New selections which have proved promising, have been widely tested and are candidates for naming include:

New York 1362—is vigorous, productive, bearing attractive, very large fruit with excellent skin and flesh quality and color.

New York 1409—is also vigorous and very productive bearing large fruit, which is only average skin and flesh texture but has rich attractive color. This selection is very promising in New England.

New York 1324—is vigorous, very productive, large fruited, with good skin and flesh, very attractive and easy to pick.

MdUS 4355—is vigorous and productive, bearing fair sized fruit with good skin and flesh. This selection is easy to pick with slightly raised trusses.

MdUS 4359—is vigorous, productive with large, attractive fruit, acceptable skin toughness and flesh firmness.

The principal strawberry varieties grown in eastern Ontario are Redcoat, and Veestar, while Bounty, Vibrant, and Earlidawn are grown on a limited scale. In the Maritime Provinces these same varieties predominate; however, Micmac, a new release, is being tried.

Production Figures — Since the Northeast has such a wide variation in climatic conditions and soil types, production figures are as variable. A poor grower with little input into his operation may realize only 2,000 quarts per acre. The growers who are doing a better job have been producing between 4,000 and 8,000 quarts per acre, while others who have been putting all the present-day knowledge about strawberry culture into practice have realized over 25,000 quarts per acre. Most of the production in the Northeast is obtained in a two-week period.

Future Varietal Needs for Northeastern U.S.—The major characteristics which growers are looking for in new strawberry varieties are: earliness, high yields, large fruit size, increased fruit firmness and tough skin and resistance to such diseases as fruit rot, Verticillium wilt, and red stele. Other characteristics include: resistance to certain herbicides, ability of the fruit to ripen and hold in good condition for four or five days and better fruit quality.

Strawberry Cultivars for Eastern and Midwestern North America

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Strawberry culture in the United States and Canada has changed markedly in the last decade for a variety of reasons (see Scott's 1971 articles in the *American Fruit Grower*). The cultivar picture has shifted rapidly as breeders have responded to changing needs. In this and the accompanying three articles, four strawberry breeders will comment on the varietal shifts in their regions, the present leading cultivars and their performance levels, and the cultivars of the future.

It should be understood that consistency of production and strawberry cultivar choice is usually governed by 1) adaptation to the climate and soils of a region, 2) resistance or tolerance to the principal plant pests of the region, and 3) suitability of the fruit for

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the purpose for which it was produced.

In Florida (data supplied by E. Albregts), winter strawberry production for shipping to northern markets is carried out by fall planting using a double to 5-row hill system with the plants set through a black plastic mulch. The plantings are fruited for one season only.

In central Florida, Tioga has been the dominant cultivar for the last 10 years. Tufts has become increasingly important over the last 5 years, and this year surpassed Tioga in acreage planted. Florida Belle, a 1974 anthracnose resistant introduction, is grown on 5-10% of the central Florida acreage. As with many new varieties, it has encountered acceptance problems, and is being shipped principally in January and February and otherwise sold through fruit stands. Florida 90 has been of no consequence the last 5 years. It is anticipated that in the near future Tioga and Tufts will be planted on 50-60% of the acreage, the soon to be released Fla 73-1965 (Dover) will have 30-40% of the acreage and Florida Belle 5-10%.

In south Florida, Florida 90 has been replaced by Florida Belle. Florida Belle has also replaced Sequoia in north Florida. Florida Belle is expected to continue as the dominant cultivar in both of these areas.

The strawberry breeding aim in Florida is to have a series of cultivars producing 15-20 tons/acre, with resistance to anthracnose, good shipping quality, and good flavor.

Table 1 illustrates the yield potential of the presently grown and newly introduced cultivars in Florida.

Louisiana has a small shipping industry producing early spring fruit from fall planted, double hill system cultured plants grown for one fruiting season only. Anthracnose and harvest labor shortages are the principal deterents to strawberry culture in Louisiana. The major cultivars are Tangi, Dabreak, and Headliner. The Louisiana breeding aims have been for strawberries that are anthracnose resistant, bearing smooth, medium bright red fruits slightly darker than Sparkle, having no hollow hearts, and capable of producing 4000-5000 12 pint flats per acre.

Table 1. Strawberry Yield Trials in Florida (Data from E. Albregts, University of Florida), Winter Production (Tons/Acre).

Cultivar	Year 1977/78	1976/77	1975/76
Florida Belle	11, 11.5, 16*	11	13
# 1965	8.5, 14, 18.5*	14	15
Tufts	7.5	—	11
Tioga	7.5	8.5	12.5

*3 separate tests in 1977-1978

Arkansas still has a small shipping industry, ripening fruit in the mid-Spring period. The preponderant Blakemore cultivar is being replaced by the new Cardinal and Comet cultivars, particularly the former. Several of the USDA red stele resistant cultivars perform well in Arkansas, as do the North Carolina clones Earlibelle, Apollo, Atlas and Titan. Arkansas strawberry culture is principally the matted row system, and Arkansas has strong breeding and certification programs.

North Carolina strawberry production has shifted almost entirely from shipping to customer harvesting (U-pick) and local marketing, but the industry is strong and growing. The major cultural system employed is the matted row, and fields are usually fruited for three seasons. The fruiting season in North Carolina is 4-5 weeks long. Cultivars developed in Coastal Plain North Carolina have usually been adapted from mid-Virginia south to Tifton, Georgia and Hammond, LA and often to Arkansas. Adaptation has often extended to the Piedmont re-

gions of the same states, and some North Carolina cultivars have performed reasonably well in Maryland, southern Illinois and southern New Jersey, and in the mountain regions of North Carolina and Arkansas.

The standard N.C. strawberry cultivars had been Albritton (since 1951) and Earlibelle (since 1965). These have been supplemented and overtaken since 1970 by the newer, larger and higher-yielding Atlas and Apollo cultivars. The high quality, large-fruited Titan is gaining a small but increasing share of the acreage.

Four new cultivars will be introduced from the NC-US breeding program as soon as plant stocks are large enough. These new cultivars are compared for the major fruit production characters at three different geographic locations in North Carolina. Table 2 shows adapted cultivar performance in a dry season with heavy beds and crop (fruit size was sub par in this year) near their point of origin in the Coastal Plain.

Table 3 contrasts the performance potential of the new cultivars with Earlibelle and Apollo in the Tidewater Area. Table 4 shows that all cultivars except Prelude are a considerable improvement over the Tennessee Beauty cultivar which has been widely grown in the mountain area. The strong breeding and certification programs in North Carolina continue to be a positive influence on new cultivar development and maintenance.

Table 2. North Carolina Strawberry Yields.
(Coastal Plain Clinton, N. C. — 1973 Rep Trials) (Dry Year — Heavy Crop)

Cultvar	(% harvest 2 wks)	Yield/A		Wtd mean Size (g/b)	% Fruit under 5.6 g/b
		Qts	Tons		
Prelude*	68	13,660			
Earlibelle	60	11,344			
Sumner*	56	13,105			
Atlas	56	15,855			
Sunrise	54	15,462			
Titan	53	13,618			
Albritton	51	13,042			
Apollo	50	13,972			
Sentinel*	48	14,404			
Rosanne*	15	12,641			
LSD .05	9	3,032			

*New varieties not yet introduced

Table 3. North Carolina Strawberry Yields.
(Tidewater Basin — Plymouth, N. C. 1976 Rep Trials)

Cultivar	Season	Yield/A		Wtd Mean Sz (g/b)	% Small Fruit
		Qts	Tons		
		16,436	12.3		
		9,909	7.4		
		11,441	8.5		
		12,206	9.2		
		16,530	12.4		
		16,387	12.3		
		1,813	1.3		

The area from Virginia to New England and west to the Great Lakes states produces strawberries almost exclusively for the customer harvest and local market trade. The narrow matted row system is the dominant cultural option. Considerable improvement in performance has been achieved by some growers using raised bed spaced matted row culture, with careful attention to weed control, fertility, irrigation, and disease and insect control procedures.

The dominent cultivars of the region from **Virginia** to **New Jersey** and west to **Michigan** and **Illinois** are the consistently productive group of red stele resistant clones developed by the U.S. Department of Agriculture and the University of Maryland. Midway, Sunrise and Surecrop have been very useful commercially, and they are being replaced by Earliglow, Redchief, and Guardian. Delite, Raritan, Marlate, Pocahontas, Catskill, Sparkle, Tennessee Beauty, Robinson and Vesper are grown in certain portions of the Middle Atlantic and Midwestern regions. Minor varieties are Darrow, Redcoat, Holiday, Fletcher, Cyclone, Comet, Cardinal, Apollo, Badgerglo, Scarlet, Bounty and Earlimiss.

Table 5 shows the performance of Redchief, Raritan, Guardian and Earliglow contrasted with Surecrop at Beltsville, **Maryland,** and at two **Illinois** locations in 1975. Table 6 records several seasons' performance at Beltsville, Maryland, for some of the principal lower Middle Atlantic region cultivars.

In the central and Northern midwest United States the matted row in varying widths predominates. Most operations are U-pick with some attempts at mechanical harvesting and capping for processing in certain locales.

In Missouri, Delite, Guardian and Redchief are good performers and Surecrop and Earliglow are average. The new Arkansas cultivars Cardinal and Comet should perform well also.

In Iowa, Guardian, Midway, Badgerbelle, Surecrop, Cyclone, Sparkle and Trumpeter are useful cultivars. One might expect Redchief, Badgerglo and Redcoat to be successful. The cultivar situation in **Wisconsin** is similar to that in Iowa with Badgerbelle, Badgerglo, Guardian, Redchief, Surecrop and Midway expected to be the most dependable performers.

In Minnesota the recommended cultivars are Trumpeter, Veestar, Badgerbelle, and Redcoat.

In Canada's central and east central provinces (Information supplied by Dr. Don Craig of the Kentville, Nova Scotia Experiment Station) strawberry culture is principally narrow matted

Table 4. North Carolina Strawberry Yields.

(Mountains — Fletcher, N. C. 1976 Rep Trials)

Cultivar	Season	Yield/A		Wtd Mean Sz (g/b)	% Small Fruit
		Qts	Tons		
Apollo		17,074			
Earlibelle		13,021			
Sentinel		16,274			
Prelude		10,876			
Sumner		16,891			
Rosanne		17,877			
Tennessee Beauty		16,690			
LSD .05		1,918			

rows mulched for winter protection. In Ontario almost all of the crop is marketed fresh, and 60% is customer picked. The principal cultivars are Redcoat (65%), Veestar (25%), with minor cultivars being Sparkle, Earlidawn, Bounty, Guardsman, Midway, Vesper and Vibrant. Principal breeding aims in Ontario include increased firmness, resistance to Verticillium wilt, and improved frozen pack quality.

In Quebec, strawberry production is for both the fresh and processed trade with 30% being Pick-Your-Own. The cultivar Redcoat occupies 90% of the acreage; Veestar is increasingly popular, and Bounty and Sparkle are also grown and should increase in popularity as pick-your-own harvesting does. Quebec needs more winter hardiness and berries better suited for fresh and processing outlets which can be mechanically harvested.

Table 5. Comparative Performance of Strawberry Cultivars in Maryland and Illinois.

	1975 Yields (1000 lbs/acre) compared to Surecrop			1975 Fruit Size (gms/berry) compared to Surecrop		
Variety	Beltsville	Dixon Springs	Urbana	Beltsville	Dixon Springs	Urbana
Surecrop	19.4	14.1	15.7	8.8	6.0	8.5
Redchief	+39%	+75%	+41%	+10%	+9%	+1%
Raritan	+51%	+83%	+36%	+6%	+10%	+2%
Guardian	+32%	+83%	+40%	+47%	+44%	+35%
Earliglow	+48%	—	+32%	+18%	—	+0%

Table 6. Comparative Performance of Strawberry Standard Varieties at Beltsville, Maryland (First Year Beds).

Variety or Selection	Season[1]	Average size (thousands lbs per acre) 1975	1976	1977	Average size (gms/berry) 1975	1976	1977	Resistance[1] RS	Vert.	Comments
Earlidawn	VE	19.4	15.7	29.9	8.4	7.0	10.8	S	PR	Frost hardy blossoms, needs fertile soil
Earliglow	VE	28.7	22.7	27.4	10.4	7.4	10.6	R	R	Botrytis resistant, fine flavor
Darrow	VE	24.1	22.7	—	9.1	7.0	—	R	PR	Sometimes irregular, fine flavor
Surecrop	E-M	19.4	13.6	—	8.8	6.7	—	R	R	Dependable
Redchief	E-M	27.0	21.6	31.3	9.7	7.8	9.4	R	R	Very consistent, espepecially against fluctuating temps
Raritan	M	29.2	23.5	—	9.3	7.7	—	S	VS	A good berry except for root diseases
Guardian	LM	25.6	22.0	30.9	12.9	9.4	11.6	R	R	Consistent, best for fresh use rather than freezing

VE—very early, E—early, M—midseason, LM—late midseason, L—late, RS—red stele, Vert—Verticillum wilt, R—resistant, PR—partially resistant, S—susceptible, VS—very susceptible.