



BC Seed Trials

Spinach Variety Trial 2016



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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 project consists of 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 can be found at www.bcseedtrials.ca.

Spinach is a high value crop for local fresh markets in BC, as well as a crop with potential for better season extension depending on varieties used. As a seed crop, spinach has strong potential as a specialization for the climate conditions of Vancouver Island and the Lower Mainland. This trial consisted primarily of varieties described in seed catalogues as *savoy* or *semi-savoy*. Savoy spinach, which is characterized by deeply crinkled (“savoyed”) leaves, has been noted for its attractive appearance, sturdy leaves, and good flavour.

Farmer feedback pointed to a range of cropping and harvest practices for spinach in BC, including uncovered, row cover, and hoop house production, and harvesting as both bunches and bulk leaves. It was therefore difficult to choose a single set of practices that would be comparable across farms. For the 2016 we chose to focus on *uncovered production* and a *mid- to late-fall harvest* and for *bunching*. Within this focus, priority traits included:

- Good germination and early vigour in a late summer planting
- Upright plant stature with minimal leaf area touching the soil
- Attractive dark green colour
- Savoy leaf texture
- Minimal bolting

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.

Farmer participants were recruited through emails to agricultural list serves and through our existing networks. Spinach trials were planted at 5 on-farm sites in 2016, all of which were certified organic. 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	8 total row-feet per variety, generally as a 4' bed with 2 rows ~15" apart
Target seeding rate	15 seeds/foot (1 seed/2cm)
Seeding method	Direct seeding by hand at most locations

Note: Weather information can be found in the document "2016 BC Seed Trials Weather Data."

Planting and Harvest Dates

Growers were asked to time spinach seeding for mid-fall harvest given their farm conditions, and to evaluate the trial when most varieties were a marketable size, around 35-40 days.

Location	Seeding	Harvest
UBC Farm	Aug. 11	Sept. 16
Wisbey Veggies	Aug. 12	Oct. 5
Other on-farm sites (baby sites)	Aug. 5 – 22	Sept. 22 – Oct. 7

Varieties and Seed Sources

The trial included commercial varieties developed by public or private plant breeders; heirloom varieties produced by mid-to-large scale companies and smaller BC companies; and varieties developed by farmer-breeders for adaptation to the Pacific Northwest (PNW). Untreated conventionally-grown seed was included only when organic was not available (Table 1). The hybrid variety 'Samish' was chosen as a check variety based on its well-known performance in BC. All other varieties were open-pollinated.

Table 1. Savoy and semi-savoy spinach 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	Source	Description	Certification
SS-01	Bloomsdale	Johnny's Selected Seeds	Savoy	conventional
SS-02	Bloomsdale	Sunshine Seeds (BC)	Savoy	organic
SS-03	Bloomsdale Dark Green	William Dam	Savoy	conventional
SS-05	Long Standing Bloomsdale	Wild Garden Seeds	Savoy	organic
SS-06	Abundant Bloomsdale	High Mowing Seeds	Savoy	organic
SS-07	Winter Bloomsdale	Uprising Seeds	Savoy	organic
SS-08	Winter Bloomsdale	Osborne	Semi-savoy	conventional
SS-09	Winter Giant	Adaptive Seeds	Semi-savoy	organic
SS-10	Giant Winter	Full Circle Seeds (BC)	Semi-savoy	organic
SS-11	Giant Winter	Fedco	Semi-savoy	conventional
SS-12	Viroflex (Giant winter)	William Dam	Savoy	untreated
SS-13	Heirloom Bloomsdale*	Brother Nature (BC)	Savoy	organic
SS-14	Popeye*	Siskiyou	Savoy	organic
SS-15	Samish F1	West Coast Seeds	Savoy	organic
SS-16	Giant Noble*	Eagleridge (BC)	Savoy	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: Savoy Spinach

Seedling Vigour

Germination stand counts were not possible for spinach because seed packets contained slightly different amounts of seed. However, a vigour score of 1 – 9 was assigned to each plot based on the thickness of the seedling stand at 2-3 weeks. Many trial locations, including the UBC Farm and Wisbey Veggies, experienced poor germination due to dry weather. This and within-field irrigation differences may account for some of the variation seen between the UBC Farm and on-farm sites.

Top varieties for germination and vigour varied greatly between sites. 'Long Standing Bloomsdale' from Wild Garden Seeds was a consistent top performer across locations. 'Samish F1' and 'Viroflex,' two semi-savoy types, germinated well at the on-farm sites but not at the UBC Farm. 'Bloomsdale' from Johnny's had some of the best seedling vigour but also some of the most variable between farms and between blocks at the UBC Farm.

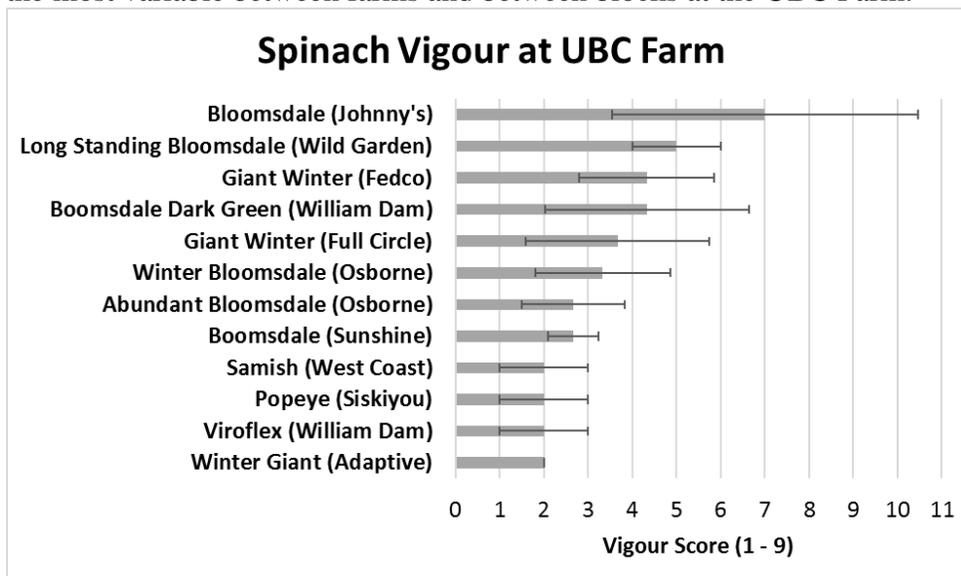


Figure 1. Mean seedling vigour scores for 12 savoy and semi-savoy spinach varieties at the UBC Farm, taken 3 weeks after seeding. 1 represents smallest seedlings with lowest germination, 9 represents largest seedlings with thickest germination. Error bars represent one standard deviation.

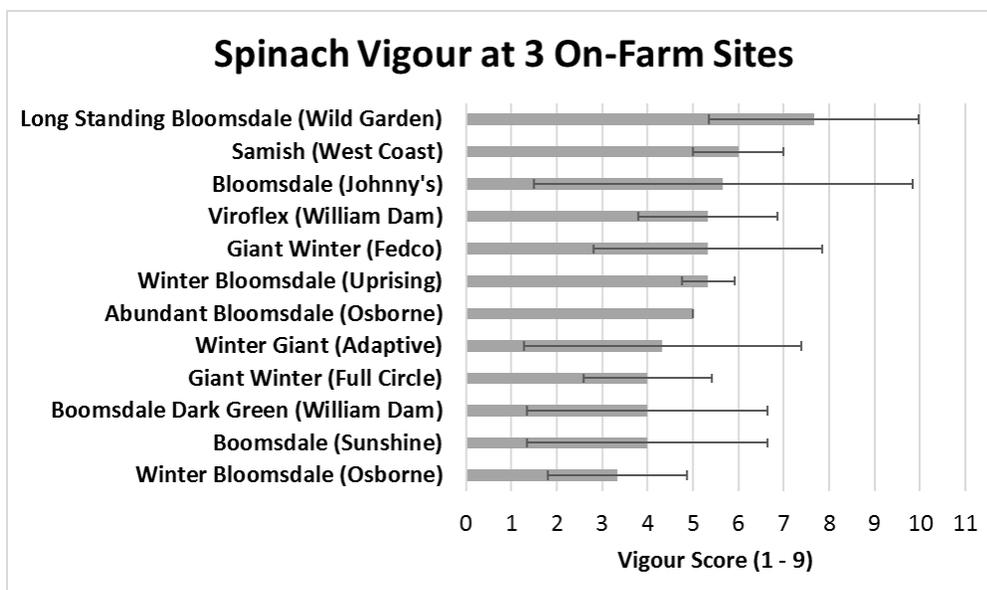


Figure 2. Mean seedling vigour scores for 12 savoy and semi-savoy spinach varieties at 3 farm sites in British Columbia, taken 3 weeks after seeding. 1 represents smallest seedlings with lowest germination, 9 represents largest seedlings with thickest germination. Error bars represent one standard deviation.

Plant and Leaf Appearance

The trial consisted of varieties described in seed catalogues as “savoy” or “semi-savoy,” and several described as both by different catalogues. Plants were also scored on a scale of 1 to 9 for plant stature, leaf texture, and colour (Table 2). There was a strong difference between savoy and semi-savoy types, even though this description varied between seed catalogues. True savoy types had darker green, thicker, and bumpier (more savoyed) leaves, with a more upright plant structure (Image 1).



Image 1. Savoy (left) and semi-savoy (right) leaf types.

Some growers prefer the smoother semi-savoy type because it is easier to wash, while others prefer the heartier texture of true savoy. The top varieties in terms of true savoy appearance were ‘Winter Bloomsdale’ from Uprising Seeds and ‘Abundant Bloomsdale,’ which is available from several seed companies.

<i>Type Classification Guidelines</i>		
	Savoy	Semi Savoy
Leaf Texture	More savoyed/crinkled	Smoother
Leaf Shape	More rounded tips	More pointed tips

<i>Scoring Guidelines</i>			
	Score of 1	Score of 5	Score of 9
Plant Stature	Lowest, most leaf area touching the soil	Intermediate	Most upright, least leaf area touching the soil
Leaf Texture	Smoothest	Intermediate	Most savoyed
Colour	Lightest green	Intermediate	Darkest green

Table 2. Scores for quality characteristics in spinach variety trials in BC in 2016. Scores were on a scale from 1 – 9, and represent of an average of scores given across 5 farm sites including UBC Farm and Wisbey Veggies.

Variety (Source)	Observed Type	Plant Stature	Leaf Texture	Colour
Winter Bloomsdale (Uprising)	Savoy	7.2	8.0	7.0
Abundant Bloomsdale (Osborne)	Savoy	7.1	7.3	7.8
Giant Winter (Fedco)	Intermediate	5.7	7.1	6.9
Bloomsdale (Johnny's)	Savoy	6.4	6.6	6.4
Long Standing Bloomsdale (Wild Garden)	Savoy	6.4	6.5	5.3
Boomsdale Dark Green (William Dam)	Savoy	5.3	6.0	5.9
Winter Bloomsdale (Osborne)	Savoy	5.3	6.1	5.3
Viroflex (William Dam)	Intermediate	3.7	5.9	5.5
Boomsdale (Sunshine)	Savoy	5.3	2.5	3.8
Samish F1 (West Coast)	Savoy	5.1	1.2	3.2
Giant Winter (Full Circle)	Semi-savoy	3.7	2.5	2.6
Winter Giant (Adaptive)	Semi-savoy	3.9	2.2	2.5
Popeye (Siskiyou)	Semi-savoy	2.2	3.3	2.9

Bolting

Bolting was evaluated by counting the number of plants that had bolted on the date of the harvest evaluation. At many sites, all varieties reached a marketable size with no bolting. Bolting data is therefore primarily from Pitchfork Farm in Abbotsford, BC, where significant bolting had occurred. These results should be viewed with caution as they are based on a single, unreplicated trial location. A further trial targeted at overwintering in 2017/2018 will provide a better venue for evaluating bolt-resistance. Varieties which displayed the most bolting in this trial were:

- ‘Bloomsdale Dark Green’ (William Dam)
- ‘Bloomsdale’ (Sunshine Seeds)
- ‘Giant Winter’ (Full Circle Seeds)

Yield

Spinach yield was measured only at the two mother sites, UBC Farm and Wisbey Veggies (Figures 3 and 4). Whole plants were pulled and weighed. Harvest weights were much higher at Wisbey Veggies overall, in part due to better germination and in part because harvest was performed later when the plants were somewhat bigger. Other than germination issues, spinach at UBC Farm did not suffer any disease or insect damage, and soil fertility at the two farms was comparable. We therefore believe that the yield differences between UBC Farm and Wisbey Veggies is more likely due to differences in germination and harvest timing than conventional versus organic management.

‘Viroflex’ and ‘Giant Winter’ were top yielding varieties at both locations, though highly variable within each location. The semi-savoy varieties generally had larger leaves, leading to higher harvest weights. Though it would superficially appear that Bloomsdale (true savoy) types did better at the UBC Farm than at Wisbey, variability between blocks at the UBC Farm was so high that no clear winners can be identified in terms of yield. Further trials in hoop house conditions in 2017 may provide better insight with more uniform conditions across blocks.

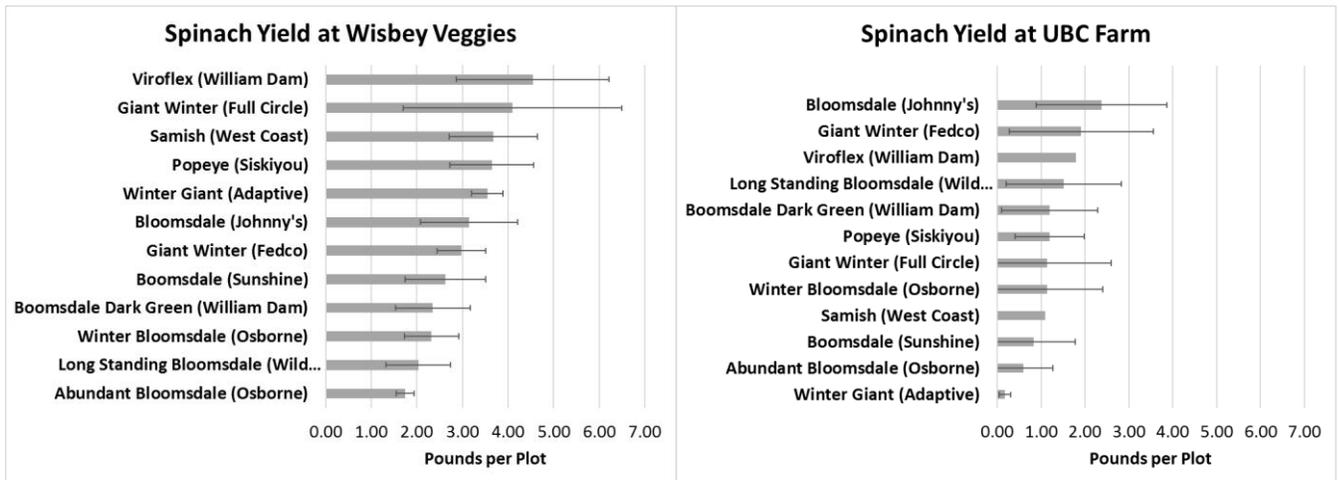


Figure 3. Spinach yields at UBC Farm and Wisbey veggies. Plots were 8 row-feet long. Error bars represent one standard deviation.