

Department of Agriculture, Trade and Consumer Protection
Division of Agricultural Development
Agricultural Development & Diversification Program (ADD)
Grant Project Final Report

Contract Number:18029

Grant Project Title:Raspberry Breeding – The Development of New Commercial Cultivars for the Wisconsin Grower

Amount of Funding Awarded: \$11,500

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Please use the following questions as a guide for writing your grant project final report. In your final report, please answer each question as it relates to your grant project.

1) What did you want to accomplish with the grant?

Increase the scope of raspberry breeding at UW-River Falls, further test advanced selections, bring these selections close to cultivar status and begin release to Wisconsin commercial growers. Evaluate/identify new cultivars for breeding potential. Educate growers on the importance of proper cultivar selection and proper culture of those selections to improve profitability. Develop greater interest in a core group that could help us continue our cultivar development and release efforts.

2) What steps did you take to reach your goal?

What worked?

All objectives were met. We established 2 new replicated raspberry trials, one in summer 2003 and the other in our summer 2004 raspberry breeding program with advanced selections included and compared with new cultivars from other North American programs and industry standard cultivars. Traveled to multiple meetings and gave presentations regarding proper raspberry cultivar selection, our raspberry breeding efforts, and general commercial production techniques specifically related to new raspberry cultivars and selection. We have one UW-River Falls selection, OAM-W2, being propagated by a national nursery for widespread release to growers for commercial field testing. We also conducted a survey of commercial growers a year ago which helps us understand our grower clientele better and allows us to better predict what types of new cultivars will serve growers best to improve profitability. Many new raspberry seedling selections were made this past year with potential for commercialization as cultivars.

What did not work?

Seedling selection evaluation trials did not grow/establish as fast as expected, so we were unable to harvest any summer-bearing cultivars or selections. 2003 trial summer-bearing selections will be harvested in summer '05 and the 2004 trial summer-bearing selections in summer '06.

What would you do differently?

Search for funding for labor to allow us to plant seedlings and replicated trials earlier (April) so that we could obtain sufficient growth the first year to allow harvesting the following year.

3) What were you able to accomplish?

Our outreach efforts this past year included one national small fruit researcher meeting, (NCR-22), one winter state-wide/regional commercial grower meeting, one commercial raspberry school, one weed control school, and one state Field Day. The national small fruit extension/research NCR-22 meeting was held in the Watsonville, CA area. All the small fruit researchers/state extension specialists from all over North America attend. Our state report outlined our raspberry breeding efforts including descriptions of our advanced selections. This not only makes other state/government workers aware of our new cultivars and selections but also allows us to network and hopefully gain access to their breeding material. In conjunction with the WBGA (Wisconsin Berry Growers Association) we organized a regional one-day in-depth Raspberry School at Hancock on December 5, 2003. We exposed growers to our breeding program efforts and proper cultural procedures. Growers from Wisconsin, Minnesota, Michigan and Iowa attended. Another commercial grower school, in conjunction with the WBGA was held on April 16, 2004 and centered around weed control in raspberries and strawberries. The statewide Berry Field Day is also joint with the WBGA and was held at Wildberry Farm in Poynette on August 6, 2004. One of the educational efforts was to promote proper raspberry cultivar selection and inform growers of our new selections that will become available for testing. We did not plant any new raspberry seedlings this past summer because of the large number of seedlings already established from past years that needed to be evaluated. The backlog of seedlings was due to winter injury in 2001-02 and 2002-03 seasons. Luckily very little winter injury occurred this past winter so a considerable number of selections were made with the following identifications and brief descriptions:

2004 Summer-Bearing (Floricanes-Fruiting) Raspberry Selections.

(First two numbers indicate the year the selection was made, 2nd two indicate the year the seedling was planted in the field (comparing the 1st and 2nd two numbers gives an indication of precociousness), the 3rd number in the series is the code for the parental combination and the last in the series is the seedling number of that progeny planted in field sequence)

FF = floricanes (summer)- fruiting and PF = primocane (fall)- fruiting selection.

- 04-01-3-26 FF, medium-sized, round to slightly conical fruit with excellent flavor. Canes have very good vigor (5.5'), low disease incidence and high yield potential.
- 04-01-3-30 FF, medium-sized fruit with very good flavor. Moderately vigorous 5' canes exhibit low to moderate disease and high yield.
- 04-01-3-32 FF, medium-small fruit with good flavor. Very high yield potential, moderate to low disease incidence; 6' canes display excellent vigor.
- 04-01-4-121 FF, very late, huge, 1"+ dark red conical, firm fruit with very good flavor. Moderate winter injury.
- 04-01-9-41 FF, medium-large fruit with good flavor. Very high yield potential. Very good vigor 5.5' but only moderate to poor disease resistance.
- 04-01-9-43 FF, small fruit with good flavor. Very high yield potential on low vigor 4.5' canes. Considerable raspberry leaf spot on plants.
- 04-01-16-99 FF, medium large, firm light red conical fruit with excellent, very unique flavor. Very little winter injury. Moderate to high vigor and moderate disease.
- 04-01-16-225 FF, medium large, conical firm fruit with very good flavor. Some fruit (very large, excellent flavor) on primocanes. Low to moderate yield potential, average disease, low to moderate vigor, average winter injury.
- 04-01-16-240 FF, slightly conical medium-sized fruit with good flavor. 5' floricanes have very high yield potential and only minor 4" winter dieback. Average disease.
- 04-02-1-29 FF, medium size, uniform, conical, excellent flavor but quite soft. Very good yield potential, moderate to good vigor 5' canes with good diseases resistance.
- 04-02-1-100 FF, small round to conical fruit on floricanes but very large fruit on suckers. Good flavor. 6' plants have very good vigor and very good to excellent disease resistance.
- 04-02-1-114 FF, medium sized fruit with good flavor. Very high yield potential on moderately vigorous 5' canes exhibiting average disease incidence.
- 04-02-1-123 FF, huge 1"+ long, conical fruit with excellent flavor and moderate to good firmness on 1° sucker. 5.5' canes exhibit excellent vigor and very good disease resistance.

2004 Fall-Bearing (Primocane-fruiting) Raspberry Selections

_04-02-UNK-38	PF, midseason, excellent flavor, round fruit, very productive. Some spines; 4' canes.
04-02-8-3	PF, late, large, bright red, conical fruit with very good flavor on very productive, 4.5' canes.
04-02-8-5	PF, early midseason, productive. Conical, tart, good quality, deep red fruit exhibit good cohesion. 4' canes.
04-02-8-14	PF, late, large, firm, medium-red, conical fruit with <u>excellent</u> flavor. Moderate vigor at 4.5'.
04-02-8-20	PF, very late, large, firm, conical rose-colored fruit with <u>excellent</u> flavor. Canes are 5' and vigorous.
04-02-10-8	PF, late midseason, large round <u>purple</u> with good quality. 6' canes are productive; canes nearly spineless.
04-02-10-10	PF, early midseason light <u>purple</u> small to medium-sized round fruit are quite tart (processing type) 5.5' canes are vigorous and very productive.
04-03-11-3	PF, medium large rose-colored firm fruit with very good flavor. Very good yield potential..5' canes, good vigor.

In addition to making multiple advanced selections this year, we also dug and replanted the 20 2003 advanced selections into observational/increase plots as part of a new replicated performance trial. The following selections were established:

03-01-3-29	03-01-10-124
03-01-4-45	03-01-10-139
03-01-4-58	03-01-11-3
03-01-4-70	03-01-11-17
03-01-4-127	03-01-11-19
03-01-6-27	03-01-19-2
03-01-7-121	03-01-19-21
03-01-9-2	03-01-19-22
03-01-10-43	03-01-21-1
03-01-10-52	
03-01-10-53	

4) What challenges did you face?

Everything went according to plan except for the weather! A cold summer delayed establishment of the '03 advanced selections. This will result in a delay of evaluation of the summer bearers until summer '06.

5) What do you plan to do in the future as a result of this project?

Continue the raspberry breeding program with more crosses made at UW-River Falls. Continue to evaluate and release more cultivars for commercial growers and actively educate these growers regarding cultural strategies that will improve raspberry production reliability and productivity.

6) How should the agricultural industry or the State of Wisconsin use the results from your grant project?

Continue to promote and assist in the expansion of commercial raspberry production by assisting in the education and business establishment of potential raspberry growers. Support continuing efforts at UW-River Falls to conduct research and outreach programs related to this economically important crop.

RECOMMENDED AND TRIAL RASPBERRY CULTIVARS

FOR WISCONSIN^Z
(Update January 2004)

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RED FLORICANE-FRUITING (SUMMER BEARING)

EARLY SEASON^Y

- *BOYNE
(N & S)^X Vigorous, winter hardy and productive cultivar. Medium-sized dk. red fruit, medium glossy with small drupelets and average cohesion (average to soft). Aromatic, excellent flavor. Good for fresh or processing. Requires trellis. Above average yields in Wisconsin.
- NOVA
(N & S) Medium large bright red attractive fruit of good quality, somewhat acid. Good winter hardiness, few spines, long fruiting laterals. Above average yields - Wisconsin (UW-River Falls), high yields-Grand Rapids, MN. Good for PYO, fresh or freezing. Resistant to yellow rust.
- PRELUDE
(NY 1009)
(for trial
N & S) Primocane-fruiting but best advantage when planted for very early summer crop. Most trials indicate at least 50% of crop harvested by the time 'Killarney' begins. Slightly larger than 'Heritage'; bright red, very good quality, good drupelet coherence. Upright and moderately vigorous growth and suckering. Average to good yields for summer crop; lower than 'Heritage' if growth for fall crop. Winter hardiness uncertain.

EARLY MIDSEASON

- FESTIVAL
(N & S) Very attractive bright red glossy medium-sized fruit with good skin strength and firm flesh. Very good for fresh market—only fair for freezing. Short but vigorous nearly spineless plants have good winter hardiness, immunity to mosaic virus and tolerance to spur blight. Susceptible to late leaf rust. High yields in Wisconsin (UW-River Falls).
- *KILLARNEY
(N & S) A sibling of Boyne released from Manitoba. Medium-large very bright red fruit of good flavor and freezing quality. Fruit tends to get soft in hot weather. Plants are medium height, spiny and produce many suckers. Susceptible to mildew and anthracnose.

^Z Recommendations based on yield-evaluation-observation trials in Wisconsin, Minnesota, Michigan, Iowa and Illinois over the past 10 years. Growers should realize that this is a list of cultivars with potential in the state and not an endorsement of any specific cultivar for a specific site.

^Y Rated on fruiting season maturity based on multiple-year trials conducted in the Upper Midwest.

^X Suggested for commercial plantings in N (northern) or S (southern) Wisconsin. Border between northern and southern Wisconsin can be visualized as a straight line drawn from LaCrosse to Marinette. Growers must use their best judgment on any microclimate exceptions and whether absolute cold temperature tolerance or fluctuating temperature tolerance may be more important in winter hardiness ratings. Northern or northeastern slopes are considered best for floricane-fruiting plantings and southern for primocane-fruiting cultivars. This is assuming suitable windbreaks are present and do not impede cold air drainage in case of frosts.

* Indicates popular commercial cultivar for region.

Very high yields in Wisconsin (UW-River Falls) and at Grand Rapids, MN.

- NORDIC (N) Fruit medium size with lighter color, superior flavor, firmness and skin strength than 'Boyne'. Good frozen product. Plants can severely lack vigor in certain areas; have fewer spines and greater resistance to anthracnose than 'Boyne'. Very good winter hardiness. Minimal trellis required. Low to moderate yields in Wisconsin and Minnesota.
- REGENCY (for trial N & S) Fruit medium red, larger and firmer than 'Boyne'. Good Flavor. Vigorous plants are completely hardy in Ontario. Very high yields in Canada.
- REVEILLE (S) Large soft fruit has very good flavor. Good for fresh but only fair frozen product. Vigorous heavily-suckering plants known for tolerance of fluctuating mid-winter temperatures. Insufficient tolerance to absolute cold—considerable winter injury after test winter, UW-River Falls. Average yields Wisconsin (UW-River Falls).
- SENTRY (S) Maryland introduction. Bright-red, medium-sized, firm-fleshed fruit with very good quality. Tolerates fluctuating mid-winter temperatures, but possibly lacks absolute hardiness for north.

MIDSEASON

- *CANBY (S for trial) only Only for far southeastern Wisconsin. Even under uniform cold in Bayfield will sustain severe winter injury. Large light bright red fruit with very good, mildly acid flavor; acceptable firmness—suitable for fresh or frozen. Plants tall, large diameter canes, thornless. High yield potential. Will not tolerate poorly-drained sites.
- HONEYQUEEN (N & S, for trial) Fruit - high quality golden; above average size, acceptable firmness. Medium height canes sucker freely. Has survived well after test winter at UW-River Falls. Average to high yields—UW-River Falls.
- K81-6 (for trial S) Medium red conic, firm, very large, very good flavor. Resistant to powdery mildew and late yellow rust; tolerant to crown gall; susceptible to fruit rots, fire blight and Phytophthora root rot. Medium tall canes with few spines at base. Moderate yields-River Falls, WI. Some hardiness problems and poor yields at Grand Rapids, MN.
- OAM-W2 (for trial N&S) Selected at UW-River Falls. Developed through the MD, NJ, VA, WI Cooperative Bramble Breeding Program. Large, conical, bright red, cohesive, somewhat soft, flavorful fruit. Vigorous, medium-height canes. Sucker freely and have a moderate spine number. High yield potential. Slight injury in Winter '02-'03.

LATE MIDSEASON

- *LATHAM (N) Fruit ripens over long period. Bright attractive red medium-large roundish fruit somewhat crumbly and lacks quality for fresh; very good quality for canning and freezing. Vigorous productive plants with excellent winter hardiness. Requires trellis. Tolerant to several viruses. Poor to moderate yields (Grand Rapids, MN)

LATE

- HAIDA**
(S, for trial N) Firm fruit are larger, firmer, and sweeter than 'Boyne'. Very good fresh or processed; vigorous plants sucker prolifically; not quite as hardy as 'Boyne', very few spines. High yield potential. Second highest yield of 12 cultivars at UW-River Falls.
- ENCORE**
(for trial N&S) Probably latest of all red floricanes - fruited. Very large, attractive, uniform, coherent, firm fruit with well-balanced flavor - good for pre-picked or PYO markets. Vigorous plant with above-average root suckering and nearly spineless canes. Trellis is recommended. Even though 'Encore' has sturdy canes, its characteristic long fruiting laterals can be more efficiently harvested when given supplemental support. Winter hardiness uncertain. Low to moderate yields (River Falls, WI); low at Grand Rapids, MN.

RECOMMENDED PURPLE RASPBERRY CULTIVARS

LATE

- *BRANDYWINE**
(S, for trial N) Large, reddish-purple fruit are firm and round-conical. Fair tart dessert quality, excellent for jams, jellies, freezing. Tall heavy canes with prominent thorns. Suckers originate only from crowns. High yield potential. Third highest yielding raspberry of 12 at UW-River Falls. Requires trellis.
- *ROYALTY**
(S, for trial N) Probably the best purple raspberry. Very large fruit somewhat soft but sweet and much better flavor than 'Brandywine'. Comparable to 'Brandywine' for processing - frozen product. Vigorous and very high yield potential. Top yielder out of 12 cultivars at UW-River Falls. Although has been considered less hardy by some than 'Brandywine' it actually had significantly less winter injury after test winter of 1993-1994. Requires trellis.

BLACK RASPBERRY CULTIVARS

None recommended due to inherent lack of winter hardiness of species to date.

**RECOMMENDED PRIMOCANE-FRUITING (FALL-BEARING)
RASPBERRY CULTIVARS
FOR WISCONSIN**

Following cultivars arranged in general order of fruiting season from earliest to latest.
Regional and local variation in growing conditions can substantially change fruiting order.

- JACLYN** New release from the Five Aces/MD/NJ/VA/WI Cooperative Bramble Breeding Program.
(for trial N & S) Very early-starts fruiting the first week of August in many locations. Large, dark-colored conical fruit are firm and cohesive, with excellent flavor/aroma and large size (1.5-2 X that of 'Heritage'). Excellent heat and sunburn tolerance. Fruit somewhat difficult to remove in cool weather. In longer growing seasons, a second primocane crop occurs naturally about 8 weeks after the first crop. Susceptible to yellow rust.
- SUMMIT (N)** Small to medium-sized firm, glossy bright red fruit with good cohesion and very good flavor. Excellent processed. Very early; usually 3 weeks ahead of 'Heritage' and even slightly earlier than 'Autumn Bliss' in some years. The very high early season yield potential offsets size problem in northern Wisconsin, but may not justify its use in southern Wisconsin. Very vigorous canes require trellis. Very susceptible to gray mold and raspberry leaf spot.
- POLANA** Medium-sized, only fair, tart flavor, bright red glossy fruit. Much shorter canes than 'Heritage'.
(for trial N & S) Good suckering capability. Quite variable in quality and performance depending on location; low yields at River Falls, WI and Grand Rapids, MN, but very high in Iowa! Difficult to harvest, plus many double fruits. Somewhat susceptible to gray mold.
- DOUBLE DELIGHT** Morden, Manitoba recent intro. Very attractive medium bright red conical fruit w/ rounded apex. Size maintained well through several harvests. Excellent flavor.
(for trial N & S) Reportedly in same season as 'Redwing' (10 days to 2 weeks earlier than 'Heritage'). Long stout canes with sparse prickles. Trellis recommended.
- AUTUMN BRITTEN** One of the more promising new cultivars, especially since it is a sibling of 'Autumn Bliss'. Uniform medium to dark red; large and firm (good drupelet cohesion).
(for trial N & S) Tends to be very close to 'Autumn Bliss' in harvest season. Can produce higher yields than its sibling. Not as erect as sibling and quite sparse spines. Vigorous plants. Fruit better quality than 'Autumn Bliss'.
- *AUTUMN BLISS (N & S)** The standard for fall-bearing raspberries in Wisconsin. Large oval-conic somewhat soft dull red to purplish-gray fruit have very good flavor. Probably the best primocane-fruiting cultivar for Wisconsin overall. Can begin ripening up to 3 weeks before 'Heritage' (August 10-15 in River Falls area). High yield potential for fall crop. (River Falls, WI and Grand Rapid, MN). Very susceptible to gray mold.
- RED RIVER** Medium bright red, glossy and attractive; good drupelet coherence. Excellent
(for trial N & S) flavor balance of sweet and tart qualities. Very winter hardy, short, stout canes with short sparse spines. Early fall crop; significantly earlier than 'Heritage' usually with 'Autumn Bliss'. However, small fruit size and only moderate yields (Grand Rapids, MN) will probably eliminate this cultivar as a commercial candidate.

- RUBY
(S, for trial N) Very large conical glossy medium to dark red fruit. Average drupelet cohesion, uniformity and firmness. Tart but good flavor. Can begin ripening up to 2 weeks before 'Heritage' in River Falls area. Average vigor and cane suckering; root disease susceptibility mandates planting in well drained soil. High yields at UW-River Falls and Benton Harbor, MI. Very susceptible to gray mold. Requires trellis.
- CAROLINE
(for trial N & S) From MD, NJ, VA, WI Coop. Bramble Breeding Program. Red, long conic, large with excellent flavor and shelf life. Usually softer than 'Heritage'. Good vegetative vigor, moderate suckering and typically higher yields than 'Heritage'. Long fruiting season. Better tolerance to yellow rust and root rots than 'Heritage'. Low incidence of gray mold. As firm as 'Heritage' at UW-River Falls and moderate to good yields. High yields at Grand Rapids, MN.
- ANNE
(for trial N & S) From MD, NJ, VA, WI Coop. Bramble Breeding Program. Large, attractive, light gold; excellent flavor and good firmness. Usually earlier than 'Heritage'. Good vegetative vigor and sparse suckering. Shy bearing!
- *HERITAGE
(S) 'Heritage' will probably not approach 'Autumn Bliss' yields anywhere in Wisconsin unless there is a late fall. Should not be planted on large scale unless grower has tested it against above cultivars on same site. 'Heritage' fruits are attractive, medium-sized, firm and bright red. Very good flavor and drupelet cohesion; vigorous, erect canes require a trellis.