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Cherry Cultivar Situation¹

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Reports were requested on the cherry industry and its cultivar status from leading fruit scientists in 15 states and provinces in North America. The text of these are published here to provide an accurate current report. Some personal views are presented by the coordinating author on needed research, particularly in breeding.

Cherries have supplied unique colors and flavors to the human diet for centuries. Orchards for this fruit are very demanding from the standpoint of freedom from spring frost, extreme mid-winter cold and picking season rains. Thus only a minor portion of the North American orchard land is devoted to this crop.

Sweet cherries (*Prunus avium*) are more important than red tarts (*P. cerasus*) in North American cherry production by a factor of almost two times (Table 1). Utilization of sweets is about 75 percent fresh and 25 percent processed (mostly brined for maraschino or frozen for ice cream and baking use) whereas tarts are over 95

Table 1. North American Cherry Production Average for 1978-1979 seasons.

State or Province	Tarts*	Sweets*
Brit. Col.	1.6	16.0
CA	—	56.0
CO	1.6	0.3
ID	—	5.5
MI	115.0	62.0
MT	—	4.8
NY	23.0	7.7
ONTAR.	17.1	4.2
OR	3.7	73.0
PA	6.3	1.7
UT	14.0	8.6
WA	—	127.0
WI	13.0	—
WV	1.3	0.3
Total	196.6	367.1

*million pounds

percent processed with about 70 percent of these being frozen and 30 percent canned (pie filling, jams, jellies and juices). Other important cherry producing areas of the world are primarily in Europe and Asia, with Italy,

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Switzerland, Yugoslavia and West Germany producing significant sweet cherry crops. Many countries produce tarts with German, Russian, Hungarian, and Yugoslavian production far surpassing other smaller producers.

BRITISH COLUMBIA CHERRIES

Sweet cherries are far more important than tarts in B.C. making up 96% of the industry. The most important variety is Lambert, a late variety which often avoids rains which split earlier ones. Lambert also has clean separation of the stem from fruit at full maturity when picked for canning, good hardiness and rapid shrivelling of split or damaged fruit which makes sorting easier. Van is the main pollinizer variety because of its attractiveness to bees and abundant bloom but plantings of Stella, the only commercially important self-fertile variety and a universal pollinator, appear to be increasing.

Problems of concern to the industry are difficulties in shipping cherries so they arrive in good condition at distant markets. Bruising and subsequent pitting of stored fruit is the most important fruit quality problem. Horticulture problems are tree damage from winter injury and poor pollination in years with cool or windy springs. Stella usually has better crops in years when pollination conditions are poor, which may partially explain its increasing popularity.

Breeding aims are to develop new varieties with self-fertility, larger fruit size combined with firmness and good flavor and compact growth habit. The only important disease of cherries in B.C. is Little Cherry Virus which is localized. Containment is being attempted by controlling the insect vector (mealybug). Research is being done at Agriculture Canada's Research Station at Summerland with some work on virus diseases underway at Vancouver.

CALIFORNIA SWEET CHERRIES

Approximately 12,500 acres of sweet cherries are grown in California. The major use is fresh market (both intra- and interstate shipment), but brining of white fleshed and some dark fleshed fruit is also an important but relatively minor use.

Bing is the most important cultivar grown in California, making up about 75% of the acreage. Other important cultivars are Royal Ann (Napoleon) (10%) for processing and Early Burlat pollinizers include Black Tartarian, (5%) for early fresh market. Primary Van and Larian.

Two new patented early maturing cultivars, Ruby and Garnett, are being tested. The University of California is testing several early season cultivar selections from its breeding program that are showing considerable promise.

In addition to cultivar evaluation, the University of California has put considerable efforts into rootstock evaluation in recent years. Western X disease, *Phytophthora* crown and root rots, stem pitting disease, and gophers have caused considerable cherry tree losses in recent years and a major effort is being placed in finding rootstocks or cultivars (Western X) that are resistant to these problems. Preliminary recent observation indicates that Early Burlat and Chinook may have some resistance to Western X disease. In addition, several cultivar selections from Utah that have shown resistance to Western X disease are being tested under conditions in California. Rootstocks that will control tree size are highly desirable and are also being sought.

COLORADO CHERRIES

The cherry industry in Colorado is very small. Of the 743 acres planted to cherries, 467 are tart cherries and 276 are sweet cherries. Montmorency accounts for 99.7% of the tart cherry

production. Bing and 'Lambert' are the popular sweet cherries accounting for 86% of the sweet cherry production. The closing of the brining plants in Utah in recent years and the expense of shipping the sweet cherries to processors in California have discouraged growing sweet cherries for processing. Over 86% of the sweet cherries are sold fresh while 14% go to processors. Over 96% of the Montmorency cherries are sold to processors while 4% are sold fresh. The tart cherry industry was declining until last year (1979) when there was an upsurge in new tree plantings. Mechanical harvesters and good prices in recent years have produced renewed interest in tart cherry production.

IDAHO CHERRIES

Idaho has about 700 acres of sweet and 100 acres of tart cherries currently planted. This small segment of the fruit industry is located in the five county area located southwest of Boise and can be described as being in a holding pattern relative to expansion. It has more optimism for new tart plantings than sweet. Bing, Lambert and Montmorency are the only cultivars of significant economic importance. Poor price for sweet cherries is the reason for limited growth in this industry.

MICHIGAN CHERRIES

Cherries are grown in Michigan on 39,000 acres with a 3 year average producer value of approximately \$60 million. Three-fourths are tart and one-fourth sweet types. Their use is both processed and fresh but processing predominates. Mechanized harvesting procedures facilitate efficient movement of fruit from trees to containers.

In sweets, primarily yellow-fleshed cherries are grown. They are processed by brining and refinishing (as dyed maraschino and glacé fruit) for use in cocktails, baking, and ice cream.

Napoleon (Royal Ann) has long been the standard cultivar for this use. Current concerns in this segment of the industry are new regulations dealing with food colorant additives, and processor-marketer ownership restructuring. Essentially all fresh market cherries are *P. avium* and are usually "black" (shades of dark red and mahogany) skinned, dark red fleshed types. Most fresh blacks are sold through roadside markets and some by pick-your-own (PYO). Few are marketed through wholesale packed fruit channels because of poor quality as compared to Western hand-picked cherries which have stems and less bruising than machine harvested Michigan fruit. Some "blacks" are canned in glass and tin and some are pitted and frozen for yogurt and ice cream. Schmidt has been the standard cv. but lacks wood hardiness. Hedelfingen is also much planted but softens excessively for processors.

Red tart cherries are 60 percent frozen in five parts fruit to one part sugar, 18 percent canned in hot pack or ready-to-use pie fillings and 22 percent in jams, juices and other uses. Over 99 percent of Michigan tarts are strains of Montmorency, an amorelle (yellow fleshed, clear juiced) cultivar. Strong grower interest exists in Montmorency mutants possessing later bloom, later maturing fruit, and longer lived fruiting spurs on compact trees. Some interest in other amorelle and morello (red juiced) cultivars exists as disease resistance, new product development and increased accent on export markets are considered.

In general, strong research emphasis is desirable for dwarfing rootstocks, self fertile sweets, bacterial canker, X-disease, leaf spot chemical control and scion cultivar tolerance, and summer hedging of close planted orchards. Cultivar testing of both sweets and tarts, and hybridization and mutation breeding of tarts, are active programs. Research is conducted at East Lan-

sing, Clarksville, Fennville, and Traverse City experiment stations and on numerous grower-cooperator sites.

MONTANA CHERRIES

Cherries are grown in Montana on 1800 acres, with 83% sweet and approximately 17% tart types. Sweet cherry production is all in close proximity to Flathead Lake. Red tart cherry production is restricted to the eastern slopes of the Bitterroot Mountains.

Montana sweet cherries are marketed primarily as hand-picked fresh fruit. Packing and marketing are handled largely by four grower-owned associations. A start has been made toward development of an export market. Roadside sales and U-pick are secondary outlets. Culls and pollinizers are commonly brined.

Lambert is the predominant sweet cherry cultivar, ripening from the latter half of July into early August at a time when most other western producing areas are off the market.

The primary climatic hazards for sweet cherry production in Montana are low winter temperatures and rain near harvest. Strong interest exists in the new self-compatible cvs. provided they prove to be at least as winter hardy as, and more crack-resistant than Lambert. Orchard research has focused on cv. testing on an experimental site at Polson, plus cooperative studies on tree nutrition in growers' orchards. Zinc and boron deficiencies are common.

Red tart cherries in Montana are almost wholly strains of Montmorency that are machine-harvested for hot-pack canning as piestock. Much of the older acreage is undergoing rejuvenation. Current tart research is being handled by the staff of Montana Agricultural Experiment Station's Western Agricultural Research Center, Corvallis, MT.

NEW YORK CHERRIES

In New York most cherries are grown just a few miles from Lake Ontario by producers who also grow apples. Most cherries are machine harvested.

Between 1970 and 1975, the tart acreage dropped about 20% to the present 5000 acres. Tarts are $\frac{2}{3}$ frozen in 30-pound tinned containers for commercial pie bakers and about $\frac{1}{3}$ are canned as prepared pie mixes packed in consumer sizes. New York prices, fluctuate widely. They are dominated by the huge Michigan tart market. A few English Morello (Table 2) are processed into special products which require high pigmentation, such as facial cosmetics and cherry juice.

Sweet cherry production in New York is only $\frac{1}{4}$ that of tarts (Table 1); 58% are dark-fruited cultivars. Light fleshed sweets are mainly for maraschinos. Windsor is the most widely grown sweet cultivar because it has a winter hardy tree and, therefore, is annually productive. Processors prefer the fully light-fleshed cultivars such as Napoleon, Emperor Francis and Gold. Gold has no red pigment either in its flesh or its skin. Gold blossom buds are winter hardy and, therefore, trees are heavy cropping but fruits are small, but more Gold is being grown due to consistent cropping. Loss of brining factories is a problem. Some difficult problems in sweet cherry growing are bird damage, fruit cracking, winter injury to trunks, branches and fruit buds, and bacterial and fungal cankers.

Cornell University's Experiment Station at Geneva has been breeding cherries continuously for 70 years. Until about 1960, breeding was mostly on sweets. This Station introduced 6 sweet cultivars: Seneca (1924), Oswego (1927), Gil Peck (1936), Sodus

(1936), Ulster (1964) and Hudson (1964). Current objectives of sweet breeding are non-cracking, self-fruited, large blacks and large white briners.

During the 1960-80 period, emphasis has shifted to breeding of tarts because they are the more important part of the industry and because of anticipated increases in demand for better morello cultivars. In 1980, about 25 superior tart selections are being evaluated in Station second-test orchards and in grower third-test orchards. Fruit samples of these promising tart selections are annually canned and evaluated by the Food Science Department.

Experiments in this cherry breeding project were the first to demonstrate that cherry viruses can be transmitted through pollen. Also specific sterility genes of certain sweet cultivars have been identified. Other cherry breeding programs include dwarfing rootstocks (J. N. Cummins) and interspecific *Prunus* hybrids (R. C. Lamb).

OHIO CHERRIES

Cherries in Ohio are mainly sold U-pick or at retail markets. Many growers have pitters and offer this service to those who pick-their-own. It is estimated that Ohio will produce and sell .75 million pounds in 1980 on 25,000 trees. It is estimated that there are 230 growers having 400 acres in production.

Diseases, nematodes, distance to processors, lack of mechanical harvest acceptance, flood (1969) and severe winter temperatures (1978) have been responsible for some decline. In 1976 66% of all tart and 49% of all sweet cherries were 11 years or older. However, due to higher prices received in 1979 and increased U-pick demand, new acreage was planted in 1980 and more plantings are expected in 1981.

Tart cherry cultivars include a few

Early Richmond, but are mostly Montmorency. Windsor, Schmidt, Napoleon and Emperor Francis are important sweet cultivars. Sam, Hedelfingen, and Vernon are some promising new cultivars.

Only two projects on cultivar evaluation exist, one in northeast and one on rootstocks in the central part of the state. Growers are interested in high density plantings and summer pruning.

ONTARIO CHERRIES

The farmgate value of Ontario's cherry crop was just under 10 million dollars in 1979. According to the 1976 fruit tree census, there were 3,600 acres planted to tart and sweet cherries. Fully 60% of that 3,600 acres was planted to tart cherries and 70% of those were located in the Niagara region.

Montmorency and its strains predominate (99%), with processing and export markets absorbing 84% and 15% respectively of the 7,760 tons produced. The percentage of the crop, canned, has declined substantially over the past 20 years while that portion frozen, has increased correspondingly; in 1979 96% was frozen.

Research emphasis for tart cherries has been on breeding to develop late blooming cultivars which will be less subject to frost injury in the spring, and on development of high quality cultivars to extend the harvesting season. Rootstock and observational high density studies are also being conducted.

Fifteen sweet cherry cultivars were listed in the 1976 fruit tree census. Hedelfingen, Vista, Bing, Windsor and Venus were the five most important cultivars accounting for 62% of the trees. Approximately 90% of the sweet cherry trees grown in the province were located in the Niagara region, and the balance in southwestern On-

tario. Just under 50% of the 1,882 tons sweet cherry crop was sold on the fresh-market in 1979, but that percentage has varied from 50 to 87% during the last 15 years.

Factors most seriously affecting production include weather conditions during both bloom and harvest, and bacterial canker. Thus, research emphasis for sweet cherries has been on breeding to develop self fertile, crack resistant, high quality, productive cultivars. It is anticipated that resistance to two strains of bacterial canker will be incorporated into the breeding program. In addition, the evaluation of new, vigorous and size controlling rootstocks will continue.

OREGON CHERRIES

Cherries are grown in Oregon on 16,982 acres with 12 percent tart (*Prunus cerasus*) and 88 percent sweet (*P. avium*) types. Their use is both processed and fresh but processing predominates. Mechanized harvesting procedures facilitate efficient movement of fruit from trees to containers on about 60 percent of the cherries grown in Western Oregon. The majority of the sweet cherry crop, including all grown east of the Cascades, is hand-picked. In sweets, primarily yellow-fleshed cherries are grown. They are processed by brining and re-finishing (as dyed maraschino and glacé fruit) for use in cocktails, baking, and ice cream. Napoleon (Royal Ann) has long been the standard cultivar for this use. Corum, and more recently, Bada, are used as pollinizers in the Willamette Valley. Current concerns in this segment of the industry are new regulations dealing with food colorant additives, and production in excess of market demand. Essentially all fresh market cherries are *P. avium* and are usually "black" (shades of dark red and mahogany) skinned, dark red fleshed varieties, primarily Bing and to a lesser extent Van and Lambert.

These are marketed fresh nationwide with some to Japan and England. Some "blacks" are canned in glass and tin and some are pitted and frozen for yogurt and ice cream. Over 99 percent of Oregon tarts are strains of Montmorency, an amorelle (yellow fleshed, clear juiced) cultivar.

In general, strong research emphasis is desired and on-going for dwarfing rootstocks, fruit set, rain cracking, mineral nutrition and disease and insect control. Cultivar testing and mutation breeding of sweets are active programs. Research is conducted at Corvallis and Mid-Columbia experiment stations and on numerous grower-cooperator sites.

PENNSYLVANIA CHERRIES

Cherries are grown in Pennsylvania on 2,546 acres with 78 percent tart and 21 percent sweet according to the 1978 tree census data. Compared to the 1972 tart cherry acreage of 2,613, the 1978 data showed 2,000 acres under commercial production. Growers with less than 200 trees comprise 66 percent of the growers, have 4 percent of the trees on 5 percent of the acres and account for 5 percent of the production. On the other hand growers with more than 200 trees make up 34 percent of the growers, have 96 percent of the trees on 95 percent of the acreage and grow 95 percent of the red tart cherries. Eighty percent of the trees are in the south-central area, with Erie County having 13 percent of the trees. Most of the red tart cherries in the southcentral area are sold to commercial fruit processors while in the rest of the state, U-pick and roadside markets are major outlets. From 1970 to 1978 tart cherry production ranged from 3.2 (1977) to 14.0 million pounds. During this same period the value of the crop ranged from 0.9 to 2.6 million dollars. Montmorency constitutes 97 percent of the 186,387 trees in the state in 1978.

Sweet cherries were grown on 546 acres in 1978 compared to 618 in 1972. Growers with less than 200 trees comprise 88 percent of the growers, have 23 percent of the trees on 24 percent of the acres and produce 34 percent of the sweet cherries. Growers with more than 200 trees number only 32, make up 12 percent of the growers, have 77 percent of the trees on 76 percent of the acreage and produce 66 percent of the sweet cherries. Production of sweet cherries is not concentrated in any one area of Pennsylvania, with 36 percent of the trees in the southeast, 24 percent in Erie County and 20 percent in the south-central area. Most sweet cherries are sold at farm markets, U-pick operations and some are sold through local wholesale distributors. From 1970 to 1978 sweet cherry production ranged from 200 (1972) to 860 (1975) tons. During this same period the value of the crop ranged from \$79,000 to \$628,000. Dark sweet cherries make up 72 percent of the sweet cherry trees with the leading cultivars being Windsor (16%), Bing (15%), Hedelfingen (10%) and Schmidts Bigarreau (9%). Light cherries comprise 28 percent of the total sweet cherry trees with Napoleon (10%) and Emperor Francis (5%) being the major cultivars.

Due to the size of the industry and the limitations in fruit research programs, little research is conducted on cherry production problems.

UTAH CHERRIES

Cherries are grown in Utah on about 4000 acres with 78 percent tart and 22 percent sweet types. Cherry acreage is increasing. Tart cherries were up 16 percent from 1972 to 1979; 30 percent of the trees are 1-4 years of age. The 1980 sweet cherry crop is estimated to be up about 100 tons from the 1979 crop. The 1980 tart cherry set appears to be a little lighter

than the 1979, but with increased acreage coming into production the 1980 crop should be about the same as in 1979. All cherries in Utah are irrigated; many of the newer plantings are under drip irrigation. The majority of tart cherries are harvested mechanically while nearly all sweet cherries are picked by hand. Tart cherries are essentially all frozen (5 parts cherries: 1 part sugar). Sweet cherries are primarily marketed fresh, some are brined. Montmorency is the only tart cherry cultivar being grown commercially. Nearly all sweet cherries are the dark red mahogany skinned types. Bing and Lambert comprise at least 90 percent of the commercial acreage. Bing is the sentimental favorite in Utah but there is a tendency to shift to Lambert because on the average Lambert sets better and out yields Bing. There is some renewed interest in the yellow sweet cherries.

Cherry research emphasis has been on virus disease control. A sweet cherry breeding program has produced the X-resistant cultivar Angela which is being planted widely in home gardens and in a few commercial plantings. Other X-resistant or tolerant cultivars are being considered for release in the near future. Cultivar testing of both sweets and tarts, growth regulator response and orchard management practices are active research programs. Research is conducted at the Farmington field station and on numerous grower-cooperator sites.

WASHINGTON CHERRIES

Washington is the leading producer of sweet cherries in the United States. Production in 1979 was 69,000 tons, 35 percent of the total U. S. crop. Of this amount, 47,500 tons were sold as fresh fruit, and 21,500 tons were processed. Two-thirds of the processed cherries were brined for the production of maraschino cherries. More

than 3,500 tons of fresh market shipments were sent overseas, 65 percent of them to Japan. Efforts are being made to increase exports to absorb some of the increasing Washington crop, which has more than tripled in the last 12 years. Seventy-eight percent of 1979 fresh market shipments consisted of Bing, followed by Lambert with 13 percent, Van with 2 percent and miscellaneous varieties with 7 percent. Tart cherries are a minor crop in Washington, amounting to less than 1,000 tons annually.

Sweet cherry research is carried on at Prosser, Wenatchee, Pullman and Mt. Vernon. Research is being conducted in the areas of breeding, variety testing, winter hardiness, spring frost resistance, irrigation methods, rootstocks, high density plantings, growth regulator effects, fruit quality factors, post-harvest physiology, harvesting and shipping methods, virus diseases, insects and mites. Additional research support is urgently needed in all areas of investigation. Presently, the spread of mottle leaf and rugose mosaic viruses in Washington orchards poses a serious threat to the industry.

WEST VIRGINIA CHERRIES

Cherries are grown in West Virginia on approximately 200 acres with 60 percent sweet (*Prunus avium*) and 40 percent tart (*P. cerasus*) types. The major cherry producing counties are Berkeley, Hampshire, Jefferson, Mineral and Morgan — all in the Eastern Panhandle. The largest commercial cherry orchard of the state is approximately 50 acres. Many landowners throughout the state have less than 10 trees. The majority of the cherries, sweet or tart, are sold through fresh market channels, roadside markets, and pick-your-own operations.

The primary sweet cherry cultivars include: Black Tartarian, Napoleon

Bigarreau, Schmidt's Bigarreau, and Hedelfingen. Other cultivars are: Van, Bing, Lambert, Stark Gold, Emperor Francis, Queen Ann, Stark Hardy Giant, Stark Golden Wax, Windsor and Yellow Wax.

Most of the tart cherry production is of the cultivar Montmorency. One tart cherry orchardist has shaken his crop for sale through fresh market channels.

Fifteen years ago, cherry production in West Virginia was double the current (1980) production and acreage. Current State tart cherry production does not exceed 1,300,000 lbs. and sweet cherry production is less than 320,000 lbs.

WISCONSIN CHERREIS

The red tart cherry (*Prunus cerasus*) acreage in Wisconsin is approximately 3800 acres. This acreage is 99+ % in Door County and the principal cultivar is Montmorency (99+ %). Commercial sweet cherry production is almost non-existent.

Approximately 80-85% of the trees are mechanically harvested with the remainder mostly young trees, which are hand picked.

The majority of the fruit is cold packed — 90% (primarily in 30# tins) with a limited hot pack and the remainder going as U-pick.

Research projects on problems in the area (other than the normal insects and diseases) are: 1) increase in lesser peach tree, American plum and common peach borers; 2) growth regulator studies; 3) nutritional needs of trees; and 4) a limited cultivar testing program (Morello types).

Some of the needs of the industry are: 1) a good spur type tree; 2) dwarfing rootstocks; 3) disease resistance (yellows); 4) improved tree type (Morellos); 5) stable market; and 6) new products.

Table 2. Percentage of top 5 tart and top 10 sweet cherry cultivars planted by state or province by age group; plus cultivar improvement research programs.

Cultivar Testing/Breeding Tree age (yrs.)	BC		CA		CO		ID	MI		MT		NY		ON		OR		PA		UT		WA		WI		WVA			
	Yes	Yes	Yes	No	No	No	1-6	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No	No	No	Yes	No	Yes	Yes	Yes	No	Yes	No		
<i>Tarts</i>																													
Early Richmond								<1	<1																				
English Morello								<1	—				5	5															
Meteor								<1	—				2	1															
Montmorency	99	99			99	99	99	99	99	99			91	92	99	99		97	97						99	99			
Northstar													1	1															
<i>Sweets</i>																													
Bing	25	14	87	78	47	33	47	55	<1						8	12	39	26		19	45	50	62	53			11	26	
Early Burlot			7	5																5									
Emperor Francis								12	2				5	2						5									
Corum							10	<1										<1											
Deacon											1	5																	
Hedelfingen								17	9				5			32	32			11						33	11		
Gold								3					5	1					4	2							7		
Hudson																													
Lambert	17	47	<1	2	35	64	12	31			87	91		2			8	10		4	45	42	5	9			11		
Napoleon (Royal Ann)			3	13			<1	5	56	42			10	18			43	53		18	3	2	23	31			11		
Ranier					2			<1					2	2									2	<1					
Sam	7	9			3	1		1														1	1						
Schmidt								13	24				15	16	4	10			11								11	20	
Stella	15	2									5		5										1						
Tartarian					1	<1		<1																				21	
Ulster																													
Valera															10	1													
Van	36	27	2	2	1	6				6	3½			7	3	10	10				4	5	7	5			28	11	
Vega					12	3		<1																					
Venus															10	6													
Vic															4	4													
Victor															4	4													
Vista								<1	<1						18	15													
Viva								<1																					
Windsor								3	22				52	59	2	13			28										

In summary it should be emphasized that cherries are a rather fragile crop to grow both climatically and because of especially numerous virus and insect vectored disease problems. Thus, many research problems remain. This is probably because of their relatively insignificant dollar value compared to citrus, bananas, pome fruits and grapes and because many fewer human cultures have learned to desire them in their diets.

Cherries have good genetic variability in their centers of genetic diversity (primarily Adriatic and Turkish Eurasia). They hold great promise for genetic improvement of both sweet and tart types as well as hybrids between them. Relatively little interspecific hybridization has been utilized and much is possible. The pioneering mutation genetics efforts in

England and Canada to provide self-fertile genes appears invaluable in sweets.

Pseudomonas research and size controlling genetic improvements from both compact scions (Italy, Canada and California) and rootstocks (England, Germany and U.S.A.) also appear to be advancing well. The most significant challenges for future breeding are in disease tolerance and size controlling procedures to allow efficient orchard production. More pigmented tart types with new flavors may offer development of new cherry products.

It is unfortunate that closer collaboration with Soviet scientists has not been achieved. Germplasm and pomological information exchange between most other major research groups shows promise of significant genetic advance for cherry culture.

Performance of Selected Grape Cultivars Under Marginal Climatic Conditions in Tennessee. I. French Hybrid Type.

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Commercial grape production in Tennessee is limited to less than 40 ha, mostly of American type cultivars (15). Considerable interest has been expressed in producing wine grapes in the state. Cultivars of *Vitis vinifera* L., the major wine grape of the world have not been very successful in the eastern United States due to lack of winter hardiness (10, 11). Some cultivars of French hybrid type grapes, crosses of *V. vinifera* L. and American grape species perform well and are winter hardy. Cultivars reported winter hardy are Rosette in Tennessee (9);

Aurore, Chancellor, Vidal 256, DeChaunac, and Villard Blanc in Ohio (3); and Vidal 256, DeChaunac, and Chelois in Pennsylvania (6, 7, 8) trials. Trials were established by University of Tennessee researchers to evaluate performance of selected French hybrid type cultivars.

PROCEDURE

One-year-old plants of the most hardy French hybrid type cultivars available were set in the spring of 1973 at the Plateau Experiment Station at

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