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Promising High Quality Apples Evaluated in New England

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Abstract

Over 200 apple cultivars and numbered selections were evaluated since 1987 at the University of Massachusetts Horticultural Research Center, Belchertown, Mass. This paper describes initial horticultural observations, fruit characteristics, and storage potential of some of the most promising apples. Among this group are four scab resistant cultivars: Pristine, NY 75414-1, Enterprise, and Goldrush. Sunrise, Sansa, and Ginger Gold were the best early maturing cultivars. Midseason cultivars that showed promise were: Arlet, Golden Supreme, Honeycrisp, Senshu, Yataka, and Shizuka. Late maturing cultivars that appeared to have commercial potential included: Braeburn, Cameo, Creston, Fortune, Gala Supreme, Orin and Suncrisp.

Introduction

In the decades following World War II apple production in the United States was dominated by a few cultivars. Planting of 'Delicious,' 'Golden Delicious,' and 'McIntosh' accounted for over 75% of all apple production (9). Several changes have occurred over the past 15 years that have resulted in major changes in production and planting of apples (9). 'Granny Smith' was successfully introduced from Australia. The popularity of this apple showed that nontraditional apples could become commercially successful in the United States. 'Gala' and 'Fuji' were planted in large numbers and accepted because they had improved taste and quality (5, 13).

Consumers are being exposed to an increasing variety of fruits and vegetables in the produce section of grocery stores and, in general, the taste and quality is continually improving. Diversity, quality and taste are now important attributes that lead to purchases. Over 80% of consumers in a recent survey indicated that flavor and crispness were very important factors in making apple purchases while price, variety, and color were considerably less important in making apple purchasing decisions (11). Prices received by growers for new apple cultivars is frequently considerably higher than that received for the older standard cultivars (10). Therefore, growers are interested in planting varieties that consistently give higher returns. The loss of daminozide (Alar) made the drop-prone and soft-fleshed cultivar 'McIntosh' much less profitable and fewer 'McIntosh' are being planted (2, 15). Apples resistant to apple scab *(Venturia inequalis)* allow growers in humid regions to offer low spray apples to an increasing segment of the population concerned about pesticides (4).

All areas of the United States show a reduction in the number of older and traditional cultivars being planted with a corresponding increase in new and less tested cultivars (2, 7, 8, 14, 15). What to plant has caused growers a major dilemma. Intensive apple cultivar evaluation programs were initiated by Dr. Robert Norton in Washington state (10) and by Dr. Robert Stebbins in Oregon (12) in an attempt to identify some of the more promising new cultivars. They have provided important information through their cultivar evaluations. The Pacific Northwest Fruit Testers' Association through Educational Director, James K. Ballard has served as an informational clearing house for grower evaluations of new cultivars. Newsletters, annual reports, and variety profile sheets help keep growers abreast of the newest cultivars and the most up to date information on new and emerging cultivars.

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The cost of establishing a new orchard has escalated and the time required to become profitable has increased. In the past the decisions about which cultivar to plant were relatively easy because there was a limited number of cultivars of apples to plant. Now there are many choices and the information about the new cultivars is still being generated. The selection of the right cultivar is critical. The right decision will lead to a price premium for the right cultivar and a market for all quality fruit produced. The wrong decision may mean an inability to sell the fruit profitably, and possibly even removing the block at a considerable loss.

More than 200 new apple cultivars have been planted and evaluated at the University of Massachusetts Horticultural Research Center since 1987. The purpose of this paper is to present fruit quality and sensory evaluation of the best and most promising cultivars that have emerged from initial screening of those cultivars. Information reported here is based upon observations made in only one location, Belchertown, Mass. Observations and data presented in this paper represent are a summary of data collect over a one to five year period.

Materials and Methods

The majority of cultivars evaluated in this investigation were chip budded in early spring on either Mark or M.9 337 rootstocks growing in the greenhouse. Four to six trees of each cultivar were grown for one year in 3.785 liter containers in a mixture of soil, peat, and perlite (1:1:1). The following spring they were planted out in pairs in two to three locations in a randomized fashion in the variety evaluation block at the University of Massachusetts Horticultural Research Center, Belchertown, Mass. Trees were headed at planting time and then supported by tying each to a stake. Other than tying the central leader to the post, minimal pruning and training was done for the life of the tree. All fruit were removed from the trees by hand the first year, and if present only a limited number was allowed to remain the second. Generally, trees were allowed to fruit the third and subsequent years when crop load was adjusted so that fruit were no closer than 15 to 20 cm and total crop load was low enough to provided an appropriate leaf to fruit ratio for proper flavor development and maturity. The stage of flower development was monitored at two day intervals starting when the first king flower opened on the earliest cultivar to petal fall on the latest. The length and relative time of bloom was established after three years of observations.

Twelve to fifteen apples were harvested from each cultivar for up to five times at weekly intervals, hopefully bracketing the proper harvest date. Ten fruit were weighed, the circumference taken and then the red color was subjectively estimated to the nearest 10% on red coloring cultivars or on those yellow cultivars that had a prominent cheek. Flesh firmness was determined on each of the ten apples with a fruit pressure tester (McCormick Fruit Company, Yakima, WA). Soluble solids were determined with a hand held refractometer on a composite juice sample collected during the pressure test. Fruit were cut in half and the pedicel half dipped in starch iodine solution and then rated using a the Cornell University generic starch chart (3). In general, fruit were considered mature and at an appropriate stage for harvest when the starch rating was between 4 to 6. 'McIntosh' was included in this evaluation to serve as a control for a standard commercial cultivar. Average harvest date for 'McIntosh' was September 19.

The remaining fruit were evaluated visually and for sensory characteristics on a specially prepared evaluation sheet adapted from Heintz and Kader (6) (Figure 1). Data collected for Sansa on 29 August, 1996 is used for illustration. Lines approximately 10 cm in length were anchored at either end with descriptive terms, e.g. dislike and like for flavor. In each category a pencil mark was drawn through the line at a point that was judged to be appropriate for the apple. These re-

sponses were quantified by measuring the length of the line to the mark, with the zero point located at the left. The line located in the middle, 5.0, was considered an average, neutral response. In general, 5.0 to 5.9 was considered average, 6.0 to 6.9 good to very good, and 7.0 or greater was considered outstanding for color, attractiveness, crispness, flavor and overall desirable. During this evaluation process tasting notes were taken which included observations on fruit shape, pedicel length, surface blemishes, flesh color, type of red color and impressions of specific flavors and flesh textures.

When sufficient numbers of fruit were available, fruit were placed in regular air storage. Periodically they were removed and evaluated for firmness, appearance, storage disorders and sensory quality.

Data collected for each cultivar in individual years was not replicated. Data presented in Tables 2 and 3 are averages of 2 to 5 years of observations (except one year for 'Enterprise,' 'Cameo' and 'Gala Supreme') when fruit had a starch rating of 4 to 6. Standard errors in Table 2 are calculated for all fruit over all years of observation. All other data presented in Tables 2 and 3 represents the yearly average over all years and the range is the high and low for the years observed.

Results and Discussion

The majority of cultivars emerged from established breeding programs (Table 1) although six were chance or open pollinated seedlings. 'Enterprise,' 'Goldrush,' and 'Pristine' came from the Purdue, Rutgers, Illinois (PRI) program and are known to have resistance to apple scab (4). Similarly, NY 75414-1 from the New York breeding program was also a scab resistant cultivar. 'Pristine' was the earliest cultivar and the time of harvest is during the second week of August, six weeks before 'McIntosh.' 'Sunrise' was the second cultivar ready to harvest, four weeks before 'McIntosh' followed 5 to 7 days later by 'Sansa,' and 'Ginger Gold.' According to starch degradation patterns, 'Honeycrisp' should be harvested fully a week before 'McIntosh,' while 'Arlet' harvest coincides with 'McIntosh.' 'Yataka,'' Senshu,' 'Golden Supreme,' and NY 75414-1 ripened approximately a week after 'McIntosh' during the last week in September. 'Creston,' 'Fortune,' 'Shizuka' and 'Orin' were ready to harvest two weeks after 'McIntosh' in the early part of October whereas 'Braeburn,' 'Cameo,' 'Enterprise,' 'Gala Supreme' 'Goldrush' and 'Suncrisp' were the latest ripening fruit. The dates of harvest was quite uniform over the 3 to 5 years of observation except for 'Ginger Gold' and NY 75414-1 which varied by as much as two weeks. The time to harvest 'Ginger Gold' was difficult to determine because starch rating changed slowly over a 3-week period while ground color changed from green, to white, to lemon yellow.

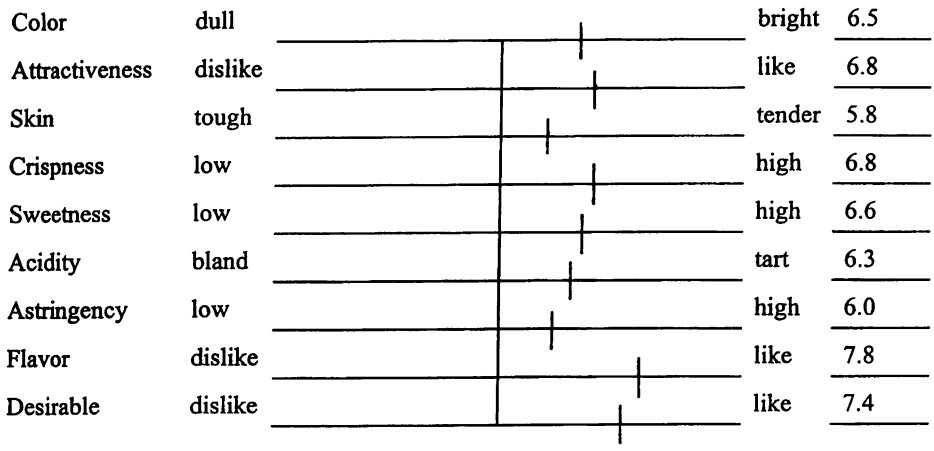
In general, fruit from young trees was quite large (Table 2). 'Pristine' had the smallest fruit but it was also the earliest fruit to be harvested. 'Braeburn,' 'Creston,' 'Fortune,' 'Gala Supreme,' 'Honeycrisp' and 'Shizuka' had fruit weight above 240 grams and could be considered large to very large fruit. All other cultivars were in the medium fruit size range. Variation in the size range of fruit may be a symptom of biennial bearing. It was noted that 'Fortune,' even when quite heavily set, it would size fruit very well. NY 75414-1 had more red color than any other cultivar, whereas most other cultivars were similar to 'McIntosh' in the extent of red color development. 'Honeycrisp' and 'Yataka' had less color than 'McIntosh.' Although considered a yellow variety, 'Goldrush' did have a substantial brownish-red cheek. Flesh firmness varied considerably among cultivars. NY 75414-1, a 'McIntosh'-type, clearly had the lowest flesh firmness. Both 'Braeburn' and 'Goldrush' had firmness above 100 N. Others that would be considered very firm include 'Cameo,' 'Ginger Gold,' 'Gala Supreme,' 'Orin,' and 'Suncrisp.'

An attractive appearance can be an important attribute of apples. 'Ginger Gold,' 'Pristine' and 'Golden Supreme' were clearly the highest rated apples (Table 3).

CULTIVAR EVALUATION FORM

Cultivar Sansa Date 8/29/96

Visual and sensory evaluation:



Weight 187 g

Soluble solids 14.2%

Color 64%

Flesh firmness 72.5 N

Circumference 7.7 cm

Comments:

Figure 1. Data sheet used to assess sensory qualities of new apple cultivars.

This is noteworthy since all are yellow apples and apples grown in a humid environment frequently have russet or fruit finish problems that detract from the overall appearance. 'Goldrush,' 'Honeycrisp,' 'Orin,' 'Senshu,' and 'Yataka' were judge to have the poorest appearance. Low numbers for skin indicate a tough skin and 'Enterprise,' 'Goldrush,' and 'Orin' scored lowest here. 'Ginger Gold,' 'Sansa,' and 'Yataka' had tender skin. 'Creston' and 'Ginger Gold' had the crispest flesh, and 'Braeburn,' and NY 75414-1 had the lowest rating for crispness. 'Orin' was the sweetest apple. Several apples were judged to have high acidity and astringency at harvest including 'Braeburn,' 'Enterprise,' 'Goldrush,' and

'Suncrisp,' but all are believed to require some period of storage before they reach their optimum eating quality. 'Pristine' is judged to be very acidic, and yet it is a summer apple.

Flavor and the overall rating are probably the most important categories for new and emerging cultivars. Apples rated 7.0 or over are outstanding and 'Cameo,' 'Ginger Gold,' 'Golden Supreme,' and 'Sansa' fall into this category. 'Ginger Gold' was placed in this category on the strength of its crispness and appearance, and not flavor, which was judged to be somewhat weak. 'Sansa' and 'Golden Supreme' were truly outstanding apples but productivity, and other horticultural characteristics may make them less desirable choices. Evaluations were made at harvest and those that benefit from storage were clearly rated lower. 'Braeburn,' 'Enterprise,' and 'Goldrush' fall into this category. 'Honeycrisp' was not outstanding in any category. It was harvested when starch rating was between 4 and 6 but as much as two weeks earlier than many suggest as the appropriate harvest season. If the fruit was harvested later, or evaluation was done out of storage, it may have been rated much higher. 'McIntosh' is a standard cultivar, and with few exception, all new cultivars rated higher to significantly higher than 'McIntosh' in flavor and overall rating.

Specific Fruit Observations

'Arlet'

This introduction in the early 1980's from Switzerland is a cross between 'Golden Delicious' and 'Idared.' it is a patented cultivar, PP #6689, and is also known as 'Swiss Gourmet.' 'Arlet' is a red, medium sized apple that ripens slightly later than 'Gala.' A drop control compound will be necessary and several harvests may be required. Fruit have a tendency to russet, and up to 25% of the surface may have this defect. Flesh is yellowish white, tart, and does not readily oxidize when cut. Quality is considered good to very good. Fruit skin may become greasy if allowed to remain on the tree too long or greasiness may develop after a period of storage. Storage potential is quite good if harvested at an appropriate time.

'Braeburn'

This is a chance seedling that originated from New Zealand in the early 1950's. It is a red, medium to large in size apple with a tart flavor. Fruit ripen with or slightly before 'Rome Beauty.' Normally it is too tart to eat at harvest when starch levels reach 4 to 6. It stores very well and the acidity declines after a few weeks in storage. Brown core reported in other areas has been noted after five months in storage, but the disorder has not been severe enough to be considered a problem. 'Braeburn' is precocious, flowers profusely, and is low to moderate in vigor. Thinning is required to keep trees annual. It is one of the most susceptible cultivars to damage by mites. Defoliation is possible if a vigorous mite control strategy is not employed.

'Cameo' (previously released as 'Carousel')

The qualities of this chance seedling, discovered in Wenatchee, WA in the early 1980's, were recognized in the late 1980's and extensive evaluation began. 'Cameo' is a vigorous yet precocious cultivar that is relatively easy to manage in the field. Fruit is conic and red stripped, quite uniform, and is medium to large in size. Flavor is sweet-tart and not strong. Fruit is firm at harvest and it retains this firmness for a several months in regular air storage. For those who like the taste of 'Delicious,' 'Cameo' will be a welcome new cultivar.

'Creston'

Originally this apple from the British Columbia breeding program in the late 1980's, was tested as BC 8M 15-10. It is the result of a cross between 'Golden Delicious' and BC 381079. Fruit is medium to large, very crisp and juicy, pleasant and refreshing with a good sugar to acid ratio. It lacks good red color. Storage potential is 3 to 4 months in regular air storage. Fruit do become greasy when kept in stor-

Table 1. Parentage, bloom date and harvest date of cultivars in the NE-183 Regional Project planting.

Cultivar	Parentage	Relative time of flowering[2]	Mean days from bloom to harvest[1]	Range in harvest dates	Register of Fruit & Nuts (1) (page number)
Arlet	Golden Delicious x Idared	E	132	Sept. 18-20	98
Braeburn	Chance seedling	ME	163	Oct. 18-23	19-20
Cameo (Carousel)	Chance seedling	ML	162	Oct.20	21
Creston	Golden Delicious x BC381049	ML	147	Oct. 4-10	---
Enterprise	PRI 1661-2 x PRI 1661-1	ML	162	Oct.20	32-33
Fortune	Red Spy x Empire	ML	151	Oct. 10-13	35
Gala Supreme	Chance seedling	ML	164	Oct.24	37
Ginger Gold	Chance seedling	ME	111	Aug. 24-Sept. 5	39
Golden Supreme	Chance seedling	M	136	Sept. 25-27	40-41
Gold Rush	Golden Delicious x Coop 17	M	165	Oct. 24-25	41
Honeycrisp	Macoun x Honeygold	M	122	Sept. 8-13	47
NY 75414-1	Liberty x MacSpur	M	141	Sept. 24-Oct. 5	---
Orin	Open pollinated seedling (Golden Delicious x Indo?)	E	150	Oct. 12-13	71
Pristine	Camuzat x PRI 1659-10	E	91	Aug. 6-15	77
Sansa	Gala x Akane	ML	109	Aug. 26-Sept. 2	86
Senshu	Toko x Fuji	ML	136	Sept. 25-28	87
Shizuka	Golden Delicious x Indo	ML	143	Oct. 2-4	88
Suncrisp	Golden Delicious x NJ 303955	ML	157	Oct. 16-18	---
Sunrise	[Mcintosh x Golden Delicious] x PCF-3-120	ME	101	Aug. 23-24	97
Yataka	Red Delicious x Ralls Janet	M	132	Sept. 18-26	107
McIntosh	Chance seedling	M	129	Sept. 18-20	---

[1]Starch rating 4-6 where 1-3 immature, 4-6 mature, and 7-8 overmature.
[2]E, ME, M, ML, L: Early, moderately early, middle, moderately late, and late, respectively.

age for a long time. The tree has medium vigor, is precocious, and crops annually if not overcropped.

'Enterprise' (previously Coop 30)

Resistance to apple scab is one of the reasons that this apple from the PRI program was selected. Fruit is medium to large with a dull muddy red color over a yellow-green background color. Fruit matures with or slightly earlier than 'Rome Beauty.' The fruit skin is thick and somewhat tough. At harvest time 'Enterprise' is quite acidic tasting. Flavor improves in storage, but under New England conditions it has not lived up to expectations. Growth is vigorous, and the tree form somewhat spreading. It does not display excessive preharvest drop.

'Fortune'

This is a cross between 'Red Spy' and 'Empire.' It is very large, attractive, and a round to oblong red apple. Some fruit exceeded 10 cm (4 inches) in diameter even on trees carrying a heavy crop load. Fruit shape is round to oblong and irregular. Thinning is essential to obtain return bloom and prevent limb breakage due to overcropping. Limbs appear to be as brittle and break as readily as 'Gala.' Thinning with Accel is not recommended because it accentuates the natural irregular fruit shape of 'Fortune.' Flesh is greenish-white, even when mature. Fruit is moderately firm and storage potential in air is moderate.

'Gala Supreme'

This is another chance seedling from a seedling rootstock that was discovered in

Table 2. Fruit quality and fruit characteristics of promising apple cultivars evaluated in Massachusetts.

Cultivar	Weight (g)		Diameter (cm)	Flesh firmness (N)	Soluble solids (%)		Red color (%)
	Mean	Range			Mean	Range	
Arlet	177	154-191	7.34 ± .08	80.3 ± .9	13.1	11.8-13.8	77 ± 2
Braeburn	260	238-280	8.20 ± .10	104.1 ± .5	13.5	13.2-13.8	73 ± 2
Cameo	193	-----	-----	87.7	12.4	-----	81
Creston	240	214-265	8.13 ± .03	76.1 ± .5	14.0	13.6-14.4	57 ± 3
Fortune	273	305-347	8.97 ± .18	72.0 ± .9	12.2	11.2-13.2	79 ± 2
Gala Supreme	245	-----	-----	86.7	15.3	-----	74
Ginger Gold	219	167-251	7.85 ± .15	92.2 ± 2.3	12.1	11.2-12.9	-----
Gold Rush	168	166-171	7.24 ± .05	113.7 ± .8	13.4	12.6-14.1	24 ± 4
Golden Supreme	213	171-266	7.85 ± .15	78.9 ± .9	12.9	11.0-13.9	-----
Honeycrisp	259	164-308	8.56 ± .38	75.7 ± .9	12.6	10.2-14.0	58 ± 3
NY 75414-1	177	158-195	7.82 ± .28	61.5 ± .9	13.3	12.2-14.3	92 ± 4
Orin	183	176-196	7.34 ± .10	86.7 ± .9	14.1	12.2-15.2	-----
Pristine	140	138-142	7.21 ± .05	76.6 ± .5	12.3	12.1-12.5	-----
Sansa	174	130-210	7.39 ± .13	76.6 ± .9	13.5	12.6-14.0	78 ± 1
Senshu	185	154-208	7.44 ± .13	70.6 ± .5	13.5	11.2-15.2	76 ± 1
Shizuka	260	207-304	8.43 ± .10	78.4 ± .9	13.5	13.2-13.6	-----
Suncrisp	196	161-216	7.67 ± .08	89.4 ± .5	14.4	11.8-16.2	-----
Sunrise	180	158-216	7.21 ± .13	76.6 ± 2.3	12.8	12.6-13.3	71 ± 4
Yataka	174	166-187	7.67 ± .15	83.9 ± .9	13.5	13.0-14.3	59 ± 2
McIntosh	178	168-178	7.82 ± .10	66.5 ± .9	11.2	11.1-11.3	76 ± 3

the late 1980's in Wenatchee, WA. Unlike the name suggests, this is not a 'Gala' strain. It is medium size, oval round, red stripped fruit that ripens in mid-October. It is somewhat flat, stripped red with prominent lenticels. Flesh is white-yellow, firm, crisp and juicy. Flavor is sweet-tart and somewhat aromatic. The acidity declines in storage but it does not maintain flesh firmness well.

'Ginger Gold'

'Ginger Gold' is an early maturing yellow apple that was discovered as a chance seedling in Virginia in the 1980's. It is medium to large, oblate to conic, white to cream fleshed, crisp apple. Fruit is not prone to russet. Fruit matures in the later part of August to early September, two to three weeks before 'Gala' and 'McIntosh.' Fruit can be picked over a 2-3 week period starting when the skin turns greenish yellow until it develops a beautiful lemon yellow color. Starch degradation appears to occur much less rapidly than other cultivars. Firmness at harvest is frequently above 92 N (20 pounds), but firmness quickly decreases when fruit are placed in cold storage. Preliminary shelf life observations indicated that it loses firmness quickly when removed from air storage. The trees is vigorous, spreading and quite productive. It is an excellent early yellow apple.

'Golden Supreme'

This was discovered as a chance seedling in Idaho in 1960. It is a medium to large, conic, yellow apple, resembling 'Golden Delicious' but ripening at least 7 to 10 days before 'Golden Delicious.' Flesh is creamy yellow, crisp, and quite firm. It requires at least two harvests and may suffer preharvest drop without a stop drop spray. At maturity 'Golden Supreme' is aromatic and fruity with an attractive orange yellow cheek. It stores better than 'Golden Delicious' and taste is frequently rated better than 'Golden Delicious.' The tree is somewhat upright and spur-like, and like most spur-type trees, it tends to be biennial. We consider it a difficult tree to grow and manage.

Table 3. Visual and sensory evaluation of promising apple cultivars evaluated in Massachusetts.

Cultivar	Color		Attractive		Skin		Crispness		Sweetness		Acidity		Astringency		Flavor		Overall desirable	
	Mean	Range	Mean	Range	Mean	Range	Mean	Range	Mean	Range	Mean	Range	Mean	Range	Mean	Range	Mean	Range
Arlet	6.2	4.7-7.1	5.7	4.9-6.6	3.0	2.9-3.0	6.1	5.7-6.8	5.8	5.2-6.8	6.4	5.9-6.7	5.5	4.1-6.3	7.1	6.8-7.4	6.9	6.6-7.3
Braeburn	5.5	3.0-7.3	5.7	3.7-7.3	3.7	2.84.6	5.5	4.0-6.4	4.5	3.2-5.0	8.1	7.3-9.0	6.6	6.1-7.3	4.4	1.2-6.3	4.5	1.5-5.8
Cameo	6.9	-----	6.9	-----	5.2	-----	7.7	-----	6.2	-----	6.3	-----	6.1	-----	7.0	-----	7.0	-----
Creston	5.7	5.5-5.9	5.7	5.5-5.9	4.9	4.4-5.3	7.1	6.9-7.3	7.0	6.9-71	64	61-68	61	57-64	73	71-75	6.9	6.8-7.0
Enterprise	6.3	6.3-6.3	6.5	6.4-6.5	2.3	2.1-2.4	6.1	5.8-6.4	5.7	5.7-57	75	75-76	68	64-72	58	55-61	5.7	5.3-6.1
Gala Supreme	6.4	-----	6.4	-----	5.6	-----	7.3	-----	6.1	-----	7.1	-----	6.7	-----	6.5	-----	6.5	-----
Ginger Gold	---	-----	7.7	7.6-7.8	6.9	6.0-8.0	7.4	6.0-8.9	4.7	4.2-5.3	4.8	3.2-6.6	4.7	3.0-5.7	6.4	6.0-6.9	7.1	6.2-7.6
GoldRush	5.2	5.0-5.3	5.2	5.1-5.3	3.3	3.1-3.4	6.2	6.1-6.2	5.3	5.2-5.3	7A	7A-7.5	6.7	6.5-6.9	5.3	53-5.3	5.1	4.8-5.4
Golden Supreme	---	-----	7.9	7.3-9.0	3.5	2.84.2	6.4	5.7-6.7	5.6	4.5-6A	5.7	5.1-6.9	5.9	5.1-6.5	7.1	6.7-7.3	7.5	7.3-7.7
Honeycrisp	5.3	4.2-6.8	5.2	4.2-6.8	3.7	3.24.5	6.6	5.6-7.2	4.4	3.4-6.1	6.1	5.8-6.4	5.5	3.4-6.6	6.1	5.5-7.0	6.2	5.3-7.0
Fortune	6.9	6.0-7.6	6.9	6.0-7.6	4.2	3.34.6	6.5	6.3-6.9	5.9	5.3-6A	6.7	6.5-7.0	6.6	6.3-6.8	6.5	6.2-6.6	6.8	6.6-6.9
NY 75414-1	7.0	6.8-7.1	6.9	6.5-7.1	4.3	3.5-5.2	5.3	4.4-7.1	5.2	4.4-60	63	59-70	58	47-69	67	62-70	6.9	6.7-7.1
Orin	---	-----	5.5	5.4-5.6	3.4	3.14.0	5.9	5.3-6.4	7.9	7.9-8.0	4.8	2.4-5.6	4.8	2.7-6.2	6.7	6.5-6.8	6.4	6.0-6.8
Pristine	---	-----	7.4	7.1-7.7	5.7	5.2-6.0	6.8	6.6-6.9	3.0	1.7-3.9	7.6	7.0-8.1	6.1	6.0-6.4	5.8	5.4-6.1	6.4	6.2-6.8
Sansa	6.7	6.4-6.8	6.7	6.4-6.8	6.2	4.8-8.0	6.4	6.0-7.2	6.4	5.6-7.2	4.1	1.8-6.3	4.7	1.8-6.6	7.4	7.0-7.9	7.5	7.0-7.9
Senshu	4.8	4.6-5.0	5.0	4.6-5.4	4.1	3.74.9	6.7	6.7-6.8	5.6	3.5-6.9	5.5	5.2-6.1	5.1	3.9-5.8	6A	5.8-6.8	6.2	5.6-6.5
Shizuka	---	-----	6.3	5.8-6.6	4.3	3.5-5.3	5.8	4.4-6.7	5.9	5.1-6.5	5.8	4.4-6.7	5.4	3.9-6.3	6.8	6.6-7.1	6.8	6.6-7.1
Suncrisp	---	-----	5.8	5.6-6.2	4.9	4.7-5.3	6.6	6.2-7.1	4.6	3.2-58	71	70-74	57	43-64	68	65-69	6.7	6.5-6.9
Sunrise	6.9	6.4-7.3	6.9	6.4-7.3	4.8	4.0-5.6	6.4	5.4-7.4	4.7	4.0-5.4	6.5	5.9-7.1	5.3	4.7-5.9	6.3	5.6-6.9	6.6	6.3-6.9
Yataka	4.5	3.2-5.5	4.6	3.5-5.5	6.0	5.4-6.9	6.2	5.6-7.1	5.8	5.5-6.2	4.1	1.8-5.6	4.7	3.1-6.8	6.6	6.0-7.2	6.5	5.7-7.2
McIntosh	6.6	6.0-6.9	6.7	6.0-7.2	2.8	1.8-3.9	6.0	5.3-7.3	4.0	2.9-5.4	7.2	6.6-7.3	6.3	5.7-6.7	5.8	5.5-6.2	6.1	5.6-6.5

'GoldRush' (previously Coop 38)

'GoldRush' is a late maturing, scab resistant selection from the PRI program that was selected in 1980. It is yellow-green at harvest, which is about 'Rome Beauty' maturity time. Fruit is medium to small in size, and ovate to conic in shape. Although russet is not a major problem, overall appearance is only fair. Fruit at harvest are quite acidic and a period of cold storage improves flavor and lessens the acidity that is present at harvest. The tree is moderately vigorous and spreading. Trees are precocious and productive.

'Honeycrisp'

'Honeycrisp' was introduced in 1991 from the Minnesota breeding program where one of their major goals is cold hardiness. Parents are 'Honeygold' and 'Macoun.' It is large, oblate to round in shape, crisp, and juicy. Over the past several years, 'Honeycrisp' has ripened about one week before 'Gala' and 'McIntosh,' based upon starch rating. When harvested at this time appearance is only fair because of insufficient red color development. Al-

though extremely crisp and juicy at harvest, the flavor is very mild, lacking strong flavor and sugar content. It is precocious, but thinning is necessary to assure annual production. 'Honeycrisp' has exceptional storage potential when harvested at the proper stage of maturity. Crispness out of regular air storage after several months can be described as explosive. Loss of flesh firmness in storage is almost negligible. In some years it can develop an ethanol taste if harvest is delayed. In regular storage, fruit can develop a disorder that is similar to high CO_2 or low oxygen injury, indicating that the cuticle may limit gas exchange. Although vigor is considered moderate, growth of the tree can be maintained easily because of early production of large fruit. Productivity is very high.

NY 75414-1

This is a medium sized red apple that is a 'McIntosh'-type that ripens after 'McIntosh.' It is a scab resistant apple from the New York breeding program. 75414-1 is attractive, has white flesh, and its flavor is somewhat tart. It is a 'Macoun' look-alike with prominent lenticels and some scarf skin. Preharvest drop is not a problem as long as it is picked at the appropriate time. The tree is quite vigorous with medium precocity.

'Orin'

'Orin' is one of the few true green apples available. In some years it does not even develop a pink cheek. Fruit is medium size, and the finish is dull and unattractive. Flesh is crisp, juicy, and extremely sweet, with little or no perceived acidity. Skin is tough and chewy and prone to russet. It ripens with 'Fuji.'

'Pristine' (previously Coop 32)

'Pristine' is one of the earliest maturing apples under test; ripening fully 7 weeks before 'Delicious' and 5.5 to 6 weeks before 'McIntosh.' It is from the PRI program, thus it is resistant to apple scab. It is a medium sized oblate to round apple with russet-free and very attractive glossy yellow skin. Flesh is crisp, juicy and flavor is mild, quite acidic, with little perceptible sugar. The skin is very tender and it appears to bruise quite easily. For an early apple, it holds up fairly well on the tree and it does have some storage potential in regular air storage.

'Sansa'

Exceptional flavor characterize 'Sansa,' a cross between 'Gala' and 'Akane.' It is medium sized, round to slightly conic apple. Fruit with very good quality can be harvested from trees for two to three weeks starting about 3 weeks before 'Gala' harvest. When ripe, fruit has an aromatic and tropical fruit taste that is rivaled by few apples. Flesh is whitish yellow and fruit have a good sugar to acid ratio. Good light exposure is required for fruit to develop good red color. Fruit will store up to two months in storage. When it softens in storage fruit has taste and texture resembling a pear. The tree growth is moderate to weak, and leaves give the appearance of having apple mosaic virus.

'Senshu'

This is not a very attractive apple due primarily to the muddy red color that develops when fruit mature. This cultivar originated in Japan from a cross between 'Toko' and 'Fuji.' It is medium size and flesh is creamy white, firm and juicy. Flavor is good; sweet and spritely. It has moderate shelf life. When 'Senshu' matures, about 4 to 7 days after 'McIntosh,' circular stem end cracking can occur, that can be quite severe if rain coincides with the ripening of 'Senshu.' The tree is moderately vigorous and precocious.

'Shizuka'

'Mutsu' and 'Shizuka' have the same parents, 'Golden Delicious' and 'Indo,' and consequently they are somewhat similar apples. They are both very large yellow-green apples that develop a pink cheek near harvest time. Both are triploid, therefore their pollen is not viable for cross pollination. Trees are very productive and vigorous. 'Shizuka' is an excellent tasting apple with and appropriate

balance of sweetness, acidity and tannins. It ripens a week before 'Mutsu,' but their storage potential are similar. 'Shizuka' does not appear to be susceptible to blister spot, a bacterial disease that frequently afflicts 'Mutsu.'

'Suncrisp'

This selection, tested as NJ 55, was introduced from the New Jersey breeding program in 1992 from a cross between 'Golden Delicious' and NJ 303955. It is a medium sized, round to conic apple that ripens in 'Fuji' season. It is yellow-green at harvest with an orange-red check. Russet and the lack of a smooth skin make it only moderately attractive. Fruit is cream color, firm, and quite high in acid at harvest, which masks a fairly high sugar content. 'Suncrisp' improves in flavor in storage. 'Suncrisp' has medium vigor but the growth habit is quite upright with rather sharp crotch angles.

'Sunrise'

'Sunrise' originated from a cross between 'Golden Delicious' and 'McIntosh' and was originally tested as BC 8C-27-96, from the British Columbia breeding program. 'Sunrise' is a medium sized, round to slightly conic apple with yellowish white flesh. Fruit ripen rapidly and somewhat unevenly on the tree and when good red color develops, shelf life is frequently short. 'Sunrise' has outstanding crispness and juiciness, and a flavor that is quite mild and very subdued. It ripens three to four weeks before 'Gala.' Tree has medium vigor and a slight semi-spur habit. Fruit must be kept cold until eaten and storage life is very short.

'Yataka'

This is an early maturing sport of 'Fuji' discovered in Japan in 1986. It ripens two or three weeks before but it has no better red color than regular 'Fuji.' Fruit quality is very good. Unlike most 'Fuji' strains, 'Yataka' does not store as well as regular 'Fuji' but it does have optimum eating quality right off the tree. Horticulturally, it appears to be similar to 'Fuji' in most ways.

The majority of apples described in this paper are included in the first regional project planting NE-183, "Multidisciplinary Evaluation of New Apple Cultivars." Plantings containing these cultivars are in 28 locations in 20 states and provinces.

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