

DUTCH ELM DISEASE: RESISTANT CULTIVARS

By Dr. Eugene B. Smalley and Dr. Raymond P. Guries

Since 1957, a program of elm germplasm collection and screening for disease resistance has been conducted at the University of Wisconsin. This collection is now one of the most extensive in the United States and provides a unique genetic base for disease resistance elm breeding. Our program has previously emphasized the Asian gene pool, especially Japanese and Siberian elms, but more recently emphasis has been given to improvement of the American elm.

General screening and seasonal susceptibility testing have identified many elm clones with good to excellent ornamental characteristics and having very high levels of resistance to Dutch elm disease. Many of these clones also possess resistance to other elm diseases such as black leaf spot, *Taphrina* leaf blister, and *Verticillium* wilt.

SAPPORO AUTUMN GOLD. In 1973, as a result of our early investigations, we (with D. T. Lester) released the cultivar SAPPORO AUTUMN GOLD which combined the high disease resistance of Siberian elm with the moderate resistance and desirable ornamental characteristics of the Japanese elm. SAPPORO AUTUMN GOLD has been widely planted, in North American and Europe, and because of the "Elms Across Europe Program" (Pitney Bowes Ltd) received considerable notoriety following ceremonial plantings at the Pitney Bowes Factory at Harlow, Essex by the American Ambassador Kingman Brewster (1979), by Prime Minister Margaret Thatcher (1982) and at Windsor Castle by Prince Phillip (1980). Presently SAPPORO AUTUMN GOLD is the only elm grown in Hyde Park in London, where the English elm was once the park's principal shade tree.

Reception of our resistant elm in the U.S. has been less enthusiastic. Our attempts to persuade President Reagan to accept SAPPORO AUTUMN GOLD for planting on the White House grounds failed. In fact the grounds keeper at Windsor Castle told us that Prince Phillip's ceremonially planted SAPPORO AUTUMN GOLD tree at Windsor Castle was very nearly decapitated by President Reagan's helicopter when it landed near the tree during his state visit there a few years ago. However, that National Capitol Parks has now planted a SAPPORO AUTUMN GOLD tree near the Capital Mall in Washington, D.C., and anticipates future plantings of new Wisconsin cultivars as they become available. Ceremonial plants of SAPPORO AUTUMN GOLD have also taken place in Wisconsin. One specimen which was planted in Arbor Day celebrations several years ago on the State Capitol grounds in Madison became notable recently when it provided shelter over several days for a large group of apartheid protesters. The tree survived the protest,

but the lawn had to be re-sodded.

Following initial resistance testing, SAPPORO AUTUMN GOLD was selected for release over other candidates because of its American elm-like vase-shaped branching habit. We were misled by this youthful characteristic since it is now clear that in age SAPPORO AUTUMN GOLD tends to develop a single strong central trunk. The amount of crown-spread is dependent upon the planting location and distance from other trees or buildings. In marked contrast to its maternal Siberian elm parent, SAPPORO AUTUMN GOLD tolerates close competition from other trees and competes in situations where adjacent trees are nearby. Because of its strong vigor, however, it generally needs to be planted at least 30' feet from other trees or buildings. The tree requires careful management during its formative years. In open grown situations, excessively vigorous side shoots need to be removed early to prevent premature side-branch development. In certain years, SAPPORO AUTUMN GOLD trees produce large seed crops, and as the tree ages, successive seed crops may result in death of fruitful twigs. Occasional cosmetic pruning may be required. In spite of its rapid growth, however, "heartwood" boards sawn from the trunks of older SAPPORO AUTUMN GOLD trees have a beautiful grain and color and could be useful for producing high quality plywood verneer.

REGAL. In 1983 we released a new hardy elm cultivar called REGAL possessing a columnar form, high disease resistance and a vigorous growth habit. It was selected from seed obtained in 1960 from Holland as part of a cooperative exchange with the Dutch elm breeding program. The improved hardiness and disease resistance of this selection, as contrasted with its maternal parent (COMMELIN) may be attributed in part to its 25% Siberian elm ancestry as well as the northern (Denmark) origin of its grandparent (*U. carpinifolia* Hoersholmiensis).

Soon after planting, REGAL develops a strong central leader and young plantings require a minimum of care to maintain a vigorous, upright, columnar habit of growth. Under very good growing conditions, top-pruning may be necessary to reduce the rate of height growth while allowing increased diameter growth. If this is not done, the tree may sustain unnecessary wind or ice storm damage. REGAL develops well in situations near buildings and provides an attractive accent to otherwise harsh exterior building surfaces. Young trees develop rapidly and in general form resemble the maternal parent COMMELIN. It grows more slowly than SAPPORO AUTUMN GOLD, and in mature plantings is less densely foliated than American elm. Such plantings allow full lawn development while maintaining

an attractive columnar habit. Its uniform, upright growth makes it an excellent choice for boulevard plantings or urban plantings associated with shopping malls, condominiums, and other modern housing developments. REGAL has been planted extensively on the University of Wisconsin, and some of the oldest specimens of this cultivar can be seen here. A large specimen of Regal was recently planted at the U.S. Forest Products Laboratory in Madison as a part of the program celebrating the Centennial Anniversary of the Laboratory.

AMERICAN LIBERTY. The AMERICAN LIBERTY elms are a group of recently released hardy American elms (eg *Ulmus americana*) from our breeding program possessing an upright vase shape, disease resistance and a vigorous growth habit. These elms constitute a genotypically diverse, multiclonal variety having similar phenotypes. The AMERICAN LIBERTY elms were derived from control-pollinations (with D.T. Lester) between selected DED resistant parents. The parents include superior survivors from the Wisconsin program, as well as resistant individuals from the New York and USDA programs. In total the parents constitute survivors of over 60,000 inoculated American elm seedlings from many locations over the natural range of the American elm. The most distinctive of the AMERICAN LIBERTY elms has been given the name INDEPENDENCE.

Growth of AMERICAN LIBERTY elms is vigorous and typical of cross-pollinated seedlings of American elm. General leaf size, shape and color, bark color and texture and other growth characteristics are not distinctive and are generally typical of the North American white elms (*U. americana*). AMERICAN LIBERTY elms exhibit unusual resistance to DED following screening with a mixture of North American strains of the pathogen. Their resistance, while clearly improved over non-selected American elms, is inferior to resistant cultivars such as SAPPORO AUTUMN GOLD or REGAL derived from Asian or European sources. However, their resistance represents the highest level thus far achieved by selection and breeding within American elm.

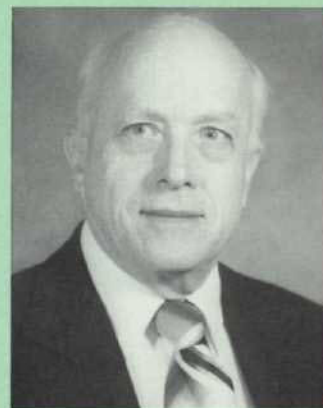
Reduced resistance in young, vigorously growing ramets from resistant parents suggests that in their early years AMERICAN LIBERTY elms can succumb to Dutch elm disease, although even under these conditions their period of susceptibility will be much less than comparable non-selected American elms. We postulate that vigorously growing ramets which are not infected during the first few years of growth will generally fail to become infected in later years after reaching maturity. The long-time survival and mature plant resistance of parents of the AMERICAN LIBERTY elms make their selected progeny worthy candidates for release and public trial. The multi-clone approach to release of American elms for urban planting may counter the problem inherent in wide-scale planting of identical genotypes with limited genes for resistance to DED. It is anticipated that as our testing continues additional and perhaps improved individuals will be added to the AMERICAN LIBERTY multiclone.

AVAILABILITY. SAPPORO AUTUMN GOLD and REGAL are available from commercial sources under license from the Wisconsin Alumni Research Foundation. Inquiries can be directed to the McKay Nursery Company, Waterloo, WI 53594; The Conservation Foundation, 11a West Halkin Street, London, SW1X8JL, and Elms Across Europe, Pitney Bowes, The Pinnacles, Elizabeth Way, Harlow, Essex, in England; or Conrad Appel, Forst-und Geholzsaaten Baumschulen, Bismarkstrasse 59, Postfach 110147, 6100 Darmstadt, West Germany. Commercial development of the AMERICAN LIBERTY elms in the United States has been assigned to the Elm Research Institute, Harrisville, NH 03450. Tel. 1-800-FOR-ELMS.

Editor's Note: Dr. Gene Smalley is nearing thirty years as a member of the UW—Madison Plant Pathology faculty. Educated in California, Professor Smalley received a B.S. degree from UCLA in 1949, a M.S. and a Ph.D. from Berkeley in 1953 and 1957, respectively. He has been at Wisconsin since 1957.

Dr. Smalley's research interest is in the control of Dutch Elm disease and mycotoxins in grain and hay. He addressed the 1974 GCSAA Conference in Anaheim on DED chemotherapy.

Dr. Ray Guries is a professor in the Department of Forestry at the UW—Madison.



Dr. Eugene B. Smalley

LAKE SHORE SAND TDS 2150 TOP-DRESSING SAND

- CREATES A TRUER PUTTING SURFACE
- IMPROVES WATER INFILTRATION RATE
- HELPS CONTROL WEEDS—INCLUDING POA ANNUA
- MATCHES USGA SPECIFICATIONS

— TYPICAL DISTRIBUTION —

MESH	MM	% RETAINED
30	0.60	0.2
35	0.50	0.8
40	0.42	3.4
50	0.30	28.0
60	0.25	25.9
70	0.21	23.5
100	0.15	18.0
140	0.10	0.2

JORDAN R. SENSIBAR — AREA REPRESENTATIVE —
(414) 271-0625

515 West Canal Street • Milwaukee, WI 53202
(take the 6th Street viaduct)