Organic Seed Alliance

Advancing the ethical development and stewardship of the genetic resources of agricultural seed

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2015 Organic Silage Corn Variety Trial for Coastal Humboldt County

These trials were conducted by Organic Seed Alliance and Titus Dairy, and sponsored by California Certified Organic Farmers and Gaia Fund.

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Introduction

Our goal was to provide coastal organic dairy farmers with better information about silage corn variety choices by evaluating silage corn varieties in a systematic trial. We chose to compare twelve varieties (Table 1) that were expected to be early maturing, yield well in organic systems, and have high silage quality.

Entry Number	Source	Name	Maturity	Notes
1	Legacy	L2341	77	Conventional
2	Blue River	09R19	79	Organic
3	Blue River	14A91	82	Organic
4	Albert Lea/Viking	087-80N	80	Conventional
5	Pioneer	P8210	82	Conventional
6	Legacy	L3011	84	Conventional
7	Albert Lea/Viking	0.44-86N	86	Conventional
8	Albert Lea/Viking	60-85N	85	Conventional
9	Blue River	21L90	85	Organic
10	Pioneer	38N86	86	Conventional
11	Blue River	26A17	88	Organic
12	Blue River	27B16	89	Organic

Table 1: Entries in 2015 Humboldt Organic Silage Corn Trial.

Methods

We planted the trials in a randomized, blocked, and replicated fashion. To do this, we divided the field into four blocks, and within each block we planted all twelve varieties in a random order. By planting this way, each variety is grown in four places throughout the field so we do not confuse a good variety with a variety that happened to be planted in a part of the field with better fertility or water. Each plot consisted of four 20-foot long rows.

0’ 20’	45’	70’	95’	120’	145’	170’	195’
12 - BR 27B16	1 - Leg L2341	4 - Vk 087-80N	1 - Leg L2341	6 - Leg L3011	10 - P P8210	9 - BR 21L90	10 - P P8210
12 - BR 27B16	1 - Leg L2341	4 - Vk 087-80N	1 - Leg L2341	6 - Leg L3011	10 - P P8210	9 - BR 21L90	10 - P P8210
12 - BR 27B16	1 - Leg L2341	4 - Vk 087-80N	1 - Leg L2341	6 - Leg L3011	10 - P P8210	9 - BR 21L90	10 - P P8210
12 - BR 27B16	1 - Leg L2341	4 - Vk 087-80N	1 - Leg L2341	6 - Leg L3011	10 - P P8210	9 - BR 21L90	10 - P P8210
9 - BR 21L90	5 - P 38N86	9 - BR 21L90	6 - Leg L3011	8 - Vk 60- 85N	11 - BR 26A17	7 - Vk 0.44-86N	2 - BR 09R19
9 - BR 21L90	5 - P 38N86	9 - BR 21L90	6 - Leg L3011	8 - Vk 60- 85N	11 - BR 26A17	7 - Vk 0.44-86N	2 - BR 09R19
9 - BR 21L90	5 - P 38N86	9 - BR 21L90	6 - Leg L3011	8 - Vk 60- 85N	11 - BR 26A17	7 - Vk 0.44-86N	2 - BR 09R19
9 - BR 21L90	5 - P 38N86	9 - BR 21L90	6 - Leg L3011	8 - Vk 60- 85N	11 - BR 26A17	7 - Vk 0.44-86N	2 - BR 09R19
3 - BR 14A91	10 - P P8210	2 - BR 09R19	3 - BR 14A91	5 - P 38N86	4 - Vk 087-80N	4 - Vk 087-80N	11 - BR 26A17
3 - BR 14A91	10 - P P8210	2 - BR 09R19	3 - BR 14A91	5 - P 38N86	4 - Vk 087-80N	4 - Vk 087-80N	11 - BR 26A17
3 - BR 14A91	10 - P P8210	2 - BR 09R19	3 - BR 14A91	5 - P 38N86	4 - Vk 087-80N	4 - Vk 087-80N	11 - BR 26A17
3 - BR 14A91	10 - P P8210	2 - BR 09R19	3 - BR 14A91	5 - P 38N86	4 - Vk 087-80N	4 - Vk 087-80N	11 - BR 26A17
8 - Vk 60- 85N	2 - BR 09R19	11 - BR 26A17	5 - P 38N86	2 - BR 09R19	7 - Vk 0.44-86N	12 - BR 27B16	3 - BR 14A91
8 - Vk 60- 85N	2 - BR 09R19	11 - BR 26A17	5 - P 38N86	2 - BR 09R19	7 - Vk 0.44-86N	12 - BR 27B16	3 - BR 14A91
8 - Vk 60- 85N	2 - BR 09R19	11 - BR 26A17	5 - P 38N86	2 - BR 09R19	7 - Vk 0.44-86N	12 - BR 27B16	3 - BR 14A91
8 - Vk 60- 85N	2 - BR 09R19	11 - BR 26A17	5 - P 38N86	2 - BR 09R19	7 - Vk 0.44-86N	12 - BR 27B16	3 - BR 14A91
4 - Vk 087-80N	6 - Leg L3011	12 - BR 27B16	7 - Vk 0.44-86N	3 - BR 14A91	1 - Leg L2341	8 - Vk 60- 85N	1 - Leg L2341
4 - Vk 087-80N	6 - Leg L3011	12 - BR 27B16	7 - Vk 0.44-86N	3 - BR 14A91	1 - Leg L2341	8 - Vk 60- 85N	1 - Leg L2341
4 - Vk 087-80N	6 - Leg L3011	12 - BR 27B16	7 - Vk 0.44-86N	3 - BR 14A91	1 - Leg L2341	8 - Vk 60- 85N	1 - Leg L2341
4 - Vk 087-80N	6 - Leg L3011	12 - BR 27B16	7 - Vk 0.44-86N	3 - BR 14A91	1 - Leg L2341	8 - Vk 60- 85N	1 - Leg L2341
11 - BR 26A17	7 - Vk 0.44-86N	10 - P P8210	8 - Vk 60- 85N	12 - BR 27B16	9 - BR 21L90	5 - P 38N86	6 - Leg L3011
11 - BR 26A17	7 - Vk 0.44-86N	10 - P P8210	8 - Vk 60- 85N	12 - BR 27B16	9 - BR 21L90	5 - P 38N86	6 - Leg L3011
11 - BR 26A17	7 - Vk 0.44-86N	10 - P P8210	8 - Vk 60- 85N	12 - BR 27B16	9 - BR 21L90	5 - P 38N86	6 - Leg L3011
11 - BR 26A17	7 - Vk 0.44-86N	10 - P P8210	8 - Vk 60- 85N	12 - BR 27B16	9 - BR 21L90	5 - P 38N86	6 - Leg L3011
0’ 20’	45’	70’	95’	120’	145’	170’	195’

Figure 1: Trial plot grid for 2015 Humboldt Organic Silage Corn Trial.

Location: Titus Dairy, certified organic farm in Ferndale, California

Planting date: 5/13/2015

Seeding rate: 35,000 plants per acre (final stand density in plots ranged from 14,000 – 40,000)

Fertility: Liquid manure

Irrigation: Overhead irrigation multiple times during the season

Harvest: Plots were harvested on 10/7/2015. Due to poor emergence and planter skips, the stand density varied widely between plots (see above), especially at the ends of the plots. To minimize the variability in stand density, we harvested the center 8 feet of each of the center two rows of each four-row plot. The plants were cut at approximately four inches above soil level and weighed to calculate wet yield. We processed a sample of ten plants randomly chosen from each plot using a chipper–shredder, vacuum-sealed the samples, and sent them to Dairyland Laboratories in Arcadia, Wisconsin, to analyze for moisture and quality criteria (see below).

Evaluation criteria: Yield in tons per acre adjusted to a constant 35% dry matter, percent moisture, quality (including starch, protein, ash, and fiber content and digestibility), and milk per acre (calculated from yield and quality using the Milk2006 equation).

Analysis: The results were analyzed with the software program R, using the agricolae package. Means grouping based on an alpha level of 0.05. The effect of stand density on yield was significant; therefore, means for yield were adjusted for stand effects.

Results

	Yield		Moisture (%)	Milk per ton	Milk per acre
	2015	2014			
Blue River 09R19	**47.5** a		**55.8%** d	**3442** ab	57235 a
Blue River 14A91	37.0 b	**43.9** abc	63.6% abc	**3528** ab	45651 a
Blue River 21L90	**44.7** ab		64.1% abc	**3449** ab	53923 a
Blue River 26A17	37.8 b		67.6% a	**3445** ab	45601 a
Blue River 27B16	**40.9** ab		65.6% ab	**3609** a	51713 a
Legacy L2341	**41.8** ab		**57.2%** cd	3230 b	47255 a
Legacy L3011	**39.4** ab		**61.2%** abcd	**3574** a	49298 a
Pioneer 38N86	**42.8** ab		**58.2%** bcd	**3382** ab	50698 a
Pioneer P8210	**47.5** a	42.5 bc	**61.8%** abcd	**3585** a	59550 a
Viking 0.44-86N	37.1 b	**52.3** a	65.3% ab	**3612** a	46839 a
Viking 087-80N	**39.4** ab		64.2% ab	**3562** a	49095 a
Viking 60-85N	**44.4** ab		63.0% abc	**3524** ab	54800 a

Table 2: Yield, moisture, and quality of silage corn entries.

Results in bold indicate entries with results statisical equivalent to the best values for that result. Grouping letters that follow the yield, moisture, and quality numbers indicate which entries are not statistically different from one another. For example, an entry that has an “a” following its yield results would not be considered to have a yield that was different from an entry with an “a”, “ab”, or “abc”.

	Starch	Crude	Fat	ADF	NDF	Lignin	Ash
Blue River 09R19	49.9% a	7.1% a	3.6% a	13.5% c	25.6% c	2.0% c	2.3% b
Blue River 14A91	37.5% bc	6.8% ab	3.2% ab	20.6% ab	36.0% ab	2.6% abc	3.3% ab
Blue River 21L90	34.9% bc	6.6% abc	3.0% ab	21.6% ab	37.5% ab	2.9% ab	3.2% ab
Blue River 26A17	31.9% c	6.5% abc	2.5% b	22.5% a	38.7% a	3.0% a	3.7% a
Blue River 27B16	37.2% bc	5.4% d	2.8% ab	20.7% ab	35.7% abc	2.8% ab	3.0% ab
Legacy L2341	44.6% ab	5.7% cd	3.1% ab	17.8% abc	32.1% abc	2.6% abc	2.7% ab
Legacy L3011	45.6% ab	6.0% bcd	3.2% ab	15.6% bc	28.9% bc	2.5% abc	2.6% ab
Pioneer 38N86	43.0% abc	6.0% bcd	3.4% ab	18.2% abc	32.9% abc	2.5% abc	2.4% ab
Pioneer P8210	44.2% ab	6.5% abc	3.6% a	16.4% abc	30.5% abc	2.1% bc	2.9% ab
Viking 0.44-86N	36.4% bc	6.8% ab	3.0% ab	20.3% abc	35.8% abc	2.8% abc	3.2% ab
Viking 087-80N	39.2% abc	6.6% ab	3.3% ab	19.4% abc	34.0% abc	2.6% abc	3.1% ab
Viking 60-85N	37.6% bc	6.2% abcd	3.1% ab	20.6% ab	35.7% abc	2.8% abc	3.0% ab

Table 3: Quality components of silage corn entries.

Discussion

Compared to 2014, the corn was harvested at close to ideal maturity. In 2015, the average moisture was 62%, as compared to 78% average moisture at harvest in 2014. However, in 2015, the stands were much more uneven. While we were able to account for this variation both with our harvest methods and in our statistical analysis, the variable stands add to the uncertainty in the results.

In terms of yield (Table 2, adjusted for moisture to a constant 65%), all entries were statistically tied for having the highest yield, except for Blue River's '14A91', Blue River's '26A17', and Albert Lea's 'Viking 0.44-86N', which were significantly lower than the rest. The yields ranged from 37.0 to 47.5 tons per acre.

Only three varieties were grown in both 2014 and 2015 (see Table 2): Blue River's '14A91', Pioneer's 'P8210', and Albert Lea's 'Viking 0.44-86N'. All of performed differently in 2015 than they did in 2014. Blue River's '14A91' was a top-performer in 2014 but not in 2015, while Pioneer's 'P8210' and Albert Lea's 'Viking 0.44-86N' did not perform in the top tier in 2014 but did in 2015.

Quality was calculated as expected milk per ton of dry silage. This calculation was derived from the quality components (Table 3) using the Milk2006 equation developed by the University of Wisconsin-Madison. All entries had similar quality ratings, except Legacy's 'L2341', which had significantly lower quality. There were no significant differences in estimated milk per acre, which is a combination of yield and quality.

From this trial, the varieties that were earliest, had the highest yield were Blue River's '09R19', Blue River's '21L90', Blue River's '27B16', Legacy's 'L3011', Pioneer's '38N86', Pioneer's 'P8210', Albert Lea's 'Viking 087-80N', and Albert Lea's 'Viking 60-85N'. Of those, the earliest maturing were **Blue River's '09R19', Legacy's 'L3011', Pioneer's '38N86',** and **Pioneer's 'P8210'**.

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