

# Evaluation of growth, yield, and fruit size of chokecherry, pincherry, highbush cranberry, and black currant cultivars in Saskatchewan

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St-Pierre, R. G., Zatylny, A. M. and Tulloch, H. P. 2005. **Evaluation of growth, yield, and fruit size of chokecherry, pincherry, highbush cranberry, and black currant cultivars in Saskatchewan.** *Can. J. Plant Sci.* **85**: 659–664. The objective of this study was to quantitatively characterize the growth, yield and fruit size of cultivars of chokecherry (*Prunus virginiana* L.), pincherry (*Prunus pensylvanica* L.f.), highbush cranberry (*Viburnum trilobum* Marsh.), and black currant (*Ribes nigrum* L.). Cultivars were evaluated in replicated trials at two sites (Saskatoon and Outlook) in Saskatchewan over 2–5 yr. Espenant, Garrington, Lee Red, and Boughen Yellow were among the highest yielding of the chokecherry cultivars (mean yield = 7.2 kg plant<sup>-1</sup> at Saskatoon); of these, Lee Red had the largest fruit. The pincherry cultivar Lee #4 (mean yield = 3.1 kg plant<sup>-1</sup>) yielded at least twice as much as Mary Liss or Jumping Pound. Highbush cranberry cultivars Alaska, Espenant, Garry Pink, Manitou, and Wentworth averaged yields of 2.0 kg plant<sup>-1</sup> at Saskatoon. Of these, Manitou had the largest fruit. Two black currant trials were established; the cultivars included in the second trial were not available at the time of establishment of the first trial. Black currant yields ranged from 0.2 kg plant<sup>-1</sup> for Willoughby to 1.0 kg plant<sup>-1</sup> for Consort in the first trial, and from 0.2 kg plant<sup>-1</sup> for the selection 4-24-29 to 2.0 kg plant<sup>-1</sup> for McGinnis Black in the second trial. Black currant cultivars with the largest fruit size included Wellington, Topsy, and three numbered selections from the University of Saskatchewan (mean = 225 fruit/cup) in the first trial, and Ben Sarek, McGinnis Black, and Ben Alder (mean = 156 fruit/cup) in the second trial. Data from the current study provide a basis on which to evaluate the performance of currently available cultivars, and any new cultivars or future selections that may be developed.

**Key words:** *Prunus virginiana*, *Prunus pensylvanica*, *Viburnum trilobum*, *Ribes nigrum*, fruit size, shoot growth, cultivar evaluation

St-Pierre, R. G., Zatylny, A. M. et Tulloch, H. P. 2005. **Évaluation de la croissance, du rendement et du calibre des fruits des cultivars de cerisier de Virginie, de cerisier de Pennsylvanie, de viorne trilobée et de gadellier noir en Saskatchewan.** *Can. J. Plant Sci.* **85**: 659–664. L'étude devait caractériser quantitativement la croissance, le rendement et le calibre des fruits des cultivars de cerisier de Virginie (*Prunus virginiana* L.), de cerisier de Pennsylvanie (*Prunus pensylvanica*, L.f.), de viorne trilobée (*Viburnum trilobum* Marsh.) et de gadellier noir (*Ribes nigrum* L.). Les cultivars ont été évalués lors d'essais répétés à deux sites de la Saskatchewan (Saskatoon et Outlook) pendant 2 à 5 ans. Espenant, Garrington, Lee Red et Boughen Yellow figurent parmi les cultivars de cerisier de Virginie les plus performants (rendement moyen de 7,2 kg par plant à Saskatoon); Lee Red est celui qui donne les plus gros fruits. Le cultivar de cerisier de Pennsylvanie Lee n° 4 (rendement moyen de 3,1 kg par plant) a produit au moins deux fois plus de fruits que Mary Liss ou Jumping Pound. Les cultivars de viorne trilobée Alaska, Espenant, Garry Pink, Manitou et Wentworth avaient un rendement moyen de 2,0 kg de fruits par plant à Saskatoon et Manitou portait les fruits les plus gros. Les auteurs ont fait deux essais avec le gadellier noir. Les cultivars du second essai n'étaient pas disponibles au lancement de la première expérience. Les gadelliers ont donné un rendement variant de 0,2 kg par plant pour Willoughby à 1,0 kg par plant pour Consort lors du premier essai et de 0,2 kg par plant pour la sélection 4-24-29 à 2,0 kg pour McGinnis Black lors du second. Les plus gros fruits ont été récoltés sur Wellington, Topsy et trois sélections numérotées de l'Université de la Saskatchewan (moyenne de 225 baies par tasse) lors du premier essai et sur Ben Sarek, McGinnis Black et Ben Alder (moyenne de 156 fruits par tasse) lors du second. Les données de cette étude permettront d'évaluer les cultivars disponibles sur le marché et les cultivars ou sélections qui pourraient être développés par la suite.

**Mots clés:** *Prunus virginiana*, *Prunus pensylvanica*, *Viburnum trilobum*, *Ribes nigrum*, calibre des fruits, croissance des pousses, évaluation de cultivar

In recent years, emphasis has been placed on investigating alternative crops to diversify the agriculture and economy of the Canadian prairies. Amongst these alternative crops were

a number of fruit species native to this region including chokecherry (*Prunus virginiana* L.), pincherry (*Prunus pensylvanica* L.f.), and highbush cranberry (*Viburnum trilobum* Marsh.), and the non-native European black currant (*Ribes nigrum* L.). The chokecherry and pincherry are shrubs or small trees native across Canada, north to the boreal forest and throughout most of the United States (Vilkitis 1974;

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Hall et al. 1981). Both are true cherries and close relatives of domesticated cherries. The highbush cranberry is a member of the honeysuckle family. This native shrub is found north to Alaska and from coast to coast throughout southern Canada and the northern United States (Stang 1990). The fruits of the chokecherry, pincherry and highbush cranberry were widely used by North American Indians and early settlers (Stang 1990; Wilkinson 1990). The fruit are still used for jellies, syrups and beverages. Cultivars of these three native fruit species have been selected from wild stands and are now grown in small orchards; breeding of these fruits has never been undertaken. A number of black currant cultivars are very winter hardy and may be suited for production on the prairies. Very few black currant cultivars have been grown in Saskatchewan, and none have been formally tested. In the past, cultivar descriptions and recommendations to growers for chokecherry, pincherry, highbush cranberry, and black currant were based on non-replicated trials, and qualitative and/or anecdotal information. The first extensive replicated cultivar trials of these native fruit species, and of black currant in Saskatchewan, were established by the University of Saskatchewan, Saskatoon, SK.

The objective of the current study was to evaluate the growth, yield, and fruit size of a number of cultivars of chokecherry, pincherry, highbush cranberry, and black currant presently under evaluation in replicated cultivar trials in Saskatchewan. This research will allow a quantitative characterization of the cultivars evaluated, irrespective of the effects of year or location, and will provide a basis on which to make cultivar recommendations to growers, and to evaluate the performance in commercial orchards of currently available cultivars, and any new cultivars or future selections that may be developed.

## MATERIALS AND METHODS

Cultivar evaluation trials of chokecherry, pincherry, highbush cranberry, and black currants were established at two sites, one at the University of Saskatchewan in Saskatoon, SK (Lat 52°7'N, Long 106°36'W; soil classification – Orthic dark brown Chernozem of the Sutherland association), and the other at Outlook, SK (Lat 51°29'N, Long 107°07'W; soil classification – Orthic dark brown Chernozem of the Bradwell association).

The trials consisted of a randomized complete block design of three blocks at each of the two sites. Five plants of the same cultivar were planted in a linear plot. Linear plots of each cultivar were randomized within each block. All plants were propagated by cuttings or tissue culture and planted as 1-yr-old plants. The plants were planted at spacings of 1 m within the rows and 3 m and 4.5 m between the rows for black currants and the native fruits, respectively.

The chokecherry cultivars evaluated were chosen on the basis of availability from propagators, and included BoughenYellow, Copper Schubert, Garrington, Goertz, Lee Red, Mission Red, Robert, and Espenant (a selection from a grower near Hudson Bay, SK). Only Boughen Yellow, Garrington, and Lee Red were planted at Outlook. All cultivars were planted in the fall of 1994 at both sites except

Copper Schubert, Mission Red, and Espenant, which were planted in the fall of 1995 because of propagation problems.

The pincherry cultivars evaluated were chosen on the basis of availability from propagators and included Jumping Pound, Lee #4, and Mary Liss at both sites. All were planted in the fall of 1994.

The highbush cranberry cultivars evaluated were chosen on the basis of availability from propagators and included Alaska, Andrews, Garry Pink, Manitou, Phillips, Wentworth and Espenant (a selection from a grower near Hudson Bay, SK). Only Alaska, Phillips, and Wentworth were planted at Outlook. All highbush cranberry cultivars were planted in the fall of 1994 except for Espenant, which was planted in the fall of the following year.

Two separate black currant cultivar trials were established. All cultivars evaluated were chosen on the basis of their availability from propagators; the cultivars included in the second trial were not available at the time of establishment of the first trial. Black currant cultivars evaluated in the initial trial (Trial 1) established in 1994 included Boskoop Giant, Consort, Coronet, Crusader, Magnus, Topsy, Wellington, Willoughby, and three open-pollinated selections of Öjebyn from the University of Saskatchewan (5-24-9, 5-23-42 and 25-23-23). The cultivars Consort, Wellington and Willoughby were planted at Outlook. These cultivars were planted in the fall of 1994 at both sites. A second black currant trial (Trial 2) was established at Saskatoon in the spring of 1998. Black currant cultivars in this trial included Ben Alder, Ben Lomond, Ben Nevis, Ben Sarek, Consort, Crusader, Magnus, McGinnis, Noir de Bourgogne, Titania, Wellington, and an open-pollinated selection of Öjebyn from the University of Saskatchewan (4-24-29). McGinnis Black is a selection from the Sottish Crop Research Institute breeding program that was named and propagated by McGinnis Berry Crops nursery in British Columbia, Canada.

The trials were irrigated by drip irrigation. All weeds were controlled manually and by cultivation. Leaf roller caterpillars in chokecherries and black currants were controlled by insecticides in 2000 and 2001. Yearly rejuvenation pruning and thinning was commenced in 2000 for all but the second black currant trial in which pruning was not done until 2001.

Annual shoot growth was recorded in late summer from five randomly selected shoots from each of the three middle plants within a plot. The number of new suckers per plant from the three middle plants within a plot was recorded for chokecherries in 1999–2001.

Fruit were manually harvested in two harvests from one to three plants of the three middle plants of each plot (the plants at each end of the linear plot for any given cultivar were considered guard plants). Total harvested fruit was the total weight obtained from both harvests expressed on a per-plant basis. Yields increased with each year as the plants matured and then attained a plateau, or fluctuated thereafter, indicating that mature yields had been attained. Only yield data from the years in which yields no longer continued to steadily increase were analyzed.

The number of fruit per cup (250 mL) was used as a measure of fruit size. This is a simple measure of relative fruit

**Table 1. Annual shoot growth, total harvested yield, and fruit size of chokecherry cultivars grown at Saskatoon and Outlook from 2000–2003. Yield data are from 2002 and 2003 only**

Cultivar	Saskatoon			Outlook		
	Annual shoot growth (cm)	Total harvested yield (kg plant <sup>-1</sup> )	Number of fruit/cup <sup>z</sup>	Annual shoot growth (cm)	Total harvested yield (kg plant <sup>-1</sup> )	Number of fruit/cup
Boughen Yellow	24.0 <sup>ab</sup>	5.90 <sup>abc</sup>	245 <sup>c</sup>	20.5	3.85	287 <sup>a</sup>
Copper Schubert	34.3 <sup>c</sup>	4.79 <sup>ab</sup>	214 <sup>abc</sup>			
Espenant	26.7 <sup>ab</sup>	9.00 <sup>c</sup>	229 <sup>abc</sup>			
Garrington	22.4 <sup>a</sup>	6.84 <sup>bc</sup>	238 <sup>bc</sup>	21.3	6.78	256 <sup>a</sup>
Goertz	25.9 <sup>ab</sup>	2.62 <sup>a</sup>	194 <sup>a</sup>			
Lee Red	25.6 <sup>ab</sup>	7.01 <sup>bc</sup>	203 <sup>ab</sup>	22.6	5.54	208 <sup>a</sup>
Mission Red	24.4 <sup>ab</sup>	3.25 <sup>ab</sup>	299 <sup>d</sup>			
Robert	27.9 <sup>b</sup>	2.40 <sup>a</sup>	211 <sup>abc</sup>			
Standard error	9.08	1.79	13.1	3.13	2.636	20.8

<sup>z</sup>One cup equals 250 mL.

a–c Means within a column followed by the same letter are not significantly different by LSD at  $P \leq 0.05$ .

size that is highly correlated with equatorial fruit diameter ( $r = -0.98$ ;  $P \leq 0.001$ ), is a useful measure for growers, and is logistically a very quick measurement of fruit size when a considerable number of measurements have to be made in the field over a short period of time. Three fruit cup replicates were randomly selected for measurement of fruit size from the first harvest of each cultivar within each block.

Cultivar data were analysed using SAS Proc Mixed (SAS Institute, Cary, NC) in which year was considered to be a random factor. Sites were analyzed separately due to the unequal representation of cultivars between the two sites. Data were checked for normality prior to statistical analysis and transformed if necessary by square root. Cultivar mean separation was accomplished by least significant difference (LSD).

## RESULTS AND DISCUSSION

### Chokecherry

Differences in shoot growth measured from 2000 to 2003 were found among the chokecherry cultivars at Saskatoon, but not at Outlook. At Saskatoon, Copper Schubert had 23–53% greater shoot growth than all of the other cultivars (Table 1). Robert also had greater shoot growth than Garrington at this site. Sucker production did not differ among the chokecherry cultivars at either site. An average of 1.4 and 2.6 suckers/plant were produced at Saskatoon and Outlook, respectively, from 1999 to 2001 (data not shown).

Mature fruit yields of the chokecherries appeared to have been reached in 2001; however, because some of the cultivars were planted 1 yr later, only yield data from 2002 and 2003 were examined. At Saskatoon from 2002 to 2003, Espenant, Lee Red, Garrington, and Boughen Yellow were among the highest yielding of the cultivars (Table 1). Espenant yielded 1.9–3.8 times more fruit than Copper Schubert, Mission Red, Goertz, and Robert. The cultivars at Outlook, Boughen Yellow, Garrington, and Lee Red, did not differ in their yield, but neither did the yield of these cultivars differ at Saskatoon.

Fruit size differed among the cultivars at both sites (Table 1). At Saskatoon, Mission Red had significantly smaller fruit than all the other cultivars; Goertz had significantly

larger fruit, by 18–35%, than Garrington, Boughen Yellow, and Mission Red. At Outlook, the fruit of Boughen Yellow were significantly smaller than those of Garrington and Lee Red by 17–38%.

### Pincherry

Pincherry yield from 1999 to 2003 differed among the three cultivars. At both sites, Lee #4 yielded at least twice as much as Mary Liss or Jumping Pound (Table 2). Fruit size or shoot growth did not differ significantly among the cultivars at both sites.

### Highbush Cranberry

Annual shoot growth did not differ among the highbush cranberry cultivars at Outlook; however, at Saskatoon, the shoot growth of Manitou was 26 and 50% greater than that of Espenant and Andrews, respectively (Table 3).

The cultivar Phillips was never harvested because it bore almost no fruit at either site. The cultivar Andrews at Saskatoon also yielded very little fruit; it was harvested only in 1999 and 2000 (mean yield = 0.37 kg plant<sup>-1</sup>), and therefore, was not included in the statistical analysis. The poor fruit yield of Andrews could be attributed, in part, to extensive mite damage that occurred on this cultivar. Mature yields of highbush cranberry appeared to have been reached by 2001, but because the cultivar Espenant was planted a year later than the others, only yield data from 2002 and 2003 were examined. Fruit yield at both sites in these 2 yr did not differ among the remaining cultivars and averaged 2.04 kg plant<sup>-1</sup> (Table 3).

Cultivars differed in fruit size at Saskatoon with Espenant having the significantly smallest fruit of all the cultivars (Table 3). Manitou had significantly larger fruit than Wentworth, Garry Pink, and Espenant at this site. Manitou was originally selected from wild stands in Manitoba for its large fruit size (Darrow 1975). The fruit size of Wentworth and Alaska did not differ at Outlook or at Saskatoon.

### Black Currant

#### Trial 1

Average annual shoot growth from 1999 to 2002 did not differ among the cultivars at Saskatoon or at Outlook (data not

**Table 2. Total harvested yield and fruit size of pincherry cultivars from 1999 to 2003 at Saskatoon and 1999 to 2002 at Outlook**

Cultivar	Saskatoon		Outlook	
	Total harvested yield (kg plant <sup>-1</sup> )	Number of fruit/cup <sup>z</sup>	Total harvested yield (kg plant <sup>-1</sup> )	Number of fruit/cup
Jumping Pound	1.55 <i>a</i>	229	1.35 <i>a</i>	276
Lee #4	3.08 <i>b</i>	224	3.13 <i>b</i>	259
Mary Liss	1.56 <i>a</i>	238	1.15 <i>a</i>	NA <sup>y</sup>
Standard error	0.237	24.5	0.672	31.4

<sup>z</sup>One cup equals 250 mL.<sup>y</sup>Data not available.*a, b* Means within a column followed by the same letter are not significantly different by LSD at  $P \leq 0.05$ .**Table 3. Annual shoot growth, total harvested yield, and fruit size of highbush cranberry cultivars grown at Saskatoon and Outlook from 2000 to 2003. Yield data are from the years 2002 and 2003 only**

Cultivar	Saskatoon			Outlook		
	Annual shoot growth (cm)	Total harvested yield (kg plant <sup>-1</sup> )	Number of fruit/cup <sup>z</sup>	Annual shoot growth (cm)	Total harvested yield (kg plant <sup>-1</sup> )	Number of fruit/cup
Alaska	32.5 <i>bc</i>	1.79	222 <i>ab</i>	33.4	0.98	263
Andrews	24.2 <i>a</i>	NA <sup>y</sup>	NA			
Espenant	29.0 <i>ab</i>	1.69	310 <i>c</i>			
Garry Pink	32.4 <i>bc</i>	2.39	252 <i>b</i>			
Manitou	36.4 <i>c</i>	1.93	212 <i>a</i>			
Phillips	32.1 <i>bc</i>	NA	NA	37.8	NA	NA
Wentworth	30.7 <i>abc</i>	2.38	247 <i>b</i>	33.2	1.38	281
Standard error	3.88	0.404	15.1	4.88	0.356	32.7

<sup>z</sup>One cup equals 250 mL.<sup>y</sup>Data not available.*a-c* Means within a column followed by the same letter are not significantly different by LSD at  $P \leq 0.05$ .**Table 4. Total harvested yield and fruit size of black currant cultivars (Trial 1) at Saskatoon and Outlook from 1999 to 2002**

Cultivar	Saskatoon		Outlook	
	Total harvested yield (kg plant <sup>-1</sup> )	Number of fruit/cup <sup>z</sup>	Total harvested yield (kg plant <sup>-1</sup> )	Number of fruit/cup
5-24-9	0.29 <i>ab</i>	248 <i>abcd</i>		
5-23-42	0.95 <i>c</i>	187 <i>a</i>		
25-23-23	0.54 <i>bc</i>	189 <i>ab</i>		
Consort	0.99 <i>c</i>	304 <i>cde</i>	1.31	352 <i>c</i>
Coronet	0.62 <i>bc</i>	319 <i>de</i>		
Crusader	0.62 <i>bc</i>	341 <i>e</i>		
Magnus	0.61 <i>bc</i>	264 <i>bcd</i>		
Topsy	0.59 <i>bc</i>	261 <i>abcd</i>		
Wellington	0.94 <i>c</i>	239 <i>abc</i>	1.52	220 <i>a</i>
Willoughby	0.21 <i>a</i>	NA <sup>y</sup>	0.53	283 <i>b</i>
Standard error	(0.236) <sup>x</sup>	56.6	0.633	19.4

<sup>z</sup>One cup equals 250 mL.<sup>y</sup>Data not available.<sup>x</sup>The transformed standard error is presented in parentheses when data were transformed prior to analysis. Back-transformed cultivar means are presented. *a-e* Means within a column followed by the same letter are not significantly different by LSD at  $P \leq 0.05$ .

shown). Mean shoot growth at Saskatoon and at Outlook was 19.4 cm and 18.2 cm, respectively, over the 4 yr.

Cultivar differences in yield from 1999 to 2002 were found at Saskatoon, but not at Outlook (Table 4). At Saskatoon, Boskoop Giant yielded enough fruit (mean yield = 0.36 kg plant<sup>-1</sup>) to be harvested in 2000; however, it was not harvested in any of the other years due to its very low

fruit production and so was not included in the statistical analysis. At Saskatoon, Consort, 5-23-42 and Wellington produced on average 3.8 times significantly greater yields than 5-24-9 and Willoughby. The yields of Consort, Wellington and Willoughby did not differ significantly at Outlook. At Saskatoon, Willoughby yielded significantly less than Wellington, but the yield of these two cultivars was

**Table 5. Total harvested yield and fruit size of black currant cultivars (Trial 2) at Saskatoon from 2000 to 2003**

Cultivar	Total harvested yield (kg plant <sup>-1</sup> )	Number of fruit/cup <sup>z</sup>
4-24-29	0.21a	202cd
Ben Alder	1.14bc	178abc
Ben Lomond	1.11bc	199cd
Ben Nevis	1.74c	180bc
Ben Sarek	1.30bc	138a
Consort	0.54ab	284f
Crusader	0.54ab	265ef
Magnus	0.54ab	236de
McGinnis Black	2.00c	152ab
Noir de Bourgogne	0.30a	257ef
Titania	0.52ab	190bc
Wellington	0.66ab	182bc
Standard error	(0.278) <sup>y</sup>	26.1

<sup>z</sup>One cup equals 250 mL.

<sup>y</sup>The transformed standard error is presented in parentheses when data were transformed prior to analysis. Back-transformed cultivar means are presented.

a–f Means within a column followed by the same letter are not significantly different by LSD at  $P \leq 0.05$ .

not significantly different at Outlook. Nevertheless, at Outlook, Wellington yielded almost three times more fruit than Willoughby.

Fruit size differed significantly at both sites (Table 4). At Outlook from 1999 to 2002, the fruit size of Wellington, Willoughby and Consort all differed from each other, with Wellington having the largest fruit and Consort the smallest. The cultivars at Saskatoon with the largest fruit size included 5-23-42, 25-23-23, Wellington, 5-24-9, and Topsy (mean = 225 fruit/cup). Fruit size of the selections 5-23-42 and 25-23-23 was significantly larger than that of Consort, Coronet, and Crusader by 71%. Although the number of fruit/cup differed between Wellington and Consort at Outlook, these two cultivars did not differ in fruit size at Saskatoon.

#### Trial 2

Annual shoot growth did not differ significantly among the black currant cultivars of the second trial established at Saskatoon (data not shown). Mean shoot growth from 2001 to 2003 of the cultivars in this trial was 25.3 cm.

The black currant cultivars differed significantly in their yield (Table 5). The cultivars McGinnis Black and Ben Nevis (mean yield = 1.87 kg plant<sup>-1</sup>) had significantly greater yields than 4-24-29, Noir de Bourgogne, Titania, Magnus, Crusader, Consort, and Wellington (mean yield = 1.18 kg plant<sup>-1</sup>). Previous studies (Muster and Röser 1993; Dale et al. 1993) have reported that the Scottish 'Ben' types have outyielded a number of other black currant cultivars. Titania has produced high yields comparable to that of the 'Ben' types in yield trials in Poland and Norway (Muster and Röser 1993; Nes 1993; Pluta and Zurawicz 1993; Pluta et al. 1993). However, in this study, Titania produced 30–45% less fruit than the 'Ben' types. The black currant cultivars in the second trial of the current study did not produce significant quantities of fruit until 2000.

Black currant yields in Norway of Ben Nevis, Ben Alder and Titania over 4 yr of production ranged from 3 to 4.7 kg plant<sup>-1</sup>; Ben Sarek yielded an average of 1.7 kg plant<sup>-1</sup> over 4 yr of production in Norway (Nes 1993). In Poland, the cultivars Ben Alder, Ben Lomond, Ben Nevis and Titania produced yields ranging from 2 to 2.7 kg plant<sup>-1</sup> (Banaszczyk et al. 1992; Pluta et al. 1993). Black currant yields of the 'Ben' cultivars in southern Ontario from 1989 to 1992 (Dale et al. 1993) were similar to, or even slightly lower on average than what was reported for the current study in Saskatchewan. The yields of the black currant cultivars from the two trials in Saskatchewan were inferior to those in Norway and Poland. However, it is difficult to compare the results of these studies due to differences in plant density. The plant densities of the trials in Poland are unknown, that of the Norwegian trial was much lower, and that of the Ontario trial was slightly higher than the plant density used in the currently reported study. Nevertheless, the climate in Saskatchewan may not be the most suitable for black currant production relative to that in Poland and Norway. In general, black currants prefer cool, moist conditions (Barney 1996), whereas the climate in Saskatchewan can often be hot and dry. The low yields may also have been associated with premature fruit drop. This condition can occur approximately 3 wk after flowering, and can cause major yield losses in black currant (Brennan 1990). Unfavourable environmental conditions, such as low but above-zero temperatures during flowering (Dale 1984), can increase premature fruit drop. The cultivar Magnus in particular has been reported to be very susceptible to premature fruit drop due to low temperatures during flowering (Dale 1984). Although other factors have been implicated in increasing premature fruit drop, such as insufficient fertilization and post-harvest drought in the previous season, there is no direct evidence to support this relationship (Brennan 1990).

Ben Sarek and McGinnis Black had the largest fruit size (mean = 145 fruit/cup) followed by that of Ben Alder, Ben Nevis, Wellington, and Titania (mean = 183 fruit/cup), all of which did not differ significantly from that of McGinnis Black (Table 5). Consort, Crusader and Noir de Bourgogne had the smallest fruit of the cultivars (mean = 269 fruit/cup) although the latter two were not significantly different from the fruit size of Magnus.

#### CONCLUSIONS

Data from the current study have provided a quantitative characterization of growth, yield, and fruit size of the chokecherry, pincherry, highbush cranberry, and black currant cultivars evaluated. The results represent a unique set of data, which, prior to now, has not been available, and will provide a basis on which to make cultivar recommendations to growers, and to evaluate the performance in commercial orchards of currently available cultivars, and any new cultivars or future selections that may be developed.

High-yielding cultivars with good fruit size are important for the commercial production of these fruit species. Of the chokecherry cultivars tested, the high-yielding selection, Espenant, and the more productive cultivars, Garrington and Lee Red, warrant further evaluation. Of the pincherry culti-

vars evaluated, Lee #4 stood out as being very productive. The highbush cranberry cultivars Andrews and Phillips were not suited for fruit production. Of the remaining cultivars, Manitou produced good yields and also had large fruit. Of the black currant cultivars evaluated, McGinnis Black, Ben Nevis, Ben Sarek, and Ben Alder were high yielding with large fruit. However, possibly due to the unsuitable prairie climate, black currant yields of these cultivars in Saskatchewan may rarely attain those produced in Europe. For this reason, the feasibility of commercial black currant production in Saskatchewan is still uncertain.

Further evaluation of cultivars of these fruit species should include an analysis of growth and yield under various growing conditions, and screening for disease and insect resistance, suckering, alternate-bearing, blossoming time, post-harvest storage and fresh fruit composition, and suitability for processing.

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