

South Dakota State University
**Open PRAIRIE: Open Public Research Access Institutional
Repository and Information Exchange**

Bulletins

South Dakota State University Agricultural
Experiment Station

7-1-1966

Prunus hortulana: A Virus-Free, Nonsprouting Understock for Hardy Plums and Ornamental Prunus

W. F. Buchholtz

C. M. Nagel

H. G. Pulsifer

Follow this and additional works at: http://openprairie.sdstate.edu/agexperimentsta_bulletins

Recommended Citation

Buchholtz, W. F.; Nagel, C. M.; and Pulsifer, H. G., "Prunus hortulana: A Virus-Free, Nonsprouting Understock for Hardy Plums and Ornamental Prunus" (1966). *Bulletins*. Paper 535.

http://openprairie.sdstate.edu/agexperimentsta_bulletins/535

This Bulletin is brought to you for free and open access by the South Dakota State University Agricultural Experiment Station at Open PRAIRIE: Open Public Research Access Institutional Repository and Information Exchange. It has been accepted for inclusion in Bulletins by an authorized administrator of Open PRAIRIE: Open Public Research Access Institutional Repository and Information Exchange. For more information, please contact michael.biondo@sdstate.edu.

BULLETIN 534

JULY 1966

Prunus hortulana

**A Virus-Free, Nonsprouting Understock
for Hardy Plums and Ornamental Prunus**

**PLANT PATHOLOGY DEPARTMENT
AGRICULTURAL EXPERIMENT STATION
SOUTH DAKOTA STATE UNIVERSITY, BROOKINGS**

Prunus hortulana

A Virus-Free, Nonsprouting Understock for Hardy Plums and Ornamental Prunus

W. F. BUCHHOLTZ, C. M. NAGEL AND H. G. PULSIFER¹

For many years, nurseries in the North Central States have been propagating hardy plums and ornamental *Prunus* on *Prunus americana* seedling understocks. Hardiness and compatibility with many scion varieties, together with general availability, ease in growing and handling, and suitability for the budding operation, are recognized attributes which have encouraged almost universal use of this species for many years. From a nursery production standpoint it leaves little to be desired.

There are two shortcomings of *P. americana* understocks, however, one potential, the other inherent. Virus occurrence in seed and seedlings is a potential danger, and there is an inherent tendency for *P. americana* to sucker and sprout profusely. Two or 3 years after setting, the *P. americana* stock of a plum tree or ornamental specimen starts producing shoots around and at some distance from the trunk. After 5 years there may be sprouts a rod or more from the base of the tree or specimen. Left to grow, such sprouts constitute in effect the start of a plum thicket. Tops of ornamental specimens have been ob-

served to be entwined and enveloped in growth of sprouts from their *P. americana* roots.

Nurserymen are aware of this attribute of *P. americana*. L. R. Sjulín of Interstate Nurseries, a veteran nurseryman, offers this statement: "The worst shortcoming of *P. americana* seedlings is that after a plum on this stock has been planted, sooner or later many sprouts grow from the roots, sometimes many feet from the tree. What is needed is a plum rootstock which does not sprout, and which is hardy enough to serve as root for trees in Iowa, Nebraska, Minnesota and South and North Dakota."

The potential hazard of virus in

¹Professor, Department of Botany and Plant Pathology, Iowa State University, Ames; Professor and Head, Department of Plant Pathology; and former Assistant Professor, Plant Pathology Department, South Dakota State University, Brookings, respectively. The research conducted was a cooperative effort between the Iowa and South Dakota Agricultural Experiment Stations and NCR Project 33. Cooperation of the Gurney Seed and Nursery Company, Yankton, South Dakota; Plumfield Nurseries, Fremont, Nebraska; and the Interstate Nurseries, Hamburg, Iowa, is gratefully acknowledged.

seed and seedlings is an almost inevitable result of random source of seed. Fruit is harvested from shelterbelt plantings or wild plum thickets by anyone inclined to collect and sell the fruit, or seed processed from it, to nurseries. In 1954, Hobart² found necrotic ring spot virus in 19 of 43 wild plum thickets in Fremont and Page counties, Iowa, and in 73% of the seedlings grown from seed from the virus-infected thickets. None was found in seedlings from the virus-free thickets. Although a deleterious effect of necrotic ring spot virus on *P. americana* or plum varieties derived from it has not been clearly demonstrated, Helton³ reports that in Idaho, orchard trees of prune (*P. domestica*) in a state of decline contained necrotic ring spot virus; similar trees in a state of normal growth and vigor did not.

Thus there seems little doubt that an assured source of virus-free plum seedling understocks should be a component of production of high quality plum trees. This publication calls attention to such a source from indexed seed trees of *P. hortulana*, a hardy, nonsprouting species.

Plum Varieties and Prunus Species Budded on *Prunus hortulana* Seedling Understocks

Need for a nonsprouting plum understock hardy enough for planting in the North Central States was emphatically expressed by Iowa, Nebraska, and South Dakota nurserymen prior to 1955. At the same time, one Iowa nurseryman had

been hoping to try *Prunus hortulana* as seedling understock for plums, but there was no fruit set on a few trees on the nursery premises.

During the course of searching for stocks of Prunus free of the common viruses of these species, a planting of bearing *P. hortulana* trees at Fremont, Nebraska, was found to be virus-negative when indexed on *P. tomentosa* and *P. persica*. *P. hortulana* is reported (Bailey⁴) to be nonsprouting and, since these trees showed no evidence of winter damage, seedlings from seed harvested from them were tried as understocks for plums andamentals at Yankton, South Dakota, and at Hamburg and Shenandoah, Iowa.

Since 1960, there has been successful propagation of the following plum varieties on *P. hortulana* understock seedlings: All Red, Compass, Green Gage, Hanska, Kaga, Kahinta, La Crescent, Lantz, Oka, Opata, Orient, Pipestone, Premier, Red Coat, Red Wing, Sapa, Sapalta, South Dakota, Superior, Tecumseh, Toka, Twilite, Underwood, Waneta; Idaho Prune, Italian Prune, Stanley Prune, Bonne St. Anne, Degolier, Dietz, Glyman, Gueii, Hall, Imperial Gage,

²Hobart, O. F. 1954. "Introduction and Spread of Necrotic Ring Spot Virus into Sour Cherry Nursery Trees." Ph.D. thesis, Iowa State University Library, Ames, Iowa.

³Helton, A. W. 1962. "Incidence of Ring-spot and Prune Dwarf and the Relationship of these Conditions to Prune Decline in Idaho." *Phytopath.* 52: 159-162.

⁴Bailey, L. H. 1949. *Manual of Cultivated Plants.* p. 541. The MacMillan Co., N. Y.

Lombard, "Peach," Prinlew, Richard, Sannois, Swedish, Swenson's Prune, Yakima.

In addition, the following ornamentals, species and clones of *Prunus* have also been successfully propagated on this understock: *P. cistena*, *P. triloba*, Pink Flowering Almond, Prairie Almond, Nanking Cherry (*P. tomentosa*), *P. angustifolia*, *P. cerasifera* (Polish myrobalan), *P. davidiana*, *P. davidiana* (Cheyenne), *P. davidiana* x *P. persica* (F₂), *P. mahaleb*, *P. mahaleb* (Polish), *P. maritima* (2 collections), *P. mexicana*, *P. munsoniana* var. Pottawatomie, *P. nigra* (Cheyenne), *P. nigra* var. Chinook, *P. nigra* var. Dandy, and *P. pedunculata*.

All items listed were successfully propagated in that on 50% or more of *P. hortulana* seedlings budded there was growth of bud through an entire season to form tree or specimen. Not listed above is peach, which was propagated with 81% success.

There were some failures, most notable being *Prunus padus*, where buds were inserted on 242 seedlings, but from which grew only 37 trees; also choke cherry (*P. virginiana*), of which 44 buds of four clones yielded only nine trees. Others with which there was less than 50% success are the following, with numbers of bud grafts and successes in parentheses: French Damson (15-1), *P. bucharia* (12-3), *P. dropmoreana* (10-3), *P. fruticosa* (10-1), *P. mackii* (12-1), *P. tenella alba* (12-4), and *P. virginiana* var. *melanocarpa* (10-3). Only

with Imperial Epineuse (15-0), *P. cerasus* (?) [A-4058(ACM-24)] (9-0), *P. fontanesiana* (12-0) and Vladimir x *P. cerasus* (10-0) was there total failure.

Propagations listed, whether as successes or failures, were made in small numbers during routine collection and maintenance of plum varieties and other *Prunus* scions. Failures, therefore, with the possible exception of *P. padus* and *P. virginiana*, should not be taken as strong indication of incompatibility between *P. hortulana* stock and the respective scions which were not budded on it successfully — especially in light of the number and diversity of the scion materials which were budded with good results.

Growth of Trees on *Prunus hortulana* Roots

Though there has not been extensive experimental evaluation of *P. hortulana* as a rootstock under growing trees or specimens, performance in several plantings leads to the conclusion that, except for lack of sprouting, it is roughly the equivalent of *P. americana* as rootstock for growing trees. Scion trees of Idaho Prune, Kaga, Kahinta, Oka, Opata, Red Coat, Sapa, South Dakota, Superior, Tecumseh, Underwood, and Waneta plums and of the ornamentals, *Prunus cistena*, *P. triloba*, Prairie Almond, and Nanking Cherry, have been growing on *P. hortulana* roots for 4 years at Yankton, South Dakota, with no mortality after the year of setting (1962). Similar trees of Stanley

Prune, Green Gage, Premier, Superior, and Twilite plums have grown for 6 years to full size and abundant flowering and fruiting at Hamburg, Iowa.

Most striking evidence of suitability of *P. hortulana* for rootstocks is the fact that a block of 450 *P. americana* seed trees at Yankton, South Dakota, has been growing normally on these rootstocks for 7 years. The trees now are well anchored and vigorous; they fruited abundantly in 1964 and 1965, and there has been virtually no tree distress or mortality.

Nonsprouting Character of *Prunus hortulana*

In his *Manual of Cultivated Plants*, Bailey gives prominence to the nonsprouting, nonthicket forming habit of *P. hortulana*. Where growing specimens of this species have been observed (Fremont, Nebraska; Hamburg, Iowa; and Yankton, South Dakota) they have been virtually free of sprouts. The planting at Fremont is 16 years old. From the *P. hortulana* roots of growing plum variety trees, ornamentals, and *P. americana* seed trees, there have been only occasional sprouts.

The same has been true in an experimental planting of South Dakota and Underwood plum trees with *P. hortulana* or *P. americana* roots at Yankton. The trees were set in the spring of 1961. During the seasons of 1963, 1964, and 1965, there was an average total (3 seasons) of 1.51 sprouts per tree on *P.*

hortulana roots, 42.7 sprouts per tree on *P. americana* roots.

Though a *P. hortulana* root does occasionally grow sprouts, they are so sparse that they present virtually no problem in care and maintenance of a plum tree or *Prunus* ornamental specimen.

Hardiness of *Prunus hortulana*

The original seed for establishing the Fremont planting of *P. hortulana* was collected in 1948 in Nemaha County, Nebraska. This is near the northern and western limit of range for this species as recorded by Bailey⁴. Seedlings grown from this seed were set at Fremont in 1950, and since 1955 there has been no twig or branch die back or any other evidence of winter injury in the planting. The same is true of a planting of currently 6-year-old trees at Hamburg, Iowa.

At Yankton, South Dakota, there has been tip death on rapidly growing twigs on young *P. hortulana* trees; on the not so rapidly growing twigs of trees 3 years or older there has been little or no twig tip winter injury. At Yankton there has been no branch or trunk die back or bark necrosis, even on young *P. hortulana* trees, once they are established and growing. Average daily temperatures (maximum + minimum \div 2) for December, January and February for these three locations are Fremont: 28.5, 22.9, 27.7; southwest Iowa (near Hamburg): 28.2, 22.9, 27.3; Yankton: 24.1, 18.1, 24.3, respectively.

At both Fremont and Yankton, *P. hortulana* has obviously been

much more hardy than *P. mahaleb* (Oregon stock seedlings), which in the Midwest serves as rootstock for Montmorency and Early Richmond sour cherries.

It seems reasonable that the *P. hortulana* stock in question should be hardy enough to serve as understock for hardy plums and ornamental *Prunus* in a climate comparable in winter severity to that of Iowa, eastern Nebraska, and southeastern South Dakota. It merits trial as such an understock in other states as well, and perhaps in certain portions of Canada. This *P. hortulana* stock is not quite as hardy as the *P. americana* observed at Yankton.

Suitability of *P. hortulana* Seedlings for Propagation Procedure

There have been 250 to 1000 or more buddings on *P. hortulana* seedlings in Gurney Nursery at Yankton during 1960 through 1964. Those doing the budding report that the bark is as separable from the wood as it is on *P. americana* seedlings at comparable times; also that *P. hortulana* bark is a bit thinner and more delicate than *P. americana* bark. One particularly skillful propagator nevertheless prefers budding on *P. hortulana* seedlings.

Budders at Interstate Nurseries at Hamburg report that bark on *P. hortulana* stays "open" longer than on *P. americana*. Preference for budding on *P. hortulana* or *P. americana* is divided, depending on length of bark incision the individ-

ual prefers for bud insertion. Those who make a short incision find such procedure a bit more operable with the somewhat thicker bark of *P. americana*. There is apparent agreement that budding on *P. hortulana* is similar to budding on peach.

Evidently to bud on *P. hortulana* seedlings presents no acute problem; successes ranging from 75 to 90 or 95% have occurred regularly at both nurseries.

Other Characters

From the time of lining out seedlings until nursery trees or specimens are grown, stored, shipped, planted, and have started vigorous growth, *P. hortulana* seedlings and roots are not as robust and tough as those of *P. americana*. Freedom from virus and the non-sprouting character of roots of the established tree or specimen on *P. hortulana* stock need to compensate for a bit of extra care in growing and handling and for the only occasional failure attributable to understock.

Roots of *P. hortulana* are in general less profusely branched than those of *P. americana*. They are susceptible to damage by peach tree borer, but not strikingly more or less so than roots of *P. americana*. Tufts and Day⁵ and Hutchins⁶ report *P. hortulana* 1-year seedlings

⁵Tufts, W. P. and L. H. Day. 1934. "Nematode Resistance of Certain Deciduous Fruit Tree Seedlings." *Proc. Amer. Hort. Sci.* 31: 75-82.

⁶Hutchins, L. M. 1936. "Nematode-Resistant Peach Rootstocks of Superior Vigor." *Proc. Amer. Hort. Sci.* 34: 330-338.

and root stocks for peach, respectively, to be root knot nematode resistant. The Fremont-Yankton material has not been tested for nematode resistance.

Occasional fast-growing variety scions have been observed to overgrow their *P. hortulana* rootstocks. For instance, in a small experimental planting at Hamburg, 3-year-old plum trees of Green Gage variety showed 5/16 inch overgrowth of scion on *P. hortulana* roots, but there was 8/16 inch overgrowth on *P. americana* roots. On trees of Stanley Prune there was 1/16 inch scion overgrowth on *P. hortulana*, 4/16 inch on *P. americana*. On trees of Premier and Superior plums, over- or undergrowth of scion was 1/16 inch or less on both understocks. However, on Myrobalan roots, trees of Green Gage, Premier, and Superior were tapered, with notably larger caliper just below than just above the stock-scion union. In general it would appear that scion overgrowth might be anticipated to be no more pronounced on *P. hortulana* than on *P. americana* understocks.

There has been no indication thus far that *P. hortulana* understocks have a noticeable dwarfing effect on the scions growing on them. In the Hamburg experiment, the 3-year-old trees on *P. hortulana* roots were as tall or taller and larger in caliper than trees of the same variety on *P. americana* roots. Both Hutchins⁶ and Johnson⁷ report markedly smaller peach trees on *P. hortulana* than on *P. persica* roots.

Identity of *Prunus hortulana*

The stock at hand is of *Prunus hortulana* as recorded in Bailey's *Manual of Cultivated Plants*. This conclusion is based on observations of floral and vegetative organs, bark, tree form and size, and growth habit. Dr. R. W. Pohl, plant taxonomist at Iowa State University, has confirmed this identification. Bailey⁸ points out the variability and range of *P. hortulana* and its possible relationship to *P. americana* and to *P. angustifolia*, a southern species (Chickasaw plum). The authors' observations, experiments, and propagations have been with the collection from southeastern Nebraska, originally planted at Fremont.

Availability of Virus-Free *P. hortulana* Seedlings

Plantings of bearing trees of *P. hortulana* are located at Yankton, South Dakota (Gurney Seed and Nursery Company); Fremont, Nebraska (Plumfield Nurseries); and Hamburg, Iowa (Interstate Nurseries). By far the largest planting is at Yankton; it consists of 560 trees, two-thirds of which are 7 years old and are beginning to fruit abundantly. This orchard was established with the intent that seedlings grown from its seed crop constitute a source of supply for nurseries in

⁷Johnson, S. 1938. "*Prunus mexicana* and *Prunus hortulana* as Rootstocks for Peaches." *Mich. Agr. Exp. Sta. Quar. Bul.* 21: 17-18.

⁸Bailey, L. H. 1898. *The Evolution of Our Native Fruits*. pp. 194-208. The Macmillan Co., N. Y.

South Dakota, Iowa, and adjoining states. The original planting at Fremont and the later planting at Hamburg each consists of 100 trees. They supply seed for seedlings at the two nurseries, with a small surplus, depending on abundance of seed crop.

The Yankton planting is clonally propagated — selected *P. hortulana* scions on *P. hortulana* seedling roots. Both scions and understock seedlings emanate from the Fremont planting, individual trees of which were originally indexed for necrotic ring spot complex and X virus on *P. tomentosa* and peach seedlings. In addition, individual trees in the Yankton planting were indexed on *P. tomentosa* in 1964, 1965, and 1966. No virus-positive trees have been detected in either the original Fremont planting or in the Yankton planting.

The trees in the Hamburg planting are from seed of the trees at Fremont. All trees at Hamburg were indexed on *P. tomentosa* in 1963; no virus-positive trees were detected.

Currently Suggested Use of *P. hortulana* Seedlings as Understocks in Nursery Propagation of Prunus

Prunus hortulana, southeastern Nebraska collection, is a hardy stock of a nonsprouting species, free from common Prunus viruses. It can replace *P. americana* as a seedling understock for hardy plum varieties and ornamental Prunus.

There have been enough nursery propagations on it, and enough observations of trees and specimens growing on its roots, that some nurserymen in Iowa, South Dakota, and Nebraska are beginning to propagate on *P. hortulana* seedlings and offer results of such propagations for sale. Since *P. hortulana* seedlings from indexed seed tree sources should become increasingly available, nurserymen, fruit growers, and gardeners in the North Central Region would do well to start exploratory use and evaluation of this understock for their particular needs.