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The History of the 'Empire' Apple

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Abstract

In 1945, unusually warm spring weather, a very early bloom in mid-April, and postbloom frosts eliminated virtually all crosses made for the N.Y. State Agricultural Experiment Station apple breeding program in Geneva, NY. The apple breeding material for 1945 was comprised of seed collections from isolated commercial orchards in the Hudson Valley containing only the desired cultivar pairs for crosses. One such collection contained 'McIntosh' seeds from an orchard of mature 'McIntosh' and 'Delicious' trees near Claverack, NY. A seedling tree from this collection was selected as NY45500-5 in 1954. This seedling was named 'Empire' in 1966.

Many apple cultivars widely grown today, such as 'Delicious,' 'Golden Delicious,' 'McIntosh,' and 'Granny Smith,' were discovered by chance (3, 4, 6, 13). Today, most apple cultivars originate from controlled crosses in breeding programs. Occasionally, however, even this process can have its improbable combinations of chance and good luck. Such is the case with the 'Empire' apple.

By 1945, apple breeding had been underway at the New York State Agricultural Experiment Station in Geneva for over half a century (5). In 1945, unusually warm temperatures reaching as high as 31°C occurred in late March and early April (7). Daily minimum temperatures during that period were also unusually high, falling to freezing only occasionally. Apple orchards in western New York began to bloom by April 14, about one month earlier than normal (7). Several frosts following this early bloom eliminated virtually the entire apple crop in western New York (7). The apple breeders at Geneva made their usual crosses during this early bloom, but the late April freezes left virtually no apples from which seedlings could be obtained (1).

Dr. A. J. Heinicke, Head of the Department of Pomology and Director of the Experiment Station, identified the solution to this dilemma. The apple breeding program emphasized crosses between commercially important cultivars to obtain late-maturing apples (1). One frequently-used cross was 'McIntosh' and 'Delicious.' Dr. Heinicke suggested that the breeders locate relatively isolated, cropping commercial orchards containing only any two cultivars normally used for crosses (C. G. Forshey, personal communication with Dr. A. J. Heinicke). Since the apples from such orchards would most likely represent natural cross-pollinations between those two cultivars, the necessary seedling material for the 1945 breeding program could still be obtained.

Since almost all the New York State apple crop in 1945 was in the Hudson Valley, orchards meeting the necessary criteria were selected there for seed collection. One such orchard, owned by Mr. Asrow Miller, was located south of Claverack, NY (21, 22; C. G. Forshey, personal communication with Dr. J. Einset). This relatively isolated orchard consisted of mature 'McIntosh' and 'Delicious' trees only. At harvest, 4,035 seeds were extracted from 'McIntosh' apples in the miller orchard and were sent to Geneva (22). 1199 seedlings originating from the Miller orchard were planted in the station test orchard in spring, 1947 (22).

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In 1954, a Miller-orchard seedling having desirable, 'McIntosh'-type fruit characteristics was assigned the selection number NY45500-5 (22). The identity of the person who selected NY45500-5 is unrecorded. Mr. Leo G. Klein, Research Associate at Geneva from 1949 until his death in 1962, was actively involved in the apple breeding program, wrote extensively on apple cultivars and selections during his career (e.g., 5, 8, 9, 10, 11, 12, 21), and may well have made the selection. Curiously, although he devoted considerable attention to alternatives for 'McIntosh,' Klein never mentioned NY-45500-5 in any of his written material.

Dr. Roger D. Way, who also joined the Pomology department in 1949, took responsibility for the apple breeding program in 1962, the year Mr. Klein died (19). By 1965, Dr. Way had recognized the potential of NY-45500-5. NY45500-5 was first described in writing in two listings of apple cultivar characteristics authored by Dr. Way and dated January 8, 1965 (14, 15). He also mentioned NY45500-5 in his presentation on apple cultivars at the annual meeting of the New York State Horticultural Society a few weeks later (16). By December, 1965, Dr. Way had described NY45500-5 briefly in three published articles (16, 17, 18) and featured it on the cover of a station circular (19).

In late 1965, the decision was made to name and release NY45500-5. Suggestions for a name were solicited from the fruit industry (20). At least 104 suggestions were received from growers, packers, and others (2). The name 'Empire' was included among those suggested, but the originator(s) of the name are unrecorded. The final list of candidate names included the following: 'Delight,' 'Delmac,' 'Empire,' 'Joy,' 'Nymac,' 'Polymac,' 'Red Jacket,' 'Sparkle,' 'Sprite,' and 'Tasty' (2).

The shippers expressed a strong preference for the name 'Empire' (C. G. Forshey, personal communication with Dr. J. Einset). A majority of those polled also favored this name. NY45500-5 was officially released by the New York State agricultural Experiment Station as 'Empire' in September, 1966 (22).

It is impossible to calculate the odds against the one seed with the genetic traits of the 'Empire' apple being formed in 1945 and also being in the right place at the right time to be collected, sent to Geneva, and grown in a test orchard. In addition to the unusual weather and crop loss at Geneva in 1945, several people had important roles in the discovery and development of the 'Empire' apple. We are fortunate that these unlikely events occurred, because the 'Empire' apple represents a worthy addition to the cultivars available to both growers and consumers.

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Cold Hardiness of Peach Stem Tissue Over Two Dormant Seasons

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Abstract

Cold hardiness of one nectarine and five peach cultivars was evaluated using electrical conductivity from January to March 1991 and from December 1991 to February 1992. Differences in cold hardiness were observed among cultivars. In both years 'Redhaven' and 'Harbrite' were the hardiest cultivars and 'Salem' was most susceptible to cold injury. For the other cultivars the results were not consistent over the two years. Training system and crop load had no influence on cold injury.

Additional index words. Cold injury, electrical conductivity.

Low temperatures during the dormant season limit the production of peaches and nectarines [*Prunus persica* (L.) Batsch] in the northern United States and Canada. Severe losses in yield have been attributed to late spring frosts, which damage the flower buds. During winter, low temperatures can cause injury to stem tissue, which weakens the tree and allows wound parasites to enter through dead and dying tissue (4). This has led to the assumption that cold injury is one of the main causes for peach tree short life (15). Differences in cold hardiness among diverse peach genotypes have been observed (3, 4, 14) and several attempts have been made to explain the physiological processes involved (5, 6, 28, 31). It has been shown that peach bud and stem tissue deep supercool to avoid freezing injury (1, 18, 19, 20, 21). During low temperature exposure, cell water does not freeze until temperatures came close to the homogeneous nucleation point. Ice formation starts spontaneously, and the freezing water releases heat, which can be measured by differential thermal analysis (DTA). Cold injury in *Prunus* species occurs mainly during this process commonly known as the low temperature (LT) exotherm. In early winter and spring the initial temperature for the LT exotherm is higher and occurs over a smaller temperature range.

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