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Raspberry Cultivars and Production in the Midwest

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Raspberry (*Rubus* spp.) cultivation has been an integral part of horticultural crop production in the Midwest. Adams (1) encouraged establishment of commercial raspberry plantings in the region as early as 1871 and by 1886 descriptions of midwestern raspberry cultivars were in print (12). Many early raspberry plantings were comprised of chance seedlings, but some varieties were selected and asexually propagated. Leading red, floricane-fruiting raspberry cultivars grown in the midwest in 1980 were 'Latham,' 'Boyne,' 'Canby,' 'Newburgh,' and smaller amounts of 'Hilton,' 'Southland,' and 'Chief.' The most widely planted red, primocane-fruiting raspberry was 'Heritage,' which had replaced 'September' (9).

The raspberry production area in the midwestern states reported by the United States Census of Agriculture (16, 17) was 712 hectares in 1978, 767 hectares in 1982, and 932 hectares in 1987. Lawrence (9) reported that two of the five leading states in raspberry production area in 1970 and 1980 were in the Midwest (Michigan and Minnesota).

This paper provides an update on raspberry cultivars, production and associated aspects for the Midwest, also referred to as the North Central Region of the United States. For purposes of discussion, we have divided the region into two somewhat homogeneous subregions, the Lower Midwest (Illinois, Indiana, Kansas, Kentucky, Michigan, Missouri, Nebraska, and Ohio) and the Upper Midwest (Iowa, Minnesota, North Dakota, South Dakota, and Wisconsin.)

A survey form was used in 1991 to obtain raspberry cultivar, production, and associated information. The survey was developed by Clark (2) and Strik (15) and adapted for raspberry cultivars in the North Central Region. Respondents (Table 1) provided information for red and purple, floricane-fruiting, black floricane-fruiting, and red primocane-fruiting raspberry types. The following information was requested for each state: 1) production area for 1980, 1990 and 2000 (projected), 2) most-popular cultivars of each type and trend of their production area, 3) new cultivars with potential, 4) marketing, 5) harvest method, 6) genetic characteristics of current cultivars that limit production, and 7) current research programs in each state. Respondents provided estimations since exact data were not available.

Production

Production estimates showed a 38% increase from 1980 to 1990 for all raspberry types and both regions, and a projected increase of 14% by 2000 (Table 2). The Lower Midwest had the largest area of production in 1980, 1990 and projected for 2000. Red and purple floricane production area constituted 54% of the total midwest area in 1980, 49% in 1990 and 47% projected for 2000. Black floricane production area was 14% of the total area in 1980, 11% in 1990 and 11% projected for 2000. Red primocane production was 32% of the total area in 1980, 40% in 1990 and 43% projected for 2000.

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Table 1. Respondents to Raspberry Survey, North Central Region, 1991.

State	Region	Respondent
Illionis	Lower Midwest	J. Wilson Courter
Indiana	Lower Midwest	Richard Hayden
Iowa	Upper Midwest	Gail Nonnecke
Kansas	Lower Midwest	Edward Hellman
Kentucky	Lower Midwest	Douglas Archbold
Michigan	Lower Midwest	Eric Hanson
Minnesota	Upper Midwest	James Luby, Paul Otten
Missouri	Lower Midwest	Chad Finn, Michele Warmund, Patrick Byers
Nebraska	Lower Midwest	Donald Steinegger
North Dakota	Upper Midwest	Arthur Boe
Ohio	Lower Midwest	Joseph Scheerens, Richard Funt, Dale Stokes
South Dakota	Upper Midwest	Brian Smith
Wisconsin	Upper Midwest	Elden Stang, Teryl Roper, Brian Smith

The Upper Midwest showed the largest increase from 1980 to 1990 (102%), and a projected increase of 25% by 2000. Lawrence (9) indicated that the red raspberry had cold hardiness in its germplasm and accurately predicted that acreage in the Upper Midwest would double by 1990. Although the raspberry production area of the Upper Midwest increased, the increase was due primarily to primocane-fruiting cultivars of which winter hardiness of the floricanes is not a factor (467% increase from 1980 to 1990). In comparison, the red and purple floricane-fruiting types increased 48% in the Upper Midwest. Black floricane-fruiting production area in the Upper Midwest was low in all years and respondents cited winter hardiness as a major limitation.

Table 2. Regional and total production of red and purple floricane-fruiting, black floricane-fruiting, and red primocane-fruiting raspberry types for 1980, 1990, and 2000 in the North Central Region.

	Hectares		
Region/Type	1980	1990	2000[z]
Upper Midwest[y]			
Red and Purple Floricane	162	240	266
Black Floricane	2	4	12
Red Primocane	24	136	196
Total	188	380	474
Lower Midwest[x]			
Red and Purple Floricane	251	274	295
Black Floricane	108	113	117
Red Primocane	220	291	317
Total	579	678	729
Type Totals			
Red and Purple Floricane	413	514	561
Black Floricane	110	117	129
Red Primocane	244	427	513
Grand Total	767	1,058	1,203

[z]Projected.
[y]Highest to lowest production in 1990 = Minnesota, Wisconsin, Iowa, South Dakota, North Dakota.
[x]Highest to lowest production in 1990 = Michigan, Ohio, Missouri, Illinois, Indiana, Kentucky, Kansas, Nebraska.

The Lower Midwest respondents estimated a 17% increase in total area from 1980 to 1990, with a projected 8% increase by 2000. Red, purple and black floricane-fruiting production area increased less than 10% from 1980 to 1990, and also projected for 2000. The red, primocane-fruiting area increased 32% from 1980 to 1990.

Cultivars

The most-widely grown red and purple floricane-fruiting raspberry cultivar in the Upper Midwest was 'Boyne,' followed by 'Latham' (Table 3). 'Latham' occupied the highest percent of the area in the Lower Midwest. 'Boyne' production area was considered by the respondents to remain steady in both regions, whereas 'Latham' was expected to decrease in the Upper Midwest and remain steady to decrease in the Lower Midwest. Lawrence (9) noted the winter hardiness of 'Boyne' and that it had largely replaced 'Latham' in the Upper Midwest, while 'Latham' was widely planted in the Lower Midwest. 'Canby,' 'Killarney,' 'Reveille,' and 'Titan' were expected to increase in some states.

Table 3. Percentage of hectares and trend of red and purple floricane-fruiting raspberry cultivars grown in the North Central Region, 1990.

Region/Cultivar	% of area	Trend[z]
Upper Midwest		
Boyne	43	S
Latham	35	D
Canby	6	I
Killarney	5	I
Reveille	3	S, I
Other	8	S, I
Lower Midwest		
Latham	43	S, D
Reveille	14	S, I
Boyne	13	S
Canby	11	S, D, I
Titan	8	D, I
Brandywine	5	S, D
Other	6	S, D

[z]Trends indicated by respondents in the various states of each region (S = steady, D = decreasing, and I = increasing).

Table 4. Percentage of hectares and trend of black floricane-fruiting raspberry cultivars grown in the North Central Region, 1990.

Region/Cultivar	% of area	Trend[z]
Upper Midwest		
Black Hawk	82	S, I
Jewel	7	S, I
Bristol	5	S, I
Other	6	S, I
Lower Midwest		
Jewel	56	I
Bristol	30	S, I, D
Allen	4	I
Black Hawk	3	S, I, D
Other	7	S, I

[z]Trends indicated by respondents in the various states of each region (S = steady, D = decreasing, and I = increasing).

Black floricane-fruiting raspberry area in the Upper Midwest was small, and respondents listed 'Black Hawk' as the most widely planted (Table 4). 'Black Hawk' was described as very winter hardy, having survived the Armistice Day blizzard of 1940 which was the most damaging out-of-season freeze for fruit plants in recorded weather history of the Midwest (8). Compared to the Upper Midwest, the Lower Midwest had a large area of black floricane-fruiting raspberries with Ohio the leading state. 'Jewel' (orig. by Ourecky and Slate, 1973) was the most widely planted black floricane type in the Lower Midwest and was projected to increase because of its fruit quality and productivity.

Significant increase in the number of hectares of red primocane-fruiting types occurred in the Midwest. Red, primocane-fruiting cultivars (Table 5) showed 'Heritage' as the leading cultivar followed by 'Redwing' for both the Upper and Lower Midwest. There was no clear consensus on the pro-

Table 5. Percentage of hectares and trend of red primocane-fruiting raspberry cultivars grown in the North Central Region, 1990.

Region/Cultivar	% of area	Trend[z]
Upper Midwest		
Heritage	63	D, S, I
Redwing	20	I, S
Autumn Bliss	11	I
Ruby	3	I
Other	3	S
Lower Midwest		
Heritage	82	D, I, S
Redwing	15	I, S
Ruby	1	I
Other	2	D

[z]Trends indicated by respondents in the various states of each region (S = steady, D = decreasing, and I = increasing).

jected trend of 'Heritage.' Cited advantages of 'Heritage' were disease resistance, high productivity, and avoidance of winter injury because of fruiting on primocanes only. Disadvantages associated with 'Heritage' were medium fruit size and a late maturation date for the Upper Midwest. In many years in the Upper Midwest, a significant portion of the 'Heritage' crop may be lost to early fall freezes in plantings without frost protection. Because of the losses with 'Heritage,' earlier maturing cultivars, such as 'Redwing' (orig. by Luby et al., 1987) and 'Autumn Bliss' (orig, by Keep et al., 1984) were expected to increase or remain steady in many states. In some Lower Midwestern states with warm autumn temperatures, primocane-fruiting cultivars that would mature later than 'Heritage' were listed as needed in order to avoid high temperatures during ripening and harvest. 'Ruby' was expected to increase because of larger fruit size than 'Heritage,' especially in the Lower Midwest.

Potential Cultivars

New promising, red, floricane-fruiting cultivars listed by respondents for the Upper Midwest were 'Nordic' (11), 'Algonquin' (5), 'Haida' (3), and 'Festival' (6). Respondents from the Lower Midwest did not list any new, promising, red floricane-fruiting cultivars. New, red primocane-fruiting cultivars with potential cited most often were 'Autumn Bliss' (7), 'Amity' and 'Summit' (4), and 'Ruby'. No new potential black floricane-fruiting cultivars were provided by the respondents.

Harvesting and Marketing

All respondents indicated harvesting was accomplished by hand-picking except for a portion of the red, primocane-fruiting raspberry crop (Table 6). Eight percent of the total Lower Midwest area (in Michigan) was harvested mechanically. A small percentage of the raspberry crop was processed, ranging from 0 to 6%, depending on the region and raspberry type. The majority of the raspberries were marketed direct-to-consumer, pick-your-own sales, except for the black floricane-fruiting raspberry fruit sold predominantly as prepicked fresh fruit.

Current Genetic Limitations

Genetic characteristics that limit production of current cultivars in the Upper Midwest provided by the respondents were winter hardiness, maturation date of primocane crop prior to fall frost, disease susceptibility [Anthracnose *(Elsinoe veneta)* and Raspberry Bushy Dwarf Virus], fruit size, yield, and fruit firmness. Winter hardiness of floricane-fruiting cultivars was listed by all of the respondents.

Genetic limitations cited by Lower Midwest respondents included adaptability to high temperature and heat stress, winter hardiness, disease susceptibility [Phytophthora Root Rot *(Phytophthora* spp.) and Anthracnose], yield, and postharvest shelf life.

Current Research Programs

Cultivar evaluations were being conducted in nine states. A raspberry

Table 6. Methods of marketing and harvesting of raspberry types in the North Central Region, 1990.

Region/Type	% Harvested		% Marketed		
	Hand	Mechanical	Processed	Fresh	PYO
Upper Midwest					
Red and Purple Floricane	100		3	29	68
Black Floricane	100		0	82	18
Red Primocane	100		6	37	57
Lower Midwest					
Red and Purple Floricane	100		2	43	55
Black Floricane	100		4	55	41
Red Primocane	92	8	4	31	65

[z]Markets include: 1) processing, 2) direct-to-consumer or wholesale, prepicked, fresh sales, and 3) direct-to-consumer, pick-your-own sales.

breeding program emphasizing primocane-fruiting types was reported for Minnesota. Studies associated with cultural practices were listed at three locations (Michigan, Missouri, and Wisconsin). Physiological studies included low winter temperature investigations (Missouri), fruit quality (Ohio, developmental physiology (Ohio) and phenology (Minnesota), and postharvest physiology (Iowa). A tissue culture research program was listed for Illinois.

Conclusions

Raspberry production has been and continues to be a substantial, viable industry in the Midwestern states. The number of hectares increased from 1980 to 1990 mainly due to increased plantings of red, primocane-fruiting cultivars. Marketing is primarily direct-to-consumer which allows for reasonable potential returns. Risks associated with production can be reduced by selection of adapted cultivars and fruiting-types and the continued improvement of germplasm for the Midwest. The major deficiencies of current cultivars are traits that limit marketable yield: winter hardiness, disease susceptibility, fruit size and fruit firmness. Several breeding programs are developing new cultivars. Minnesota, New York and Canadian breeding programs may provide new cultivars adapted to Upper Midwest environmental conditions. For the Lower Midwest, breeding programs in the Middle Atlantic states may provide new cultivars. Additionally, primocane-fruiting cultivars appear to be adapted to a wide range of environmental conditions, (e.g. the world-wide planting of 'Heritage,' and the adoption of 'Autumn Bliss,' an English cultivar, in the United States). Raspberry research is being conducted in most midwestern states and will provide new information on raspberry genetics, physiology, and production.

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Raspberry Genotypes for the East Coast

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Abstract

The changes in raspberry cultivars planted in the eastern U.S. were determined from a 1987 grower survey as compared to a partial survey of Cooperative Extension Service and Agricultural Experiment Station recommendations over the last two decades. As future changes will be dependent on cultivars bred for the rigorous climatologic conditions specific to the region, the results and progress of the three eastern raspberry breeding programs are also summarized.

Limitations to Production

Temperature is the major limitation to raspberry production in the eastern U.S. East of the Appalachian Mountains (i.e. at elevations of less than 300m); native stands of red raspberries (*R. idaeus var. strigosus)* occur only above 41° N latitude. Accordingly, red raspberry production in the South is limited to the Appalachian highlands; however, from VA northward, production also occurs in the Piedmont and Coastal Plains. Black raspberries *(R. occidentalis)* are found north of Georgia. In the NY and New England growing regions, midwinter temperatures in raspberry growing areas (near the Great Lakes and Atlantic Ocean) typically reach -20°C. From southern PA and NJ to GA, midwinter minimum temperatures are milder; from -18°C to -10°C. Typically temperatures are about 5°C colder in the Appalachians. Frequent mid-winter episodes of subtropical air masses from the Gulf of

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