Future Germplasm Reserves—Stone Fruit Possibilities[1]

P. R. FRIDLUND[2]

ABSTRACT

The diversity of stone fruit germplasm in North America has decreased rapidly and, unless the trend is stopped or reversed, fruit breeders and associated scientific disciplines may lose their future resources. Many remaining collections lack permanence, so permanent maintenance should be attempted through a repository system representing diverse disciplines.

Before starting my assigned subject, Dr. Harold Fogle kindly gave me a farily accurate list of current locations of North American stone-fruit collections. Most are maintained by individuals for breeding, variety and adaptation testing and other horticultural purposes. In some respects the list is impressive, but collections of cherries, apricots and almonds are noticeably few, probably partially due to limited adaptation of the species.

Meanwhile an ominous projection for the future also was evident since many collections were followed by notations such as defunct, inactive, curator retired, awaiting someone's replacement or merely a question mark. The obvious lack of permanence plus the ever dwindling number of clones within collections (mainly due to lack of immediate need and the economics of maintenance), portends a dangerous narrowing of germplasm resources. Furthermore, a compounding narrowness can be assumed since as clonal numbers within collections are reduced, the preponderance of remaining clones probably will be limited mostly to newer varieties that in themselves have a narrowing genetic background.

This information is not new, and the situation probably is similar for most horticulturally produced crops. From information I have received, the problem is not confined to North America, but exists in almost all advanced countries; and responsible scientists there are also concerned.

Since the ephemeral natures of many stone fruit collections of individuals as well as clones within them are realities, there is no point in belaboring the moment with details. The computerized fruit germplasm resources inventory as proposed by Drs. Fogle and Winters can supply current information when needed. This excellent proposal certainly should be activated soon. Meanwhile the inventory will not solve the basic problem but it will point out sources of remaining genetic material. Additionally, if the current trend is not reversed, succeeding print-outs will clearly document the increasing seriousness of the problem.

The problem is well known and well described so what should be done about it? In my opinion a permanent maintenance system appears mandatory, and this can be accomplished best with a permanent repository. Such permanence would reduce the effects of collection abandonment as well as of individuals maintaining only those clones of immediate value and other unusual items of local interest.

[1]Information Paper, Project 1262, College of Agriculture Research Center, Washington State University.

[2]Plant Pathologist-In-Charge, Interregional Virus-Free Deciduous Fruit Tree Repository (IR-2), Irrigated Agriculture Research and Extension Center, Prosser, Washington.

Therefore, I would like to digress from my titled subject and project some of my ideas on what a repository should do and how it should operate. Most of my professional life has been spent supervising the limited operations of the IR-2 Interregional Virus-Free Deciduous Fruit Tree Repository so I have had some experience. Because IR-2 contains apples and pears as well as stone fruits, I may have to cite some examples from another speaker's subject. Admittedly, most of my opinions are drawn from operating experiences of IR-2.

Because of the extent of our present knowledge and assumed future discoveries, a truly modern and functional repository should not merely duplicate the former, extensive, germplasm collections. Thus, the term repository should imply a nonstatic, modern and superior activity. To accomplish this a repository must represent all interested scientific disciplines, in contrast to former collections that served one or two. Those disciplines most interested at the moment appear to be genetics, pomology and plant pathology, but distribution experience of IR-2 has indicated an awakening interest among other fields.

Several facets frequently overlooked are the values of a virus-free repository to industry and to international exchange of germplasm. For example, through state agencies the IR-2 program is importantly represented in a number of state nursery improvement programs, and in cooperation with the USDA Germplasm Resources Laboratory, it is active in international exchange of virus-free genetic material. Accordingly, IR-2 has been included in a loosely organized, semiformal group entitled European Committee for Cooperation in Fruit Tree Virus Research—Exchange of Virus Tested Fruit Tree Varieties and Rootstocks. The members of this group are very concerned scientists.

A single repository scheme with satellite sub-repository locations only as necessary appears superior to a series of independent regional repositories that may eventually become duplicative and competitive. Stone and pome fruits could be incorporated into one program providing a favorable climatic site is selected. This combination would create a large undertaking, but on the other hand would eliminate some duplication of efforts and expenses.

A repository must be extremely well contrived by experts from diverse disciplines before it is put into operation. Broad objectives and procedures should be devised, and an administrative structure including budget developed. Through consultation, the disciplines to be served can be determined as well as their goals.

The broad policies and objectives of a repository must be governed by a technical advisory committee representing diverse disciplines. The details should be left up to those performing the operations in order to immediately incorporate new knowledge gained from unanticipated experiences and discoveries of others. A large technical advisory committee need not be a disaster if it is composed of truly interested and currently informed persons.

The obvious primary objectives of a repository are to assemble, maintain and distribute pertinent germplasm for various disciplines. These simple sounding operations are surprisingly complex and require careful planning. For instance, to what depth should clonal entries of each species be maintained, and what present or future useful values determine clonal acceptability? Some species have thousands of named cultivars, and any attempt to maintain all would cause a repository to collapse from its own weight.

Decisions must be made concerning types of materials to be released, volumes of each and to whom. IR-2 has released budwood, some seed and virus-free foliage. Requests are not now honored for pollen, rooted cuttings and cultured tissue. We felt that small starts of propagation material or perhaps enough to directly set up a reasonably sized experiment were sufficient. Larger amounts were considered of a service nature and not a function of a repository. Our releases are made only to scientists or regulatory personnel of state and federal agencies for a variety of uses, and it is through them that material also reaches industry and the public.

After the questions of assmbly and distribution are resolved, clonal maintenance can be planned. The first problem is location since economically a repository should be in one place. This may not be entirely possible, but a surprisingly large number of diverse clones can be held at one location, if germplasm maintenance is the primary goal. The fortunate site selection for IR-2 has demonstrated this, and only a few *Prunus salicina* and *P. amygdalis,* and *P. persica* with chilling requirements of less than about 400 hours have winter survival problems in some years.

The degree of isolation from commercial and wild fruit species is a further consideration in order to exclude vrius infections and some insects from external sources. To ignore virus infections is passé in light of present knowledge. Our isolation has been good since during fourteen years of operation, no virus infections were detected in the isolated repository. Additionally, no fungicides, miticides or insecticides were used there. Thus our trees have never been sprayed. So far biologic control in this undisturbed area is satisfactory for containing populations of mites, aphids and other insects for our purposes of maintaining germplasm and producing propagation materials.

Each clone should be obtained initially from a reputable source. However, during maintenance, verification of trueness to species, variety or selection is necessary to detect mechanical errors, chance mutants or plain mistakes. More extensive comparisons such as evaluating different lines of the same variety normally are not a function of a repository. Moreover, comparisons made in one location are not necessarily valid for another. Thus, these types of evaluations are made best in the localities of use by those interested.

Virus freedom of clones maintained in a repository is mandatory except in instances where a healthy individual of an exact, valuable genotype is unknown. The exceptions could be maintained separately and so labeled, but concurrent attempts should be made to rid them of the infectious agents. The term virus as used here also functionally includes mycoplasma and other organisms that cause virus-resembling diseases.

The effects of viruses on fruit trees is complicated because of interactions of many kinds and strains on different tree species and genotypes. Briefly, tree damage can range from imperceptible through size reduction to death. Certain intra and interspecific graft combinations are prevented. Fruiting effects range from nearly none to considerable reduction in volume or production of unmarketable, deformed fruit. Pollen deformity has been reported. Transmission means are varied but include pollen, seed, insects, eriophyid mites and nematodes. Many viruses do not appear to spread in nature except through rootgrafting. The most important means of spread is during propagation, and topworking is the worst and most unnecessary form.

There are several methods for virus eradication, but thermotherapy is most widely used. Thermotherapy is not always difficult, and can be done in a remarkably inexpensive enclosure. Such heat treatment is more necessary with some species than others. Currently virus-infected fruiting varieties of *Malus* and *Pyrus* are most likely to be encountered. Originally the percentage of infected pome varieties received by IR-2 was so high that it became necessary to change our procedures. Now all are heat treated before becoming candidate clones for the repository. Consequently we now have over 100 each of *Malus* and *Pyrus* cultivars that apparently are freed from infecting viruses, but are not yet on the distribution list.

Many beneficial side effects of an active repository occur that cannot be anticipated. For example, through the combined knowledge and experiences of the IR-2 technical committee and the project, two widely used, index-host series for detection of all viruses that infect *Prunus* and latent viruses of *Malus* were developed.

At first the size and cost of a repository similar to that just sketched may appear unworkable and excessive. This may not be true since many procedural and cost cutting techniques used by various disciplines could be incorporated into a program. However, neither can be estimated until they are studied and debated in some detail. Then decisions can be made and an outline developed. From this the size and cost can be estimated and a source of funding approached.

Preservation of Small Fruits Germplasm For Germplasm Work Shop

D. H. Scott[1]

INTERPRETATIVE SUMMARY

There is no large collection of cultivars and species of small fruits in the United States. As old cultivars are discontinued for commercial use they are discarded and no longer available for breeding. There is a need to preserve the germplasm to avoid genetic vulnerability. A proposal is made to make plans to establish a germplasm repository of small fruits cultivars and species in a greenhouse until such time that meristem cultures can be developed.

small fruits research wo
replied and several points
indicated. All were in fav
more national germplasm
Most people were in favo
genotypic germplasm
which rules out seed st
there are no homozygous
of the small fruit crops.
of research stations in
States with 50 or more c
selections per crop are
blackberries 3, blueberri
berries, raspberries 4, str
and only 1 station had a