

# NORTHWEST CROPS & SOILS PROGRAM



## 2022 Spring Emmer Variety Trial



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**2022 SPRING EMMER VARIETY TRIAL**  
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Emmer (*Triticum dicoccon*) is an ancient two-rowed hulled wheat, also known as farro. Emmer was domesticated in the Fertile Crescent and was widely cultivated in the ancient world, but has since been replaced with higher yielding modern wheat varieties. Emmer is high in protein and as the ancestor of durum wheat, may be a suitable grain for producing pasta and flatbreads. There is an increasing consumer interest in locally grown grain for human consumption, and this has expanded the demand for end-products such as breads and pastries. Food grade grains will usually bring a premium price, but growers must also meet the higher quality standards, which can be difficult since there is very little information on emmer production in the Northeast. Varietal selection is one of the most important aspects of crop production and significantly influences yield potential. In 2022, the University of Vermont Extension Northwest Crops and Soils (NWCS) Program initiated a trial to evaluate yields and protein of eight spring emmer varieties.

**MATERIALS AND METHODS**

In 2022, a spring emmer variety performance trial was conducted at Borderview Research Farm in Alburgh, VT. Eight spring emmer varieties were evaluated for yield and quality (Table 1).

**Table 1. Spring emmer varieties planted in Alburgh, VT, 2022.**

Variety	Seed source
CDC Tetra	University of Maine
Debra	Cornell University
Lucille	Cornell University
ND Common	Cornell University
NY15330-01-01-05-4	Cornell University
Red Vernal	Cornell University
Vernal	Cornell University
Yon	University of Maine

The trial was planted at Borderview Research Farm in Alburgh, VT on a Covington silty clay loam, 0 to 3% slope (Table 2). The experimental design was a randomized complete block with four replications. The previous crop was corn. The research plots were 5' x 20' and the seedbed was prepared with a Pottinger TerraDisc. The spring emmer varieties were planted on 25-Apr with 6" row spacing at a rate of 125 lbs ac<sup>-1</sup>.

**Table 2. Agronomic practices for the 2022 spring emmer variety trial, Alburgh, VT.**

Location	Borderview Research Farm, Alburgh VT
Soil type	Covington silty clay loam, 0-3% slope
Previous crop	Corn
Tillage operations	Pottinger TerraDisc
Row spacing (in)	6
Plot size (ft)	5 x 20
Seeding rate	125 lbs ac <sup>-1</sup>
Replicates	4
Planting date	25-Apr
Harvest date	5-Aug

On 5-Aug, plant measurements of heights and lodging were taken prior to harvest. Lodging was assessed using a visual rating of 0 (no lodging) to 100 (complete lodging). Plots were harvested on 5-Aug with an Almaco SPC50 plot combine. The emmer grain was dehulled with a Trumpet Abrasion Dehuller. Following dehulling, test weight was taken on the dehulled emmer grain and an approximate one-pound grain sample per plot was collected for quality analysis. Grain quality was determined at the E. E. Cummings Crop Testing Laboratory at the University of Vermont (Burlington, Vermont). Samples were ground using the Perten LM3100 Laboratory Mill. Flour was analyzed for protein content using the Perten Inframatic 8600 Flour Analyzer. Falling number was measured (AACC Method 56-81B, AACC Intl., 2000) on the Perten FN 1500 Falling Number Machine. Deoxynivalenol (DON), a vomitoxin, was analyzed using Veratox DON 2/3 Quantitative test from the NEOGEN Corp. This test has a detection range of 0.5 to 5 ppm. Samples with DON values greater than 1 ppm are considered unsuitable for human consumption.

All data were analyzed using a mixed model analysis where replicates were considered random effects. The Least Significant Difference (LSD) procedure was used to separate cultivar means when the F-test was significant ( $P < 0.10$ ). Variations in yield and quality can occur because of variations in genetics, soil, weather, and other growing conditions. Statistical analysis makes it possible to determine whether a difference among varieties is real or whether it might have occurred due to other variations in the field. At the bottom of each table a LSD value is presented for each variable (e.g. yield). LSD at the 10% level of probability are shown. Where the difference between two varieties within a column is equal to or greater than the LSD value at the bottom of the column, you can be sure in 9 out of 10 chances that there is a real difference between the two varieties. In the example, variety A is significantly different from variety C, but not from variety B. The difference between A and B is equal to 725, which is less than the LSD value of 889. This means that these varieties did not differ in yield. The difference between A and C is equal to 1454, which is greater than the LSD value of 889. This means that the yields of these varieties were significantly different from one another. The asterisk indicates that variety B was not significantly lower than the top yielding variety shown in bold.

Variety	Yield
A	3161
B	3886*
C	<b>4615*</b>
<b>LSD</b>	889

## RESULTS

Weather data was recorded with a Davis Instrument Vantage Pro2 weather station, equipped with a WeatherLink data logger at Borderview Research Farm in Alburgh (Table 3). Temperatures in Apr, Jun, and Jul were slightly cooler than normal. May was warmer than normal, averaging 2.09 degrees above the 30-year average. Apr and Jun had 4.97 inches of precipitation above the 30-year average. There was a total of 3510 Growing Degree Days (GDDs) from Apr to Jul, marking 36 GDDs less than the 30-year normal.

**Table 3. Temperature and precipitation summary for Alburgh, VT, 2022.**

Alburgh, VT	April	May	June	July
Average temperature (°F)	44.8	60.5	65.3	71.9
Departure from normal	-0.81	2.09	-2.18	-0.54
Precipitation (inches)	5.57	3.36	8.19	3.00
Departure from normal	2.50	-0.40	3.93	-1.06
Growing Degree Days (32-95°F)	391	883	1000	1236
Departure from normal	-20	65	-64	-17

Based on weather data from a Davis Instruments Vantage Pro2 with WeatherLink data logger.

Historical averages are for 30 years of NOAA data (1991-2020) from Burlington, VT.

Just prior to harvest, heights, lodging, and heading date were measured (Table 4). The average height was 107 cm and ranged from 85.7 to 116 cm. ND Common was the tallest variety and was statistically similar to all varieties except CDC Tetra and Debra. The average lodging was 23.1 percent with Debra being the only variety with 0.00 percent lodging and also the shortest variety in the trial. Four other varieties were statistically similar to Debra. The average heading date for this trial was 29-Jun and ranged from 25-Jun to 2-Jul.

**Table 4. Pre-harvest measurements by spring emmer variety, Alburgh, VT, 2022.**

Variety	Height cm	Lodging %	Heading date
CDC Tetra	100	41.7	26-Jun
Debra	85.7	<b>0.00*</b>	25-Jun
Lucille	111* <sup>†</sup>	38.3	30-Jun
ND Common	<b>116*</b>	18.3*	1-Jul
NY15330-01-01-05-4	110*	1.67*	1-Jul
Red Vernal	114*	1.7*	1-Jul
Vernal	113*	71.7	2-Jul
Yon	108*	11.7*	26-Jun
LSD (0.10) ‡	10.3	30.8	2.05
Trial mean	107	23.1	29-Jun

†Treatments with an asterisk (\*) are not statistically different from the top performer, shown in **bold**.

‡LSD; least significant differences at p=0.10.

Harvest and quality measures for each spring emmer variety are presented in Table 5. The average yield for this trial was 2028 lbs ac<sup>-1</sup>. Yon had the highest yield, 2543 lbs ac<sup>-1</sup>, and that was not statistically different from three other varieties. All varieties performed statistically similar to each other in test weight, falling number, moisture, crude protein, starch, and DON quality parameters. NY15330-01-01-05-4 had the highest test weight at 57.3 lbs bu<sup>-1</sup>. Vernal had the highest falling number at 448 seconds, and the highest crude protein content at 16.1%. DON levels were high this season in the spring emmer varieties. The trial average was 3.88 ppm, and that is above the acceptable level for human consumption of 1 ppm. Red Vernal had the highest level of DON at 4.87 ppm.

**Table 5. Harvest and quality measures, Alburgh, VT, 2022.**

Variety	Yield @ 13.5% moisture  lbs ac <sup>-1</sup>	Test weight  lbs bu <sup>-1</sup>	Falling number  seconds	Moisture  %	Crude protein @ 12% moisture  %	Starch  %	DON  ppm
CDC Tetra	1527	51.3	422	23.5	15.4	57.1	<b>3.33</b>
Debra	2274* <sup>†</sup>	55.3	377	26.9	14.7	57.1	3.83
Lucille	1964	55.3	377	23.7	13.2	<b>58.4</b>	3.40
ND Common	2035	54.0	413	25.4	14.3	57.5	4.30
NY15330-01-01-05-4	1631	<b>57.3</b>	409	28.7	15.7	57.0	4.40

Red Vernal	2084*	55.0	432	23.6	141	57.8	4.87
Vernal	2161*	55.0	<b>448</b>	23.6	<b>16.1</b>	56.4	3.47
Yon	<b>2543*</b>	56.3	441	<b>23.0</b>	14.9	57.0	3.43
LSD (0.10) ‡	502	NS	NS	NS	NS	NS	NS
Trial mean	2028	55.0	415	24.8	14.8	57.3	3.88

†Treatments with an asterisk (\*) are not statistically different from the top performer, shown in **bold**.

‡LSD; least significant differences at  $p=0.10$ .

## DISCUSSION

It is important to remember that these results represent data from one year at one location. In 2022, the average yield was 2028 lbs ac<sup>-1</sup>, slightly lower than the 2021 emmer variety trial average yield of 2236 lbs ac<sup>-1</sup>. The level of deoxynivalenol (DON) was higher than the other spring grain trials from this season, and all of the emmer varieties had DON levels greater than 1 ppm, making them unsafe for human consumption. The availability of quality seed is very important, especially for these ancient grain varieties. With the growing interest in heirloom and ancient grains, it is important to conduct more research on spring emmer varieties to determine which ones will do well in this region. The UVM Northwest Crops and Soils Program plans to repeat this trial again in 2023.

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