2010 Organic Carrot Variety Trial Results

The following tables present the results of organic carrot variety trials that took place on research stations and cooperating farms in Washington, Oregon, Wisconsin, Minnesota, and New York in 2010. These trials were part of the USDA-OREI funded project “Northern Organic Variety Improvement Collaborative”. Trials will continue in 2011, 2012, and 2013.

Detailed descriptions of the trial methods and rating systems are listed after the results tables.

Table 1: NOVIC 2010 Washington Carrot Data

Variety Name	Top Height (1-5)	Tip Fill (1-5)	Uniformity (1-5)	Root Shape (1-5)	Flavor (1-5)	Notes
Bolero	3.33 a	3.67 a	3.60 ab	4.17 ab	3.00 a	
Mokum	1.50 a	3.00 a	3.67 ab	3.00 c	3.00 a	
Napoli	2.62 a	3.57 a	3.50 ab	3.50 bc	1.93 a	truly bland with off flavor, best texture of trial
Nectar	2.67 a	3.17 a	4.20 a	3.25 bc	2.33 a	Some real soapy examples, truly a poor tasting carrot,
Nelson	2.00 a	3.57 a	3.58 ab	3.43 bc	1.93 a	
Nerja	1.67 a	2.79 a	4.00 a	3.14 bc	2.29 a	perfumy and tender
Rumba	2.67 a	3.57 a	3.83 ab	3.93 abc	2.86 a	surprise chewy-not so good/pulls long here
Scarlet Nantes	2.67 a	3.86 a	2.67 b	4.14 ab	3.14 a	
Spring Market	3.25 a	4.14 a	3.33 ab	4.86 a	2.14 a	Dense, chewy, and real variartion for tenderness (fibrous but some much better),
Yaya	2.00 a	3.17 a	3.70 ab	3.33 bc	2.67 a	

Trait scores are colored on a spectrum with green being best and red being worst. Letters after the scores represent groups of varities whose means are not significantly different for that trait. In other words, all the varities which have a score with an "a" after the number have essentially the same score for that trait. For more information about what the scores mean and how they were measured, please see the protocols at the end of this document.

Table 2: NOVIC 2010 Oregon Carrot Data

Variety Name	Top Height (1-5)	Top Density (1-5)	Foliar Disease Resistance (1-5)	Root Shape (1-5)	Tip Fill (1-5)	Flavor	Notes
Bolero	3.50 ab	3.50 ab	2.75 a	4.17 ab	2.50 ab	4.25 a	strong tops / 2 split roots
Napoli	2.83 bc	3.00 bc	5.00 a	3.33 bc	2.83 ab	2.50 a	split roots, strong tops / 2 split roots
Nectar	3.33 b	3.50 ab	4.50 a	3.83 bc	3.00 a	4.00 a	poor uniformity,
Nelson	2.33 bc	2.83 bc	4.75 a	3.00 c	2.92 ab	3.00 a	variable flavor, split roots, 1 badly split root, somewhat variable shape, strong tops / 1 split root
Nerja	3.00 bc	3.67 ab	4.25 a	1.67 d	1.67 b	1.75 a	immature and small, 1 badly split root, many mishapen roots, 4 tops broke during harvest
Rumba	2.17 bc	1.83 c	4.25 a	4.17 ab	2.67 ab	2.00 a	highly variable especially rep to rep, some split roots,
Scarlet Nantes	3.00 bc	3.33 b	3.50 a	3.83 bc	3.23 a	2.75 a	variable, all plots highly variable, 1 bolting on 10/27,
Spring Market	4.83 a	4.83 a	4.00 a	5.00 a	3.50 a	1.75 a	1 split root
Yaya	1.83 c	2.33 bc	4.00 a	3.00 c	3.00 a	2.25 a	variable flavor, lots of split roots, most uniform at LBF, 3 tops broke during harvest

Trait scores are colored on a spectrum with green being best and red being worst. Letters after the scores represent groups of varities whose means are not significantly different for that trait. In other words, all the varities which have a score with an "a" after the number have essentially the same score for that trait. For more information about what the scores mean and how they were measured, please see the protocols at the end of this document.

Table 3: NOVIC 2010 New York Carrot Data

Variety Name	Top Height (1-5)	Top Density (1-5)	Foliar Disease Resistance (1-5)	Root Shape (1-5)	Tip Fill (1-5)	Uniformity (1-5)	Flavor (1-5)
Bolero	4.00 abc	5.00 a	4.67 ab	3.00 bc	3.00 ab	4.00 a	3.30 a
Napoli	2.33 bcd	2.67 abc	2.67 bcde	3.00 bc	3.00 ab	3.00 a	4.31 a
Nectar	3.00 abcd	3.33 abc	2.33 cde	3.33 abc	2.00 b	2.67 a	2.48 a
Nelson	1.33 d	2.00 bc	1.33 e	3.00 bc	3.00 ab	4.00 a	3.25 a
Nerja	1.00 d	2.67 abc	4.00 abc	2.67 c	2.33 b	4.33 a	2.26 a
Rumba	2.67 abcd	2.67 abc	3.00 abcde	4.00 abc	2.00 b	3.00 a	4.33 a
Scarlet Keeper	5.00 a	4.33 ab	3.67 abcd	4.67 ab	4.67 a	2.67 a	3.02 a
Scarlet Nantes	2.33 bcd	3.00 abc	3.00 abcde	3.33 abc	3.33 ab	2.67 a	2.71 a
Spring Market	4.33 ab	4.00 abc	5.00 a	5.00 a	3.00 ab	3.67 a	2.55 a
Yaya	1.67 cd	1.67 c	1.67 de	3.00 bc	3.00 ab	4.00 a	2.91 a

Trait scores are colored on a spectrum with green being best and red being worst. Letters after the scores represent groups of varities whose means are not significantly different for that trait. In other words, all the varities which have a score with an "a" after the number have essentially the same score for that trait. For more information about what the scores mean and how they were measured, please see the protocols at the end of this document.

Table 4: NOVIC 2010 Wisconsin Carrot Data

Variety Name	Top Height (1-5)	Top Density (1-5)	Root Shape (1-5)	Tip Fill (1-5)	Uniformity (1-5)	Flavor (1-5)	Notes
Bolero	4.17 a	3.50 ab	2.75 a	3.83 ab	4.00 a	2.50 cd	limited germination,
Napoli	3.33 ab	2.92 abc	2.92 a	4.00 ab	2.50 ab	3.17 abc	
Nectar	4.25 a	3.50 ab	2.75 a	4.17 a	3.33 a	3.25 abc	
Nelson	2.08 b	2.00 bc	3.67 a	2.83 abc	3.33 a	3.92 a	
Nerja	2.17 b	1.83 bc	3.00 a	1.58 c	2.83 ab	1.50 d	limited germination, very weedy, bottom of hill, strong
Rumba	2.00 b	1.75 c	3.08 a	2.58 bc	3.17 a	1.83 d	little germination; 11 carrots incl buffers only 4 carrots incl buffers, only 11 carrots incl buffers, short
Scarlet Nantes	2.25 b	2.25 abc	2.83 a	3.25 ab	3.42 a	2.58 bcd	sweet, but bitter,
Spring Market	4.00 a	3.92 a	2.33 a	4.25 a	1.42 b	2.33 cd	; see note,
Yaya	1.83 b	1.42 c	3.83 a	2.92 abc	2.92 ab	3.83 ab	watery, very mellow, still sweet

Trait scores are colored on a spectrum with green being best and red being worst. Letters after the scores represent groups of varities whose means are not significantly different for that trait. In other words, all the varities which have a score with an "a" after the number have essentially the same score for that trait. For more information about what the scores mean and how they were measured, please see the protocols at the end of this document.

CARROT DESCRIPTORS

Effective carrot evaluation in a trial requires both data describing the tops or foliage as well as data describing the roots. This is especially true where we are trying to determine which carrots are best suited to compete with weeds by having tops with increased height and increased density of foliage. Root evaluation will be practiced considering a number of root characteristics that are universally considered important among farmers for producing high quality market carrots. This includes traits like the shape of the root, shape of the root's tip, the smoothness of its surface, and its flavor. These carrot trials will evaluate Nantes and Nantes X Imperator hybrid types as they are the predominant class used for the local and regional organic fresh market in North America.

Trait Evaluation: Most traits will be scored on their agronomic or market desirability using a 1 to 5 scale for relative merit with the "1" being the least desirable and "5" being the most desirable. In order to get a good statistical spread it is important to assign all 5 numbers in this scale for each trait evaluated. This entails "setting the scale" of each trait for the specific set of accessions that are evaluated in that particular trial on that specific day. Reserving a "5" or a "1" score for an idealized best or worst carrot entry you have seen previously in another time or place is strongly discouraged. In order to use the entire range of scores effectively the evaluators must "walk the trial" before beginning the evaluation process, observing all the entries to get an overview of all of the accessions for each trait. Then they will identify the least desirable variety in the trial for a particular trait and assign it a "1" and then identify the most desirable variety in the trial for the same trait and assign it a "5." Many evaluators then find one or more intermediate varieties between these extremes and establish their "3." From there it is quite easy to assign scores of both "2" and "4" to other accessions.

Root Shape and Root Tip Fill are the two carrot traits that will be scored with an established specific phenotypic value, whereby a specific numerical value has been established for the overall shape of the storage root and for the shape of the terminus or root tip of the storage root. For each of these traits a sheet with pictures of carrots representing the possible shapes will be supplied by the Organic Seed Alliance.

Planting Specifications; Carrot trials will be planted in 4 rows on a bed with 15 inch centers. Rows will be planted in 1.5 – 2 inch bands, similar to the width achieved with a Planet Junior planting box with a standard scatter shoe. Within row density will be 16 – 20 roots/foot (avg. 18 roots/foot), which will require a sowing rate of ~ 22 to 26 seeds/foot. All seed will be tested for germination rate to insure an adequate stand. Carrots will require from 110 – 120 days to fully attain market size. Evaluators will check market size development by digging and inspecting roots of check varieties from the guard rows at 105, 110, and 115 days. Each entry in the trial will be planted in adjacent double rows that are 6 feet long with three replications in the trial.

Evaluation Criteria

1) Top Height / Foliar Height
This trait is based on relative height of the carrot foliage or "tops." While some researchers gather actual measurements on this trait, with experience, an evaluator can easily make the distinction between short (1), medium (3), and tall (5), and then make the finer distinctions of the medium-short (2) and medium-tall (4) entries in the trial. This descriptor is based purely on vertical reach of the tops and should not consider the angle or mass of the foliage.

2) Top Density / Foliar Density
The scoring of this characteristic is based on the visual impression of the volume and density of the foliage. While the scoring of Top Mass may be somewhat more objective than other traits, with practice it is possible to determine the relative "bushiness," based on both the volume and density of the foliage of each variety.

3) Foliar Disease
This relative rating is only used when foliar disease symptoms are present. The rating is based on a visual impression of the relative degree of disease symptoms in the tops. The predominant carrot foliar disease in North America is Alternaria leaf blight, which is caused the fungal pathogen *Alternaria dauci* and can occur at all of the NOVIC testing locations. In carrot growing regions of the Northeast and Upper Midwest another foliar blight, Cercospera leaf blight (*Cercospra carotae*), can occur alone or form a complex with Alternaria. The leaf spotting that is a symptom can be scored with carrot varieties with the most extensive leaf spotting getting a "1" and the least infected getting a "5."

4) Root Shape
Root shape is a trait that will require a small picture chart with specific pictures of the 5 possible root shapes. This rating will be fairly simple as organic fresh market carrots fall into essentially 2 market classes, Nantes and Imperator, and intermediate types. The 5 shapes depicted in the photographs will be definitive possibilities for the entries. The data will reveal specific shape classes for each entry as opposed to indicating which carrot is the best or worst for shape.

5) Root Tip Fill
The terminus of the storage root portion of the carrot root will usually fill out, often called "blunting" or "stubbing" by growers. This tip fill occurs near the end of the growth cycle as the carrot attains its market-size. This trait will also require a small picture chart with 5 pictures of the definitive possibilities of the type of tip fill possible with these carrots.

6) Root Smoothness
The "smoothness" of a carrot is largely judged on the number, size, and depth of lateral root scars that are present on the carrot storage root. This trait is judged relative to the other entries in a particular trial. The roughest carrot variety will score a 1, while the smoothest will be a 5.

7) Root Flavor
Carrots have one of the most complex flavor profiles of all of the common vegetables. Sweetness must be balanced with a rich, full carrot flavor to be considered superior. Harsh, soapy, or bitter flavors should lower scores in the evaluation process. Evaluators will have to first taste all of accessions before setting a relative standard for the worst tasting carrot (1) and best tasting carrot (5) in the trial.

ROOT SHAPE