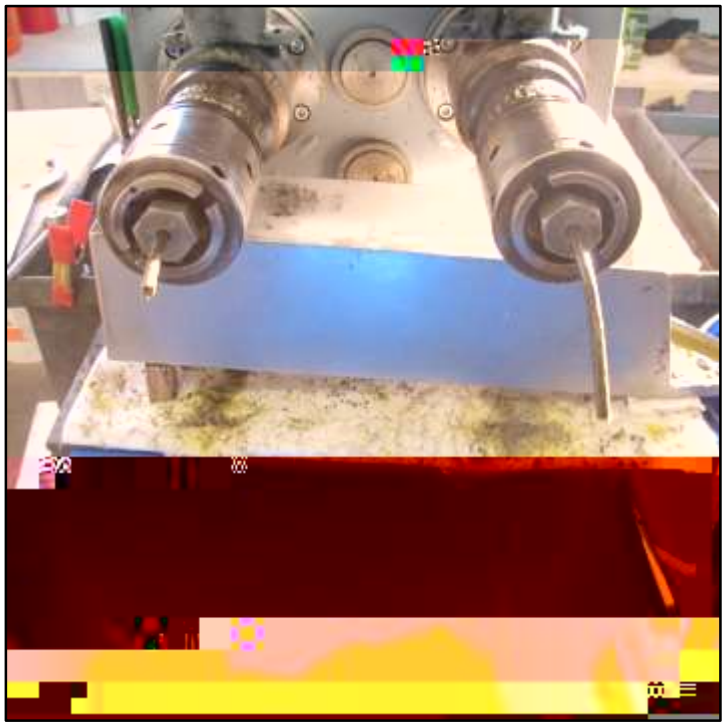
2015 Oilseed Meal as a Fertility Amendment in Sweet Corn



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UNIVERSITY OF VERMONT EXTENSION
CULTIVATING HEALTHY COMMUNITI

2015 OILSEED MEAL AS A FERTILITY AMENDMENT IN SWEET CORN

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Many Northeast growers are integrating oilseed crops such as canola, soybeans, and sunflower into their operation, in hopes of on-farm fuel production, value-added products, and/or livestock feed. Many producers are using small-scale presses to mechanically separate oil from the seed. Oilseed meal, the high-protein byproduct left after the extrusion of oil, can be milled and used as a soil amendment to increase fertility and organic matter. This material has the potential to replace high-cost imported fertilizers, especially for organic growers.

MATERIALS AND METHODS

A trial was initiated at Borderview Research Farm in Alburgh, Vermont to assess the effectiveness of using oilseed meals as a fertility amendment in sweet corn (Table 1). The experimental design was a randomized complete block with three replications. Treatments consisted of four fertility amendment types (three different oilseed meals and sodium nitrate) at two different application rates (50 and 100 lbs nitrogen per acre) and a control that received no fertility. Application rates were adjusted based on the percentage of plant available nitrogen (PAN) at 70 days. The PAN at 70 days for the canola is 52.0%, for the soybean is 52.9%, for the sunflower is 39.0%, and for the sodium nitrate is 84.1%.

Table 1. Agronomic information for oilseed meal trial 2015, Alburgh, VT.

Location	Borderview Research Farm Alburgh, VT
Soil type	Benson rocky silt loam, 8-15% slope
Previous crop	Spring wheat
Soil amendments	Canola meal, soybean meal, sunflower meal, sodium N
Amendment rates (lbs ac^{-1})	50, 100
Replications	3
Plot size (ft)	10 x 25
Sweet corn variety	Johnny's 'Sugar Buns' (F1, 70 days, treated)
Soil amendment date	19-May
Planting date	25-May
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Meal

RESULTS

Seasonal precipitation and temperature was recorded with a Davis Instrument Vantage Pro2 weather station, equipped with a WeatherLink data logger, at Borderview Research Farm in Alburgh, VT. June was a wet month with 2.73 more inches of precipitation than normal (Table 3). The remainder of summer was relatively dry with 6.61 fewer inches of precipitation than normal over July and August. Temperature varied with May being much warmer than the 30 year average. Overall, there were an accumulated 2031 Growing Degree Days (GDDs) May – August, approximately 137 more than the historical average.

Table 3. Consolidated weather data and GDDs for sweet corn, Alburgh, VT, 2015.

Alburgh, VT	May	June	July	August
Average temperature (°F)	61.9	63.1	70.0	69.7
Departure from normal	5.5	-2.7	-0.6	0.9
Precipitation (inches)	1.94	6.42	1.45	0.00
Departure from normal	-1.51	2.73	-2.70	-3.91
Growing Degree Days (base 50°F)	376	399	630	626
Departure from normal				

Table 4. Effects of soil amendment treatments on nitrate levels, Alburgh, VT, 2015.

Soil amendment & rate

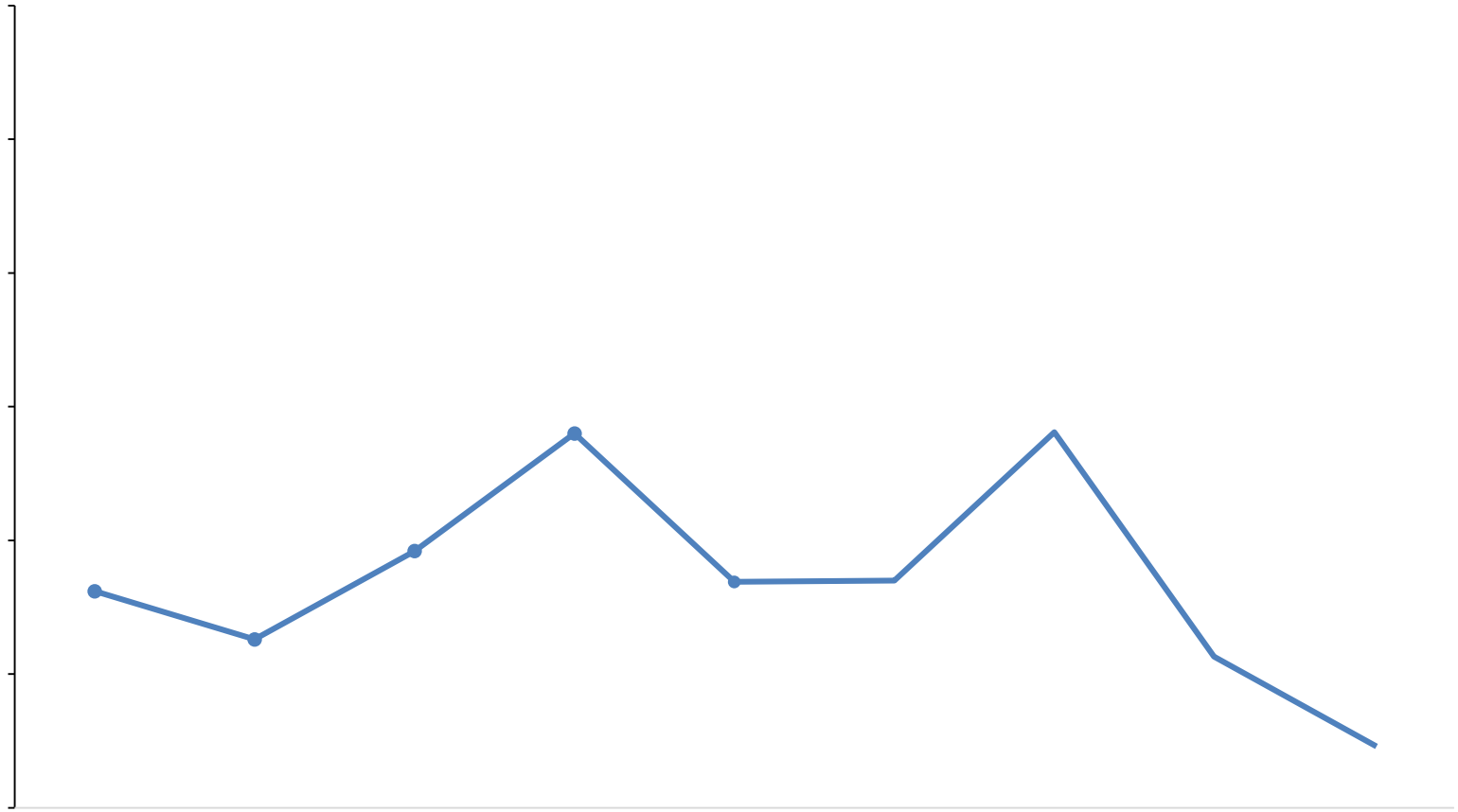

Figure 1. Nitrate levels from 29-May to 13-Aug 2015, Alburgh, VT. There was a significant difference in NO_3 level by treatment for eight of the nine sample dates (p=0.10). The thick black line represents the trial mean.

Sweet corn populations tended to be low, with the sodium nitrate at 100 lbs ac^{-1} having the highest population at 25903.7 plants ac^{-1}, though this was not statistically different from three other treatments (Table 5). The canola at 100 lbs ac^{-1} had the highest number of ears per plot, which was not statistically different from three other treatments. Ear length also varied significantly by treatment, with sunflower at 100 lbs ac^{-1} being the highest, though not significantly different from three other treatments. The canola at 100 lbs ac^{-1} had the highest yield, at 2.8 tons ac^{-1}, which was not statistically different from sunflower at 100 lbs ac^{-1}, soybean at 100 lbs $acre^{-1}$, sodium nitrate at 100 lbs $acre^{-1}$, or the control (Figure 2).

Table 5. Effects of soil amendments on population and yields of sweet corn, Alburgh, VT, 2015.

Soil amendment and rate	20-Aug population	Yield	Corn ears	Ear length

DISCUSSION

Based on this study, oilseed meal has the potential to deliver adequate N to crops. Not surprisingly, canola (5.8% N), soybean (5.7% N), and sunflower (3.8% N) all had lower nitrate levels in the first two soil sample dates than sodium nitrate (16.0% N), at both application rates (Table 4). Interestingly, the soybean, sunflower, and canola meal had a peak in nitrate release on 17-Jun (about 30 days after fertilizing) and another peak on 17-Jul (Figure 1). This indicates that the fertilizers required about one month before providing a peak level of PAN. Also, nitrate release rates may have decreased in June due to it being extremely wet and cool. The N in the canola and soybean meal mineralized more rapidly than other meals especially when applied at high rates.

Overall, the sweet corn yields were poor and was likely due to high weed pressure at the site. Extreme wet and cool weather during the month of June made it difficult to control weeds during early season corn development. Poor crop performance was also reflected in the variation in ear lengths and relatively low number of ears per plot, averaging 3694 ears ac^{-1}, whereas the national averages for organic sweet corn is 12,000 ears ac^{-1}. Although yields were low, canola, sunflower, and soybean meal each at 100 lbs ac^{-1}