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Current Status of Several Japanese Apple Cultivars

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Abstract

Apple breeding programs in Japan have resulted in the introduction of such cultivars as Mutsu, Fuji, and Akane to the U.S., Canada, and Europe. Many of the more recent Japanese introductions have not been evaluated outside their home country, and their potential for commercial development elsewhere is unknown. Descriptions of some of these new apple cultivars, obtained in Japan during informational tours of tree fruit research stations and commercial and nursery growers, may be of value to those who have an interest in obtaining material for possible introduction.

This article updates our evaluation of new apple cultivars and planting trends in Japan and follows the report by Yoshida and Mink of more than 10 years ago (2). The information reported was obtained during a three-week

tour of tree fruit research stations in northern Honshu in September-October 1985 by the senior author,² a two-week visit to Japan in 1984 by the second author and also through subsequent correspondence with breeders and nurserymen in Japan and the United States. Some of the cultivar descriptions are condensed from Japanese nursery catalogs.³

A brief historical perspective of apple cultivar development and the apple industry in Japan has been presented by Yoshida and Mink (1, 2). The first apple cultivars imported into Japan from the United States in 1871 included 'Baldwin', 'Ben Davis', 'Jonathan', 'Ralls Janet' and 71 others. 'Delicious', 'McIntosh', 'Golden Delicious',

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'Redgold,' 'Jonagold' and many others were imported in later years (1, 3). Many of these cultivars are still grown today but are rapidly being replaced by a host of new cultivars which have distinctly higher quality and better appearance.

Apple breeding and variety development is done at several locations in northern Honshu, but primarily at two research stations, one Federal and the other Prefectural (State).

The Morioka Branch of the Fruit Tree Research Station, Ministry of Agriculture, Forestry & Fisheries (MAFF) is located in Iwate Prefecture, but is funded by the main research station at Tsukuba, just north of Tokyo (the so-called "Science City"). Hybridization projects begun in 1939 produced the cultivars 'Fuji' and 'Akane,' both available in the United States. 'Fuji' presently occupies over 44% of the apple acreage in Japan. Recent breeding programs at Morioka have involved the exchange of seed and pollen in a cooperative project of Yoshida and D. W. McKenzie from New Zealand,⁴ crossing Japanese cultivars with superior cultivars from the southern hemisphere. Promising selections from the program are to be released soon.

The Aomori Apple Experiment Station is located in the most northern prefecture of Honshu in the largest apple production area of Japan. Plantings in Honshu total nearly 60,000 acres or 46% of the total apple acreage in the country. With such a concentration of one type of fruit, it is understandable that research at Aomori concentrates on this single crop. Apple breeding at Aomori was initiated in 1928. Many cultivars have been named and released, but 'Mutsu,' often called 'Crispin' in European and New York markets, is by far the most common outside of Japan. In Japan, the individual fruits of 'Mutsu' are commonly grown in paper bags until near maturity. When the bag is removed, the skin develops a beautiful pink color which

commands a high price in the Tokyo market.

In addition to the cultivars developed by the public breeding programs described above, a number of cultivars and mutations have been introduced by private individuals throughout northern Japan. Indo was derived from a chance seedling grown by an American schoolteacher in Aomori in 1875. Several recent introductions described in the table have been developed by private breeders and registered officially.

Since there is a growing interest in the United States in recent Japanese cultivar introductions, we have attempted to list most new cultivars offered by Japanese nurseries, along with a brief description and an indication of current planting interest. We realize that the latter may be subject to considerable disagreement, particularly among researchers, nurserymen and growers in Japan. We polled all three groups to a limited degree on the recent trip by the senior author. Understandably, we found that one cultivar would be better adapted in some areas than in others. Also, commercial testing of some new introductions has just begun. In spite of this, we feel that these descriptions may be of value to those who might have interest in obtaining this material. A number of older cultivars, such as 'Fukunishiki,' 'Shinko,' 'Megumi,' 'Shinsei,' 'Kyokko,' and 'Amanishiki' are not included because we could find little interest in their propagation. These and others were discussed previously by Yoshida and Mink (2).

It is of interest to note that there seems to be a preference in Japan for a sweet tasting apple with a soluble solids concentration of at least 13% and an acidity less than 0.5%. Everywhere in Japan, people say, "Japanese like sweet apples." For example, 'Red Delicious' and 'Redgold' apples are often left on the tree until water core develops. 'Jonagold' is quite popular in Japan, but is considered by some to

Table 1. Description of apple cultivars developed in Japan.

Cultivar (Reg. No.)	Source (Date) ¹	Parentage	Season ²	Description ³ (Av. size in gms./fvt., color, flavor, storage, etc.)	Planting Trend
Natsumidori (P 367)	Aomori (1983)	Kitakami × Meku 10	Gravenstein -20 Delicious -50	200 gms, round, yellowish-green skin w. pale red blush, med. firm, juicy, sweet, low in acidity, good flavor, 2 week shelf life.	Too new to evaluate
Hanaiwai —	Aomori (1930)	Wealthy × Amer. Summer Pearmain	Gravenstein -20	250 gms., round, red striped, juicy with fair flavor, subject to cracking, short shelf life.	Down (flavor)
Michinoku —	Aomori (K. Maeda) (1981)	Kitakami × Tsugaru	w. Gravenstein	270-300 gms, round to oblate, solid red skin w. prominent lenticels, firm, crisp, juicy, good flavor, sweet, very attractive, shelf life 1 month.	Increasing in northern area
Nebuta —	Aomori (K. Maeda) (1981)	Kitakami × Tsugaru— sister of Michinoku	w. Gravenstein	250-300 gms, round to round conic, solid red, ver attractive, flesh pale yellow, firm, somewhat acid, shelf life about 20 days, develops water core.	Down in Aomori, Up in Hiroshima
Kitanosachi (P 131)	Aomori (1981)	Tsugaru × Amer. Summer Pearmain	w. Gravenstein	200-250 gms, round, red stripe over yellow ground, flesh yellow, sweet, juicy, good flavor, life 2-3 weeks, an early Tsugaru type.	Stable
Scarlet (P 528)	Nagano (1984)	Akane × Starking	Tsugaur -15 w. Gravenstein	250-300 gm, brilliant red stripe with no russet, flesh firm, white, juicy, low acid (0.34-0.38%), sugar content 13.5° brix, stores 1 month.	Too soon to evaluate
Kitakami (P 366)	Morioka (1983)	Tohoku No. 2 × Redgold	Gravenstein +5	150-250 gms. oblate, red, firm, juicy, med. acid 0.5%, med. sweet shelf life (1-2 weeks), adapted to cooler areas.	Increasing in Hokkaido

Table 1. Continued.

Cultivar (Reg. No.)	Source (Date) ¹	Parentage	Season ²	Description ³ (Av. size in gms./frt., color, flavor, storage, etc.)	Planting Trend
Kogetsu (P 130)	Aomori (S. Taniuchi) (1981)	Golden × Jonathan	w. Gala	300-350 gms, round, 95% red skin, cream flesh, with good sugar (14-17%) and low acid (0.36%), excellent flavor, some drop, stores well.	No trend as yet
Senshu (P 42)	Akita (1980)	Toko × Fuji	w. Gala	270-300 gms, round, striped red, with firm, juicy flesh of excellent quality, 20-30 day shelf life, good disease resistance, cold storage until January.	Increasing rapidly
Alps—Cotone	Nagano (K. Hatakoshi)	Jonathan × Fuji	Delicious -7	40 gms, small, dark red fruit with orange yellow flesh, very sweet (17° brix) dwarf tree, self fertile.	
Sekai-ichi —	Aomri (1974)	Delicious × Golden Delicious	w. Jonagold	500-600 gms, very large, round conic, red striped, firm flesh.	Stable to decreasing
Red Sekai-ichi		Solid red sport of Sekai-ichi	Delicious -7	Similar to Delicious, sweet, low acid, good flavor.	Slight decline
Newjonagold (P 63)	Aomori (M. Saito) (1980)	Bud sport of Jonagold	w. Jonagold	300-500 gms, resembles Jonagold but has deep red stripe and ripens slightly earlier, firm, subacid flesh, excellent quality.	Stable
Shizuka (Pat. app. for)	Aomori (T. Murakami)	Golden × Indo	Mutsu -10 w. Delicious	450 gms, yellow with pink blush, sister of Mutsu, fine texture, sweeter than Mutsu, moderate acidity, stores till April, longer than Mutsu, triploid?	Too new to evaluate
Mutsu —	Aomori (1949)	Golden Delicious × Indo	Delicious +10	400-600 gms, conic, yellow (unless bagged), firm, coarse flesh, juicy, good sugar/acid ratio, excellent storage.	Stable to slight decrease

Table 1. Continued.

Cultivar (Reg. No.)	Source (Date) ¹	Parentage	Season ²	Description ³ (Av. size in gms./fvt., color, flavor, storage, etc.)	Planting Trend
Akane —	Morioka (1970)	Jonathan × Worcester Pearmain	Gravenstein +5	200-250 gms, red with whitish undercolor, white flesh, good flavor right off tree, holds well on tree, poor storage, inferior to Kitakami.	Down
Tsugaru (P 277)	Aomori (1975)	Golden Delicious × Unknown	Gala -10 Delicious -24	300-350 gms, round, wide red stripes over yellow green firm, juicy, subacid, good flavor, stores 2 months, preharvest drop.	Stable but substantial
Tsugaru Sports: Homei — Solid red sport, ripens earlier than standard Natsuka — Red sport, darker than Homei Shuko — Red sport, larger fruit, with scarlet stripe Misuzu — Red sport Yamamoto No. 3 — Red sport Todoroki-kei Soma Chakushoku					
Himekami (P 931)	Morioka (1985)	Fuji × Jonathan	Gala -10	300-320 gms, oblate, solid red skin, cream flesh, juicy, sweet, water core, shelf life 4-5 weeks, 2 months cold storage.	Too soon to evaluate
Iwakami (P 932)	Morioka (1985)	Fuji × Jonathan	Gala -10	200-250 gms, similar to Jonathan in shape and color, flesh cream, firm, mod. acid, may require careful thinning.	Too new to evaluate
Sayaka —	Nagano—(K. Hatakoshi) (1984)	Jonathan × Sekai-ichi	Gala -5	300-400 gm, purplish red stripe over yellow ground with prominent lenticels, flesh yellow, med. firm with some water core, subacid, disease resistant.	Too new to evaluate
Hatsuaki —	Morioka (1976)	Jonathan × Golden De.	Gala -3 Delicious -17	300 gms, round, oblate, light red on yellow ground, flesh crisp, juicy, slightly acid similar to Jonagold, slight russet around basin	Stable to decreasing

Table 1. Continued.

Cultivar (Reg. No.)	Source (Date) ¹	Parentage	Season ²	Description ³ (Av. size in gms./frt., color, flavor, storage, etc.)	Planting Trend
Hokuto (P 368)	Aomori (1983)	Fuji × Mutsu	w. Mutsu Fuji -14	320-350 gms, round purplish-red stripe over yellow ground, flesh cream, dense, sweet with moderate acidity, excellent quality, long storage.	Increasing rapidly
Yoko (P 129)	Gunma (1981)	Golden Delicious open	Mutsu +5	300 gms, round oval shape, solid red with slight stripe, flesh firm, white, sweet, slightly coarse, tendency to russet, excellent keeping quality.	Increasing in Nagano and Gunma Pref.
Kotoku (P 928)	Aomori (J. Kimura) (1985)	Toko open	Mutsu +5 (late October)	270-300 gms, round, pinkish blush over yellow, flesh white, very firm, sweet with low acidity, water core, excellent storage quality.	Too new to evaluate
Orin —	Fukushima (T. Otsuki)	Golden Del. × Indo	Fuji -7	250-300 gms, oblong, yellow-green with prominent russetted lenticels, flesh firm, aromatic, sweet and juicy, excellent storage, productive.	Increasing
Jumbo Orin —	Aomori (S. Taniuchi) (1977)	Golden × Indo	Fuji -5	400 gms, similar in appearance to Orin but slightly larger and sweeter, good storage quality.	Too new to evaluate
Toko —	Aomori (1963)	Golden Delicious × Indo	w. Granny Delicious +30	300 gms, yellow with some russet, similar to Golden, good sugar/acid ratio, tends to have fungi in cores	Decreasing
Ambitious (P 929)	Aomori (J. Kimura) (1985)	Toko open	w. Granny	260-280 gms, yellow-pink skin with red spots, firm, fine, yellow flesh, juicy, sweet, low acid, no water core, good storage.	Too new to evaluate

Table 1. Continued.

Cultivar (Reg. No.)	Source (Date) ¹	Parentage	Season ²	Description ³ (Av. size in gms./frt., color, flavor, storage, etc.)	Planting Trend
Fuji	Morioka (1962)	Ralls Janet [*] Delicious	Granny +7 (November)	300-350 gms, round oblong, yellow with pink blush, sweet, firm, pale yellow flesh, low acidity, best quality, excellent storage, productive.	Stable to increasing
Fuji Sports:	Many sports of Fuji (Nagafu Nos. 2, 6, 12; Akifu No. 1 etc.) are being discovered and promoted. Some claim increased color, size and sugar content.				Increasing
Kinsei (P 238)	Aomori (1972)	Golden Del. × Ralls Janet	Fuji +7	320-400 gms, round conic, yellow skin with red blush and considerable russet, firm, sweet (13-18° brix), excellent flavor, sets heavily, requires severe thinning, excellent storage.	Stable to increasing

¹Source: refers to research station where developed unless followed by a name indicating a private breeder from that area. Date is year of registration.

²Season: approximate number of days before (-) or after (+) the comparison cultivars. i.e. Gravenstein -25 means harvested 25 days before Gravenstein.

³Description: includes average weight per fruit and other characteristics as given in Japanese nursery catalogs. Approximate U.S. box size equivalents: 48 = 397 grams per fruit; 56 = 340 g.; 64 = 298 g.; 72 = 284 g.; 88 = 217 g.; 100 = 191 g.; 113 = 169 g.; 125 = 153 g.; 138 = 138 g. Box size 100 apples are approximately 3-inch diameter; each box size changes diameter by approximately 1/8 inch. Storage life is considered shelf life at room temperature; for cold storage life, multiply by four.

be too acid. Europeans, on the other hand, appear to prefer apples with a higher acidity, while Americans seem to have a mixture of preferences.

We would like to emphasize a most important point for persons desiring to test some of the new introductions outside of Japan. Except for cultivars previously mentioned, very few of the Japanese apple varieties listed in the table are available outside of the country. Note that some are officially registered and carry a Japan registration (akin to a plant patent) Ex. P367. Others may be named but not yet registered. Color sports of registered

cultivars are not given separate registration. Importation of any plant material from Japan requires a post-entry quarantine period in the United States, at Glenn Dale, MD (USDA). Arrangements to import patented cultivars are likely to be most successful if done by larger nurseries able to make contractual arrangements with the patent holder, so that payment of royalties or other considerations can be arranged. It is unlikely that individuals can obtain much, if any, of this material at present.

The listing which follows (Table 1) is offered because little is known out-

side of Japan about the recent productive efforts that have been made to breed new apple cultivars. There no doubt will be increased efforts to obtain some of this material for evaluation in other parts of the world. The table is arranged in approximate order of maturity and compared to that of well-known cultivars.

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