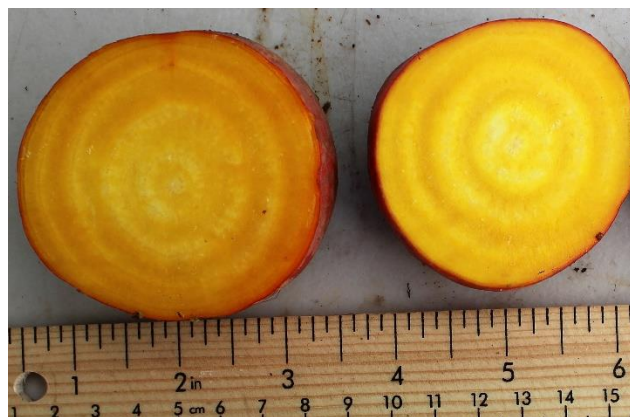


BC Seed Trials

Specialty Beet Variety Trial 2016



DELIVERED BY

FUNDING PROVIDED BY

Contents

Background and Objectives	2
Materials and Methods	2
Results and Discussion	4
Summary	4
Germination and Vigour	4
Beet Top Quality	6
Beet Root Quality	6
Culinary Evaluation	8
Images	9

Authors

Completed February 1, 2017

Dr. Alexandra Lyon, Centre for Sustainable Food Systems, University of British Columbia

Melanie Sylvestre, Centre for Sustainable Food Systems, University of British Columbia

Chris Thoreau, FarmFolk CityFolk

Shauna MacKinnon, FarmFolk CityFolk

Dr. Renee Prasad, University of Fraser Valley

For additional copies of this and other research reports, visit www.bcseedtrials.ca.

Acknowledgements

We are deeply grateful to the farmer participants in the BC Seed Trials who grew the trial material and contributed to the development of the research. We also thank the BC Eco-Seed Co-op, Dr. John Navazio, and Dr. Irwin Goldman for consultation and advice. Finally, we would like to acknowledge the work of our field crew including Carla Hick, Nicolette Lax, and Sonja Hadden as well as the UBC Farm staff.

This report was funded in part by Agriculture and Agri-Food Canada and the B.C. Ministry of Agriculture through programs delivered by the Investment Agriculture Foundation of B.C.

Agriculture and Agri-Food Canada, the B.C. Ministry of Agriculture and the Investment Agriculture Foundation of BC, are pleased to participate in the delivery of this project. We are committed to working with our industry partners to address issues of importance to the agriculture and agri-food industry in British Columbia. Opinions expressed in this report are those of the authors and not necessarily those of the Investment Agriculture Foundation, the B.C. Ministry of Agriculture or Agriculture and Agri-Food Canada.

Background and Objectives

The goal of the BC Seed Trials is to engage farmers in producing knowledge relevant to seed systems development in British Columbia. The central activity in this effort is a network of variety trials aimed at identifying superior crop varieties for fresh market farming and seed production. This report covers variety trials conducted in 2016 at the University of British Columbia Farm (UBC Farm) and on a group of organic and conventional farms, primarily in the BC Lower Mainland and Vancouver Island. More information about the BC Seed Trials can be found at www.bcseedtrials.ca.

Golden and Chioggia beets (*Beta vulgaris*) were chosen for this project in 2016 because of their unique appearance, which may give them niche value as seed crops for BC. The Pacific Northwest of the US is a key region of global beet seed production, and with similar climate conditions BC is well positioned to produce this biennial seed crop. Golden beets are known to have poor germination, an important production challenge. Priority traits for this trial included:

- Good germination
- Smooth, uniform, and globe-shaped roots with few root hairs
- Attractive tops that are a good size for bunching
- Disease resistance

Materials and Methods

Trial Design

We used a Mother-Baby trial design, which pairs larger, researcher-managed trials with a group of farmer-managed trials on participating farms. The UBC Farm in Vancouver and Wisbey Veggies in Abbotsford, BC, served as organic and conventional “mother” sites, respectively, with each variety planted in three replications in the field on these farms. “Baby” sites (called “on-farm” sites henceforward) consisted of a single planting of all varieties, and two plantings of the check variety discussed below.

Beet trials were planted at 5 on-farm sites, including 2 farms that were certified organic and 3 that were not. Farmer participants were recruited through emails to agricultural list serves and through our existing networks. Farms that were not certified organic employed a range of ecological practices from using integrated pest management (IPM) to guide their use of conventional inputs, to complying with most organic standards but opting out of certification.

Planting Specifications

Farmers were given planting guidelines and allowed to vary the precise bed spacing based on their growing system.

Plot size	12 total row-feet per variety, generally as a 6' bed with 2 rows ~15" apart
Target seeding rate	15 seeds/foot (1 seed/2cm)
Seeding method	By hand at most locations

Planting and Harvest Dates

Growers were asked to direct seed beets within an appropriate time window for mid-summer harvest given their specific farm conditions, and to evaluate the trial when most varieties were at a marketable size, around 70-80 days.

Location	Seeding	Harvest
UBC Farm	May 5	July 13
Wisbey Veggies	May 18	July 15
Other on-farm sites (baby sites)	Apr. 23 to May 9	June 30 – late July

Note: Weather information for 2016 trial regions can be found at www.bcseedtrials.ca.

Varieties and Seed Sources

The trial included commercial varieties developed by mid- to large-scale seed companies and/or public plant breeding programs; heirloom varieties produced by both mid-to-large scale companies and small BC seed companies; and varieties developed by farmer plant breeders for adaptation to the Pacific Northwest (PNW). Three check varieties, indicated below, were selected based on well-known performance in BC. Untreated conventionally-grown seed was included only when organic was not available.

Table 1. Golden and Chioggia beet varieties grown in participatory variety trials in British Columbia in 2016. Companies offering solely BC-grown seeds are indicated after the company name.

Code	Variety	Class	Source	Certification
BR-01	Red Ace F1	Red (Check)	Johnny's Selected Seeds	organic
BG-02	Touchstone Gold	Golden (Check)	Johnny's Selected Seeds	organic
BG-03	Touchstone Gold	Golden	Wild Garden Seeds	organic
BG-04	Yellow Sunrise	Golden	Osborne	conventional
BG-05	Golden	Golden	Osborne	conventional
BG-06	Golden*	Golden	Full Circle Seeds (BC)	organic
BG-07	Boldor	Golden	Johnny's Selected Seeds	conventional
BG-08	Golden Grex	Golden	Fedco	organic
BC-10	Chioggia	Chioggia	Sunshine Seeds (BC)	organic
BC-11	Chioggia Guardsmark	Chioggia (Check)	Johnny's Selected Seeds	organic
BC-12	Chioggia	Chioggia	Uprising	organic
BC-13	Chioggia Guardsmark Improved	Chioggia	West Coast Seeds	organic
BC-14	Chioggia*	Chioggia	Eagleridge (BC)	organic

*Grown at UBC Farm only due to limited seed quantity

Evaluation

Evaluation criteria were developed by the research team with consultation from farmer participants and members of the BC EcoSeed Co-op, and using a province-wide survey of vegetable growers conducted in early 2016. Evaluations on the UBC Farm were led by Mel Sylvestre and Alexandra Lyon, and at Wisbey Veggies by Renee Prasad and Alexandra Lyon. Some evaluations at on-farm sites (particularly early-season monitoring) were carried out independently by farmers, while others were carried out jointly by farmers and the research team.

Members of the research team including Lyon, Thoreau, and MacKinnon visited nearly all farms to jointly perform harvest evaluations and record farmers' overall impressions of the varieties.

Results and Discussion

Summary

Differences between golden and Chioggia types were greater than differences between any individual varieties within these types. Golden beets had poorer germination, thinner and more upright tops, and rounder roots with rougher skin and more root hairs. Chioggia beets had better germination, larger and floppier tops, and more squat or disk-shaped roots with smooth skin and fewer root hairs. 'Golden Grex,' advertised as a mixed population, was notably different from all other varieties with extremely large tops and large, elongated roots more typical of a fodder beet.

Trait	Best Golden	Best Chioggia
Germination	'Golden' (Osborne), "Touchstone Gold" (Wild Garden Seeds)	Similar across varieties
Top Quality	'Yellow Sunrise,' 'Golden' (Full Circle), 'Touchstone Gold'	Similar across varieties
Root Smoothness	'Touchstone Gold'	Similar across varieties
Flavour	'Yellow Sunrise,' 'Touchstone Gold', 'Golden Grex'	'Chioggia' (Sunshine Seeds), 'Chioggia Guardsmark'

Germination and Vigour

Germination was evaluated by counting the number of seedlings in a 2-foot sample, two to three weeks after seeding at *all farm sites* (Figure 2). At the *UBC Farm only*, a count of all seedlings in each plot was also conducted (Figure 1). The expectation that Chioggia varieties would have better germination than golden varieties was confirmed, with the exception of 'Golden Grex,' a mixed population of golden and fodder beet types. Most Chioggia varieties did nearly as well as the red hybrid check variety, 'Red Ace F1.' Variation in germination between the on-farm sites was great enough that it is difficult to draw conclusions about the golden beet varieties. At the UBC Farm, 'Golden' from Osborne Seeds and 'Touchstone Gold' from Wild Garden Seeds seemed to outperform the other varieties, though within-field variation due to soil differences between plots may have affected the results. A further year of germination data will help to clarify germination rates among golden beets.

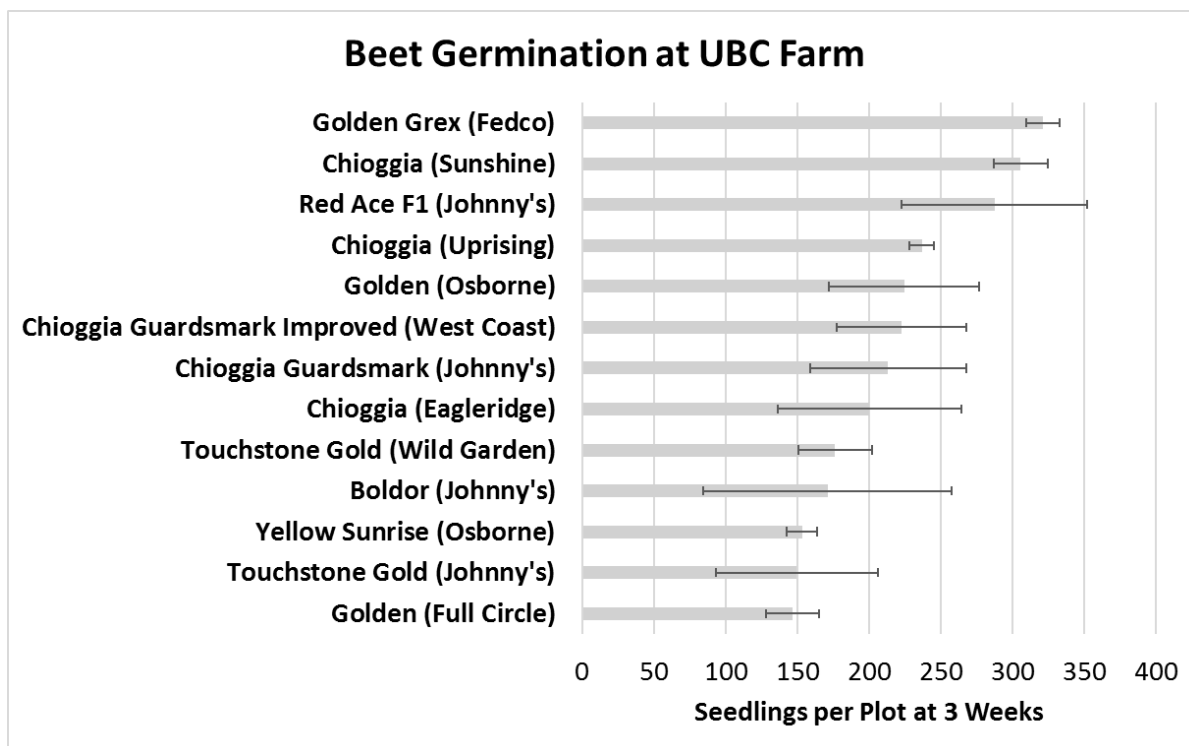


Figure 1. Mean stand count 13 beet varieties at the UBC Farm, 3 weeks after seeding. Error bars represent one standard deviation from the mean.

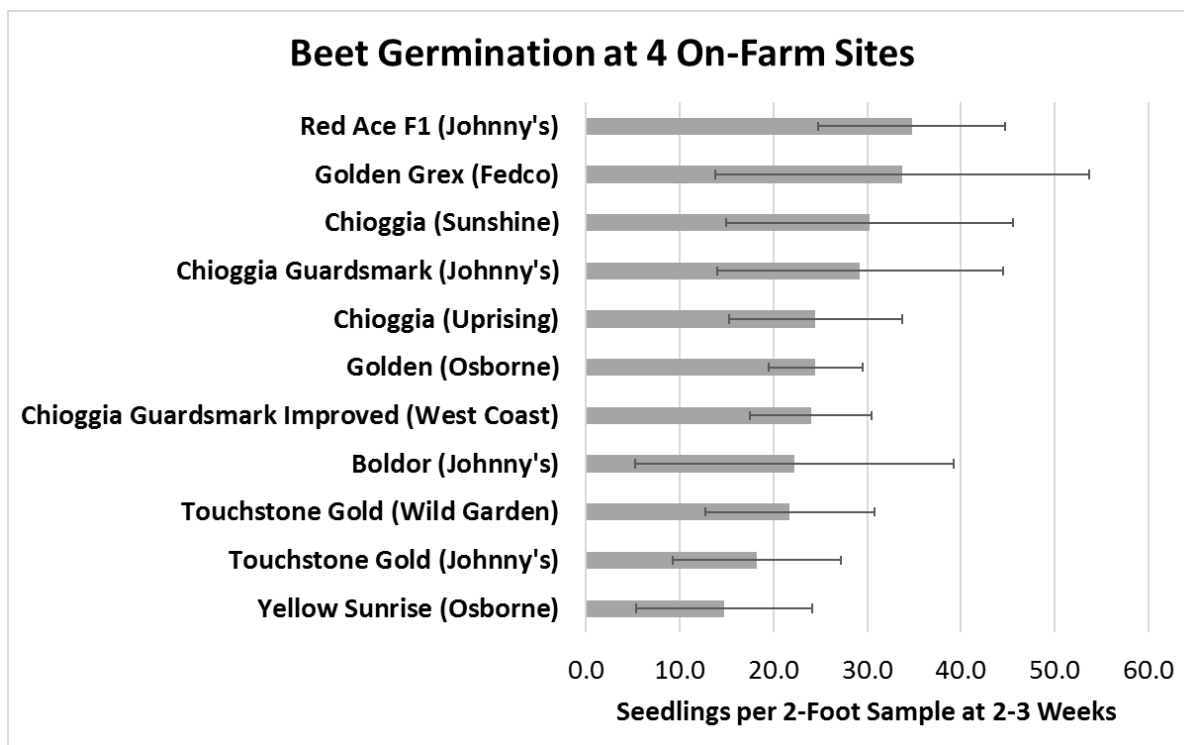


Figure 2. Mean stand count of 11 beet varieties at 4 farm sites in British Columbia, 2-3 weeks after seeding. Error bars represent one standard deviation from the mean.

Beet Top Quality

Among golden beets, ‘Yellow Sunrise’ and ‘Golden’ from Full Circle seeds were scored best for top stature for bunching. ‘Touchstone Gold’ also scored well at the UBC Farm and Wisbey Veggies, but performed unevenly on other farms where disease pressure was higher. ‘Golden’ from Osborne and ‘Boldor’ tended to have thinner tops. ‘Golden Grex’ from Fedco had extremely tall tops which most growers found undesirable. Chioggia varieties tended to have more delicate, tender, and floppy leaves which were easily damaged when bunching but had superior eating quality. Opinions about ideal top height and bushiness varied widely among growers, making this a difficult characteristic to assess with ranking.

Beet Root Quality

Beet root smoothness was scored from 1 to 5, with 5 being the smoothest and 1 the roughest (Figures 3 and 4). At the UBC Farm, ‘Yellow Sunrise’ and ‘Touchstone Gold’ from Wild Garden Seeds performed equally well as the top golden beet types, while at the on-farm-sites ‘Yellow Sunrise’ did much more poorly. Both strains of ‘Golden’ had much rougher skin with discolouration and more root hairs. ‘Boldor’ displayed significant scarring, cracking, and internal rot in many locations. Based on reports that ‘Boldor’ performs well in other regions such as the Northeast US, we suspect this variety may be more sensitive to soil micronutrient deficiencies that tend to be common in BC.

The Chioggia varieties had smoother, more hairless roots overall, with less difference between the varieties than displayed in the golden beets. They varied in terms of internal appearance, with the Chioggia from Uprising Seeds showing the clearest concentric circle pattern when sliced (see photos, p. 9).

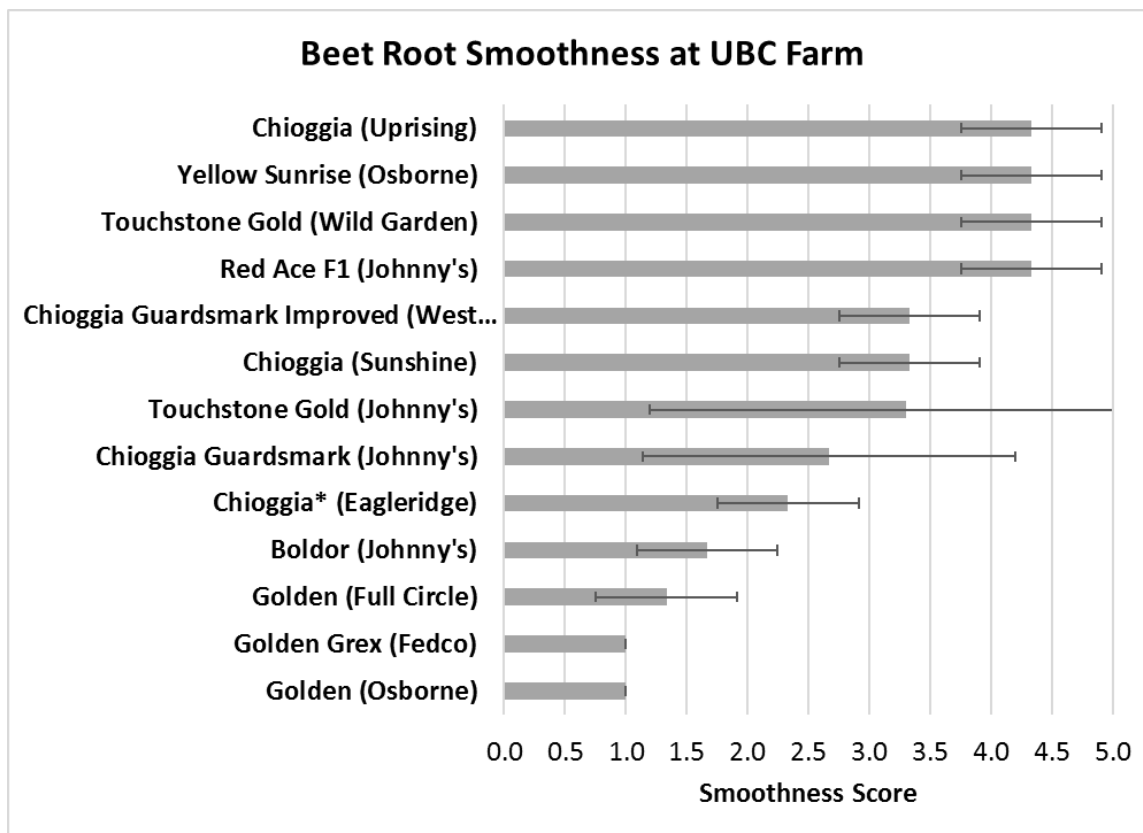


Figure 3. Mean scores for root smoothness of 13 beet varieties at the UBC Farm. A score of 5 is the smoothest 1 is the roughest. Error bars represent one standard deviation from the mean.

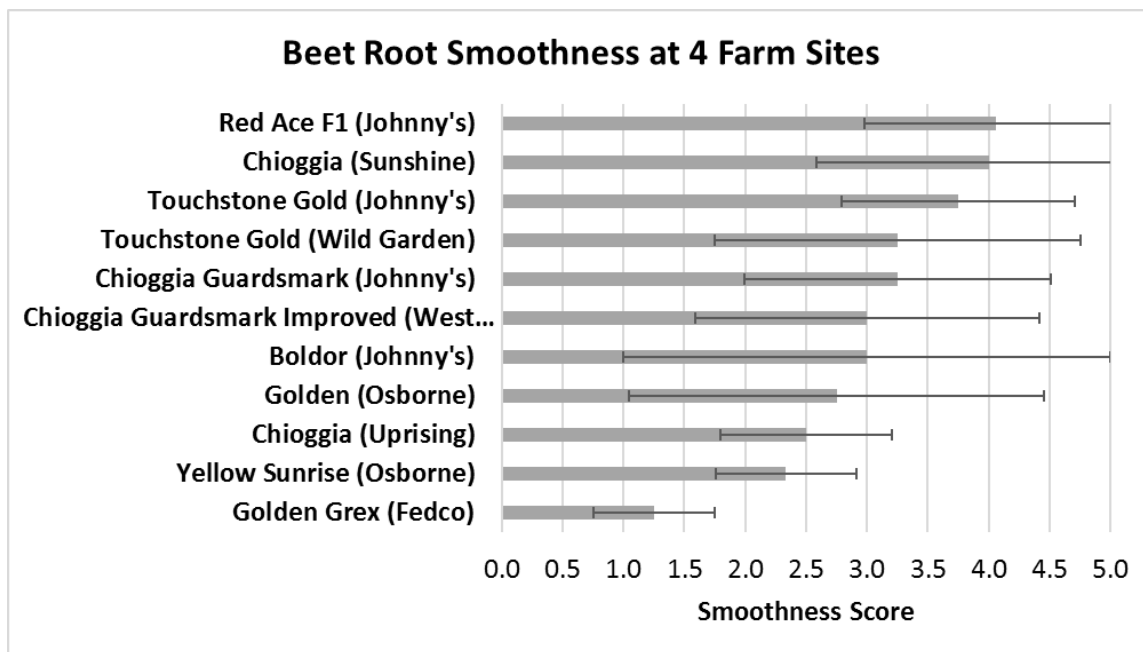


Figure 4. Mean scores for root smoothness of 11 beet varieties at 4 farm sites in British Columbia. Error bars represent one standard deviation from the mean.

Culinary Evaluation

In order to evaluate culinary quality and raise awareness about seed research, a public tasting event was held on July 9, 2016, at the UBC Farm's regular Saturday farmers' market. A selection of ten varieties was prepared by Chef Rob Cleland of Ash Street Bistro in Vancouver. Shoppers at the farmers' market were invited to taste the varieties prepared raw (thinly sliced) and cooked (roasted), as well as a feature dish using beets. Participants' scores were recorded for texture, flavour, preference for raw or cooked, and whether they would buy it (Table 2). In addition, Chef Cleland's impressions of each variety were recorded (Table 3).

Table 2. Culinary evaluation of 10 beet varieties, rated by 30 participants at a public tasting event in July, 2016. Flavour and texture were rated on a scale of 1-5, with 1 = worst and 5 = best.

Variety (Source)	Flavour		Texture		Preferred Preparation		Would Buy	
	mean	st. dev	mean	st. dev.	raw	cooked	yes	no
Golden Varieties								
Yellow Sunrise (Osborne)	3.8	0.9	3.8	0.9	4	18	16	4
Touchstone Gold (Wild Garden)	3.7	1.0	3.7	0.9	8	12	16	4
Golden (Osborne)	3.7	1.0	4.0	0.8	4	18	17	2
Golden Grex (Fedco)	3.7	0.9	3.8	0.7	6	14	18	3
Touchstone Gold (Johnny's)	3.6	0.8	3.8	0.8	4	17	16	4
Boldor (Johnny's)	3.2	1.0	3.7	0.9	4	17	10	9
Chioggia Varieties								
Chioggia (Sunshine Seeds)	4.0	0.8	4.3	0.7	1	18	19	1
Chioggia Guardsmark (Johnny's)	3.7	0.9	4.1	0.7	5	15	12	6
Chioggia Guardsmark Improved (West Coast Seeds)	3.7	0.8	3.8	0.6	2	17	19	1
Chioggia (Uprising)	2.9	0.8	3.8	0.9	6	14	10	8

Table 3. Notes from Chef Rob Cleland on 10 beet varieties prepared for a public tasting in July 2016.

Variety (Source)	Chef's Notes
Touchstone Gold (Johnny's)	Good, reliable, classic beet flavour.
Touchstone Gold (Wild Garden)	Different flavours present through the beet. Exciting but variable.
Yellow Sunrise (Osborne)	Mushroom-like flavour, not as much "pop" as other varieties. Clean-tasting but would not use in large volumes.
Golden (Osborne)	Very marketable, consistent flavour. A classic, approachable beet, good in every preparation.
Boldor (Johnny's)	Difficult to clean (due to cracking), metallic tasting, boring.
Golden Grex (Fedco)	Weird, wacky flavour. Parsnip-like flavour when raw, bold when cooked. Unique character with a lot of variation between beets.
Chioggia (Sunshine Seeds)	Too variable in terms of appearance.
Chioggia Guardsmark (Johnny's)	Plain, sweet, not a lot of character.
Chioggia (Uprising)	Acidic, more metallic. Less sweet than others, but good.
Chioggia Guardsmark Improved (West Coast Seeds)	Not very sweet, firmer texture.

Images

‘Touchstone’ Gold (Wild Garden Seed)



‘Golden’ (Osborne)



‘Golden’ (Full Circle Seeds)



‘Yellow Sunrise’ (Osborne)



‘Boldor’ (Johnny’s)



‘Golden Grex’ (Fedco)



**‘Chioggia Guardsmark’
(Johnny's Selected Seeds)**



**‘Chioggia Guardsmark’
(West Coast Seeds)**



‘Chioggia’ (BC-10)



‘Chioggia’ (BC-14)



‘Chioggia’ (Uprising Seeds)

