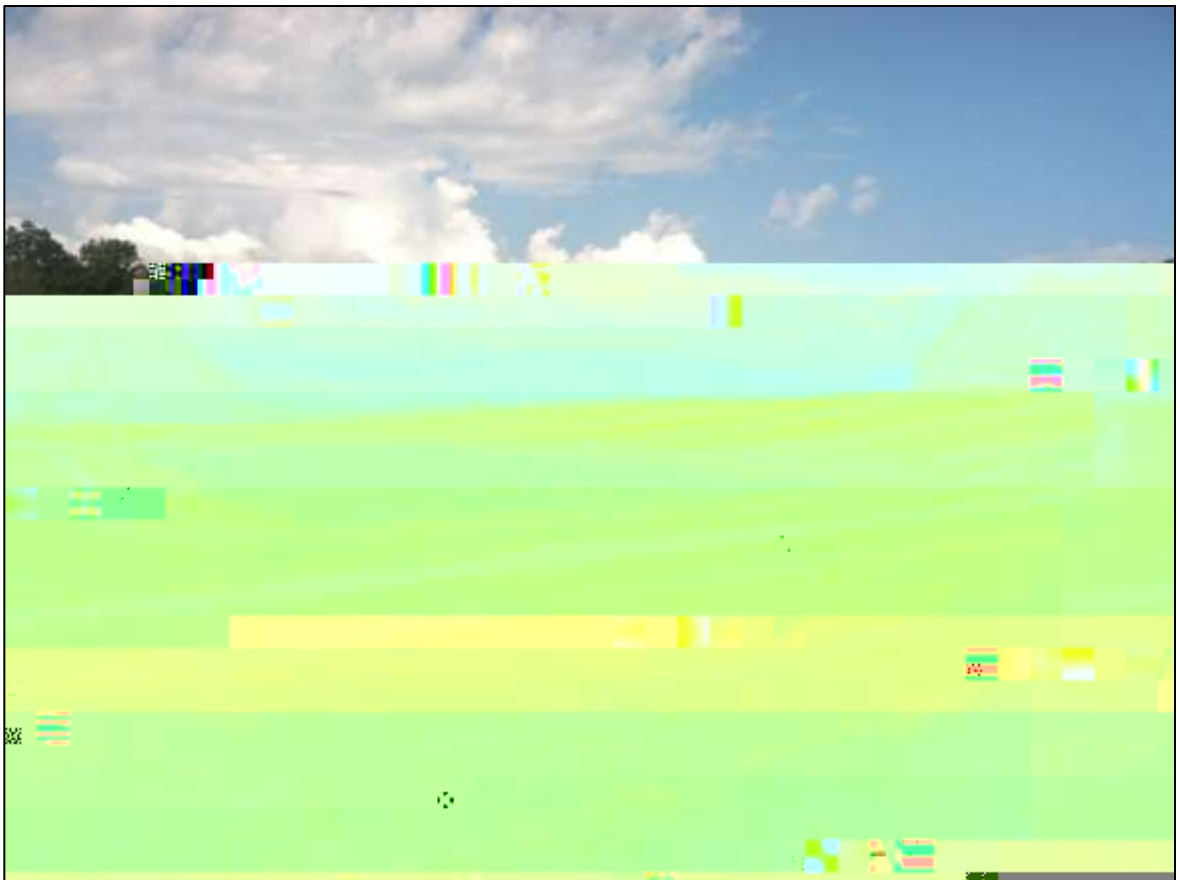
Enhancing Forages with Nutrient Dense Sprays 2014 Trials



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ENHANCING FORAGES WITH NUTRIENT DENSE SPRAYS, 2014 TRIALS

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The purpose of the Nutrient Dense Spray trial is to evaluate the efficacy of amending forages with foliar sprays. Twenty fourteen was the third year of the trial. The nutrient spray program was developed by Advancing Eco-Agriculture and consisted of five foliar sprays recommended for the farms participating in this study. In 2014, a sixth The recommended spray program included applications of Rejuvenate in the early spring and late fall, and a combination of PhotoMag, Phosphorus, Potassium, MicroPak, and Sea Shield applied in the spring and after each cut of hay or graze (Table 1). This study was conducted based on farmer interest in enhancing nutrient density of forages through foliar sprays and was funded by the Lattner Foundation. Any reference to commercial products, trade names or brand names is for information only, and no endorsement or approval is intended.

Table 1. Information on Advancing Eco-Agriculture nutrient dense sprays.[1]

Spray	What is it?	What does it do?
Rejuvenate	humic substance, carbohydrates, sea minerals	stimulates soil microbial life
PhotoMag	magnesium, sulfur, boron, cobalt, sea minerals	promotes chlorophyll and sugar production
Phosphorus	mined phosphate ore	improves photosynthesis and plant root vigor
Potassium	mined potassium sulfate	improves storability
MicroPak	boron, zinc, manganese, copper, cobalt, molybdenum, sulfur	enhances sugar translocation, root strength, and plant immunity
Sea Shield	crab and shrimp shell concentrate	enhance plant health and immune response

[1]Information gathered from the Advancing Eco-Agriculture website: growbetterfood.com.

MATERIALS AND METHODS

In 2014, forages were amended with nutrient dense sprays at two locations: Shelburne Farms in Shelburne, VT and Butterworks Farm in Westfield, VT. Both hayfields had been in native grass/legume mixture for numerous years. The nutrient recommendations from Advancing Eco-Agriculture are listed in Table 2. In order to understand what as well as a control of water. The experimental design was a randomized complete block with four replications.

Table 2. Timing and amount of Nutrient Dense Sprays used.

Timing	Recommendations (per acre)
Early Spring	3 tons compost, 20 lb. Borate (10%), and 5 lbs. Zinc sulfate, 2 gal. Rejuvenate, 1 gal. Sea Shield
After Each Cut	1 gal. PhotoMag, 1 gal. Phosphorus, 1 quart Potassium, 2 quarts MicroPak, 2 quarts Sea Shield
Fall, post harvest	6 quarts Rejuvenate, 2-3 tons compost

Six by ten foot plots were established in existing hay fields in 2012. The same plots were used in 2013 and 2014. Harvest and spray dates for each location are listed in Table 3. Plots were harvested with a BCS sickle bar mower (Portland, OR), raked by hand, gathered and weighed on a platform scale. A subsample was dried at 40^{o}C and weighed to determine dry matter. Oven dry samples were coarsely ground with a Wiley mill (Thomas Scientific, Swedesboro, NJ), finely ground with a UDY cyclone mill with a 1 mm screen (Seedburo, Des Plaines, IL) and analyzed with an NIRS (Near Infrared Reflectance Spectroscopy) DS2500 Feed and Forage analyzer (FOSS, Eden Prairie, MN) at the University of Vermont Cereal Testing Lab (Burlington, VT). Results were analyzed with an analysis of variance in SAS (Cary, NC).

Table 3. Harvest and spray dates at each location.

Treatment	Butterworks Farm	Shelburne Farms
Spray Spring Treatments	8-May	7 & 9-May
1st Cut	6-Jun	27-May
Spray All Treatments	17-Jun	4-Jun
2nd Cut	3-Jul	30-Jun
Spray All Treatments	14-Jul	8-Jul
3rd Cut	6-Aug	6-Aug
4th Cut	24-Sep	None

Forage samples were dried, ground and analyzed for quality characteristics including crude protein (CP), acid detergent fiber (ADF), neutral detergent fiber (NDF) and various other nutrients. The Nonstructural Carbohydrates (NSC) were calculated from forage analysis data. Mixtures of true proteins, composed of amino acids and non-protein nitrogen make up the crude protein (CP) content of forages. The bulky characteristics of forage come from fiber. Forage feeding values are negatively associated with fiber since the less digestible portions of the plant are contained in the fiber fraction. The detergent fiber analysis system separates forages into two parts: cell contents, which include sugars, starches, proteins, non-protein nitrogen, fats and other highly digestible compounds; and the less digestible components found in the fiber fraction. The total fiber content of forage is contained in the neutral detergent fiber (NDF). Chemically, this fraction includes cellulose, hemicellulose and lignin. Recently, forage testing laboratories have begun to evaluate forages for NDF digestibility. Evaluation of forages and other feedstuffs for NDF digestibility is being conducted to aid prediction of feed energy content and animal performance. Research has demonstrated that lactating dairy cows will eat more dry matter and produce more milk when fed forages with optimum NDF digestibility. Forages with increased NDF digestibility (NDFD) will result in higher energy values, and perhaps more importantly, increased forage intakes. Forage NDF digestibility can range from 20 80%. The NSC or non-fiber carbohydrates (NFC) include starch, sugars and pectins.

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

RESULTS AND DISCUSSION

Seasonal precipitation and temperature recorded at weather stations in close proximity to Westfield and Shelburne, VT are reported in Table 4. The temperature in Westfield was below the 30-year average for the growing season, while precipitation was above average. There were a total of 4694 GDDs (growing degree days), which is 222 GDDs below the average. In Shelburne, monthly temperatures were above the 30-year average for every month of the growing season except April. There were a total of 5567 GDDs, 226 GDDs above average. Warmer temperatures in Shelburne contributed to the earlier harvests of hay. There was over 3 inches of precipitation above the 30-year normal for April through July. However, August and September were dry, almost 4 inches below than the 30-year normal.

Table 4. Seasonal weather data collected near Westfield and Shelburne, VT, 2014.

Westfield*	April	May	June	July	August	Sept
Average Temperature (F)	39.4	53.6	62.9	67.2	64.6	57.4
Departure from Normal	-3.2	-1.2	-0.9	-0.8	-1.5	-0.9
Precipitation (inches)	3.04	5.39	4.45	5.85	4.83	2.73
Departure from Normal	0.23	1.72	0.49	1.52	0.22	-0.65

Table 5. First cut hay yield and quality, Westfield, VT, 6-Jun 2014.

Treatment	DM	DM yield	CP	Starch	ADF	NDF	NFC	NDFD

Table 8. Fourth cut hay yield and quality, Westfield, VT, 24-Sep 2014.

Treatment	DM %	DM yield lbs. $acre^{-1}$	CP %	Starch %	ADF %	NDF %	NFC %	NDFD %

matter yields were highest for first cut, averaging 2270 lbs acre^{-1} (Figure 2). Second and third cut yields averaged 1505 and 1827 lbs acre^{-1}, respectively. Average crude protein levels were highest for second cut, averaging 18.1%.

Table 9. First cut hay yield and quality, Shelburne, VT, 27-May 2014.

Treatment	DM %	DM yield lbs. acre^{-1}	CP %	Starch %	ADF %	NDF %	NFC %	NDFD %
All	16.7	2379						

Figure 2. First, second and third cut dry matter yields, Shelburne, VT, 2014.

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