



## Organic Seed Alliance

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

PO Box 772, Port Townsend, WA 98368

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# 2014 Organic Silage Corn Variety Trial for Coastal Humboldt County

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These trials were conducted by Organic Seed Alliance and Warren Creek Farms, and sponsored by California Certified Organic Farmers, Columbia Foundation, Organic Valley Farmers Advocating for Organics Fund and University of California Cooperative Extension – Humboldt County.

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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 10 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	Eureka	ST-7141	78	Conventional, untreated seed, hybrid
2	Blue River	07M91	77	Organic seed, hybrid
3	Blue River	14A91	82	Organic seed, hybrid
4	Blue River	23L99	86	Organic seed, leafy type, hybrid
5	Blue River	33L90	90	Organic seed, leafy type, hybrid
6	Albert Lea	E-95 OP	95	Conventional, untreated seed, open pollinated
7	Viking	0.44-86N	86	Conventional, untreated seed, hybrid
8	Masters Choice	OG468	83	Organic seed, hybrid
9	Kussmaul	K01078	78	Conventional, untreated seed, hybrid
10	Pioneer	P8210	82	Conventional, untreated seed, hybrid

Table 1: Entries in 2014 Humboldt Organic Silage Corn Trial.

## Methods

We planted the trials in a randomized, blocked, and replicated fashion, formally known as randomized complete block design (RCBD). To do this, we divided the field into four blocks, and within each block we planted all ten varieties in a random order. By planting the varieties this way, each variety is grown in four places throughout the field so that we don't 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' long rows.

20'	45'	70'	95'	120'	145'	170'	195'
#3 - 14A91	#2 - 07M91	#9 - K01078	#5 - 33L90	#9 - K01078	#7 - 0.44-86N	#7 - 0.44-86N	#2 - 07M91
#3 - 14A91	#2 - 07M91	#9 - K01078	#5 - 33L90	#9 - K01078	#7 - 0.44-86N	#7 - 0.44-86N	#2 - 07M91
#3 - 14A91	#2 - 07M91	#9 - K01078	#5 - 33L90	#9 - K01078	#7 - 0.44-86N	#7 - 0.44-86N	#2 - 07M91
#3 - 14A91	#2 - 07M91	#9 - K01078	#5 - 33L90	#9 - K01078	#7 - 0.44-86N	#7 - 0.44-86N	#2 - 07M91
#8 - OG468	#10 - P8210	#2 - 07M91	#8 - OG468	#6 - E-95 OP	#2 - 07M91	#10 - P8210	#4 - 23L99
#8 - OG468	#10 - P8210	#2 - 07M91	#8 - OG468	#6 - E-95 OP	#2 - 07M91	#10 - P8210	#4 - 23L99
#8 - OG468	#10 - P8210	#2 - 07M91	#8 - OG468	#6 - E-95 OP	#2 - 07M91	#10 - P8210	#4 - 23L99
#8 - OG468	#10 - P8210	#2 - 07M91	#8 - OG468	#6 - E-95 OP	#2 - 07M91	#10 - P8210	#4 - 23L99
#4 - 23L99	#1 - ST-7141	#4 - 23L99	#7 - 0.44-86N	#4 - 23L99	#3 - 14A91	#3 - 14A91	#9 - K01078
#4 - 23L99	#1 - ST-7141	#4 - 23L99	#7 - 0.44-86N	#4 - 23L99	#3 - 14A91	#3 - 14A91	#9 - K01078
#4 - 23L99	#1 - ST-7141	#4 - 23L99	#7 - 0.44-86N	#4 - 23L99	#3 - 14A91	#3 - 14A91	#9 - K01078
#4 - 23L99	#1 - ST-7141	#4 - 23L99	#7 - 0.44-86N	#4 - 23L99	#3 - 14A91	#3 - 14A91	#9 - K01078
#5 - 33L90	#6 - E-95 OP	#1 - ST-7141	#3 - 14A91	#8 - OG468	#1 - ST-7141	#8 - OG468	#6 - E-95 OP
#5 - 33L90	#6 - E-95 OP	#1 - ST-7141	#3 - 14A91	#8 - OG468	#1 - ST-7141	#8 - OG468	#6 - E-95 OP
#5 - 33L90	#6 - E-95 OP	#1 - ST-7141	#3 - 14A91	#8 - OG468	#1 - ST-7141	#8 - OG468	#6 - E-95 OP
#5 - 33L90	#6 - E-95 OP	#1 - ST-7141	#3 - 14A91	#8 - OG468	#1 - ST-7141	#8 - OG468	#6 - E-95 OP
#7 - 0.44-86N	#9 - K01078	#6 - E-95 OP	#10 - P8210	#5 - 33L90	#10 - P8210	#5 - 33L90	#1 - ST-7141
#7 - 0.44-86N	#9 - K01078	#6 - E-95 OP	#10 - P8210	#5 - 33L90	#10 - P8210	#5 - 33L90	#1 - ST-7141
#7 - 0.44-86N	#9 - K01078	#6 - E-95 OP	#10 - P8210	#5 - 33L90	#10 - P8210	#5 - 33L90	#1 - ST-7141
#7 - 0.44-86N	#9 - K01078	#6 - E-95 OP	#10 - P8210	#5 - 33L90	#10 - P8210	#5 - 33L90	#1 - ST-7141

Figure 1. Layout of Organic Silage Corn Trial.

**Location:** Warren Creek Farms, certified organic farm in Arcata, CA

**Planting date:** 5/30/14

**Final stand density:** Average 36,000 plants/ac (plots ranged from 34,000 – 40,000)

**Fertility:** Prior bell bean + oat cover crop plus 75 lb/acre of pelletized chicken manure applied (4/3/2) in-row prior to planting

**Cultivation:** Two mechanical cultivations. In addition, because planting was delayed after final tillage, these test plots were hoed to reduce weed competition.

**Irrigation:** None (dry-farmed)



Figure 2. Collecting plants for sampling



Figure 3. Processing plants for quality analysis

**Harvest:** Plots were harvested on 10/11/14. We had intended to harvest at approximately 65-70% plant moisture. Unfortunately, the threat of severe predation from birds (starlings) forced us to harvest at above optimum moisture. Whole plant moisture at harvest ranged from 73 – 82% (see results below). We harvested the center two rows of each four-row plot at approximately 4 inches above soil level and weighed the plants 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, WI, to analyze for moisture and quality criteria (see below).

**Evaluation criteria:** Yield in tons/ac adjusted to a constant 35% dry matter, percent moisture, quality (including starch, protein, fiber content and digestibility, and ash), and milk/ac (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.

## Results

	Yield (tons/acre at 65%)		Moisture (%)		Milk per ton of dry		Milk per acre	
Albert Lea E-95 OP	<b>50.0</b>	ab	80.0%	a	<b>2651</b>	abc	32940	a
Blue River 07M91	41.2	bc	<b>76.5%</b>	bcd	<b>2951</b>	a	33650	a
Blue River 14A91	<b>43.9</b>	abc	79.5%	ab	<b>2803</b>	ab	30630	a
Blue River 23L99	<b>45.2</b>	abc	<b>75.5%</b>	cd	<b>2671</b>	ab	33950	a
Blue River 33L90	<b>49.5</b>	ab	<b>77.5%</b>	abcd	2598	bc	34420	a
Eureka ST-7141	<b>43.9</b>	abc	<b>77.0%</b>	abcd	<b>2861</b>	ab	34410	a
Kusmaul K01078	38.0	c	<b>77.3%</b>	abcd	<b>2948</b>	a	30490	a
Masters Choice OG468	43.3	bc	80.0%	a	<b>2859</b>	ab	30420	a
Pioneer P8210	42.5	bc	<b>75.3%</b>	d	<b>2944</b>	a	36020	a
Viking 0.44-86N	52.3	a	78.5%	abc	2341	c	31840	a

Table 2: Average yield, moisture, and quality of silage corn entries. Results in **bold** indicate entries with results statistical 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 Protein (%)		Fat		ADF		NDF		Lignin		Ash	
Albert Lea E-95 OP	12.3%	cde	9.7%	a	2.7%	abcd	32.3%	ab	52.7%	ab	4.0%	ab	6.3%	a
Blue River 07M91	19.8%	ab	8.5%	bc	2.8%	abc	29.0%	b	48.0%	b	4.0%	ab	5.3%	a
Blue River 14A91	15.5%	abcd	8.3%	c	2.5%	bcd	32.3%	ab	51.5%	ab	4.3%	a	5.8%	a
Blue River 23L99	14.3%	bcde	8.5%	bc	2.3%	cd	31.3%	ab	51.3%	ab	3.8%	ab	5.5%	a
Blue River 33L90	10.5%	de	9.3%	ab	2.0%	d	33.3%	a	55.3%	a	4.0%	ab	6.0%	a
Eureka ST-7141	20.5%	a	8.8%	abc	3.3%	a	31.3%	ab	49.8%	b	4.0%	ab	5.5%	a
Kusmaul K01078	18.8%	abc	9.3%	ab	3.0%	ab	29.8%	ab	48.3%	b	3.8%	ab	6.0%	a
Masters Choice OG468	17.0%	abc	8.8%	abc	2.5%	bcd	30.5%	ab	49.8%	b	3.5%	b	5.5%	a
Pioneer P8210	17.5%	abc	8.3%	c	2.3%	cd	30.5%	ab	50.5%	ab	3.5%	b	5.3%	a
Viking 0.44-86N	8.8%	e	8.0%	c	2.0%	d	32.3%	ab	52.8%	ab	4.0%	ab	5.5%	a

Table 3: Quality components of silage corn entries. Grouping letters work as explained above in Table 2.

## Discussion

While all of the entries were harvested at above optimum moisture because of bird predation (discussed in the Methods section), four of the varieties had significantly high whole plant moisture compared to the others (Table 2): Albert Lea’s ‘E-95 OP’ (95 day), Masters Choice’s ‘OG468’ (83 day), Blue River’s ‘14A91’ (82 day), and Albert Lea’s ‘Viking 0.44-86N’ (86 day). These entries do not correspond to what would be expected based on the listed maturities. For example, Blue River’s ‘23L99’ was listed at 86 day maturity, but was drier than both ‘OG468’ and ‘14A91’ even though the listed maturities indicate they would be earlier maturing.



In terms of yield (Table 2, adjusted for moisture to a constant 65%), 'E-95 OP', '14A91', '23L99', '33L99', and 'ST-7141' were all statistically tied for having the highest yield. The yields of these varieties ranged from 43.9 to 50.0 tons per acre.

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 Blue River's '33L90' and Albert Lea's 'Viking 0.44-86N', 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, and the highest quality were Blue River's '23L99' and Eureka's 'ST-7141.'

However, the results of this trial are tempered by the early harvest of the varieties. Silage corn for bunker storage should be harvested at 65-70% moisture. These varieties were harvested at 5 to 15% above that. If the varieties in this trial had been able to fully mature, it is possible that the ranking for relative yield and quality may have been different from the reported results. In addition, 2014 was an unusually warm summer in coastal Humboldt. This trial was planned in the spring of 2014, and there was a limited number of silage corn varieties available in untreated seed at that time. Seed for future trials will be ordered in the fall, potentially allowing us to include more varieties in our evaluations. Trials in future years will be able to provide additional data to aid in making good decisions about appropriate silage corn varieties for organic production in coastal Humboldt County.

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Photos courtesy of Jared Zystro

### **Reference as:**

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