Journal American Pomological Society 56(2):118-128 2002

Comparative Agronomic Performance of 15 Saskatoon (*Amelanchier alnifolia* Nutt.) Cultivars During Their First Seven Years of Growth

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Abstract

This study quantitatively characterizes 15 different saskatoon cultivars grown in replicated trials at two sites (University of Saskatchewan and Moonlake, SK) during their first seven years of growth from 1992 to 1998. The 15 cultivars included 'Bluff', 'Buffalo', 'Forestburg', 'Honeywood', 'JB30', 'Martin', 'Nelson', 'Northline', 'PAR 90', 'Parkhill', 'Pearson II', 'Pembina', 'Smoky', 'Success', and 'Thiessen'. Data were collected on survival, shoot growth, stem growth, suckering, blossoming time, fruit size, and yield. Growth as measured in this study, did not differ among the cultivars in most years. However, in 1994, 'Thiessen' had a greater current season's shoot growth than most of the other cultivars. Cultivars that produced the fewest suckers (4 to 10/plant in total over the seven years) included 'Forestburg', 'Martin', 'Nelson', 'PAR 90', 'Pembina', 'JB30', and 'Thiessen'. 'Buffalo', 'Bluff', and 'Parkhill' produced the most suckers with a mean of 34, 36 and 64 suckers per plant, respectively, over seven years. Cultivars that tended to bloom earlier in the season included 'Bluff' and 'Parkhill'; 'Thiessen' and 'Martin' also blossomed relatively early. 'Pembina', 'Success', 'Northline' and 'JB30' were among the last of the cultivars to blossom. 'Martin' and 'Thiessen' had the largest fruit with mean diameters of 14.2 and 13.9 mm, respectively. The cultivars, 'Success', 'Bluff' and 'Parkhill' had the smallest fruit with mean diameters of 10, 10.9 and 11 mm, respectively. The top yielding cultivars included 'Pearson II', 'Smoky' and 'Honeywood', with a mean cumulative yield over the seven years of 8.5 kg per plant. The yield of 'Pembina' was unusually low with a mean cumulative yield of just over 2 kg per plant.

Introduction

Amelanchier alnifolia Nutt. (saskatoon, juneberry or serviceberry) is a small tree or bush native to the North American prairies. Its fruit were used widely by aboriginal peoples in pemmican, and by early settlers, often as their primary source of fruit (2). Saskatoon fruit are still favoured by people on the Canadian prairies today, and are commonly eaten fresh, or as jams, jellies, syrups and pies.

The first saskatoon cultivar to be released was 'Success' in 1878 in the United States (1). In Canada, early research on the saskatoon was done at the Beaverlodge Research Station in Alberta (Agriculture and Agri-Food Canada) commencing with the transplanting of wild saskatoons in 1918 (6). Since then a number of saskatoon cultivars have been released, and there are now approximately 26 named cultivars of saskatoons (6). Interest in the commercial production of the saskatoon has increased substantially in recent years, and increasingly more acres are being planted to saskatoons on the prairies. According to a 1996 census, there were 2,000 to 2,500 acres of saskatoons planted in the three Canadian prairie provinces (Manitoba, Saskatchewan and Alberta). Currently demand for saskatoon fruit exceeds supply.

The characteristics of a number of saskatoon cultivars have been previously published (4, 5,6, 7), however, these descriptions have been based on non-replicated trials, qualitative and anecdotal information. No replicated trials quantitatively comparing the performance of saskatoon cultivars have been published to date.

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The authors gratefully acknowledge Saskatchewan Agriculture and Food, Agriculture Development Fund, for financial support.

This paper presents the results of a study of 15 different saskatoon cultivars grown in replicated trials at two locations during the first seven years of growth. The objective of this research was to quantitatively compare the performance of the different saskatoon cultivars to provide a sound basis for recommendations to the developing industry. This is the first quantitative characterization of saskatoon cultivars. The knowledge derived from this study will allow us to initiate an objective breeding program, and to compare the performance of potential new cultivars with standard ones.

Materials and Methods

The cultivar trials were difficult to establish because of problems with propagation and consequent lack of availability of plant material. The trial was originally established at seven sites; six of these were grower-managed sites located throughout Saskatchewan. Five of these sites were eventually excluded from the study because of site-related issues including excessive browsing by deer, lack of irrigation, excessive salinity, and poor management on the part of the co-operator. Data from the remaining two sites are presented in this paper.

Fifteen saskatoon cultivars were planted in replicated trials at the University of Saskatchewan (U of S) in Saskatoon, Saskatchewan (52°N), and at a grower-managed site approximately 15 km southwest of the City of Saskatoon (Moonlake). The trial consisted of a randomized complete block design with three blocks at each of the two sites. Five plants of each cultivar comprised a plot within each block. The 15 cultivars tested included 'Bluff', 'Buffalo', 'Forestburg', 'Honeywood', 'JB30', 'Martin', 'Nelson', 'Northline', 'PAR 90', 'Parkhill', 'Pearson II', 'Pembina', 'Smoky', 'Success', and 'Thiessen'. Of these, the cultivars 'Parkhill' and 'Success' originated in the United States, and are likely hybrids of *A. stolonifera* with *A. alnifolia* (8); all other cultivars are *A. alnifolia*.

One year old saskatoon plants were planted in the fall of 1991. The cultivars 'JB30', 'Pembina' and 'Smoky' were propagated from cuttings; all other cultivars were micropropagated. Plant spacing was set at 1 m within a row and 4.5 m between rows. Because of difficulties in propagation, not all cultivars were available in 1991. 'PAR 90' and 'JB30' (at both sites) and 'Forestburg' (Moonlake) were planted in 1992; 'Nelson' was planted at both sites in 1993. Replacement planting of plants that did not survive occurred in the spring and fall of 1992 and 1993, and in the spring of 1994. Data were not recorded from recently planted replacement plants until they were old enough to become indistinguishable from the others by size.

The sites were maintained using recommended management practices (6). These included the use of registered pesticides to control insects, disease, and weeds. Manual weeding and cultivation were also used. Both sites were irrigated when necessary during the first four years of establishment. The U of S site was set up permanently under drip-irrigation and continued to be irrigated when necessary. During these years any diseased or damaged wood was removed, but no other pruning occurred. In general, the U of S site was managed more intensively than the Moonlake site.

Survival: The number of plants of the five in each plot that survived each year was recorded and presented as percent survival. Plants that died were replaced and survival of these were included in the data the following year.

Growth: The current season's shoot growth was measured from the middle three of the five plants in a plot in 1993, 1994 and 1998. Only the main shoot was measured in 1993 and 1994; in 1998, five randomly selected shoots from each plant were measured. From 1995 to 1997, stem growth was measured. The main stems of the middle three plants were marked with ink approximately 10 cm from above the ground, and the diameter was measured at this point each year in the spring and fall.

The difference between the two measurements indicated the increase in growth for that year. The switch was made from measuring shoot growth to stem growth because it was thought that stem growth would be a less variable measurement. However, the measure of stem growth did not seem representative of the plant's overall growth, thus shoot growth was measured again in 1998.

Suckering: The number of new suckers per plant were recorded each fall from the three middle plants in a plot.

Blossoming Time: Each spring from 1995 to 1998, the date that 50% of the flowers reached full bloom was recorded for each plot. Growing degrees-days (GDD) (base 5°C) were obtained from Environment Canada weather records for Saskatoon. Consecutive GDD prior to and including the day of 50% bloom were calculated for each plot. The first day of the consecutive GDD was determined by going back in date from 50% bloom until three or more consecutive days had a GDD of zero.

Fruit Size: The number of fruit in one cup, and fruit diameter were used to measure fruit size. The number of ripe fruit required to fill a one cup measure (250 mls) was counted and recorded. Data on fruit per cup was collected from 1995 to 1998. Plot yields in 1994 were often not sufficient to fill one cup; missing data in 1995 were a result of insufficient fruit yield to fill one cup. Fruit diameter was measured from 30 fruit per plot in 1997 and 1998. Fruit diameter data from 1997 were taken only from the U of S site.

Yield: Plants did not yield significantly prior to 1994. In 1994 and 1995, the fruit were hand-picked from three of the five plants as the fruit ripened (usually in two harvests). Mean yield per plant was calculated for each plot.

When the plants began to yield more substantially, accurate yield data were difficult to collect due to uneven ripening, drop of overripe fruit, and loss to birds. To address some of these concerns and still attempt to record yield accurately and efficiently, harvest modifications were implemented for the 1996 to 1998 seasons. In addition, a B.E.I. model H blueberry harvester was used to harvest ripe fruit in 1997 and 1998. This type of harvester utilizes handheld shakers to release the fruit into catch frames placed under the plants.

In 1996 and 1997 all the fruit from one plant per cultivar in a block were harvested in a once-over harvest when a cultivar reached the stage of approximately 75% ripe fruit (fruit were considered ripe when purple-black in colour) on the plant. Ripe, red and green fruit were sorted from either a 1 kg sample or the entire harvest and weighed separately. From this the percentage of each was calculated. The weight of 30 fruit was recorded for each category and the mean fruit weight calculated. The potential weight of what the red fruit would have been if harvested when ripe was calculated as follows:

$$\text{potential yield of red fruit when ripe} = \left(\frac{(\text{total plant yield})(\%\ \text{red fruit})}{\text{mean red fruit weight}}\right)\left(\text{mean fruit weight of ripe fruit}\right)$$

where % red fruit =

(weight of red fruit/weight of total plant yield) x 100

or = (weight of red fruit in kg) x 100 if a 1 kg sample was taken

mean red fruit weight = weight of 30 red fruit / 30
mean ripe fruit weight = weight of 30 ripe fruit / 30
total plant yield = weight of ripe, red and green fruit harvested from one plant

The same calculation was done for green and ripe fruit, and the results of the three calculations added together to obtain the total potential yield if all the fruit had been ripe at the time of harvest.

In 1998, fruit were harvested from one plant in each plot as the cultivars ripened. Only ripe fruit were harvested in a once-over harvest when the maximum amount of fruit was ripe on the plant before overripe fruit dropped. The percentage of ripe fruit on the plant at the time of harvest was visually estimated and used to calculate the potential yield of the plant if all the fruit were harvested when ripe.

Potential fruit yield =
(actual harvest yield / (% ripe fruit /100))

Data Analysis: The data were checked for normality and transformed when necessary prior to statistical analysis. The transformation used for each set of data is presented in the tables. Back-transformed means, the transformed standard error, and the transformed overall mean are presented in the tables for data that were transformed prior to analysis. The data were analyzed by analysis of variance using the GLM procedure of SAS (SAS Institute Inc., Cary, NC). The sites were considered as random factors with blocks nested within sites. Cultivar separation was accomplished by the LSMEANS (least-square means) option of SAS at a probability level ≤ 0.05.

Results and Discussion

Plant Survival: Data on plant survival was not statistically analyzed as transformation of this data to create normality was not possible (data not shown). Within the first two years of planting, the cultivars had a mean plant survival of 89%. The majority of the cultivars ranged in survival from 77 to 97%. 'Parkhill' and 'JB30' had the lowest survival rate of 64 and 60%, respectively. The planting stock of 'JB30' was from poor quality cuttings which probably was responsible for its poor survival rate. Although 'Parkhill' had a poor survival initially, replacement plantings of 'Parkhill' the following year had an 87% survival rate. Differences among the cultivars in plant survival likely are more associated with the quality of the plant material as opposed to a genetic difference, although the latter cannot be ruled out. However, as the plant material originated from a variety of sources, which factor had the greatest influence was not possible to discern.

Growth: Stem growth did not differ significantly among the cultivars in the years that it was measured. The length of the current season's shoot growth differed significantly among the cultivars only in 1994 (Table 1). In this year, 'Thiessen', 'Pearson II', 'Smoky', 'Martin', and 'PAR 90' (mean = 42.5 cm) had significantly greater shoot growth than 'Honeywood', 'Success', 'Bluff', 'Northline', 'Pembina', and 'Nelson' (mean = 20 cm). Some of the shorter cultivars such as 'Nelson' and 'Success' naturally may have less shoot growth than taller, larger cultivars. The length of the current seasonís shoot growth often was quite variable among the shoots on one plant; this variability likely accounted for the lack of significance in most years.

The plants at Moonlake had significantly greater shoot growth by 110% and 32% than at the U of S in 1993 (data not shown) and 1994, respectively. Stem growth, however, was greater at the U of S than at Moonlake although this was only significant in 1996; that year mean stem diameter increased 36% more at the U of S than at Moonlake.

Suckering: The mean number of suckers produced per plant did not differ significantly among the cultivars until their sixth growing season (1997) (data not shown). The total number of suckers produced from 1993 to 1998 differed significantly among the cultivars (Table 1). The cultivars 'Thiessen', 'Nelson', 'Forestburg', 'Pembina', 'JB30', 'Martin' and 'PAR 90' were among those that produced the least suckers (mean = 6.3 suckers/plant); these cultivars produced significantly fewer suckers than 'Northline', 'Buffalo', 'Bluff', and 'Parkhill' (mean = 40.8 suckers/plant).

'Forestburg' and 'Pembina' were previously noted as producing few suckers (4, 5). 'Thiessen' was reported as having moderate to good suckering, and 'Nelson' as moderate suckering (6), however, these cultivars produced few suckers at these two sites after seven years of growth. 'Nelson' is two years younger than the other cultivars, and may produce more suckers as the plant matures. 'Parkhill' was previously noted to have low to moderate suckering (6) contrary to what was found in this study. However, sucker production was observed to vary considerably with soil conditions and plant vigour. For example, some of the cultivars, primarily

Table 1. Mean shoot growth per plant in 1994 and sucker production from 1993 to 1998 of 15 saskatoon cultivars grown at Moonlake and the University of Saskatchewan (U of S).

	Shoot Length (cm)	Sucker Number Per Plant
	1994	1993-1998
Cultivar		
Bluff	21.9 ab[1]	35.5 cd
Buffalo	25.9 bc	33.7 cd
Forestburg	31.4 bcd	5.1 a
Honeywood	23.8,b	18.9 abc
JB30	31.4 bcd	6.7 ab
Martin	40.8 de	7.6 ab
Nelson	10.0 a	4.7 a
Northline	20.7 ab	29.8 c
PAR 90	38.9 cde	9.1 ab
Parkhill	31.3 bcd	64.1 d
Pearson II	43.2 de	21.8 bc
Pembina	19.8 ab	6.3 ab
Smoky	42.9 de	21.6 bc
Success	23.7 b	14.7 abc
Theissen	46.8 e	4.4 a
Site		
Moonlake	34.2 a	25.0 a
U of S	26.0 b	9.1 b
Transformation		SQR[5]
Mean[3]	30.1	4.01
(S.E.)[4]	(4.48)	(0.772)

[1]Means within a column followed by the same letter for cultivar and site separately are not significantly different using SAS LSMEANS ($p \leq 0.05$).
[2]Data not available.
[3]The transformed mean and of transformed standard error of the cultivar are presented when data were transformed prior to analysis.
[4]Standard error.
[5]Square root transformation.

'Buffalo', 'Honeywood', 'Pearson II', and 'Success', produced substantially fewer suckers at the U of S than at Moonlake in 1997 and 1998 (data not shown).

Cumulative sucker production over the seven years was almost three times greater at Moonlake than at the U of S. Significantly greater suckering occurred at Moonlake from 1994 to 1997. During these four years the mean number of suckers produced per plant was 4 at Moonlake compared to only 1.2 at the U of S (data not shown).

A small amount of sucker production is desirable to promote plant expansion and renewal, however, plants with moderate to profuse suckering have greater pruning requirements.

Blossoming Time: Blossoming times as expressed in growing degree-days (GDD) differed significantly among the cultivars each year (Table 2). The spring of 1995 was cooler than normal and the first plants to reach 50% bloom did so on May 27. The cultivars blossomed over a span of three days after that and therefore, few differences existed among them. Only 'Pembina' and 'JB30' stood out as blossoming later than most or all of the other cultivars that year. Blossoming also occurred late (commencing on May 30) in 1996 as the weather was cooler than normal until the last week in May. The cultivars 'Parkhill' and 'Bluff' (mean = 112 GDD) bloomed significantly earlier than all other cultivars except 'Buffalo', 'Pembina', 'Success' and 'JB30' which were among the last of the cultivars to reach 50% full bloom (mean = 141 GDD). Both the months of April and May in 1997 were cooler than normal and the plants did not start to reach 50% bloom until May 25. That spring, 'Bluff' bloomed significantly earlier than all of the other cultivars by a mean of 19 GDD. 'Pembina' and 'Success' bloomed later than all other cultivars except for 'Northline'. The spring of 1998 was warmer than normal and blossoming commenced on May 6 that year. The cultivars reached 50% bloom over a span of seven days. Blossoming followed a similar trend with 'Parkhill' and 'Bluff' (mean = 107 GDD) blooming earlier than all other cultivars except 'Martin', 'PAR 90', and 'Thiessen'. Once again 'Pembina', 'Success' and 'Northline' (mean = 137 GDD) were among those cultivars that were last to bloom.

Overall the cultivars 'Bluff' and 'Parkhill' bloomed the earliest followed by 'Thiessen' and 'Martin'. 'Pembina' was consistently the last of the cultivars to reach 50% full bloom. 'Success', 'Northline' and 'JB30' also tended to bloom later than most of the other cultivars. The cultivars 'Smoky' and 'Honeywood' tended to rank in the middle among the cultivars

Table 2. Growing degree-days (GDD) (base 5°C) prior to 50% bloom of 15 saskatoon cultivars at the University of Saskatchewan (U of S) to 1997, and at Moonlake and the U of S in 1998.

	GDD			
Cultivar	1995	1996	1997	1998 (2 sites)
Bluff	123 ab[1]	114 a	107 a	107 a
Buffalo	129 bc	119 ab	119 bc	123 def
Forestburg	129 bc	129 cd	125 cd	116 bcd
Honeywood	129 bc	132 cde	128 de	122 def
JB30	141 de	139 ef	128 de	127 efg
Martin	129 bc	126 bc	116 b	110 ab
Nelson	N/A[2]	132 cde	125 cd	128 fg
Northline	135 cd	132 cde	135 ef	133 gh
PAR 90	129 bc	129 cd	116 b	110 ab
Parkhill	118 a	111 a	116 b	106 a
Pearson II	129 bc	129 cd	128 de	119 cdef
Pembina	147 e	146 f	139 f	139 h
Smoky	129 bc	135 de	125 cd	119 bcde
Success	129 bc	139 ef	139 f	138 h
Theissen	123 ab	124 bc	122 bcd	111 abc
Mean	130	129	125	121
(S.E.)[3]	(3.4)	(2.8)	(2.7)	(2.9)

[1]Means within a column followed by the same letter are not significantly different using SAS LSMEANS ($p \leq 0.05$).
[2]Data not available.
[3]Standard Error.

in terms of their blossoming time. 'Nelson' is reported as blossoming later than most other cultivars (6), however its blossom time was similar to that of 'Smoky' and 'Honeywood' in both 1996 and 1997.

Fruit Size: Fruit size measured as the number of fruit per cup is presented in Table 3. Some cultivars did not produce enough fruit to fill one cup in 1995 and 1996 and therefore were excluded from the analysis. In all years, 'Martin', 'PAR 90', 'Thiessen' and 'JB30' consistently produced the largest fruit (mean = 98 fruit/cup). From 1995 to 1997, 'Martin' had the largest fruit with significantly fewer fruit per cup than all other cultivars except 'Thiessen', 'PAR 90' and 'JB30' in 1995 and 1997, and all cultivars but 'Thiessen' and 'PAR 90' in 1996. In 1998, 'PAR 90' produced significantly larger fruit than all cultivars except 'Thiessen', 'Martin' and 'JB30'. 'Success', 'Parkhill' and 'Bluff' consistently were in the group producing the smallest fruit in all years (mean = 199 fruit/cup). In most years, 'Smoky', 'Honeywood', and 'Northline' (mean = 159 fruit/cup) tended to rank in the middle amongst the other cultivars in terms of fruit size, however, in 1996, 'Smoky' and 'Honeywood' produced the smallest fruit although this was not significantly different from many of the other cultivars. In the same year, the fruit of 'Northline' were significantly larger than the majority of the other cultivars.

Measurements of fruit diameter are presented in Table 4. In 1997 and 1998, 'Martin' and 'Thiessen' (mean = 14 mm) produced the largest fruit followed by that of 'PAR 90' (mean = 13.6 mm). In 1997, the fruit of 'Martin' and 'Thiessen' were significantly larger in diameter than all other cultivars including 'PAR 90'. In 1998, the fruit of 'Martin', 'Thiessen' and 'PAR 90' did not significantly differ from each other and had larger fruit than all other cultivars

Table 3. The mean number of fruit per cup of 15 saskatoon cultivars from 1995 to 1998 at Moonlake and the University of Saskatdhewan (U of S).

	Number of Fruit Per Cup			
	1995	1996	1997	1998
Cultivar				
Bluff	215 fg[1]	175 de	167 efg	212 ef
Buffalo	158 def	157 d	189 fg	170 de
Forestburg	N/A[2]	159 de	126 bcd	145 bcd
Honeywood	155 de	187 e	149 def	148 cd
JB30	110 abcd	109 b	108 abc	117 abc
Martin	82 a	87 a	78 a	106 ab
Nelson	N/A	N/A	151 def	170 de
Northline	145 cde	130 c	140 cde	182 de
PAR 90	87 ab	95 a	90 ab	102 a
Parkhill	219 g	163 de	165 defg	213 ef
Pearson II	142 bcde	173 de	132 cde	145 bcd
Pembina	173 efg	167 de	152 def	205 ef
Smoky	174 defg	185 de	149 de	172 de
Success	221 g	184 de	205 g	243 f
Theissen	93 abc	90 a	101 abc	110 ab
Site				
Moonlake	144	150 a	133	156
U of S	159	129 b	147	164
Transformation		$^{-1}/X$		SQR[5]
Mean[3]	152	-0.00732	140	12.6
(S.E.)[4]	(19.0)	(0.000317)	(13.2)	(0.55)

[1]Means within a column followed by the same letter for cultivar and site separately are not significantly different using SAS LSMEANS ($p \leq 0.05$).
[2]Data not available.
[3]The transformed mean and the transformed standard error of the cultivar are presented when data were transformed prior to analysis.
[4]Standard Error.
[5]Square root transformation.

except 'JB30' which did not differ significantly from 'Thiessen' and 'PAR 90' in fruit diameter. The fruit of the cultivars 'Success', 'Bluff' and 'Parkhill' (mean = 10.7 mm) were among the smallest in both years, with 'Success' producing significantly smaller fruit than that of all the cultivars except 'Bluff' and 'Parkhill' in 1998, and smaller fruit than all the cultivars in 1997. In 1998, 'Honeywood', 'Northline' and 'Smoky' (mean = 12.3 mm) were similar in fruit size and ranked in the middle among the cultivars, but in 1997, 'Smoky' produced significantly smaller fruit than 'Honeywood' and 'Northline'; this may be attributed to the very high yields that 'Smoky' produced that year.

The results from both measures of fruit size are comparable. On average, 'Martin', 'Thiessen', 'PAR 90' and 'JB30' produced the largest fruit of the cultivars, while 'Parkhill', 'Success' and 'Bluff' produced the smallest. This trend for the most part was fairly consistent from year to year. The cultivars 'Northline', 'Smoky', and 'Honeywood' usually ranked in the middle in terms of fruit size, with the exception of 1996 in which case the fruit of 'Northline' were significantly larger than

Table 4. The diameter of fruit from 15 saskatoon cultivars grown at the University of Saskatchewan (U of S) in 1997, and Moonlake and the U of S in 1998.

Cultivar	Diameter (mm) 1997	1998
Bluff	10.7 b[1]	11.1 ab
Buffalo	11.0 bc	12.2 de
Forestburg	11.5 cd	13.2 fg
Honeywood	11.9 d	13.0 efg
JB30	11.4 cd	13.7 gh
Martin	13.9 f	14.5 h
Nelson	11.6 cd	12.1 cde
Northline	11.9 d	12.8 ef
PAR 90	12.9 e	14.3 h
Parkhill	10.7 b	11.3 abc
Pearson II	11.1 bc	13.2 fg
Pembina	11.6 cd	11.6 bcd
Smoky	11.2 bc	12.8 ef
Success	9.5 a	10.6 a
Theissen	13.3 f	14.4 h
Mean	11.6	12.7
(S.E.)[2]	(0.21)	(0.27)

[1]Mean within a column followed by the same letter are not significantly different using SAS LMEANS ($p \leq 0.05$).
[2]Standard Error.

that of many other cultivars including 'Smoky' and 'Honeywood' which seemed to have smaller fruit than usual that year.

Some similar observations with regards to fruit size have been published. Fruit of 'Thiessen' were previously noted to be very large (5, 7). The cultivar 'Martin' was derived from a seedling of 'Thiessen' and was selected for its large fruit size (6). Some discrepancies between previous published information and the results from these trials are worthwhile noting. The cultivar 'Pearson II' was reported to have fruit up to 10 mm in diameter (6), however our data indicate that the fruit of 'Pearson II' are much larger than this with diameters often up to 14 to 15 mm. Likewise, 'Success' was reported to have fruit up to 14 mm in diameter (6); although the occasional fruit of 'Success' was found to reach this size, by far the majority of the fruit were much smaller with a mean diameter closer to 10 to 11 mm.

Fruit size did not differ significantly between the two sites except in 1996 in which case 17% more fruit were required to fill one cup at Moonlake than at the U of S (Table 3).

Yield: Accurate yield data were difficult to collect because of uneven ripening, drop of overripe fruit and loss to bird feeding. Nevertheless, the data collected allowed for a relative comparison of cultivars in terms of potential total yield. Fruit yield in 1994 and 1995 is more of an indication of plant precocity rather than a cultivar's yielding ability (Table 5). In 1994, the cultivars 'Nelson', 'JB30', 'Forestburg' and 'PAR 90' produced no fruit because they were planted later than the other cultivars. Disregarding these four cultivars, 'Bluff' produced significantly more fruit than 'Smoky', 'Thiessen' and 'Martin'. In 1995, the cultivar 'Parkhill' (mean = 1301 g) was the highest yielding producing significantly more fruit than 'Pembina', 'Forestburg', 'PAR 90', 'JB30', and 'Nelson' (mean = 254 g). The latter four cultivars were younger than the others, therefore, they produced fewer fruit. Yield was not significantly different in 1996. There was substantial variability in the data as indicated by the relatively high standard error that year. In spite of the lack of significance, a trend existed in the data similar to that in 1994 and 1995 with 'Parkhill' yielding the most fruit. This was the first season that 'Nelson' produced any fruit, although only at the Moonlake site (mean = 374 g/plant at Moonlake). In 1997, 'Pearson II' yielded significantly more fruit than the majority of the other cultivars. The cultivars 'Smoky', 'Honeywood', 'Thiessen', 'Forestburg', 'Northline' and 'Parkhill' were also among the highest yielding cultivars along with 'Pearson II' (mean = 3581 g) and did not differ significantly from each other; all of these cultivars had significantly greater yields than 'Success', 'Nelson' and 'Pembina' (mean = 834 g). Overall yield was lower in 1998 than in 1997, decreasing by a mean of approximately 1 kg per plant. Not all cultivars experienced a decrease in yield; the yield of 'Bluff' and 'Martin' increased in

Table 5. Fruit yield per plant from 1994 to 1998 of 15 saskatoon cultivars at Moonlake and the University of Saskatchewan (U of S). Yield from 1996 to 1998 are estimates of potential yield if all fruit had been ripe at the time of harvest.

	Yield (g)					Cumulative Yield (g)
	1994	1995	1996	1997	1998	1994 to 1998
Cultivar						
Bluff	35.7 e[1]	733 bcd	1043	2294 abcd	2381 ef	6566 bcd
Buffalo	8.6 de	772 bcd	827	2501 bcd	1642 cdef	6069 bcd
Forestburg	0.0 ab	346 bc	829	2837 cde	2222 def	6571 bcd
Honeywood	5.8 cde	1204 cd	464	3883 def	1778 def	7605 cd
Martin	0.5 abcd	888 bcd	805	2466 bcd	2997 f	7266 bcd
Nelson	0.0 a	0 a	187	857 ab	569 ab	1629 a
Northline	2.5 bcde	908 bcd	1095	2837 cde	1320 abcde	6380 bcd
PAR 90	0.0 abc	299 b	613	1705 abc	1476 bcde	3949 abc
Parkhill	19.0 de	1301 d	1601	2570 bcde	1248 abcde	6750 bcd
Pearson II	1.6 abcde	1192 cd	718	5487 e	1843 def	9459 d
Pembina	1.1 abcde	359 bc	546	694 a	477 a	2136 a
JB30	0.0 a	268 ab	426	1851 abc	1083 abcd	3876 ab
Smoky	0.2 abcd	1197 cd	600	4597 de	1638 cdef	8324 d
Success	2.1 abcde	403 bcd	409	950 abc	692 abc	2516 a
Theissen	0.3 abcd	742 bcd	804	2859 cde	1970 def	6398 bcd
Site						
Moonlake	5.10 a	791	838	2895	2251 a	7099 a
U of S	0.04 b	472	626	1934	862 b	3975 b
Transformation	$(X)^{0.2}$	SQR[4]		SQR	SQR	SQR
Mean[2]	0.982	24.92	932	1546	1215	2329
(S.E.)[3]	(0.387)	(5.42)	(250.4)	(237.4)	(151.9)	(258.6)

[1]Means within a column followed by the same letter for cultivar and site separately are not significantly different using SAS LSMEANS ($p \leq 0.05$).
[2]The transformed mean and the transformed standard error of the cultivar are presented when data were transformed prior to analysis.
[3]Standard Error.
[4]Square root transformation.

1998 by 87 and 531 g, respectively. These were the two top yielding cultivars in that year although not significantly different from a number of the other cultivars. Of these 'Martin' yielded significantly greater fruit by a mean of 2016 g than 'PAR 90', 'Northline', 'Parkhill', 'JB30', 'Success', 'Nelson', and 'Pembina'. Once again, 'Pembina' and 'Nelson' were among the lowest yielding cultivars (mean = 523 g). 'Pearson II', 'Smoky', and 'Honeywood' were among the cultivars with the highest cumulative yield over five years (mean = 7965 g); their yields were significantly greater than that of 'JB30', 'Success', 'Pembina' and 'Nelson' (mean = 2539 g).

Cultivar yield performance in these trials agrees with previous observations. 'Smoky' was known to produce high yields, and 'Honeywood' to be fairly productive and precocious (5, 7). 'Pearson II' is a seedling selection of 'Smoky', and like 'Smoky', it is not surprising that it was equally high-yielding (6). The cultivars 'Nelson', 'Pembina' and 'Success' in particular had low cumulative yields, yielding significantly less than all other cultivars except 'JB30' and 'PAR 90'. 'Forestburg'

(at one site), 'JB30' and 'PAR 90' were planted later than the other cultivars. In spite of this, the yields of 'Forestburg' were among those of the highest yielding cultivars in 1997 and 1998. The low yields of 'Nelson' are primarily due to the fact that the plants were two years younger. Although making direct comparisons between years is not possible, yields of 'Nelson' in its fourth (1997) and fifth (1998) years are comparable to those of most of the other cultivars in their fourth (1995) and fifth (1996) year. Another factor contributing to the low yields of 'Nelson' and 'Success' was that both these cultivars have a dwarf habit which naturally may yield less than taller cultivars. In addition, problems with establishment and vigour of 'Nelson' existed at the U of S site which resulted in lower yields than what may be normal for this cultivar ('Nelson' yielded 48% of the mean of all the cultivars at Moonlake compared to only 10% at the U of S). The poor performance of 'Nelson' at the U of S is thought to be associated with the heavy clay soil at this site; Moonlake has a lighter-textured loam soil which appeared to be more favourable for saskatoons. The low yields of 'Pembina' were unexpected and may indicate that it is not a very precocious producer, as this cultivar was normally considered to be fairly productive (6). In the current trials, 'Parkhill' was the most precocious of the cultivars, however within three years, it was soon outyielded by other more productive cultivars ('Pearson II', 'Smoky' and 'Honeywood').

In all years, fruit yield at the Moonlake site was greater than that at the U of S, however, this difference was only significant in 1994 and 1998 (Table 5). Plants at the Moonlake site in 1998 yielded 161% more fruit than those at the U of S. Cumulative yield was also significantly greater at Moonlake by a mean of 3 kg per plant.

Summary and Conclusions

Differences were found among the 15 saskatoon cultivars tested with regards to suckering, blossom time, fruit size, and fruit yield. Plant growth measured as the yearly increase in stem diameter did not significantly differ among the cultivars; plant growth measured as the length of the current season's shoot growth differed significantly only in one year of the four that it was measured. In 1994, 'Thiessen' had a greater current season's shoot growth than most of the other cultivars. Total sucker production over the seven years was the least among the cultivars 'Thiessen', 'Nelson', 'Forestburg', 'Pembina', 'JB30', 'Martin' and 'PAR 90'; the cultivars 'Parkhill', 'Bluff' and 'Buffalo' produced the most suckers per plant. Cultivars that tended to bloom earlier included 'Bluff' and 'Parkhill'; 'Thiessen' and 'Martin' also blossomed relatively early. 'Pembina', 'Success', 'Northline' and 'JB30' were among the last of the cultivars to blossom. 'Martin' and 'Thiessen' had the largest fruit overall, followed by that of 'PAR 90' and 'JB30'. The cultivars, 'Success', 'Parkhill' and 'Bluff' produced the smallest fruit in this trial. The top yielding cultivars were 'Pearson II', 'Smoky' and 'Honeywood'; the yield of 'Pembina' was unexpectedly quite low.

Plants at the Moonlake site tended to exhibit a more vigorous growth with a greater sucker production and a significantly larger overall yield than at the U of S site. These differences are mainly attributed to the lighter-textured loam soil at Moonlake being more favourable for saskatoon growth compared to the heavier-textured clay soil at the U of S site.

High yielding cultivars with good fruit size are important for the commercial production of saskatoons. A large fruit size is particularly attractive to the U-pick market. Plants with minimal suckering are easier to maintain and reduce pruning costs. Late-blooming cultivars are more likely to avoid crop loss due to late spring frosts.

This study was useful in quantitatively characterizing and comparing a large number of saskatoon cultivars. A continuation of this research into plant maturity would be of great benefit particularly for the examination of such traits as yield, growth and suckering.

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American Pomological Society Website is Revised and Expanded

The website for the American Pomological Society, located at http://hortweb.cas.psu.edu/aps, has been updated and expanded to better meet the needs of APS members. The site contains general information about the Society, its purpose, history and membership. Officers can be located and contacted, by-laws, membership and journal information is presented, and links to other pomology web sources are available. Tables of contents for recent volumes of the Journal of American Pomological Society and Fruit Varieties Journal are listed along with contact information for new fruit and nut registrars. An archival listing of APS award recipients is available for pomological history buffs. Input from members is encouraged.

Please help keep this site accurate and contemporary! Email Kim Hummer (hummerk@bcc.orst.edu) or Joseph Postman (jpostman@ars-grin.gov) NOW to submit interesting pomology photos, news items or suggest links to add. Webmasters of fruit related websites are encouraged to link to this site.

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Call for Wilder Medal Nominations

The Wilder Medal Committee of the American Pomological Society (APS) invites nominations for the 2002 Wilder Silver Medal Award. The Wilder Medal was established in 1873 in honor of Marshall P. Wilder, the founder and first President of the Society.

The Wilder Medal is conferred on individuals or organizations which have rendered outstanding service to horticulture in the area of pomology. Special consideration is given to work relating to the origination and introduction of meritorious fruit cultivars. Individuals associated with either commercial concerns or professional organizations will be considered if their introductions are truly superior and have been widely planted.

Significant contributions to the science and practice of pomology other than through fruit breeding will also be considered. Such contributions may relate to any important area of fruit production such as rootstock development and evaluation, anatomical and morphological studies, or noteworthy publications in any of the above subjects.

To obtain nomination guidelines, contact committee chairperson, Desmond R. Layne, Dept. of Horticulture, Box 340375, Clemson University, Clemson, SC 29634-0375; phone: 864-656-4960; fax: 864-656-4960; e-mail: dlayne@clemson.edu. Nominations must be submitted by **1 May 2002.**