Banana Supreme yielded 30 tons/acre (67 t·ha^{-1}) . Yields for all cultivars were much lower at QSND under severe BLS epidemic conditions (Table 5). All cultivars, including 'Pageant' were affected by BLS. 'Pageant' appeared to be segregating for resistance or was perhaps a mixture of susceptible and resistant plants with 12 out of 16 plants appearing to be very susceptible. 'Market Sweet', a susceptible cultivar, had about the same level of disease as 'Pageant'.

Miscellaneous specialty peppers. One habanero pepper (*Capsicum chinense*), one home garden hot pepper ('Super Chili'), and a large-fruited cayenne type hot pepper ('Mesilla') were included in the RACE trials. Yields of each cultivar were high at LEX but reduced by severe BLS pressure at QSND (Tables 6 and 5, respectively). Although yields were reduced at QSND, the habanero pepper had only 22% of its leaves with symptoms and very little defoliation in spite of not having any known BLS resistance gene (Table 5).

Xcv races. Although eleven Xcv races have been identified to date (Ritchie et al., 1998), only races 1, 3, 4, and 6 are of economic importance in the United States at this time. Races 1, 3, and 6 (1995) and races 1, 3, and 4 (1996) had been recovered at the end of the season from previous trials at QSND after susceptible transplants had been inoculated with races 1, 2, and 3 (Rowell et al., 1999). Races 3 and 6 were detected at the end of the 2000 season in the QSND bell pepper trial. Race 6 was detected in one of only two samples collected from the QSND hot/specialty trial. Only race 3 was detected in samples collected from the affected hot and specialty cultivars at LEX.

Race 6, for which resistant cultivars are not currently available, was found associated with some of the cultivars appearing to be the most resistant in the QSND trial ('X3R Ironsides' and jalapeño 'X3R Ixtapa') while only race 3 was found on leaf samples from 'Boynton Bell', 'Lexington', and 'King Arthur'. Several cultivars were high yielding with few BLS symptoms and little defoliation in spite of the severe epidemic and the presence of race 6 in the trial field. All Xcv isolates from the QSND trials were sensitive to both copper and streptomycin indicating that these materials can still be effective in controlling BLS under certain conditions in Kentucky.

Pepper types, cultivars, and bacterial spot risk. Eastern and central Kentucky growers experienced periodic devastating BLS epidemics before the widespread planting of *Bs2*-gene resistant bell pepper cultivars. Our studies indicate that there is considerable variation in the degree of resistance among these cultivars and that some "resistant" cultivars are much more susceptible than others. There is increasing interest in Kentucky and other states in growing hot and specialty peppers, most of which do not carry any major resistance gene. While there is a significant risk of serious BLS epidemics associated with the production of some of these cultivars, others can be grown with less likelihood of disaster (Table 7), especially with timely protectant chemical applications.

As part of an overall pest management program, we recommend that pepper growers produce their own transplants using treated seed whenever possible and to practice strict greenhouse and field sanitation. We recommend that growers use horticulturally acceptable resistant cultivars in conjunction with copper plus maneb protectant spray treatments. Further research will help determine to what extent these treatments can be minimized with resistant cultivars.

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Evaluation of Carrot Cultivars for Cut and Peel Processing in Prince Edward Island, Canada, 1997–98.

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Additional index words. *Daucus carota* , yield

Summary. **Twelve carrot (*Daucus carota*) cultivars were evaluated at two sites in 1997 and 13 carrot cultivars were evaluated at one site in 1998 for their potential use as cut and peel carrots. The cultivars were evaluated for total yield, marketable yield and root characteristics. Yields were quite variable with the highest yielding cultivars having the shortest root length. Of the cultivars tested, 'Presto' produced high marketable yields, root diameters and root weights, however, it was very short. 'Indiana' produced consistent yields and stand with a good root length. 'Bolero', 'Presto' and Indiana' were the best performing cultivars for cut and peel production in Prince Edward Island, Canada.**

Carrots have been an important vegetable crop in Prince Edward Island (PEI), Canada, with a farm gate value of about CDN $ 2.5 million (PEI Department of Agriculture and Forestry, 1999). The crop is primarily grown for the fresh pack wholesale and retail market and produces an average yield of about 13 tons/acre (29.1 t·ha^{-1}). Recently, a small acreage of processing

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carrots has been grown successfully in PEI for a major processing plant in Nova Scotia. Construction of a vegetable processing plant within the province resulted in a group of growers needing information on the potential for production of carrots for cut and peel processing. In Nova Scotia, carrots grown for cut and peel produced marketable yields of 12 to 16 tons/acre (26.9 to 35.8 t·ha^{-1}) of grade size ranging from 0.5 to 1.75 inches (1.27 to 4.44 cm) in diameter (K. Best, personal communication). K. Vander Kooi in Ontario (personal communication), also reported marketable yields for cut and peel carrots of 7.8 to 13.8 tons/acre (17.5 to 30.9 t·ha^{-1}). Greenland et al. (1999) reported carrot yields of 12 to 28 tons/acre (26.9 to 62.7 t·ha^{-1}) of grade size ranging from 0.75 to 1.5 inches (1.91 to 3.81 cm) in diameter. The objective of this study was to evaluate carrots cultivars for cut and peel processing in PEI.

Materials and methods

Field trials were conducted at three sites over 2 years, 1997–98, in PEI (lat. 46°20'N and long. 62°60'W). Carrots were grown at Heatherdale and Valleyfield in 1997 and Cardigan in 1998 to evaluate their potential for cut and peel processing. The soils were Orthic Humo-Ferric Podzols with loamy sand to sandy loam textures. Clay content (<2μm), silt (2 to 50 μm), and fine sand (50 to 250 μm) content ranged from 5% to 12%, 10% to 25%, and 25% to 28%, respectively. The climate of PEI is humid with a cool boreal temperature regime and a relatively short growing season (May to October). Immediately prior to hill formation, 650 lb/acre (728 kg·ha^{-1}) of 6N–10P–18K–0.2B–4Zn–2Mg was broadcast on fall plowed cereal fields and incorporated with harrows to a depth of 4 inches (10 cm). The source of nutrients were ammonium nitrate, diammonium phosphate, muriate of potash, FBD, zinc, and K–Mag. Carrot seeds were planted using a precision Stanhay 785 Singulaire air seeder (Stanhay Webb Ltd., Exning, Newmarket, Suffork, UK) on hills 7 inches (18 cm) wide across the top and about 11 inches (28 cm) high at a target planting density of 50 seeds per ft (164 seeds/m) in a three-line staggered arrangement. Each line was 1.5 inches (3.8 cm) apart. Seeding rate was adjusted to compensate for the certified percent germination of each cultivar. Plots consisted of two hills 30 ft (9.1 m) long with 3 ft (0.91 m) between hills. All data was collected from the hill that was seeded with the same seeding unit of the two-row Stanhay seeder. Planting dates were 9 and 12 June in 1997 and 15 June in 1998. Weeds were controlled with a preemergence application of linuron (a.i.) at 0.54 lb/acre (0.6 kg·ha^{-1}) 5 to 7 d after seeding. A postemergence herbicide application was made of linuron (a.i.) at 0.69 lb/acre (0.77 kg·ha^{-1}) and fluazifop-p-butyl (a.i.) at 0.22 lb/acre (0.25 kg·ha^{-1}) at Heatherdale when carrots were 3 to 4 inches (7.6 to 10.2 cm) tall and annual grasses were at the two to five leaf stage. Diazinon (a.i.) was applied over the row at planting at 0.04 lb/acre (0.05 kg·ha^{-1}) for carrot rust fly (*Psila rosae*) control. Each site was monitored for diseases and insects, however, no additional control measures were warranted The experimental design was a randomized complete block with four replications. Plots were not irrigated.

The carrots were harvested on 7 and 14 Oct. 1997 and 25 Oct. 1998. Harvest area consisted of 16.4 ft (5 m) of row, excluding the ends. Roots >4 inches in length were hand sized according to crown diameter into small [0.38 to 0.62 inches (9.5 to 16 mm)]; medium [0.62 to 0.88 inches (16 to 22 mm)]; large [0.88 to 1.0 inches (22 to 25 mm)] and unmarketable (<4 inches in length, aster yellows, crooked, growth crack). Weight of each size class was determined and total yield calculated. Mean length and midpoint diameter were also calculated by measuring a total of 20 randomly picked roots proportionately selected by yield from the small, medium and large grade size. Mean root weight was calculated from the total weight of marketable roots divided by the number of marketable roots. Carrot stand was determined by dividing the total number of roots at harvest by the target planting density. Means were separated with Fisher's least significant difference (LSD) test at the 5% level of significance (SAS Institute, 1998).

Carrot seeds were obtained from the following sources: Vilmorin Inc. (Empire, Calif.), Sunseeds Co. (Morgan Hill, Calif.), Bejo Seeds Inc. (Oceano, Calif.), Syngenta Seeds Inc. (Boise, Idaho), Daehnfeldt Inc. (Albany, Ore.), Seminis Vegetable Seeds, Oxnard, Calif., and Chriseed Co. (Mount Vernon, Wash.).

Results and discussion

1997 TRIAL. Overall, marketable yield ranged from 6.4 to 17.1 tons/acre (14.3 to 38.3 t·ha^{-1}) and 5.9 to 12.0 tons/acre (13.2 to 26.9 t·ha^{-1}) at Heatherdale and Valleyfield, respectively, with all cultivars harvested at 124 to 134 d (Table 1 and 2). 'Presto', 'Bolero' and 'Primecut' were among the top five yielding cultivars at both sites in 1997 based on marketable yield. 'Presto' and 'Bolero' had the greatest marketable yield at Heatherdale and Valleyfield. 'Presto' had the greatest plant stand at both sites. Overall, plant stand was low, ranging from 30 to 70% of the desired target stand. 'Bolero' had the greatest percent marketable yield (78%) at Heatherdale with 'Indiana' (59%) at Valleyfield. Across sites, percent marketable of small, medium and large ranged from 3% to 27% (mean = 10%), 41% to 66% (mean = 57%) and 12% to 51% (mean= 33%) in 1997, respectively (data not shown).

Across sites, 'Presto' had the greatest midpoint diameter, followed by 'Bolero' and 'Enterprise' (Table 4). Most cultivars had an overall root length greater than 6 inches, however, 'Presto' and 'Bolero' were the shortest at 5.6 and 5.2 inches (14.2 and 13.2 cm), respectively. 'Enterprise' had the greatest root weight.

1998 TRIAL. Overall, marketable yield was 9.4 to 17.1 tons/acre (21.2 to 38.3 t·ha^{-1} with all cultivars harvested at 132 d after seeding (Table 3). 'Enterprise' had the greatest marketable yield and percent marketable carrots. 'Presto' had 45% marketable yield, however it yielded 15.6 tons/acre (34.9 t·ha^{-1}). Percent stand ranged from 57% to 108% in 1998. Percent marketable of small, medium and large ranged from 2% to 14% (mean = 8%), 45% to 68% (mean = 57%) and 12% to 51% (mean= 35%) in 1998, respectively (data not shown). In 1998, 'Presto' had the greatest midpoint diameter and 'SXC 3274' the greatest root length (Table 4). 'Plato' had the greatest root weight. 'Enterprise' was the best yielding cultivar in 1998 with 63% marketable yield from a 89% plant stand (Table 3) compared to Heatherdale in 1997, where it produced the lowest at 34% marketable yield from a 30% plant stand (Table 1). Lazacano et al. (1998) reported that

Table 1. Yield of carrot cultivars grown for cut and peel, Heatherdale, Prince Edward Island, Canada, 1997.

Cultivar	Seed source	Marketable yield[z] (tons/acre)[x]	Marketable yield[z] (%)[w]	Total yield (tons/acre)	Plant stand[y] (%)
Presto	Vilmorin	17.1 a[v]	59 b–c	29.3 a	66 a
Bolero	Vilmorin	15.0 a–b	78 a	19.3 b–c	62 a–b
Comanche	Sunseeds	12.3 b–c	58 b–c	21.1 b	54 a–b
Indiana	Bejo	11.6 b–c	60 a–c	19.2 b–c	58 a–b
Primecut 59	Sunseeds	11.3 b–c	54 c	21.5 b	55 a–b
Tripleplay 58	Sunseeds	11.0 c	54 c	20.9 b	53 a–c
RCR4677	Syngenta	10.4 c–d	70 a–b	15.0 d–e	47 b–d
Newport	Bejo	10.3 c–d	55 c	18.9 b–c	49 b–d
LDR945474	Daehnfeldt	9.9 c–e	54 c	18.3 b–d	38 c–e
Caropak	Seminis	9.8 c–e	58 b–c	16.8 c–e	48 b–d
Plato	Chriseed	7.2 d–e	50 c	14.3 e	36 d–e
Enterprise	Petoseed	6.4 e	34 d	17.8 b–e	30 e

[z]Marketable yield = 0.38 to 1 inch (9.5 to 25 mm) crown diameter.
[y]Plant stand = carrots per foot at harvest divided by target density at seeding of 50 seeds/ft (164 seeds/m) expressed as a percentage.
[x]1.0 ton/acre = 2.24 $t \cdot ha^{-1}$.
[w]Percent of total yield.
[v]Means in the same column followed by the same letter are not significantly different ($P \leq 0.05$) according to Fishers least significant difference test.

Table 2. Yield of carrot cultivars grown for cut and peel, Valleyfield, Prince Edward Island, Canada, 1997.

Cultivar	Seed source	Marketable yield[z] (tons/acre)[x]	Marketable yield[z] (%)[w]	Total yield (tons/acre)	Plant stand[y] (%)
Bolero	Vilmorin	12.0 a[v]	48 a–c	25.2 a	70 a
Presto	Vilmorin	11.1 a–b	50 a–d	23.0 a	60 b–d
Primecut 59	Sunseeds	9.9 a–c	53 a–c	18.7 b–c	57 c–d
Plato	Chriseed	9.8 a–c	52 a–c	18.8 b	53 d–e
Enterprise	Petoseed	9.4 b–d	48 a–c	19.5 b	43 e
Caropak	Seminis	9.4 b–d	54 a–c	17.6 b–d	69 a–b
Newport	Bejo	9.2 b–d	55 a–b	16.6 b–e	65 a–c
Indiana	Bejo	8.8 b–d	59 a	15.0 d–e	65 a–c
LDR945474	Daehnfeldt	8.6 c–d	55 a–b	15.8 c–e	52 d–e
RCR4677	Syngenta	7.9 c–e	48 a–c	16.5 b–e	58 c–d
Tripleplay 58	Sunseeds	7.0 d–e	45 b–c	15.7 c–e	46 e
Comanche	Sunseeds	5.9 e	43 c	13.8 e	51 d–e

[z]Marketable yield = 0.38 to 1 inch (9.5 to 25 mm) crown diameter.
[y]Plant stand = carrots per foot at harvest divided by target density at seeding of 50 seeds/ft (164 seeds/m) expressed as a percentage.
[x]1.0 ton/acre = 2.24 $t \cdot ha^{-1}$.
[w]Percent of total yield.
[v]Means in the same column followed by the same letter are not significantly different ($P \leq 0.05$) according to Fishers least significant difference test.

Table 3. Yield of carrot cultivars grown for cut and peel, Cardigan, Prince Edward Island, Canada, 1998.

Cultivar	Seed source	Marketable yield[z] (tons/acre)[x]	Marketable yield[z] (%)[w]	Total yield (tons/acre)	Plant stand[y] (%)
Enterprise	Petoseed	17.1 a[v]	63 a	27.2 c–d	89 b–d
Presto	Vilmorin	15.6 a–b	45 c–e	34.7 a	95 a–c
Indiana	Bejo	14.3 a–c	55 a–c	26.0 b–d	90 b–d
Newport	Bejo	14.1 b–c	58 a–b	24.2 d–e	78 d–e
Plato	Chriseed	12.9 b–d	50 b–d	25.9 b–d	60 f
RCR2566	Syngenta	12.6 b–e	48 b–d	26.3 b–d	108 a
RCR4677	Syngenta	11.7 c–f	43 d–e	27.0 b–d	88 b–d
RCR4256R	Syngenta	11.5 c–f	45 c–e	25.9 b–d	100 a–b
Caropak	Seminis	11.3 c–f	50 b–d	22.6 e	78 d–e
CXC2670	Chriseed	10.9 d–f	43 d–e	25.6 c–e	78 d–e
Sugarsnax	Sunseeds	10.3 d–f	35 e	28.9 b	66 e–f
SXC3274	Sunseeds	9.6 e–f	40 d–e	24.3 c–e	60 f
Tripleplay 58	Sunseeds	9.4 f	35 e	26.8 b–d	57 f

[z]Marketable yield = 0.38 to 1 inch (9.5 to 25mm) crown diameter.
[y]Plant stand = carrots per foot at harvest divided by target density at seeding of 50 seeds/ft (164 seeds/m) expressed as a percentage.
[x]1.0 ton/acre = 2.24 $t \cdot ha^{-1}$.
[w]Percent of total yield.
[v]Means in the same column followed by the same letter are not significantly different ($P \leq 0.05$) according to Fishers least significant difference test.

Table 4. Root characteristics of carrots cultivars grown for cut and peel processing in Prince Edward Island, Canada, 1997–98.

	1997[z]			1998		
Cultivar	Midpoint diam[y] (inch)[v]	Root length[x] (inch)	Root wt[w] (oz)[u]	Midpoint diam (inch)	Root length (inch)	Root wt (oz)
Presto	0.86	5.6	1.50	0.80	4.4	1.19
Bolero	0.79	5.2	1.21	---	---	---
Comanche	0.73	6.6	1.24	0.69	6.8	1.32
Indiana	0.73	6.7	1.20	0.67	6.6	1.01
Primecut 59	0.75	6.9	1.35	0.72	6.9	1.33
Tripleplay 58	0.75	6.7	1.49	0.70	6.5	1.30
RCR4677	0.69	6.3	1.13	0.67	6.7	1.07
Newport	0.74	6.4	1.24	0.68	6.5	1.13
LDR945474	0.73	6.9	1.46	---	---	---
Caropak	0.70	6.5	1.24	0.68	6.2	1.12
Plato	0.72	6.8	1.32	0.71	7.1	1.41
Enterprise	0.79	7.0	1.56	0.71	6.2	1.16
RCR2566	---	---	---	0.67	6.5	0.98
RCR4256R	---	---	---	0.66	6.6	0.98
CXC2670	---	---	---	0.67	6.5	1.11
Sugarsnax	---	---	---	0.71	6.8	1.37
SXC3274	---	---	---	0.71	7.2	1.40

[z]1997 = Mean of two sites, Heatherdale and Valleyfield.
[y]Midpoint diameter = weighted mean at the root midpoint by grade (small, medium, and large) of 20 roots.
[x]Length = weighted mean root length by grade (small, medium, and large) of 20 roots.
[w]Root weight = weighted mean root weight by grade (small, medium, and large) of 20 roots.
[v]1.0 inch = 2.54 cm.
[u]1.0 oz = 28 g.

root size at harvest proved to be the main factor affecting projected marketable processed yield of cut and peel baby carrots.

Overall, the total yield and plant stand was higher in 1998 than 1997. McCollum et al. (1986) reported that carrot yields are strongly dependent on plant density with total and marketable yields increasing as plant density increases. In this study, a target stand of 50 plants per foot in a three-line arrangement was chosen, however, plant stand ranged from 30% to 70% of target in 1997 and 57% to 108% in 1998. Low germination and plant stand would have contributed to considerable variation in carrot yield. Generally, greater yield was associated with greater plant stand at each site. Marketable yield and size distribution was comparable in both years. 'Presto' and 'Indiana' consistently produced good yield in both years, however, 'Presto' tended to be short in length.

Our results indicate that suitable carrots can be grown in PEI for cut and peel production. Performance of individual cultivars varied by site and season. Marketable yields of 9 to 17 tons/acre (20.1 to 38.1 $t \cdot ha^{-1}$) were attainable with most cultivars. Based on marketable yield, percent marketable and stand, the best performing cultivars were 'Bolero', 'Presto', and 'Indiana'. 'Presto' had consistently high marketable yield. 'Indiana' had consistent yield, stand and good root length, which would contribute to maximize quantity of cut and peel product.

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