Expanding Winter Harvest and Sales for New England Vegetable Crops

Expanding Winter Harvest and Sales for New England Vegetable Crops is a three-year project (2010-2013) funded by USDA/Northeast SARE.

A major goal of this project is to look into improving the quality and longevity of storage crops. We are currently researching varieties, harvest dates, post-harvest handling and storage methods using carrots as a model crop for long-term storage. Methods and preliminary results from 2010 trails are below.

Planting: June 28th 2010. Direct seeding was done with a using a Clean Seeder model JP-1. Settings for rollers included; for seed sized 1.8 to 2.0 mm, roller x-24 was used with a gear setting of 9 rear and front 14. For this particular set up, test samples indicated an average seed drop of 27 per ft. For seed sized 1.6 to 1.8 mm, roller x-12, gears R 9, F 14; samples indicate average seed drop at 31 per ft. For Clean Seeder rollers x indicates hole size for holding seed and 12 indicates number of holes on the roller. 24 has double row. At planting the furrow maker was set for ½ inch seed depth, approx. Soil conditions were dry; seedbed raked clean of debris and smoothed out. String was used to mark each row, seeded was planted consistently on the north side of each string for each plot.

Plot Layout: Randomized controlled block design with 4 replicates each consisting of 6 treatments (carrot variety). Each plot consists of 2 rows, 18 inches apart, 20 ft long with no break between plots. Each replicate consists of six 20-ft double rows totaling 120 ft in length. Replicates were separated by 5 ft.

	Carrot Variety Trial 2010 Plot Layout						
	1.5'		1.5'		1.5'		1.5'
	REP 1	5' aisle	REP 2	5' aisle	REP 3	5' aisle	REP 4
20'	V6		V2		V1		V5
20'	V5		V6		V4		V2
20'	V2		V4		V2		V4
20'	V3		V5		V6		V3
20'	V1		V1		V3		V6
20'	V4		V3		V5		V1
120'	total per rep						

Treatments/Varieties:

V1 Canada (Bejo, size 1.6-1.8)

V2 Carson (Bejo, size 1.8-2.0)

V3 Bastia (Bejo, size 1.8-2.0)

V4 Berlanda (Bejo, size 1.8-2.0)

V5 Bolero (Johnny's, listed at 1.6-1.8 but seed appears to be closer to size 1.8-2.0 so we used x-24 roller)

V6 Sugarsnax (Johnny's, size not listed but appears to be size 1.6-1.8 so we used x-12)

Harvest Methods: Carrots were harvested on September 29th, October 12th, October 27th and November 10th. A digging fork was used to loosen soil. Carrots were pulled by hand placed in a bin and labeled with rep & variety**.** Tops were clipped to leave ½ inch of stem and then washed in plain water initially followed by a second wash in a bleach solution of 1/4 cup bleach per 4 gallons water. Total weigh of harvest per plot was measured in pounds.

Evaluation Methods: At harvest carrots were sorted into marketable, those with characteristics of USDA; United States Standards for Grades of Topped Carrots U.S. No.1 and U.S. No.2. Carrots with characteristics out side of these parameters were categorized as culls. Categories for culls included: small, insect damage, splits, misshapen, forks, hairy (excessive root growth on carrot). At each harvest a subset of marketable carrots was placed in storage and evaluated monthly over the course of four months. Monthly samples looked at brix and water loss. Samples from each harvest date were tracked separately. Storage conditions were maintained at 32-34°F and 95% relative humidity as much as possible. Carrots were stored in perforated poly bags. Below are details of evaluation standards used at harvest.

Culls

- Small - carrots with length less than 5 inches.
- Insect damage – appears to mostly be wireworm, but insects not present so can't tell. Some secondary rot beginning to show at 3rd harvest, but still counted as insect damage. Other attributes (such as shape) not considered, insect trumps others.
- Split—usually lengthwise, but sometime crosswise. Caused by growth of carrot, not by external injury sometimes (3rd harvest) shows beginning of secondary disease.
- Misshapen – intact, no forks, but whole carrot bends or twists. Marketable size. Will be pooled with other marketable carrots for a 'direct sales marketable' category eg farmers market, maybe even whole foods, but not the mainstream wholesale market. We need to do more queries on what's marketable in which market
- Forks – any forking including 'buds' forming below first two inches of the carrot or a fork at the very tip, ie two buds at the tip. For harvest 3 and 4, these are divided into those with minor forking (eg buds only, fork near the tip only) which will be considered marketable for direct markets, and major forks which begin well up the stem and divide the stem into two or more parts. Our info at this time suggests these would be left in the field as culls, at least in many operations.
- Hairy – starting in harvest 3, we found enough with rootlets growing off the sides to start a new category. This was especially noticeable in V5 but also in others but in very small numbers of carrots. Sometimes accompanied by a roughening and darkening of the skin (esp V5).

Marketable

- Total marketable carrots for each treatment were weighed in the field. A sample of ten of these was evaluated at the lab. Measurements taken on each individual carrot in the lab included length, pith diameter and bitterness.

Preliminary Results

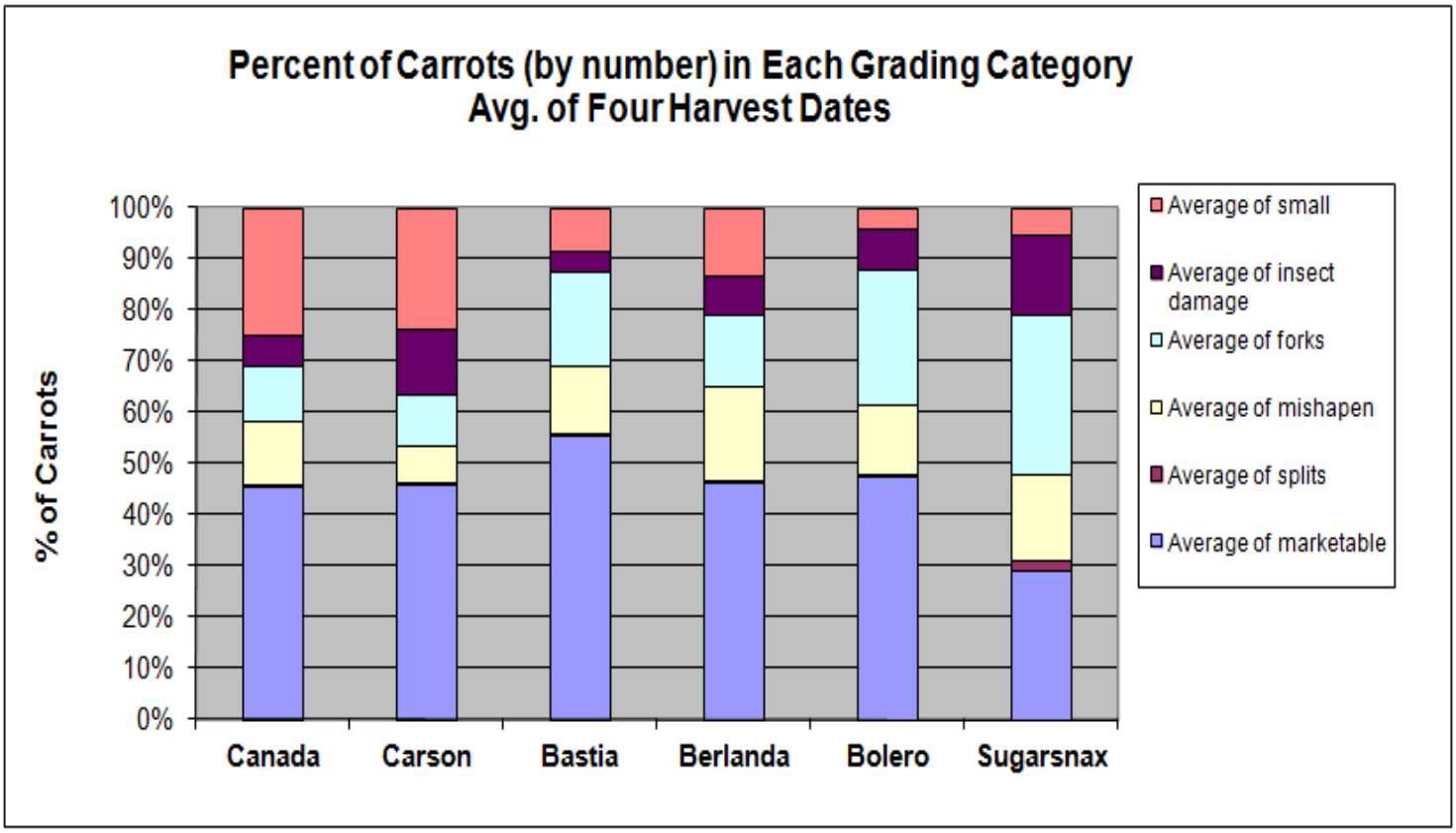

Figure 1. Percentage of carrots in each grading category across all harvest dates.

Overall it appears that Bastia had the highest number of marketable carrots followed by Bolero and Carson. Sugarsnax had the highest number of culls particularly forked and misshapen carrots.

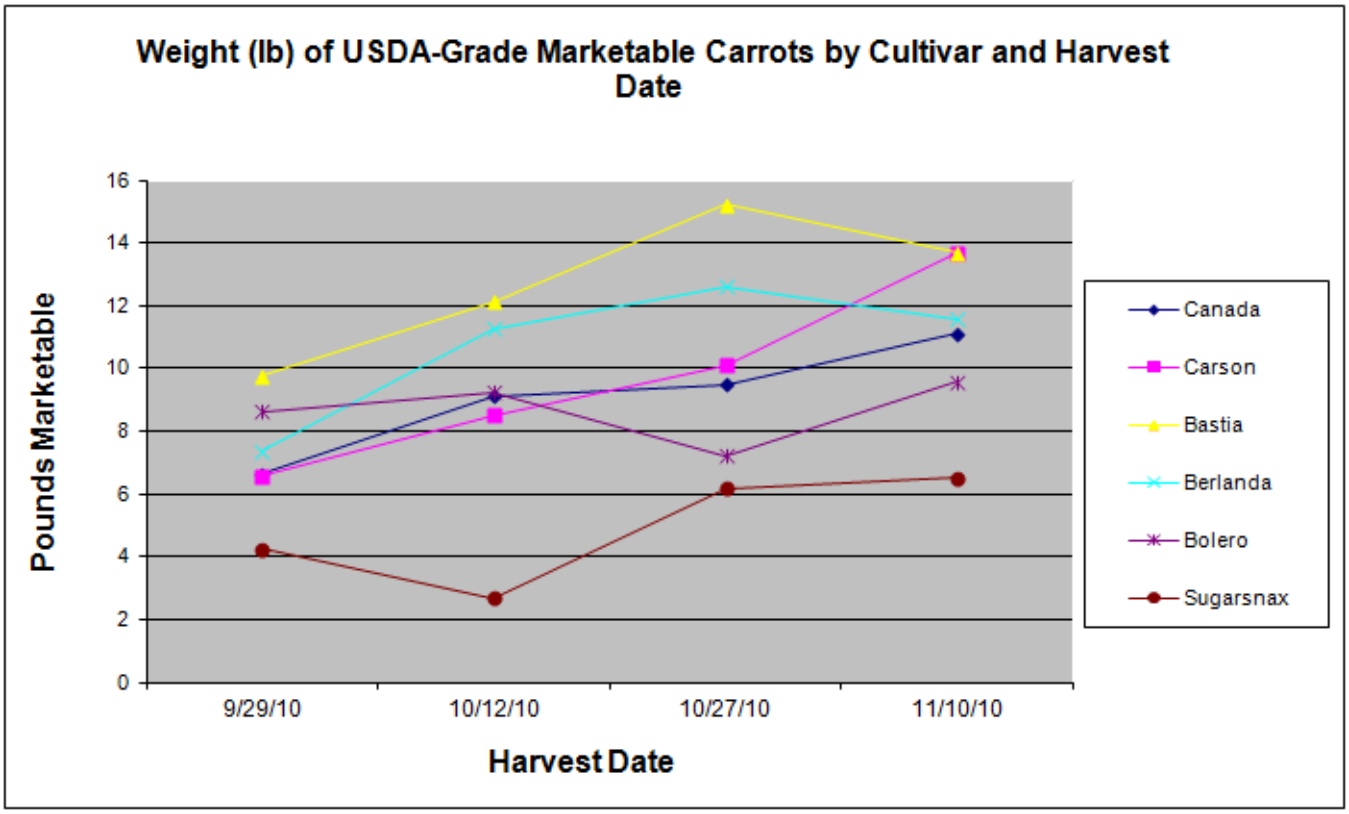

Figure 2. Weight of marketable carrots by variety for each harvest date.

Weight of marketable carrots appeared to increase across harvest dates for most varieties, indicating that carrots continued to grow late into the season without compromising quality from insects, disease, or other factors. Quality of Berlanda and Bastia may have started to decline at the end of the harvest period.

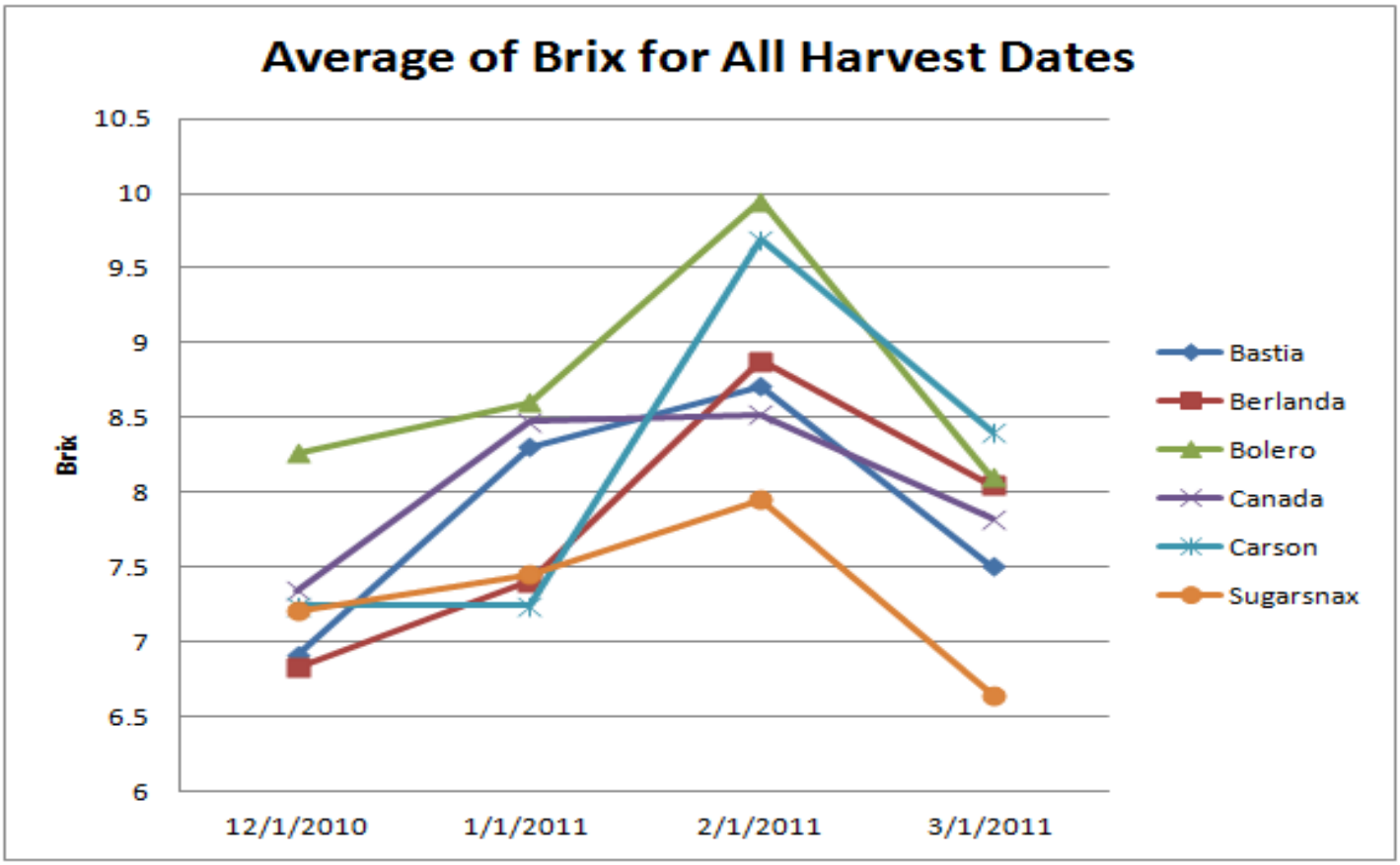

Figure 3. Brix scores by variety over the course of four months of storage

Overall, brix appears to increase during storage for the first several months and then decline rapidly. Based on this graph we could say peak brix or sweetness occurred after certain duration of storage for all varieties before beginning to decline. We are still exploring the interaction between harvest date, variety, and length of storage on brix.