History and Pedigree of Public Onion Releases in the United States

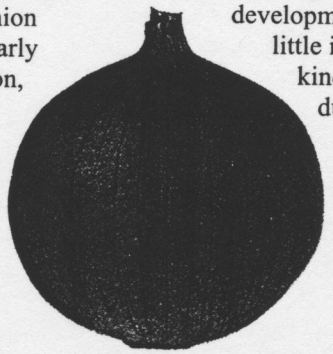
By Irwin L. Goldman and Michael J. Havey

The bulb onion (*Allium cepa* L.) was introduced to the United States by European immigrants and by trade with European countries. Farmers maintained these introductions as open-pollinated populations for approximately three centuries before the U.S. Department of Agriculture (USDA) initiated a dedicated scientific program of onion improvement.

Although some information about the founding onion populations in the U.S. has been collected, no systematic study of their relationships has been published. A proliferation of varietal names during the 19th century during the early growth of the vegetable seed industry led to much confusion about the genetic relationships among open-pollinated populations. The aim (here) is to present a brief history and pedigree of the founding onion populations in the U.S. and to trace the development of modern onion germplasm following the establishment of a National Onion Breeding Program in 1922 by Dr. Henry A. Jones.

Founding Populations

It appears that early settlers to the New World brought onion seed with them as they crossed the Atlantic. These populations, of unknown origin and type, were likely the founding populations of 'storage' onion germplasm in the Eastern U.S. The market classification 'Eastern Storage' fits well with these early introductions and selections. Although little is known of the varietal distinctions of these early onion populations, it is clear that early settlements around the Boston, Mass., and Hartford, Connecticut areas were home to a number of important onion populations. These populations, such as Yellow Globe Danvers (Mass.) or Red Wethersfield and Southport Red, White, and Yellow Globe (Conn.) formed the foundation for many of the early onion cultivars in the eastern U.S.



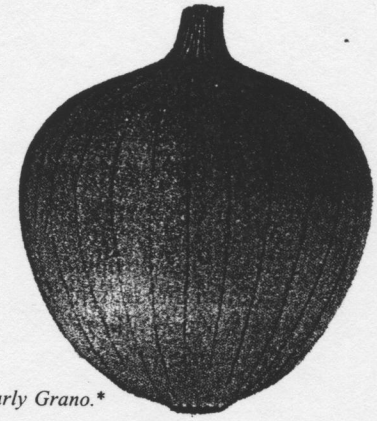
*Yellow Globe Danvers.**

Four founding populations make up much of the modern onion germplasm used in the U.S. These derive from Yellow Globe Danvers (eastern storagé), Valencia (Grano), White Bermuda (Granex), and Spanish. Each of these will be discussed.

Yellow Globe Danvers: Danvers, Mass., was the birthplace of the Yellow Globe Danvers onion, a variety developed during the 18th century and said to be perfected by Daniel Buxton . This variety became very important throughout the country as a storage onion and was distributed around the world by 1850. Yellow Globe Danvers originated as selections from Silverskin, a common European onion, and a population known simply as 'common yellow.' Because varietal distinctions were not common in the 18th and early 19th centuries, the 'common yellow' name refers not to a variety but to a mixed population of yellow onions. Yellow Globe Danvers was the founding population for much of the Eastern storage onion germplasm developed in the U.S.

Yellow Globe Danvers was selected into several important populations, including Extra Early Yellow, Mountain Danvers, and, likely, Southport Yellow Globe.

Selection within the open-pollinated Yellow Globe Danvers to develop these populations does not preclude introgression of other germplasm during their development, however we have little if any information on the kinds of germplasm used during the selection process. An exception is Downing Yellow Globe, which was selected by Ken Trapp of Michigan using Southport Yellow Globe, Valencia and Siberian Red. Extra Early Yellow was selected into Early Yellow Globe and incorporated into many of the early 'B' series inbreds such as B2108B (For Beltsville, Md., home of the USDA and National Onion Breeding Program), which ultimately figured into a number of the early hybrid releases such as Pioneer from the National program. Downing Yellow Globe was selected into Rochester Bronze, which formed the foundation population for all of the 'W' inbred releases (for University of Wisconsin) developed by W.H. Gabelman during the 1950s – 1990s. Southport Yellow Globe, developed originally in Southport, Conn., was selected into the early MSU inbreds (for Michigan State University) by C.E. Peterson and into the important variety Brigham Yellow Globe. The latter was selected into a series of 'B' inbreds such as B2215C and used in early hybrids such as Bonanza. Alternatively, Brigham Yellow Globe was selected into Iowa Yellow Globe and then into inbred lines such as IA736



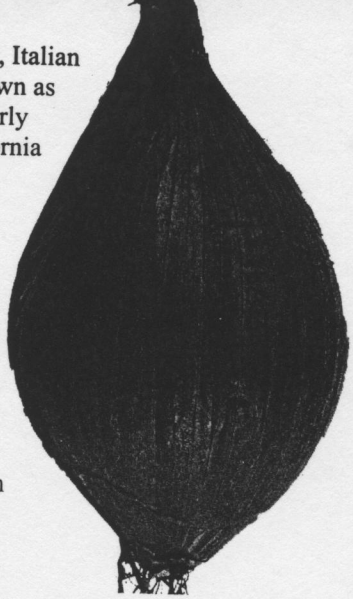
*Early Grano.**

Grano and Granex: The short-day populations known as Grano and Granex originated from two key open-pollinated populations: Valencia, introduced to the U.S. from Spain in 1925, and White Bermuda, introduced to the U.S. in 1883 from Bermuda, although the variety originated in Italy (see Figure 2). By the time of their introduction, both of these populations had long histories in onion production in southern Europe.

Valencia was originally selected into

Early Grano and then into three key populations: Texas Grano, Texas Early Grano 502, and Crystal Grano. Texas Early Grano 502 was selected into Texas Early Grano 951C, which was used to produce the popular variety Texas 1015Y by Dr. Leonard Pike. Texas Early Grano 502 was also selected into many of the NuMex varieties developed at New Mexico State University by Dr. Joe Corgan. Texas Early Grano 951C was also used as a parent of the very popular hybrid known as Granex. The other parent was YB986, a selection that arose from Excel, which was derived from White Bermuda. White Bermuda was also selected into the popular Crystal Wax, which served as a parent of L690 and ultimately to Crystal Hybrid.

Fundamental to the development of modern onion hybrids was the discovery of sterile cytoplasm and its nuclear restorer by Jones and Clarke. The source of sterility for the entire National program was a single plant from the variety Italian Red, known as Italian Red 13-53.



This Italian Red is a scan of one of Henry Jones' original black-and-whites of this cultivar taken in Davis, Calif., in 1925.

Originally, Italian Red was known as California Early Red or California Early Red UC#1, the latter of which was released in 1935. These populations arose from Red Italian Tripoli, a popular Italian onion variety. California Early Red and Italian red were common varieties grown by market gardeners in the San Francisco Bay Area in the early part of the 20th century. Italian Red 13-53 was observed in 1925 and later became a parent to Calred, the first released hybrid in 1947.

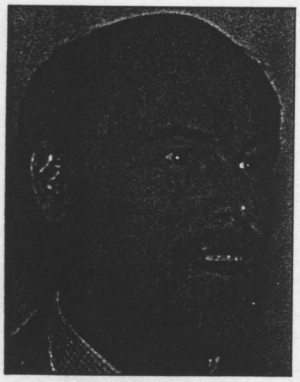
Sweet Spanish or Spanish: Sweet Spanish or Spanish germplasm was first officially introduced into the U.S. in 1916, although there is some evidence that informal introductions were made much earlier. Certainly, the population known as Sweet Spanish was introduced in 1916 from Spain and selected into Yellow Sweet Spanish, Utah Sweet Spanish, and Currier Sweet Spanish in the Western U.S.

Yellow Sweet Spanish was the progenitor of many of the important 'P' series inbreds developed by D.F. Franklin at Idaho ('P' refers to Parma, Idaho, the location of the experiment station). Utah Sweet Spanish was the progenitor of 'B' series inbreds such as B12115C and of White Sweet Spanish. Currier Sweet Spanish was used to

select 'B' series inbreds such as B1340B.

National Onion Breeding Program

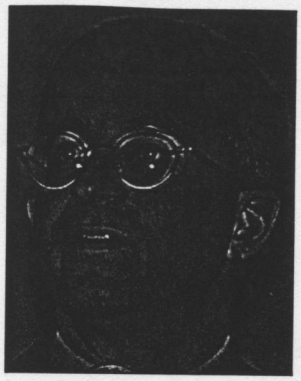
Up through the mid-1900s, onion seed was produced by individual growers and commercially by groups or individuals. This seed production was based on mass selection of bulbs, maintaining strains adapted to a specific growing region. In the 1920s, breeding programs were established in the public sector to improve the quality of onion populations available to growers and consumers. The first onion-breeding program in the U.S. was supported by the California Agricultural Experiment Station. In 1922, Jones joined the faculty of the University of California-Davis and initiated research on the breeding and genetics of onions. The contributions of Jones epitomize the early years of public onion breeding in the U.S. His laudable accomplishments have been documented elsewhere.



Michael J. Havey

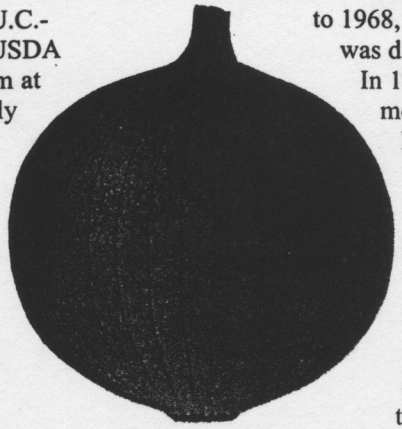
While at the U.C.-Davis, Jones and colleagues established many of the techniques still widely used by onion breeders of today, such as self or small mass pollination using flies. Jones and Davis (1944) observed that inbreeding onions for one to two generations often produced uniform lines. Vigor was restored by crossing between inbreds and a few hybrid combinations were higher yielding than the parental populations. Jones and Davis (1944) concluded that uniform, high-yielding hybrids could be generated after inbreeding and selection for two to five generations. Most publicly released onion inbreds were developed by selfing individual plants from open-pollinated cultivars or recombining previously developed inbreds.

The advantages of hybrid onions could not be realized without a method to ensure cross-pollination. The onion umbel consists of hundreds of small, perfect flowers making emasculation impractical. The production of hybrid onion seed became economically feasible with the discovery of cytoplasmic male sterility (CMS). Although maize researchers had described a maternal effect for CMS, the report by Jones and Clarke (1943) was the first to recognize the interaction between the cytoplasm and nucleus in conditioning male sterility. Jones and Clarke (1943) also described the use of CMS to produce hybrid seed. This discovery must be considered as Jones' most significant contribution to plant breeding. After the discovery and characterization of CMS, onion-breeding efforts in the public and private sector have concentrated on the development of hybrids.



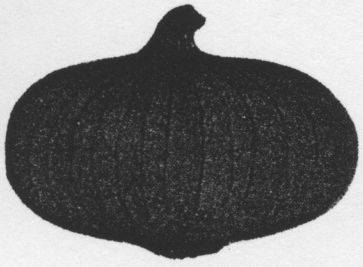
Irwin L. Goldman

In 1936, Jones left U.C.-Davis to establish the USDA onion-breeding program at Beltsville, Md. The truly unique attribute of Jones' USDA program was the development of an onion-breeding network in the U.S. The USDA provided Jones with a modest budget and he used these funds to support cooperators at up to 22 state agricultural experiment stations. The early cooperators with Jones included G. Davis and L. Mann of California, D.F. Franklin of Idaho, A. Kehr of Iowa, E. Tims of Louisiana, C. Peterson of Michigan, B. Perry of Texas, and W. Gabelman of Wisconsin.



*Sweet Spanish.**

These cooperators worked with Jones to develop onion inbreds, test experimental hybrids, and identify superior combinations. From about 1952 to 1960, Dr. Jones grew his experimental material at the USDA field station at Greeley, Colo. He appointed D.F. Franklin, W. Gabelman, and H. Munger as USDA collaborators. These three men, along with C. Peterson, a USDA employee until he moved to Michigan State, met for a week every February in Greeley and at other locations to evaluate inbreds and hybrids and, most importantly, openly discuss ideas, germplasm and techniques to successfully expand cooperation between the federal and state programs.



*Yellow Bermuda.**

In 1957, Jones left the USDA to assume a position with Dessert Seed Company, El Centro, Calif. From 1957 to 1968, the USDA program was directed by Dr. E. Davis. In 1966, Dr. G. McCollum moved from Parma, Idaho, to Beltsville and established a program concentrating on the crossing relationships among onion and closely related wild *Allium* species and introgression of diverse germplasm in the bulb onion. In 1968, the onion breeding efforts of the USDA program moved from Beltsville to Madison, Wis., and Dr. C.E. Peterson assumed responsibilities. Peterson primarily developed elite inbreds for production of disease-resistant, well-storing, long-day hybrids grown in the eastern half of the U.S. Many state programs cooperated closely with the USDA National Onion program in the evaluation of populations or hybrids. Some states supported breeding efforts independent of the USDA, of which the most successful are or were located in California, Idaho, Texas, Michigan, New Mexico and Wisconsin. ■

Editor's Note: Dr. Irwin L. Goldman and Dr. Michael J. Havey are both stationed at the University of Wisconsin-Madison, Madison, Wis. Dr. Goldman is with the Department of Horticulture, and Dr. Havey is with the USDA Agricultural Research Service as well as with the Department of Horticulture. The information here is included in the Proceedings of the 1998 National Onion (and other Allium) Research Conference, held Dec. 10-12, 1998, in Sacramento, Calif.

***Photo source:** Magruder, R., R.E. Webster, H.A. Jones, T.E. Randall, G.B. Snyder, H.D. Brown, L.R. Hawthorn, and A.L. Wilson. 1941. Descriptions of types of principal American varieties of onions. USDA Misc. Publ. No. 435. Washington, DC. 87 p.

Trade, *from page 9*

onion per day significantly increased bone density in lab rats. The findings have implications in the treatment of people with osteoporosis.

Promotional success is one reason for some growers' optimism about onions. The National Onion Association reports that over the past 15 years, fresh onion consumption has risen from 12.2 pounds per capita to 18.6.

New Look for Idaho-E. Oregon Onion Committee Web Site

The Idaho-E. Oregon Onion Committee (IEO) recently updated and expanded its web site at www.onions.org. The new site sports a freshly updated look, is easier to navigate and provides information not available on the previous site.

The new site is organized into retail, foodservice, consumer, broker and export sections that provide targeted information for each type of onion buyer. The site even offers a new kids' section, where fun puzzles and coloring pages help children learn about the importance of including fruits and vegetables, including onions, in their daily diet.

According to IEO Promotion Coordinator Norma Standerford, "The re-organized web site makes it easy for anyone to find the information they need about IEO onions. It answers a lot of questions and also informs buyers about some of the programs we offer."

Like the old site, the new site provides a list of IEO onion shippers, a helpful sizing chart, contact information for IEO merchandising reps, nutritional information, and a wealth of other information about IEO onions. The recipe section has been expanded to include more than 40 recipes conveniently organized into categories. Other new information on the site includes current crop photos and offers from the IEO.

The IEO is a is a non-profit organization representing the interests of more than 300 growers and 35 shippers.