

# STRAWBERRY GENE BANK INFORMATION ON THE WORLDWIDE WEB

K.E. Hummer <sup>1</sup> and B.C. Strik <sup>2</sup>

<sup>1</sup>Contact for additional information.

U.S. Department of Agriculture, Agricultural Research Service,  
National Clonal Germplasm Repository, 33447 Peoria Road,  
Corvallis, Oregon 97333-2521, USA

<sup>2</sup>Oregon State University, Department of Horticulture,  
4017 ALS, Corvallis, Oregon 97331, USA

Additional keywords: *Fragaria x ananassa*, germplasm, genetic resources, cultivar description

## Summary

The U.S. Department of Agriculture, Agricultural Research Service (USDA-ARS), National Clonal Germplasm Repository at Corvallis, Oregon houses the *Fragaria* genebank for the U.S. National Plant Germplasm System (NPGS). This collection includes 411 unique *F. x ananassa* Duch. cultivars and selections in addition to 1079 representatives of 33 taxa from 29 countries. The clonal germplasm is maintained as potted plants growing in screenhouses and backed up as *in vitro* cultures stored for up to 5 years at 4°C. Seeds for wild species are preserved at -20°C. The background, or passport, information for each of the accessions is on the Germplasm Resources InfoNet (GRIN), which is accessible through the worldwide web at:

<http://www.ars-grin.gov/npgs> or from the Repository homepage at:

<http://www.ars-grin.gov/ars/PacWest/Corvallis/ncgr>. An approved taxonomic list with authorities, citations, and synonyms is available. Background clonal information includes breeder, history of development, pedigree, intellectual property rights, and a descriptive summary from the cultivar release and citations, where available. Background species information includes collector, locality, and collection notes. Evaluation information includes yield components, phenology, and fruit, plant and leaf characteristics. Cultivar fruit images are also electronically accessible. Co-ordination of the data entry for internationally approved descriptors is planned. Plant requests can be placed electronically or through conventional correspondence.

## 1. Introduction

The USDA-ARS National Clonal Germplasm Repository was established in 1981 as the genebank for *Fragaria*. This collection includes 411 unique *F. x ananassa* Duchesne cultivars and selections, in addition to 1079 representatives of 33 taxa from 29 countries. The active collection, which is used for regeneration, multiplication, distribution and evaluation, has two components: clonal and seed. Specific genotypes are maintained clonally, as potted plants growing in screenhouses and as *in vitro*

cultures stored at 4°C. Clonal cryogenic preservation techniques are under research at the unit. The active seed collections for species are preserved at -20°C. The base collection for the strawberry seed will be located at the USDA-ARS National Seed Storage Laboratory at Fort Collins, Colorado.

A core subset of 389 *Fragaria* cultivars and species has been designated with input from the Curator and the Small Fruit Crop Germplasm Committee. The core was selected to represent a maximum of genetic variation within a manageable number of samples. Researchers may wish to utilize the core, or a part of it, for evaluation trials of particular traits.

## 2. Information management

The U.S. National Plant Germplasm System (NPGS) maintains an extensive database concerning the plants and seeds in the active collections. This information is maintained on a publicly accessible database through the worldwide web. The Repository also has additional searchable information on its website.

### 2.1. Germplasm Resources InfoNet: GRIN

The Corvallis Repository, along with the other genebank sites in the NPGS, maintains a database called the Germplasm Resources InfoNet (GRIN). The GRIN homepage is located at: <http://www.ars-grin.gov/npgs>. The main database, which is searchable through the homepage is written using Oracle(Tm) by the Database Management Unit in Beltsville, Maryland. The GRIN system has many features and valuable data for breeders and researchers of economically important crops. The strawberry accession data are entered and updated by the Corvallis Repository.

The botanical taxonomy throughout GRIN has been reviewed for consistency and validity. The correct spelling and authors of taxa are on line and available to those who search the system.

Individual accessions listed in the system can be searched for background and evaluation information. In the case of cultivars, the pedigree, breeder, date released, origin institute, and country of origin are listed. For wild species, the collection location, including the latitude, longitude, elevation and site notes are entered. The presence of voucher samples, such as herbarium specimens or linked digital images is noted. By 1997, images will be linked to the written background descriptions. Intellectual property rights information is also presented. These data are updated as additional information becomes available. Germplasm release descriptions for cultivars on the system are currently being entered by the Repository staff.

For some accessions descriptive evaluation data have been obtained. These data include phenological and morphological traits useful to cultivar identification and performance (Table 1). The study location and year are noted. The long term goal is to include the data in the format approved by the Union Internationale pour la Protection des Obtentions Vegetales (UPOV) for strawberry descriptors (Clamot *et al.*, 1986). The key to coded variables is given along with a histogram displaying where the search value occurs within the range observed in the study-year.

The Corvallis staff is entering available germplasm release descriptions for cultivars in the system.

## 2.2. Corvallis Repository Information

The Corvallis Repository homepage can be selected from the GRIN homepage, or can be reached directly at: [http:// www.ars-grin.gov/ars/PacWest/Corvallis/ncgr](http://www.ars-grin.gov/ars/PacWest/Corvallis/ncgr).

The Corvallis Repository homepage provides several additional options for strawberry and other small fruit information retrieval. First, from this page the GRIN page can be reached and the searches as described above can be performed. Second, the Repository features unusual plants in the “What’s New, What’s Cool, What’s Weird” section. One strawberry recently featured is a variegated *F. x ananassa* from Sweden. This accession is performing very well as a ground cover in the landscape in front of the Repository main building complex. The featured plants for May 1996 will include strawberries collected from Chile in 1990 by J. Scott Cameron, Washington State University. Third, the catalogs of the Repository holdings are obtainable electronically for on-line review or to be downloaded by saving the file on the local computer. Anyone with an E-mail account on the net can receive an electronic copy of the Corvallis Repository Strawberry Catalog by sending a message to: [almanac@oes.orst.edu](mailto:almanac@oes.orst.edu) with the enclosed message of: **send ncgr fragaria**. Fourth, the Corvallis Repository has scanned and entered the images from the Small Fruits of New York (Hedrick, 1925). The Repository is in the process of loading new photographs of cultivars to be linked with the cultivar descriptions through GRIN.

## 3. Plant Distribution

Besides the collection and preservation of genetic resources, another component of the Repository mission is to distribute plant material for research in crop improvement. Plant requests can now be made electronically through either the GRIN or the Corvallis Repository homepages. The Repository distributes limited quantities of plant material for research and asks that research data or summaries be returned to enrich the database for future users.

### 3.1. Quarantine Regulations

The Repository ships plant material according to quarantine regulations of the United States and the requesting country. In most cases, an import permit from the requesting country must be received by the Repository so that the inspector can prepare the USDA phytosanitary certification accordingly.

The Repository tests clonal accessions for pathogens and provides pathogen-negative plant material whenever possible.

### 3.2. Intellectual Property Rights

Most of the Repository plant material is in the public domain. However, some material may have restrictions because of intellectual property rights. This restricted plant material is flagged on the GRIN database. A signed material transfer agreement, and in some cases written permission of the rights owner, is needed before the Repository can distribute this material.

#### 4. Concluding Remarks

The U.S. NPGS and the Corvallis Repository provide strawberry genetic resources on the worldwide web. This database is in the initial stages at present and is updated daily. In 1996 fruit images will be integrated with descriptive text on the GRIN system. The Repository welcomes comments concerning improvement of the presentation or the data. Those having study records related to accessions in the US strawberry collection are encouraged to contact the Curator at the Corvallis Repository to have the data loaded to the GRIN system.

Although more than 10 USDA sponsored small fruit plant collection expeditions have occurred during the past 10 years, a number of gaps in the US collection still exist. During 1996, USDA plant exploration trips will visit northeastern China and Alaska to collect *Fragaria* species as well as other small fruits. As new accessions are obtained, the information will be added to the system and the plant material will become available for distribution.

#### 5. References

- Clamot, G., N. Linden, and H. van der Borg, 1986. Strawberry Descriptors. International Board for Plant Genetic Resources (IBPGR), Rome, Italy. Pp. 1-28.
- Hedrick, U.P., 1925. The Small Fruits of New York. J.B. Lyon Co., Albany, USA. Pp. 614.
- Hummer, K.E., 1991. *Fragaria* at the National Clonal Germplasm Repository at Corvallis, Oregon. Pp. 106-107 in: The strawberry into the 21st Century (A. Dale and J. Luby, eds). Timber Press, Portland, USA.

Table 1. Strawberry Descriptors on GRIN as of April, 1996.

Variable	Description
Achene color	color of achenes
Anther viability	anther viability
Bloom exposure	amount of bloom covered by foliage
Botrytis	resistance to Botrytis
Calyx reflex	amount of the calyx reflexion
Chromosome number	chromosome number
Color uniformity	uniformity of berry flesh color
Duration of harvest	duration of harvest
Everbearing	everbearing habit
First bloom	Julian calendar date of first bloom
First red	Julian calendar date of first red
First ripe	Julian calendar date of first ripe
First runner	Julian calendar date of first runner
Flavor	quality of fruit flavor

Table 1. (continuation)

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Flesh color	flesh color
Flesh firmness	firmness of the fruit
Flower diameter	diameter in centimeters
Fruit length	mean of 5 fruit per plant, mm
Fruit set	coded 1-9
Fruit shape	coded values
Fruit size 1	fruit size of first pick
Fruit size 2	fruit size of second pick
Full bloom	Julian date of full bloom
Gender	male, female, hermaphrodite
Glossiness	glossiness of fruit
Inner peg	presence of green peg after capping
Last bloom	Julian date of last bloom
Last red	Julian date of last red
Last ripe	Julian date of last ripe
Leaf angle	mean of 5 leaves per plant in degrees
Malformations	fruit malformations
Petal count	number of petals per flower
pH	pH of fruit
Plant habit	plant growth habit
Plant height	plant height in cm
Plugging	presence of central plug
Part of core collection	member of core: Yes or No
Receptacle height	height in cm
Runner	amount of runners
Self fertility	self fertility
Skin color	color of skin
Skin toughness	toughness of skin
Stamen height	relative height of stamen to receptacles
Stem breaking	stem breaking habit
Symmetry	symmetry of fruit
Titrateable acidity	measured in meq per 100 g fresh wt.
Total solids	total dissolved solids in ppm
Total soluble solids	TSS measured by refractometry
Uniformity of berries	uniform appearance of berries
Yield	fruit yield per plant

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