MANTENANCE OF CLONAL PLANT GERMPLASM

Rubus parviflorus Nutt., the thimbleberry, shown in bloom on the cover, is a common native of the Pacific Coast region of North America. It and an associated species, R. spectabilis Pursh, the salmonberry, have a raspberry-type fruit. The R. parviflorus has many small drupelets and is a dark-red color, while R. spectabilis has fewer, larger drupelets and is a light-orange color. Both species are unusual in that they are semi-shrubs with perennial rather than biennial canes. The mode of inheritance of this perennial character, also present in a few other canes. The mode of inheritance of this perennial character, also present in a few other

rubus species, has not been studied, although some crosses to cultivated species have been made. The perennial cane character may provide a useful alternative to the current labor-intensive biennial type.

A collection of plants with unique traits of potential value in crop production, like these Rubus species, is one objective of the National Plant Germplasm System (NPGS). Other objectives include the maintenance, evaluation, and distribution of such genetic stocks (germplasm) (2, 3). Until recently, Rubus and most other clonally propagated crops were not maintained in NPGS collections. Although germplasm of all crops has been collected, the maintenance of germplasm within NPGS has been largely limited to seed-propagated crops like corn, tomatoes, beans, etc. Clonal crop germplasm has been maintained in working collections for use in breeding or for other purposes. These collections have not been adequate to provide for the increasing use of species material in breeding programs; they have not been coordinated to provide for access to germplasm or to reduce unnecessary duplication. Furthermore, they have not prevented the loss of germplasm, including species that now are becoming extinct in their native habitats. Adequate germplasm resources are necessary to continue the improvement of these crops and to insure that these resources are available in case of an emergency, such as a disease outbreak. This is especially true since most of our crops were introduced species and therefore have no native gene sources.

The concern for genetic vulnerability in all crops in the early 1970s brought renewed attention to the problems of germplasm maintenance. In the mid-1970s the National Plant Germplasm Committee (NPGC), with the help of crop committees, formalized a plan for bringing fruit and nut crops into the NPGS (1). This proposal for the development of 12 repositories was initially funded by Congress in 1978. Construction of the Northwest Plant Germplasm Repository (NWPGR) at Corvallis, Ore., began in 1979, and the facility was dedicated on April 15, 1981. Construction of the second repository at Davis, Calif., began in 1980 and construction at Geneva, N.Y., is to start soon. The remaining repositories are still awaiting further planning and funding. The development and operation of the repositories is a cooperative federal and state program with management and funding shared by the State Agricultural Experiment Station where the repository is located, and the U.S. Department of Agriculture through the Agricultural Research Service (ARS) and the Cooperative State Research Service (CSRS).

These repositories will complement the Interregional (IR-2) program at Profser, Wash. The IR-2 program is intended to acquire or develop, maintain, and distribute virus-free tree fruit clones of apple, pear, and stone fruits of current interest to the industry. Research on virus diseases is an important part of that program. The clonal repositories will include more crops than does IR-2 and emphasis is on future breeding or scientific use rather than commercial interest. The repositories are to build broad genetic collections including cultivars and clones of pollen- or graft-compatible species. Research at the repositories is to be on methods of maintenance and evaluation of germplasm.

The locations of the clonal repositories were selected to provide a minimum of environmental stress for the plants and to avoid or minimize insect and disease problems for the assigned crops (1). Most of the locations selected already have germplasm collections which will serve as the nucleus for the repository. They also have active research programs on these crops which will be helpful in getting the programs established.

As currently operating, each repository has a technical committee consisting of crop-related specialists who advise the curator on issues of concern to the user community. At Corvallis, the crops (and technical committee responsibilities) are: pear (M. Westwood and T. van der Zwert), hazelnut (M. Thompson and H. Lagerstedt), mint and hops (A. Haunold), strawberry (R. Bringham and G. Galletta), raspberry (E. Denison and J. Overcash), blueberry (A. Draper and J. Ballington), and other small fruit crops. At Davis (D. Parfitt, Curator), the crops (and technical committee responsibilities) are stone fruit (D. Ramming and D. Cain), grape (R. Pool and L. Lider), and nuts (D. Kester and D. Ramos).

During its first year of operation, the NWPGR has acquired a collection consisting of 1345 pear cultivars and Pyrus and related species clones; 140 raspberry and blackberry cultivars and Rubus species clones; 120 blueberry cultivars and Vaccinium species clones; 11 strawberry cultivars and Fragaria species clones; 54 hazelnut cultivars and Corylus species clones; 18 currant and gooseberry (Ribes) cultivars and 3 hop (Humulus) cultivars. Initial emphasis on germplasm acquisition has been on propagation of some collections scheduled for removal and transferring plants that had been held in working collections. As the program develops, a balanced collection will be developed.

The NWPGR collection will be housed in the 18,000 square feet of screenhouses (Fig. 1) to minimize pest problems, especially for the protection of virus-indexed clones. About 10,000 square feet of greenhouse space is available for the initial isolation of new clones, virus indexing, and propagation. Virus indexing is desirable before germplasm is released, and a virus cleanup program has been started. The facility includes about 6,000 square feet in offices and laboratories, with space for research on the characterization and evaluation of clones and to support the indexing and virus cleanup work. Once minimum criteria for identity and condition of germplasm are met, lists and limited amounts of plant material (budwood, cuttings, seed, pollen, etc.), will be available for distribution to scientists.

The evaluation of accessions will be based on field plantings and on the work of cooperators. Information resulting from this work will become part of an extensive information file being developed as part of the NWPGR and NPGS records. This file will include historical information on each clone: source, pedigree, etc., and descriptive information on its uniqueness, characteristics, and performance. Information from this file will eventually be available for distribution with the germplasm.

Persons interested in keeping informed of progress in the development of these repository programs are encouraged to contact the appropriate curator.

Literature Cited


O. L. Jahn, Curator
M. N. Westwood, Horticulturist
Northwest Plant Germplasm Repository
33447 Peoria Road
Corvallis, OR 97333