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# LIBERTY, a new disease resistant apple

Robert G. Lamb, Herb S. Aldwinckle, Roger D. Way, and David E. Terry



Breeding apples resistant to diseases has been an important cooperative project of the Department of Pomology and Viticulture and the Department of Plant Pathology at the New York State Agricultural Experiment Station, Geneva since 1949. This new variety, 'Liberty,' is the first variety to be named from this project.

The reasons for initiating breeding for disease resistance are several. The cost of materials, equipment, and labor to control the four important apple diseases that are important in New York is considerable. Control of pests of apples by chemical means requires more pesticides per acre than

any other crop in the United States, and there are increasing concerns about environment pollution by pesticides. Furthermore, some of the disease-causing organisms have become tolerant to certain fungicides, making chemical control more difficult. Finally, the increasing strictness of the standards of the Environmental Protection Agency concerning the deleterious effects of pesticides on humans has increased the probability of losing effective fungicides and bactericides for disease control.

At first, the objective of this project was resistance to apple scab only, but it soon became clear that when apples were grown without any chemical disease control, the other major diseases (cedar apple rust, fire blight, and mildew) could be more serious. Thus, the objectives were broadened to include resistance to these diseases as well. In 'Liberty,' we have an apple that has a measure of resistance to all four of these diseases. Our experience so far is that it can be grown without any fungicidal sprays. Since it is not resistant to insect, however, spraying or other means of insect control must still be used.

### ORIGIN

'Liberty' resulted from a cross, 'Macoun' x Purdue 54-12, made in 1955. The pollen was supplied by Dr. Ralph Shay of Purdue University, Indiana. Its resistance comes from *malus floribunda*.

From this cross, 261 seeds were planted and screened for resistance to scab. Thirty-eight resistant seedlings were planted in the seedling orchard to be grown to full size for fruiting. One of these seedlings, NY 55140-19, first fruited in 1961 and was selected and propagated for further trial in 1964. It was included in the New York State Fruit Testing Cooperative Association catalog in 1974 and has been tested in numerous orchards since that time.

The name, 'Liberty,' was suggested by Mrs. Bernadine Aldwinckle of the Entomology and Plant Pathology Departments at the Geneva Station to denote freedom from disease. The name also revives the tradition of using New York place names for Geneva apple introductions.

### DISEASE RESISTANCE

'Liberty' was screened for resistance to scab as a small seedling in a severe test in the greenhouse and was found to be resistant. This test, which was done by the Department of Plant Pathology, consists of inoculation of very susceptible tissue with a high concentration of scab (conidia) spores under conditions ideal for infection so that resistance can be identified with a high degree of confidence. As an additional precaution, however, trees in the field are maintained without fungicidal sprays and examined each year for freedom from disease. 'Liberty' has remained free of scab lesions in field plantings for 22 years.

Resistance to cedar apple rust has been determined in the greenhouse by controlled inoculation and in the field where red cedar branches with rust galls were brought in as sources of spores. In both situations, 'Liberty' has shown very high resistance to cedar apple rust.

Similarly, 'Liberty's' resistance to fire blight has been checked under greenhouse and field conditions and under controlled inoculations and natural infection. It has shown a high level of resistance in all cases.

Resistance to mildew has been determined by observations of natural infection in the field. 'Liberty' has shown less mildew infection than 'McIntosh' over the 20 years that it has been under test. The leaves sometimes show scattered lesions of mildew, but only very infrequently will there be infected terminals which are the sites where the fungus causing the disease overwinters. For this reason, we believe that it will not be necessary to use chemical sprays to control mildew on this variety.

### THE TREE

Trees of 'Liberty' are vigorous and annually productive. The form is round spreading. The growth habit is such that blossom buds are frequently set terminally and laterally on shoots of the current year's growth. Where blossom buds



Figure 1.—A branch of 'Liberty' with some of the leaves removed showing the fruiting habit of the variety. Note that the fruit is set terminally and laterally on the 1977 growth and that the many spurs on the 1976 growth are also bearing fruit.

are not set on the current season's growth, typically three or four shoots will grow, and the remainder of the buds will break to form spurs. It is not a typical "spur" type of growth but is very productive due to the large numbers of spurs which are formed (Fig. 1). Spurs remain fruitful for several years, and the trees bear annually. A comparison of the estimated yield of trees of 'Liberty,' 'McIntosh,' and 'Delicious' topworked on 10-year-old trees is presented in Table 1.

Table 1.—Comparison of estimated yields of same-age topworked trees of Liberty, McIntosh, and Delicious.

| Variety   | 1975<br>bu. | 1976<br>bu. | 1977<br>bu. | 1978<br>bu. |
|-----------|-------------|-------------|-------------|-------------|
| Liberty   | .25         | 4           | 4           | 7           |
| McIntosh  | .25         | 2           | 3           | 6           |
| Delicious |             | 2           | .75         | 2.5         |

Extremely severe winters have not occurred during the test period to completely test the winter hardiness of this selection, but no evidence of winter injury or frost injury to the blossoms at time of bloom has been observed. With 'McIntosh' and 'Wealthy' in its parentage, it might be expected to be quite cold hardy.

Trees of 'Liberty' have become infected with chlorotic leafspot virus (CLSV) with no apparent deleterious effect on growth and yield. The variety has, however, been sent to the IR2 Repository at Prosser, Washington for heat treatment, and it is hoped that propagating wood free of CLSV will be available soon.

### THE FRUIT

The fruit of 'Liberty' is a deep dark red over 90 per cent of the surface. The ground color is yellowish. The red is striped rather than blushed. The shape of the fruit is oblate to oblate conic, and the size averages 2 3/4-3 inches although it may be smaller on heavily cropping trees. The cavity is obtuse, broad, smooth to slightly russeted. The stem is short. The calyx is medium large and mostly closed. There are numerous light colored small sunken dots on the surface of the fruit.

The flesh is yellowish in color, juicy, crisp, fine. The flavor is subacid and good. The core is medium large and is slightly to wide open. The quality has been rated as good. At Geneva, it is ripe about October 5 on the average or about 10 days after McIntosh. 'Liberty' is considered to be primarily a dessert apple and has not as yet been given a processing test.

### AVAILABILITY OF TREES

Trees and propagating wood are available from the New York State Fruit Testing Cooperative Association of Geneva, New York. Some commercial nurseries have secured propagating wood of this variety and may have trees available in 1979.