It is a tall hardy plant with spreading branches and pleasing proportions. The young branchlets are grooved, slightly pubescent, and yellow or purplish brown. The elliptic-obovate or mostly oblong leaves are finely pubescent above and more conspicuously so beneath. Abundant yellow flowers are borne in dense racemes on slender puberulous peduncles. In the fall the oblong-ovoid fruits are at first somewhat greenish in color, but change first on the sun-exposed side to pinkish hues and finally to a lovely deep blood red. The foliage also colors handsomely in the fall. The fine specimen on the Overlook in the Arboretum is from seed collected by Purdom (No. 589) and received from China in February 1911.

B. circumserrata. Another Chinese barberry which has much merit but is little known, is *Berberis circumserrata*. It develops into a rounded bush up to 6 feet high and has a stiff twiggy habit of growth. The leaves are somewhat papery in texture, and color brilliantly in the autumn. The large ellipsoid-oblong fruits which taper to a distinct style are yellowish-red in color and are borne singly or in groups of three to five, prominently supported by rigid peduncles and strong pedicels. The fruit persists well through the winter. This is a hardy, handsome shrub of a distinctive type.

B. koreana. From Korea comes a hardy barberry of outstanding character. Seeds of *B. koreana* were first sent to the Arboretum by T. Uziyama in 1904. Our plant is upright in growth habit and has now attained a height of 6 feet. The clusters of large globose-ovoid red fruit persist over the winter. They combine with the reddish to dark

brown branches and the many leaf-like spines of the same color to produce an interesting plant during the dreary winter months. In the spring and summer new interest comes with the yellow flower clusters and the development of the large, rounded, thick paper-like leaves which take on a deep red color, and other hues, in the autumn. In recent years a number of nurseries have propagated this plant, and although a considerable proportion of the seedlings produce plants of upright growth there will be an appreciable number of less desirable growth forms. This hardy barberry is a fit type to replace *B. vulgaris* wherever hedges or individuals of that habit are desired.

B. concinna. Our *Berberis concinna*, which was received from the Royal Botanic Gardens, Kew, in March, 1885, failed to withstand the New England climate. It is reported, however, that at Kew, *B. concinna* forms a low bush of 3 feet in height, of close compact habit. Its leaves are lustrous green above, white beneath, obovate in shape, an inch or less in length, and petiolate, with the midrib ending in a sharp spiny tooth. The solitary, pendant flowers are deep yellow and a half-inch in diameter. The fleshy berries are red. This plant was introduced to Kew by Sir Joseph Hooker from Sikkim about 1850. Under suitable climatic and soil conditions it is a very lovely barberry, distinct because of the vivid whiteness of the under surface of the leaves.

B. aemulans. The hardy, but quite uninteresting *Berberis aemulans* was introduced to the Arboretum in 1908, from seed collected by Wilson in western China.

B. Edgeworthiana reached England about 1845; but the earliest plants at the Arboretum came from seed sent by Mr. R. M. Parker in 1920 from India, where it is native. The species, like *B. aemulans*, apparently has little to recommend it from a horticultural standpoint.

B. dictyophylla f. albicaulis. Graceful and of slender habit, *Berberis dictyophylla* f. *albicaulis* is unusual and charming because of the dense snow-white bloom covering the new shoots and the under surface of the leaves. This form apparently turned up by chance as a minor segregate of *B. dictyophylla*, grown at Hesse's nursery at Weener, Germany, shortly before 1916. The species is native to southwestern China. Most of the flowers are solitary and rather inconspicuous. The fruit is not abundant enough for ornamental value, but this is unimportant in view of the graceful sprays of lovely white stems and the chalky under-surfaces of the leaves, which make a splendid display in both summer and winter. The plant is not hardy at the Arboretum, but it can be grown south of Washington, D.C., or somewhat farther north if given sufficient winter protection.



PLATE XV

Berberis circumserrata, another handsome shrub of distinctive habit.

B. Beaniana. Trim, slow-growing *Berberis Beaniana* has withstood the New England climate since 1923. This species was introduced to England in 1904, seeds being collected from western Szechuan, China, by a Veitch expedition. The plants at Kew were first reported to have flowered and fruited in 1914. It is not surprising then that the plant at the Arboretum, received from Kew Gardens, England, in April, 1923, has failed to blossom until this year when a few flower clusters appeared. Judging from flowering and fruiting herbarium specimens, this will be a very attractive species from a horticultural standpoint. It has reddish, angled branches, small elliptic-lanceolate leaves which are whitish beneath, and it bears panicles of yellow flowers which are followed by long, purple fruits covered with bloom.

B. Potanini is closely related to *B. Beaniana*, but it is less hardy. This species, like the above, is native to China. Our plants which fail to survive the local climate were grown from seed received from Kew Gardens in February, 1927. *B. Potanini* is remarkable for its numerous long spines. The somewhat leathery or rigid, lanceolate to ovate leaves are armed with from 1 to 4 spiny teeth on each side and are whitish beneath. The flowers are produced in racemes, and the fruits are subglobose, red, and tipped with a short style. It should be of distinct value farther south.

EVERGREEN SPECIES

B. Darwinii, a native of Chile, it is not hardy at the Arboretum; it is root hardy but not top hardy at Washington, D. C. In milder climates, as along the Pacific Coast, *B. Darwinii* thrives. This beautiful evergreen was discovered by Charles Darwin in 1835 while on his famous voyage on the *Beagle*. In 1894 it was introduced to cultivation by William Lobb for the Messrs. Veitch, Chelsea, England, from the Island of Chiloe. When grown under suitable conditions. *B. Darwinii* is a plant of great beauty, especially when laden with a profusion of deep orange blossoms early in the spring. In the autumn when it is burdened with a large crop of bluish berries it is also very attractive, and at all seasons the small holly-like leaves produce a pleasing effect.

B. stenophylla. The beautiful, graceful hybrid *Berberis stenophylla* (*B. Darwinii* $\times$ *B. empetrifolia*) first appeared in the nursery of Fisher & Holmes of Hansworth, near Sheffield, England, about 1880. Under conditions such as obtain in the milder parts of England it grows to a height of 8 to 10 feet, is evergreen, and has a graceful habit which neither parent possesses. In addition it has the floral beauty of *B.*

Darwinii and the added hardiness of *B. empetrifolia*, for in April and May it is blanketed with rich golden blossoms. In New England, the plant loses most of its leaves in winter and does little more than cling to life. The Arboretum specimen, which dates from 1884, is scarcely more than 2 feet in height. Even the milder weather of Washington, D. C., is not sufficient to bring out its potential beauty. Probably, then, only in the regions where *B. Darwinii* thrives will this gorgeous plant come into its own.

B. buxifolia. Another evergreen species from South America, this plant is approximately as hardy as *B. stenophylla* and like it has just managed to survive at the Arboretum where it has been growing since 1884. This species was introduced to England about 1826 by Anderson, the botanical collector who went with Captain King's expedition to survey the Magellan Straits. It will form a tall bush (up to 10 feet) of erect stiff habit. The leaves are leathery or hard in texture, the flowers are borne one or two in a fascicle, and the globose fruits are dark purple.

B. triacanthophora. China has produced several of our hardiest, most useful evergreen barberries. The most attractive, *Berberis triacanthophora*, is one of our hardiest evergreens and is a graceful shrub with spreading branches which are well armed with strong slender spines. The narrow leaves are of a clear bright green color above and somewhat whitish beneath. They are borne in almost flattened whorls which aid in giving the shrub a distinctive airy lightness that is very pleasing. This plant was collected by Wilson and sent to the Arboretum in 1907.

B. Julianae. One of our hardiest and strongest growing evergreen barberries is *B. Julianae*. This species was sent to the Arboretum by Wilson in 1908. It is the tallest and most vigorous of the Chinese group, remarkable for its dense, glossy, dark green, luxuriant leaves. The stiff, yellowish gray, somewhat angled stems, armed with vicious spines, make it particularly valuable for protective hedges. The fascicles of yellow flowers are followed by ovoid fruits which are bluish-black, covered with bloom, and have a short but distinct style.

B. Sargentiana. The much less hardy *B. Sargentiana* has rounded slender branches which are graceful in comparison with those of *B. Julianae*. The young branches are reddish in color, and the leaves, which are much longer and wider than those of the foregoing species, are closely spiny-serrate and firmly coriaceous in texture. The yellow flowers are borne in fascicles. The ovoid fruits are bluish black with a slight bloom and with a sessile stigma. Wilson sent this species to

the Arboretum in 1908, but it had been introduced to England by Veitch in 1907.

B. Gagnepainii. The undulating margins of the firm, dark green, narrow leaves of *Berberis Gagnepainii* give this species a distinctive appearance. The spreading branches are well armed with three-parted spines one-half to three-quarters of an inch long which, together with the sharp forward-pointing teeth set in the margins of the linear-lanceolate leaves, provide it with unusually effective weapons of self-defense. It is a native of Szechuan, China, and was introduced for the Messrs. Veitch, Chelsea, England, by Wilson about 1904. Our first plant came from Chelsea in 1908. This species bears large yellow flowers in clusters of about six or sometimes more in the axis of each whorl of leaves. The fruits are long, oval, black berries covered with a bluish bloom.

B. verruculosa. The warty branches of *Berberis verruculosa* account for the specific name of this species, which is a sturdy, dwarf, evergreen shrub. The leaves are leathery in texture, lustrous green above and white beneath, and the recurved margins are armed with a few spiny teeth. The plant is suitable for rock gardens, edges of shrub border, and fronting foundation planting. Carefully pruned it will form spiny green domes which are very attractive. This fine evergreen surely is worth the trouble of winter protection and the necessary pruning because of its lovely form and color. The large golden flowers are solitary or in few-flowered fascicles. The berries are black and covered with bloom. The species was introduced into England by Wilson in 1904 from western China; five years later Wilson sent seeds directly from China to the Arnold Arboretum.

B. candidula. The less hardy *B. candidula* was first collected by Farges in 1894, and in 1895 was raised from seed by M. Maurice de Vilmorin in France. Although it has been growing at the Arboretum since 1929, it scarcely more than remains alive even with considerable winter protection. It is a dwarf evergreen shrub with smooth arching branches. The tufts of small leaves, borne in the axils of the stiff three-parted spines, are dark shining green above and show a vivid blue-white color beneath. It produces large, yellow, solitary flowers. The species is suitable for rock gardens, but will thrive only under mild climatic conditions.

B. sanguinea. From the mountains of Szechuan, China, *Berberis sanguinea*, was introduced to France by M. Maurice de Vilmorin in 1898. The specific name refers to the color of the flower stalks and sepals. It is an evergreen shrub that will attain a height of 6 to 9



PLATE XVI

Berberis Gilgiana, hardy in Boston and valued for its fruit and autumn color.

feet. The pale grayish, smooth branches are armed with long slender spines and bear tufts of leaf clusters. The leaves are deep green in color, linear-lanceolate in shape, tapering to a fine point, and the margins are armed with sharp, forward-pointing teeth. The fascicles of golden yellow flowers, with the sepals reddish on the outside, are borne on reddish stalks of unequal length. The berries are small and blue-black in color.

B. Chenaultii is a hybrid concerning the origin of which no definite information is available. The name suggests, however, that it may have originated in the nursery of Léon Chenault et Fils, Orleans, France. The plant appears to be a hybrid of *B. Gagnepainii* and *B. verruculosa*. The branches are verruculose, which is characteristic of the latter species, and the medium long, somewhat undulating leaves suggest the former. In stature it is intermediate between the two, and although slightly is scarcely an improvement on either species.

All of the evergreen barberries need more or less winter protection in New England either to survive our worst winters or to insure against possible injury during milder ones. It is necessary to cover the ground sufficiently to prevent freezing of the roots, thus permitting the replacement of water lost by the plants through transpiration.

It may be timely to suggest the futility of trying to obtain immune species from seed obtained from an arboretum, or any other place where the different species grow in close proximity. Hybridization, which takes place very readily, will be responsible for many disappointments. Seeds gathered from immune species in such a place will probably give rise to hybrids susceptible to attack by the rust fungus, so one should obtain species of known and dependable purity for real satisfaction. Barberry plants of dependable ancestry can usually be obtained from nurserymen who hold Federal permits to ship immune barberries into protected States, since such permits are not issued until their nurseries have been freed of all susceptible bushes.

Our other native immune members of the Berberidaceae are thus far restricted to three species of the genus *Mahonia*. The members of this genus have unarmed stems, pinnate evergreen leaves, and generally form handsome undershrubs or, rarely, small trees. The dwarf, creeping *Mahonia repens* is native to the Rocky Mountain region, while the low-growing *M. nervosa* and the taller upright *M. Aquifolium* are native to the Pacific Northwest.

Mahonia repens is very useful as a ground cover, especially under trees and shrubs or in locations not subjected to the full rays of the sun. It thrives without an abundance of moisture and requires very

little attention after it is once well established. Its shapely foliage, its abundance of yellow flowers early in the spring, and the bluish fruit in the fall make the plant an ideal cover for areas that might otherwise be bare and unsightly.

M. Aquifolium. The taller *Mahonia Aquifolium*, Oregon-grape as it is known in its native habitat, is a beautiful plant which likewise enjoys considerable shade; in fact, it grows better under such conditions than in the open. These two species are not only of much ornamental value to the home surroundings but for soil erosion and wild-life conservation they will surely serve a valuable purpose. The sheltering leaves and branches aid in the protection of wild life and the edible fruits contribute to the subsistence of birds and other animals.

M. nervosa is a handsome, low-growing plant with lustrous, rigidly coriaceous leaflets armed with spiny teeth. The stem bears conspicuous, persistent lanceolate bud scales which are 2 to 3 cm. long. The bright yellow flowers are borne on erect racemes 8 inches or more in length. The fruits are rounded oblong, small, and of purplish blue color.

Mahoberberis Neuberti, a cross between *Mahonia Aquifolium* and *Berberis vulgaris*, is very susceptible to black stem rust. This hybrid has often been erroneously called *B. ilicifolia*.

In view of the increasing number of States excluding susceptible species of *Berberis* and *Mahonia*, it becomes more and more desirable for all nurserymen interested in barberries to rid their nurseries of rust-susceptible plants and to establish a stock of the immune species sufficient for normal horticultural requirements.

Only recently four additional States (Missouri, Pennsylvania, Virginia, and West Virginia) have asked to be included in the area protected by Quarantine No. 38 (revised). If this expansion in the protected area is made there will be 17 states in which the interstate shipment (into or between) of susceptible species of barberry is prohibited by Federal quarantine. All these States are now cooperating with the United States Department of Agriculture in the barberry-eradication program.

Owing to the steadily diminishing market for barberries that are susceptible to attack by the stem rust fungus, many nurserymen are now restricting their stock to immune species, thus becoming eligible to apply for a Federal permit to ship approved species to any point from which orders are received. Customers will automatically assist in the stem rust control program if, when making purchases, they



Ames, L. M. 1937. "Barberries Immune or Highly Resistant to Black Stem Rust of Cereals." *Bulletin of popular information - Arnold Arboretum, Harvard University* 5(11-13), 57-72. <https://doi.org/10.5962/p.250061>.

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