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The 'Northern Spy' Apple

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The origins and commercial development of the Northern Spy apple have been described by Upshall (35). I shall use his review as the basis for this paper.

Origin

The exact origin of the cultivar is somewhat obscure. According to Upshall (35) the original seedling was probably planted by Oliver Chapin of Salisbury, CT, on a 300 acre tract that he had purchased near E. Bloomfield in Ontario County, NY, in 1790. In 1800, Heman Chapin, a brother of Oliver, bought land nearby and either planted seed brought from Connecticut or transplanted some of Oliver's seedlings to his own farm. Roswell Humphrey, Heman's brother-in-law, also bought land adjacent to Heman's, and planted vigorous suckers arising from the root system of one of the original seedlings whose top portion had died. These eventually fruited, giving rise to the 'Northern Spy.' A slightly different version is found in the account of J. H. Watts (23, p. 104), who quotes from a letter from Oliver Chapin dated 20 January 1847. Chapin indicates that the cultivar originated from seeds brought to New York from Connecticut by Elijah Taylor about 1800, that the "original tree" was set by Heman Chapin, and that Roswell Humphrey took sprouts from this tree, which died before having borne fruit. Whatever the exact circumstances, the first 'N. Spy' fruits were Humphrey's. A marker (Fig. 1) was placed on the farm in 1964 to commemorate this cultivar, although no orchard existed there as of 1965 (35).

The origin of the name of this cultivar is not mentioned in any of the early publications. Gemmer (20) cited a brief letter to the editor of a gardening magazine published about 1853 claiming that it was named for the "hero" of a dime novel (*The Northern Spy*). This anonymous tale described the exploits of a man who, posing as a slave catcher, assisted slaves to escape from bondage in the South.

Commercial importance

A. J. Downing (14) listed 'N. Spy' in his *Fruits and Fruit-Trees of America.* Specimens were exhibited by Ellwanger and Barry Nurseries of Rochester, NY, at the Massachusetts Horticultural Society meeting in 1844 — "its first introduction to...eastern cultivators" (23, p. 72). According to Hovey (23) it had been known locally for 5-6 years, and Ellwanger and Barry had 3000 trees in their nursery. As of 1846, one Mr. Hand of Mendon, Ontario County, NY, had been selling the fruits in Rochester for 10 years (15, pp. 482-3). By this time it was sufficiently popular on the Rochester market that apple sellers were "counterfeiting" it by selling similar apples as 'Northern Spy' (27).

In 1852 the American Pomological Society first recommended the cultivar for planting in "particular localities," it being "so little known out of its native locality" (24, pp. 68-69). As of 1892 it was listed in nursery catalogues from 10 of 13 North American areas of production (7). However, the variety is commercially important today only in New York-New England, Michigan, and Eastern Canada.

Beach (8) reported that 'N. Spy' was the third most important cultivar in New York in 1905, behind Baldwin and R. I.Greening; Gillett (21) confirmed this ranking in the mid-1920s, although the number of 'Baldwins' and 'McIntosh' trees far outnumbered 'N. Spy' trees. In 1927 it was chosen for emphasis as one of the "New England Seven" in a coopera-

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Table 1. Number of 'N. Spy' trees (1000s) by state and province 1940-1995. Approximate values for 5 or 10-year periods.

Time period	United States							State/province Canada	
	MA	ME	MI	NH	NY	PA	VT	NS	ON
1940-49			385[1]					80[2]	246[2]
1950-59	9[2]	12[2]				30[2]	15[2]	43[2]	210[2]
1960-69		9[2]	225[1]	2[2]				59[2]	240[2]
1970-79	3[4]	5[4]		2[4]		10[3]	6[4]	68[6]	229[6]
1980-89			332[1]		74[5]	11[3]		88[6]	309[6]
1990-95	1[4]	1[4]	350[1]	1[4]	18[5]	12[3]	2[4]	88[6]	343[6]

[1]Anonymous (5)
[2]Upshall (35)
[3]Anonymous (3)
[4]Anonymous (4)
[5]Anonymous (2)
[6]Ontario Apple Marketing Commission (29)

tive project among extension personnel to reduce the number of cultivars on the market and concentrate on a chosen few (17, 30). It ranked second only to 'McIntosh' in Vermont in the early 1930s. Its popularity has declined considerably since then, although it remains a fruit highly prized by connoisseurs and processors. It was one of the top 20 cultivars in the U.S. as a whole — 2.3 % of the commercial crop — and was still the third ranking cultivar in Canada in the late 1960s, production there having more than doubled in the previous 20 years (38). It remained 14th in the U.S. in 1991-95, slightly behind 'Yellow Newtown,' 'R. I. Greening,' and 'Cortland,' annual production averaging 2.25 million 42-lb. bushels (42.8 MT) (26).

Michigan has been the leading state in production for many years; Gardner (19) remarked that the State had "always been considered Baldwin, Spy and Greening territory." Following a survey of 100 commercial orchards, he reported that 'N. Spy' was sixth in order of total tree numbers, but third, behind 'Jonathan' and 'McIntosh,' in numbers of non-bearing trees. Planting of 'N. Spy' has remained relatively constant in Michigan since

Table 2. Apple introductions with 'N. Spy' or one of its sports as one parent in addition to those listed by Upshall (35). [American Society for Horticultural Science, (10); Brooks and Olmo, (1)].

Cultivar	Other parent[z]	Year introduced	Origin
Farley N. Spy	sport	ca. 1946	Albion, MI
Fortune	Empire (M)*	1995	Geneva, NY
Graham Spy	sport	1936	Manistee, MI
Greene Spy	sport	1923	Victor, NY
Keepsake	MN447 (F)	1979	St.Paul, MN
Kestrel	Macoun (F)**	1975	Kentville, NS
Loop Spy	sport	1925	N.East, PA
Norspy	N.W. Greening (F)	1929	Ottawa, ON
Red N. Spy	sport	1930	Marshall, MI
Red Spy	sport	ca. 1895	Victor, NY
Scoharie Spy	sport of Red Spy	1936-40	Peru, NY
Str. Graham Spy	sport	1926	Manitou, MI
Sweet Sixteen	MN 477 (F)	1950	St. Paul, MN

[z]See (1) and (10) for synonyms.
[Y]M = male, F = female parent
*Parent = Scoharie Spy; **Parent = Red Spy



Figure 1. Monument near the site of the first 'Northern Spy' tree, north of E. Bloomfield, NY. A – general view; B – close-up of plate on monument. Photographed 1996.

1960 (Table 1, Fig. 2), despite fluctuations in planting of several other cultivars, especially 'Delicious' and 'G. Delicious' (Fig. 2), and it remains popular for processing. It was ninth or tenth in terms of total production in New York and the Eastern U.S. (New York/New England) in 1973-77 (37), and 13th in New York in 1985. Tree numbers fell considerably in the New England States (Maine, New Hampshire, Vermont) between 1950 and 1990 (Table 1), although the variety was projected to be 8th in importance there in 1994, and its percentage of total production was relatively stable at slightly less than 1% between 1970 and 1994 (6). Pennsylvania remains third among the States in tree numbers (Table 1). A decline in plantings was evident in Nova Scotia between 1949 and 1964, but tree numbers now approximately equal those in 1949 (Table 1). Tree numbers in Ontario remained stable between 1941 and the 1970s, but are now increasing (Table 1).

Fruit

The fruit is large to very large (75-100 mm in diameter) under moderate cropload, round-conic, and usually ribbed. The skin is green with dull red streaks. The cavity may have a greenish russet, and is acute, the stem moderately long to long. The basin is small to medium. The skin is thin, tender and smooth, the flesh yellowish, fine-grained, tender and crisp, and the fruit is easily bruised. It is one of the last "native American" cultivars to ripen, harvest normally occurring in mid- to late October in the Great Lake States. Bitter-pit is a problem with large fruits, and a storage disorder ("spot" disease) can be troublesome under some conditions (32, 34).

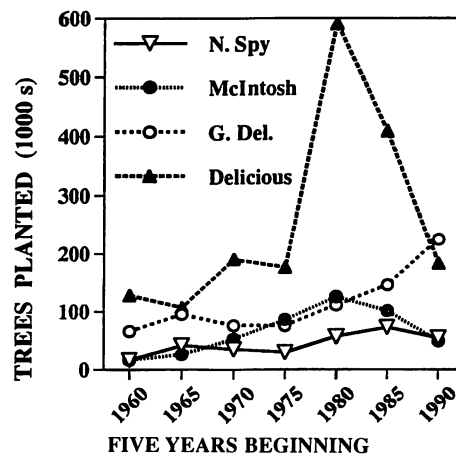


Figure 2. Number of trees of 'N. Spy' and three other major cultivars planted in Michigan 1960-90. Values are totals for 5-year periods beginning with year indicated (16).

Tree

The tree is vigorous, late in bearing, and upright, with narrow crotch angles becoming spreading as fruiting weighs down the limbs. Bloom is late relative to other cultivars. Fruits are often borne on terminal shoots, resulting in a somewhat willowy, weeping growth habit, with upturned shoot tips. It does not respond readily to chemical thinners; if fruits are not thinned, the tree is strongly biennial—a fact recognized as early as 1849 (14). The bark is a dull brownish-red.

Strains

Red strains are available, but not widely planted (35). Shamel and Pomeroy (31) listed a total of 10 strains, 8 of which were highly colored, and Bregger (9) noted 13 such sports, including the 'Red Spy,' which was found on the farm of William C. Greene of Victor in Ontario County, NY, about 1895 (22). [Note that Brooks and Olmo (10) list 'Red Northern Spy' as a mutant of 'N. Spy' discovered near Marshall, MI, in 1928.] Trees propagated from the original mutant first fruited at the New York State Agricultural Experiment Station, Geneva, NY, in 1920. Hedrick (22) described them as "typical Spies excepting in color" and reported that observers pronounced them to be the "handsomest Spies ... ever seen." 'Schoharie Spy' is another red sport (Table 2). 'Graham Spy' is still grown in small quantities in Michigan.

Hardiness.

'Northern Spy' is considered to be relatively tender; its late ripening may contribute to this. After the severe winter of 1933-34, Blair (cited in 35) at Ottawa assigned a winter injury rating (0 = no injury; 100 = severe injury) of 89 to 'N. Spy' vs. 5 for 'Duchess of Oldenburg' and 100 for 'Delicious.' Following field evaluations and artificial freezing tests in Maine, Waring and Hilborn (36) classified 'N. Spy' as intermediate in hardiness, along with 'Delicious,' 'G. Delicious,' and 'Wealthy,' whereas 'McIntosh' and 'Duchess of Oldenburg' were rated as hardy, and 'Baldwin,' 'Ben Davis' and 'Gravenstein' as non-hardy.

Use as a Rootstock

'Northern Spy' is resistant to woolly aphis [(*Eriosoma lanigera*) (Hausmann)], and is therefore used as a rootstock where this insect is a problem, as in Australia, New Zealand, and South Africa. 'Northern Spy' was used as one parent in breeding the aphid-resistant Malling-Merton series of rootstocks. A clone derived from an open-pollinated seedling of 'N. Spy' ('Spy 227') is extremely sensitive to viruses carried by the scion, and has been used as an indicator plant (18).

Use in Breeding Programs

The excellent quality of 'N. Spy' fruits encouraged its use as a parent in breeding programs for commercial cultivars (Table 2). Ottawa released 38 selections, all but one from open-pollinated 'N. Spy,' between 1910 and 1930, but none was widely planted (35). Six selections were released by the New York State Agricultural Experiment Station at Geneva between 1915 and 1968, of which 'Spigold' and 'Wayne' were the most popular (35). Nova Scotia named 'Kestrel' in 1975, and 'Novaspy,' a scab resistant cultivar, in 1986. 'Fortune' ('Schoharie Spy' X 'Empire') was released by the Geneva Station in 1995 (11). Other strains are listed by Upshall (35) and in Table 2.

Yield and Profitability

Gardner (19) found 'Northern Spy' to be one of the more productive and profitable cultivars grown in Michigan in total return per acre (19), although its yield efficiency was lower than 'Delicious,' 'McIntosh,' and 'Jonathan' in a later comparison (W. Toenjes and J. E. Gilmore, unpublished data — see 13).

Prospects

Lack of precocity is the main difficulty in growing 'Northern Spy' on seedling rootstocks. The use of semi-dwarf and dwarf stocks could give new impetus to production, given that such trees will fruit

in 4 to 6 years as opposed to 10 to 12 years on seedling stocks. Carlson and Tukey (12) compared several cultivars on 3 clonal rootstocks, and reported that 'N. Spy'/M. 7 fruited in the 5th leaf, although yields were lower for the first 10 years than those of 'McIntosh' and 'Cortland' on the same stock. In 1985, 58 percent of the 'Northern Spy' trees in New York State were propagated on clonal stocks (33). Another potential method of reducing the age of bearing is the use of growth retarding chemicals to stimulate flowering. M. J. Bukovac (personal communication) found several sterol synthesis inhibitors to be effective for this purpose in Michigan. However, given its limited red color and resultant lack of fresh market appeal, 'Northern Spy' will probably remain a processing apple, with fresh market sales limited to retail customers who "know their apples".

Literature Cited

1. American Society for Horticultural Science. 1996. The Brooks and Olmo register of fruit and nut varieties. 3rd ed. ASHS Press, Alexandria, VA.
2. Anonymous. 1990. New York Fruit Tree Survey 1990. New York Agr. Statistics Service, Albany, NY.
3. Anonymous. 1992. Pennsylvania Orchard and Vineyard Survey.
4. Anonymous. 1993. New England Fruit Tree Inventory, 1991. New England Agr. Statistics Service. Concord, NH.
5. Anonymous. 1995. Michigan Rotational Survey. Fruits — 1995. Michigan Agr. Statistical Service, Michigan Dept. of Agr./U.S.D.A., Lansing, MI.
6. Autio, W. R. 1991. Contemporary evolution of the New England apple industry: cultivar and rootstock trends. Fruit Var. J. 45:98-100.
7. Bailey, L. H. 1893. Annals of Horticulture in North America for the Year 1892. The Rural Publ. Co., New York.
8. Beach, S. A. 1905. The Apples of New York. Vol. 1. Rept. New York Agr. Expt. Sta. for 1903.
9. Bregger, J. T. 1932. Present status of mutation studies in deciduous fruit varieties. Proc. Amer. Soc. Hort. Sci. 29:144-150.
10. Brooks, R. M., and H. P. Olmo. 1972. Register of New Fruit and Nut Varieties. 2nd ed. Univ. California Press, Berkeley, CA.
11. Brown, S. K., R. D. Way, D. E. Terry, and K. G. Livermore. 1995. 'Fortune' apple. New York's Food and Life Sciences Bul. 147. 2 pp.
12. Carlson, R. F., and H. B. Tukey. 1959. Fourteen-year orchard performance of several apple varieties on East Malling rootstocks in Michigan (second report) . Proc. Amer. Soc. Hort. Sci. 74: 47-53.
13. Dennis, F. G., Jr. 1979. Factors affecting yield in apple, with emphasis on 'Delicious.' Hort. Rev. 1:395-422.
14. Downing, A. J. 1845. The fruits and fruit-trees of America. New York. (Revised by Charles Downing 1857. Many subsequent editions to 1900).
15. Downing, A. J., ed. 1846-47. The horticulturist and journal of rural art and rural taste. Albany, NY. Vol. I.
16. Fedewa, D. J., and S. J. Pscodna. 1987. Michigan orchard and vineyard survey 1986. Michigan Agricultural Statistics Service, Lansing, MI.
17. French, A. P. 1976. Massachusetts, pp. 72-76. In: D.V. Fisher and W. K. Upshall, (eds.). History of fruitgrowing and handling in United States of America and Canada. 1860-1972. Amer. Pom. Soc., University Park, PA.
18. Gardner, F. E., P. Marth, and J. R. Magness. 1946. Lethal effects of certain apple scions on Spy 227 stock. Proc. Amer. Soc. Hort. Sci. 48:195-199.
19. Gardner, V. R. 1927. Varieties and locations as factors in apple production. Michigan State Agr. Expt. Sta. Bul. 161.
20. Gemmer, C. D. 1996. Naming the Northern Spy. Pomona XXIX (2): 18-19.
21. Gillett, R. L. 1928. A preliminary report on some phases of the 1927 apple orchard survey in New York. Proc. New York State Hort. Soc. 78:143-146.
22. Hedrick, U. P. 1923. New or noteworthy fruits. VI. New York State (Geneva) Agr. Expt. Sta. Bul 497. 18 pp.
23. Hovey, C. M., ed. 1847. The magazine of horticulture, botany, and all useful discourses and improvements in rural affairs. Vol. XIII (Vol. III, N.S.) : 72-73, 104-105.
24. Hovey, C. M., ed. 1853. The magazine of horticulture, botany, and all useful discourses and improvements in rural affairs. Vol. XIX (Vol. IX, N.S.):68.
25. International Apple Institute. 1989. 1989 Apple marketing clinic: production and utilization analysis. Intern. Apple Inst., McLean, VA. (cited by Autio, 1991)
26. International Apple Institute. 1996. Crop outlook and marketing conference. Intern. Apple Inst., McLean, VA.
27. Lee, D., ed. 1845. Genesee farmer 6:30.
28. New York Statistics Service. 1986. New York orchard and vineyard survey - 1985. (cited by Stiles, 1991)
29. Ontario Apple Marketing Commission. 1996. (data supplied by Crosby Mitchell, Secy./Statistician)
30. Rasmussen, E. J. 1976. New Hampshire, p. 93-94. In: D. V. Fisher and W. H. Upshall (eds.). History of fruitgrowing and handling in the United States of America and Canada. 1860-1972. Amer. Pomol. Soc., University Park, PA.

31. Shamel, A. D., and C. S. Pomeroy. 1932. Bud variation in apples. A study of the role of bud mutation in deciduous fruit improvement. J. Heredity 23:173-180, 212-221.
32. Smock, R. M. 1947. The "spot" disease of Northern Spy apples. Proc. Amer. Soc. Hort. Sci 50:95-99.
33. Stiles, W. C. 1991. Apple cultivars — current situation and trends in New York State. Fruit Var. J. 45:101-106.
34. Tyler, L. J. 1944. New York Emergency Plant Disease Survey Rept. No. 9 (cited by Smock, 1947).
35. Upshall, W. H. 1970. Northern Spy. pp. 115-126 In: W. P. Upshall, ed., North American apples: varieties, rootstocks, outlook. Michigan State Univ. Press, E. Lansing, MI.
36. Waring, J. H. and M. T. Hilborn. 1936. Some observations and current studies of winter injury to apple. Proc. Amer. Soc. Hort. Sci. 34:52-56.
37. Way, R. D. 1979. Apple cultivars grown in eastern United States. Fruit Var. J. 33:2-6.
38. Wilcox, E. C. 1970. Trends in current apple varieties. pp. 31-44. In: W. P. Upshall (ed.). North American apples: varieties, rootstocks, outlook. Michigan State Univ. Press, E. Lansing, MI.

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Growth, Yield, Survival, and Leaf Nutrient Concentrations of Plums on Various Rootstocks

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Abstract

Effects of seedling rootstocks Lovell, Halford, Nemaguard, and Nemared and asexually propagated rootstocks St. Julien A and Pixy on tree growth, yield, survival and leaf nutrient concentration of 2 plum cultivars was studied. Yields did not differ among rootstocks for 'AU-Producer' or 'AU-Amber'. Cumulative yield efficiency (CYE) did not differ among rootstocks grafted with 'AU-Amber,' but was significantly lower for Pixy rootstock grafted with 'AU-Producer' compared to Lovell, Halford, Nemaguard, Nemared and St. Julien rootstocks. St. Julien and Pixy dwarfed scions, resulting in smaller canopy widths and trunk cross-sectional areas (TCA). Their effect on bloom dates was inconsistent, delaying bloom in some years but not in others. The only rootstock-by-year interactions for foliar nutrient levels were for Mn, Fe, and B with 'AU-Producer'. Nutrient levels and multiple regression results indicated that Mg was a positive predictor for canopy width and TCA while Zn and Mn were negatively related to TCA. Attempts to predict tree survival rates in 1994 and 1995 with 1993 and 1994 leaf nutrient levels, respectively, indicated that survival in 1994 was positively predicted with K and negatively with Mn with an R^2 of 0.143. There was no predicted model for 1995 survival based on 1994 nutrient data. Survival in 1995 was negatively predicted with 1995 Zn levels with an R^2 of 0.277.

Introduction

A number of different rootstocks are available for plum production. Rootstocks can affect scions in a number of ways, including bloom and harvest dates, growth characteristics, yields, and survivability (8, 10, 12, 16).

Rootstocks are often regionally adapted. In a trial at Harrow, Ontario, Canada, the best rootstocks for peach were Siberian C, Halford, Bailey, and Lovell (14). The plum, peach x almond, and self-rooted trees all had high mortality rates. Dozier et al. (8), by contrast, found Siberian C to be an unacceptable peach rootstock for the southeastern United States.

'Redhaven' peach on Lovell rootstock flowered and fruited later than 'Redhaven' on Halford, Bailey, Siberian C and cuttings of GF677 (peach x almond), GF655-2 (*Prunus insititia* L.), Damas 1869 (plum) and 'Redhaven' seedlings (3). Adesoto 101 (*P. insititia*), a new rootstock for stone fruit, advanced fruit maturation by 3-7 days (15).

Yield and fruit size are also been shown to be influenced by rootstock. When European plums were grown in Norway on Eruni, Pixy, and St. Julien A rootstocks,

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