

Comparisons of Hydra-Hume™, Asset® RS and SuperBio® AgBlend on Late Spring and Early Summer Alfalfa Yields and Quality

Michael D. Rethwisch, Mark Reay, Rigo Perez, Jessica Wellman, David Ramos and Jessica Grudovich

Abstract

Asset® RS, HydraHume™ and SuperBio® Ag Blend were evaluated during several sequential alfalfa harvests for their effects on alfalfa yields and quality. Addition of Hydra-Hume™ or AgBlend when applied via chemigation appear to have slightly increased hay yields over the three cutting period by 0.12-0.22 tons/acre respectively when compared with an area of the field that received 10-34-0 but was a different soil type. Addition of Asset® RS to Hydra-Hume™ did not provide any additional consistent yield increase in this study. Addition of Asset® RS resulted in increased hay quality as measured by protein levels, acid detergent fiber, total digestible nutrients, neutral detergent fiber and relative feed value. These parameters were often statistically different than the Hydra-Hume™ treatments. It is unknown if application of Asset® RS would result in similar or greater quality and yeild response alone or on another soil type. Different results for all products may occur if heavier soils are used for experimentation rather than sandy soils, as nutrient availability is affected by soil type and pH.

Introduction

There are a number of products currently available that claim to increase alfalfa tonnage and profits, which in a year with higher than average alfalfa prices could pay for themselves if they are indeed effective. Limited published research from the desert southwest is available on the effects of products that contain substances such as humic acid on alfalfa production however. Humic acids and humates are thought to aid in the conversion of fertilizers to forms usable by plants and augment micronutrient availability with greater results expected on heavier soils, and therefore may increase alfalfa tonnage and/or quality.

One low desert study noted that several products containing humic acid resulted in a numeric increase of total digestible nutrients as well as slightly lower acid detergent fiber when utilizing a foliar application to alfalfa just beginning to green up after a mid-summer cutting (Rethwisch and Reay, 2003), although yield trends due to treatments were not able to be detected. This study only recorded data from one cutting after application however. Field trials conducted in the Pacific Northwest found that the humic acid containing product Hydra-Hume™ consistently increased yield and quality under the enviromental conditions associated with eastern Oregon and western Idaho (soil types not denoted) for several cuttings after application (Helena Chemical Company, 2000), although these applications were made to soil/foliage, and not via chemigation.

Low desert growers using products containing humic acid and other products apply them via irrigation waters to minimize the costs associated with product and application, rather than apply these products to foliage however. This experiment was initiated to obtain alfalfa yield and quality data for such products applied via chemigation under low desert production conditions.

Methods and Materials

Three products were applied via irrigation waters (chemigation) to alfalfa (var. WL 525 HQ) in its first year of production being grown on an 80 acre field that consisted primarily of fine sandy loam and fine sandy soils (approximately 50% Gilman fine sandy loam, 15% Meloland fine sandy loam, 17% Rositas fine sand, and 17% Gilman silty clay loam, with about 1% each of Imperial fine sandy loam and Glenbar silty clay loam).

As the silty clay loam soils were almost exclusively in the western 20 acres of this field, the eastern 60 acres were used to evaluate the products using a randomized complete block design and three replications. The western 20 acres (consisting of 4 land areas) was used only for 10-34-0 fertilizer.

Products tested in 2004 were Hydra-Hume™, Asset® RS (both Helena Chemical Company, Collierville, TN) and SuperBio® AgBlend (Advanced Microbial Solutions, Pilot Point, TX). Hydra-Hume™ has a guaranteed analysis of 2 % nitrate nitrogen, and 0.1% soluble potash (K₂O), and 8% humic acids derived from leonardite. Asset® RS is not a fertilizer but an fertilizer additive, usually used with starter fertilizers for the purpose of enhancing the solubility and absorption of plant nutritional products. It consists of 37% ammonium carboxylates and polyacrylates, and 63% inert ingredients, and was applied at 24 and 48 oz./acre in combination with one gallon/acre of Hydra-Hume™. SuperBio® AgBlend contains over one million culturable bacteria per milliliter, as well as many other species of microorganisms and their by-products. This product is a 3-0-0 formulation and is enhanced with humate material.

The field had been fertilized at planting with 200 lbs/acre of 11-52-0 fertilizer and had received no fertilization since that time. The field was soil sampled in early May prior to study initiation, with one sample (16 total) obtained per plot. Laboratory analyses (Stanworth Crop Consulting, Blythe, CA) indicated the following soil fertility production parameters:

-----Parts/million-----						
<u>NO₃-N</u>	<u>PO₄-P</u>	<u>K</u>	<u>ECe</u>	<u>Sp</u>	<u>Zn</u>	
9	12	63	1.22	41.6	1.17	

Four treatments were applied along with 10-34-0 fertilizer to the eastern 60 acres of the field. Amount of 10-34-0 applied was approximately 7 gal/acre on May 11, and 10 gal/acre on June 4. Treatments were as follows:

<u>Product</u>	<u>Rate/acre</u>	<u>Application date(s)</u>
Hydra-Hume™	1 gallon	May 11, June 4
Hydra-Hume™ + Asset® RS	1 gallon 24 oz	May 11, June 4
Hydra-Hume™ + Asset® RS	1 gallon 48 oz	May 11, June 4
SuperBio® AgBlend	6 qts	May 11

As acreage per plot varied (range of 4.89-5.92 acres/plot for sandy loam/fine sand soils), special care was taken to assure that amount of product per acre for treatments was adjusted for each plot accordingly. Exact amounts of 10-34-0/acre as well as total water varied however, as plots were not exactly the same acreage, although watering time for each replicate (4 lands) was the same. The western four plots that had silty clay loam soils received only 10-34-0 during the May 11 application did not receive any 10-34-0 during the June 4 irrigation.

Treatments for each individual replicate were applied in the same manner, beginning about 30 minutes after irrigation waters were initiated to replicates. Product necessary for each plot was calculated by dividing by a factor of 12 to 15 (depending upon time expectancy for irrigation), and further divided by number of ports for at each individual plot. The calculated amount of product then added at each appropriate port every 15-20 minutes.

Products were applied in the same manner in each replicate, although variances between replicates were noted. These included shorter/longer irrigation sets than originally calculated for several replicates, resulting in either a larger amount of product in the final port application to apply the correct amount of product/acre, or finishing before the set for the replicate was completed. A marked difference in consistency of Hydra-Hume™ was noted for the two application dates, with product very thick on the May 11 application, but quite fluid on June 4.

Plots were cut on May 18, June 15, and July 17, raked and then baled utilizing small bales to enable data to be collected from these cuttings. The August cutting utilized large bales and accurate yields and quality could not therefore be obtained from this harvest. After baling, number of bales for each land were counted, and weights of a number of bales/plot were obtained to calculate average bale weight for each individual plot. Alfalfa yields per acre were then calculated.

Quality samples were also obtained by sampling seven bales from each of the 16 plots for each harvest. Samples consisted of cores from ends of bales (usually one/row) obtained with a Utah sampler. Three samples obtained from the June 15 cutting (Hydra-Hume™ + 48 oz/acre of Asset® RS, and 2 from the 10-34-0 only plots) were unable to be analyzed due to sampling and handling error.

Samples were analyzed for various quality components by near infrared technology (Stanworth Crop Consultants, Blythe, CA). Data were analyzed with Fisher' least significant difference to determine if differences in results were due to treatments.

Results

Hay Yields

No differences in yield were noted at the first cutting after application, with all treatments resulting in almost equal hay yields (Table 1). This was not unexpected as harvest occurred on May 18, just one week after treatment application to cutting. In the June harvest a slight increase in yields from treated all treatments was noted from all treatments when compared with the 10-34-0 only plot areas. Noted differences may be partially due to the different soil types for the 10-34-0 plot areas, the treatments and/or a combination of both. Addition of Asset® RS to Hydra-Hume™ resulted in an additional 1/20 of a ton/acre in both May and June cuttings than Hydra-Hume™ without Asset® RS, but this increase was not noted in the July harvest however.

July yields were very similar to that of June yields in treated plots, although yields decreased by 0.08 tons/acre in the 10-34-0 plot area when comparing the two harvests. Hydra-Hume™ and Hydra-Hume™ + 24 oz./acre of Asset® RS resulted in significantly more hay than the 10-34-0 plots in the July harvest. Sandier soils and/or treatments resulted in an increase of 0.12-0.22 tons/acre over the three cuttings that data were able to be collected (Table 1).

Hay Quality

Overall hay quality decreased during the study, which was expected. Effects of treatments were more pronounced on hay quality than on yields. Although hay yields were very similar in the May harvest for all plots, some differences (although not statistical) were noted in quality for treated alfalfa when compared with 10-34-0 plots only. Asset[®] RS appeared to effect hay quality more than either Hydra-Hume[™] or SuperBio[®] AgBlend, resulting in highest hay quality in most parameters tested, with differences due to this product most noticeable from the July harvest. The exact reason for this is unclear, but there is thought that Asset[®] RS increases fine root hair growth and would therefore result in increased ability to uptake nutrients and water.

Crude Protein

In the May cutting every treatment resulted in slightly higher crude protein (22.08% average) than the 10-34-0 only plots (21.6%). In the June harvest lowest crude protein was noted in alfalfa treated with SuperBio[®] AgBlend (17.07%) and Hydra-Hume[™] treatments (16.97%). Additional of Asset[®] RS to Hydra-Hume[™] increased crude protein (Table 2), with the 48 oz./acre rate resulting in the highest amount of crude protein at this cutting (17.65%). The treatment containing 24 oz./acre of Asset[®] RS also had a higher percentage of crude protein (17.27%) than Hydra-Hume[™] alone, it was less than the 10-34-0 treatment (17.5%) for the June harvest.

Addition of Asset[®] RS to Hydra-Hume[™] resulted in a significantly higher level of crude protein (17.4% average) in the July cutting than did Hydra-Hume[™] by itself (16.4%). AgBlend and HydraHume[™] treatments resulted in lowest levels of crude protein, similar to that noted in the June cutting.

Digestible Protein

Digestible protein levels (Table 3) were very similar to that noted for crude protein. Alfalfa from plots which received only the 10-34-0 in the May application had the lowest levels of digestible protein in the May harvest. Alfalfa receiving AgBlend and Hydra-Hume[™] treatments had the lowest levels of digestible protein in both the June and July cuttings, with alfalfa from plots receiving only 10-34-0 having slightly higher for both of these harvests. Addition of Asset[®] RS resulted in a significantly higher digestible crude protein in July harvested alfalfa.

Acid Detergent Fiber (ADF)

Alfalfa from plots receiving only 10-34-0 had lower percentage acid detergent fiber (ADF) in the May harvest although this was not statistically different (Table 4). Alfalfa from all treatments was classed in the 'good' category (ADF of 29-32%) for alfalfa hay quality for this cutting. Similar trends were noted for the June cutting. Although no statistical differences or quality class differences existed (all hay classed as fair), a lower ADF value (34.0) was noted for alfalfa receiving only 10-34-0 than all other treated alfalfa with the exception of the Hydra-Hume[™] + 48 oz./acre of Asset[®] RS (33.4).

Statistical differences for ADF did exist in the July cutting, as alfalfa receiving treatments containing Asset[®] RS had significantly lower ADF (Ave. 35.95) than did SuperBio[®] AgBlend or the untreated check (both 37.8). Alfalfa receiving Hydra-Hume[™] without Asset[®] RS was over 1 percentage point higher (37.2) than the Hydra-Hume[™] treatments which included Asset[®] RS.

Total Digestible Nutrients (TDN)

As total digestible nutrients (TDN) calculations are based on ADF values, data for this quality parameter mirror those noted for ADF in somewhat of a reversed image, as lower values for ADF translate into higher values for TDN (Table 5).

Neutral Detergent Fiber (NDF)

Neutral detergent fiber (NDF) results are similar to those reported in the immediate two preceding subsections. No statistical differences were noted for alfalfa due to treatments from the May harvest and the 10-34-0 only treatment resulted in the lowest NDF value. Statistical differences did occur in the June harvest (Table 6) which were not noted in either ADF or TDN for this harvest. The treatment containing 48 oz./acre of Asset[®] RS resulted in an NDF level of 42.8%, significantly different than that of AgBlend (44.9%). All other treatments resulted in alfalfa hay NDF values between these two values.

Neutral detergent fiber levels from July harvested hay indicated greater statistical differences than than noted from the June harvest. Alfalfa receiving Asset[®] RS (24 or 48 oz./acre) had significantly lower NDF (ave. = 46.0%) than either Hydra-Hume[™] or AgBlend (ave. = 48.4%). The latter two values were slightly higher than the 10-34-0 only alfalfa (48.0) which was statistically different from the treatment containing 24 oz./acre of Asset[®] RS (45.9%).

Modified Crude Protein (MCF)

Modified crude protein results followed that reported of other fiber parameters in that lower values were noted in May from the 10-34-0 only treated alfalfa than the other treatments (Table 7), and slightly lower values for MCF were noted from Asset[®] RS containing treatments than AgBlend or Hydra-Hume[™] from the June cutting. A significantly lower MCF value was noted from alfalfa treated with the 24 oz./acre rate of Asset RS than Hydra-Hume[™] alone for the July harvest, with Asset[®] RS alfalfa having the lowest MCF values, while AgBlend and Hydra-Hume[™] alfalfa had the highest MCF values for the July cutting.

Relative Feed Value (RFV)

Alfalfa from 10-34-0 only plots had the highest relative feed value (146.2) from the May harvest (Table 8), consistent with all other quality parameters noted for this harvest but may be a result of a different soil type for this area of the field rather than treatment effects in light of applications being made only seven days prior to harvest. All other alfalfa had very similar, but slightly lower, RFV scores than alfalfa from the 10-34-0 only plots (Table 8) for this harvest.

Some statistical differences were noted in both the June and July harvests for RFV. For both harvests alfalfa receiving the treatment containing 48 oz./acre of Asset[®] RS had a significantly higher RFV score than alfalfa treated with SuperBio[®] AgBlend, with larger differences noted for the July harvest. Highest RFV score for the June harvest was noted from alfalfa which received the treatment containing 48 oz./acre of Asset[®] RS. Highest RFV score (123.6) for the July harvest was noted from alfalfa the treatment containing 24 oz./acre of Asset[®] RS, followed closely by the 48 oz./acre rate (122.6). Relative feed value of alfalfa from plots receiving 10-34-0 only were similar to alfalfa receiving Asset[®] RS treatments from the June harvest, but was significantly less than these treatments in the July harvest.

Conclusions

Addition of Hydra-Hume[™] or AgBlend when applied via chemigation appear to have slightly increased hay yields over the three cutting period by 0.12-0.22 tons/acre respectively when compared with an area of the field that received 10-34-0 but was a different soil type. Different results may occur if heavier soils are used for experimentation rather than sandy soils, as nutrient availability is affected by soil type and pH.

Addition of Asset[®] RS at rates evaluated to Hydra-Hume[™] did not provide any additional consistent yield increase in this study. Addition of Asset[®] RS resulted in increased hay quality as measured by protein levels, acid detergent fiber, total digestible nutrients, neutral detergent fiber and relative feed value. These parameters were often statistically different than the Hydra-Hume[™] treatments. It is unknown if application of Asset[®] RS would result in similar or greater quality and yield response alone or on another soil type.

Literature Cited

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Table 1. Alfalfa Yields (tons of hay/acre) from May-July 2004

Treatment	Rate/acre	Date* Applied	Cutting date			Total
			May 18	June 15	July 17	
AgBlend + 10-34-0	6 qts **	1 1, 2	2.03a	1.885a	1.83ab	5.75a
HydraHume™ + 10-34-0	1 gal **	1, 2 1, 2	1.95a	1.82a	1.87a	5.65a
HydraHume™ + Asset® RS + 10-34-0	1 gal 24 oz **	1, 2 1, 2 1, 2	1.99a	1.87a	1.85a	5.71a
HydraHume™ + Asset® RS + 10-34-0	1 gal 48 oz **	1, 2 1, 2 1, 2	2.01a	1.87a	1.84ab	5.72a
10-34-0	7 gal	1	2.01a	1.79a	1.71 b	5.53a

* Dates of application: 1 = May 11, 2 = June 4; 1, 2 = applied on both dates.

** Rate of 7 gpa at first application (1) May 11, and 10 gpa on June 4 (2).

Means in columns followed by the same letter are not statistically different at the $P \leq 0.05$ level (Fisher's LSD test).

Table 2. Percent crude protein present in alfalfa hay from May-July 2004 cuttings

Treatment	Rate/acre	Date* Applied	Cutting date		
			May 18	June 15	July 17
AgBlend + 10-34-0	6 qts **	1 1, 2	21.93a	17.07a	16.6ab
HydraHume™ + 10-34-0	1 gal **	1, 2 1, 2	22.20a	16.97a	16.4 b
HydraHume™ + Asset® RS + 10-34-0	1 gal 24 oz **	1, 2 1, 2 1, 2	22.13a	17.27a	17.5a
HydraHume™ + Asset® RS + 10-34-0	1 gal 48 oz **	1, 2 1, 2 1, 2	22.07a	17.65a	17.3a
10-34-0	7 gal	1	21.60a	17.50a	16.7ab

* Dates of application: 1 = May 11, 2 = June 4; 1, 2 = applied on both dates.

** Rate of 7 gpa at first application (1) May 11, and 10 gpa on June 4 (2).

Means in columns followed by the same letter are not statistically different at the $P \leq 0.05$ level (Fisher's LSD test).

Table 3. Percent digestible protein at 100% dry matter of alfalfa hay from May-July 2004 cuttings

<u>Treatment</u>	<u>Rate/acre</u>	<u>Date*</u> <u>Applied</u>	<u>Cutting date</u>		
			<u>May 18</u>	<u>June 15</u>	<u>July 17</u>
AgBlend + 10-34-0	6 qts **	1 1, 2	15.4a	12.1a	11.5 c
HydraHume™ + 10-34-0	1 gal **	1, 2 1, 2	15.6a	12.1a	11.5 c
HydraHume™ + Asset® RS + 10-34-0	1 gal 24 oz **	1, 2 1, 2 1, 2	15.5a	12.3a	12.2a
HydraHume™ + Asset® RS + 10-34-0	1 gal 48 oz **	1, 2 1, 2 1, 2	15.4a	12.5a	12.1ab
10-34-0	7 gal	1	15.2a	12.35a	11.6 bc

* Dates of application: 1 = May 11, 2 = June 4; 1, 2 = applied on both dates.

** Rate of 7 gpa at first application (1) May 11, and 10 gpa on June 4 (2).

Means in columns followed by the same letter are not statistically different at the $P \leq 0.05$ level (Fisher's LSD test).

Table 4. Acid detergent fiber levels of alfalfa hay from May-July 2004 cuttings

Treatment	Rate/acre	Date* Applied	Cutting date		
			May 18	June 15	July 17
AgBlend + 10-34-0	6 qts **	1 1, 2	31.90a	34.63a	37.8 b
HydraHume™ + 10-34-0	1 gal **	1, 2 1, 2	31.60a	34.93a	37.2ab
HydraHume™ + Asset® RS + 10-34-0	1 gal 24 oz **	1, 2 1, 2 1, 2	31.57a	34.33a	35.8a
HydraHume™ + Asset® RS + 10-34-0	1 gal 48 oz **	1, 2 1, 2 1, 2	31.83a	33.40a	36.1a
10-34-0	7 gal	1	31.08a	34.0a	37.8 b

* Dates of application: 1 = May 11, 2 = June 4; 1, 2 = applied on both dates.

** Rate of 7 gpa at first application (1) May 11, and 10 gpa on June 4 (2).

Means in columns followed by the same letter are not statistically different at the $P \leq 0.05$ level (Fisher's LSD test).

Table 5. Total digestible nutrients (TDN) at 90% dry matter from May-July 2004 cuttings

Treatment	Rate/acre	Date* Applied	Cutting date		
			May 18	June 15	July 17
AgBlend + 10-34-0	6 qts **	1 1, 2	52.57a	50.73a	48.6 b
HydraHume™ + 10-34-0	1 gal **	1, 2 1, 2	52.77a	50.50a	49.0ab
HydraHume™ + Asset® RS + 10-34-0	1 gal 24 oz **	1, 2 1, 2 1, 2	52.80a	50.93a	49.9a
HydraHume™ + Asset® RS + 10-34-0	1 gal 48 oz **	1, 2 1, 2 1, 2	52.60a	51.55a	49.7a
10-34-0	7 gal	1	53.10a	51.15a	48.6 b

* Dates of application: 1 = May 11, 2 = June 4; 1, 2 = applied on both dates.

** Rate of 7 gpa at first application (1) May 11, and 10 gpa on June 4 (2).

Means in columns followed by the same letter are not statistically different at the $P \leq 0.05$ level (Fisher's LSD test).

Table 6. Neutral detergent fiber levels of alfalfa hay from May-July 2004 cuttings

Treatment	Rate/acre	Date* Applied	Cutting date		
			May 18	June 15	July 17
AgBlend + 10-34-0	6 qts **	1 1, 2	42.2a	44.9 b	48.8 c
HydraHume™ + 10-34-0	1 gal **	1, 2 1, 2	42.4a	44.7ab	48.1 c
HydraHume™ + Asset® RS + 10-34-0	1 gal 24 oz **	1, 2 1, 2 1, 2	42.7a	44.4ab	45.9a
HydraHume™ + Asset® RS + 10-34-0	1 gal 48 oz **	1, 2 1, 2 1, 2	42.5a	42.8a	46.1ab
10-34-0	7 gal	1	41.2a	43.4ab	48.0 bc

* Dates of application: 1 = May 11, 2 = June 4; 1, 2 = applied on both dates.

** Rate of 7 gpa at first application (1) May 11, and 10 gpa on June 4 (2).

Means in columns followed by the same letter are not statistically different at the $P \leq 0.05$ level (Fisher's LSD test).

Table 7. Modified crude fiber (MCF) percentage of alfalfa hay at 100% dry matter from May-July 2004 cuttings

<u>Treatment</u>	<u>Rate/acre</u>	<u>Date*</u> <u>Applied</u>	<u>Cutting date</u>		
			<u>May 18</u>	<u>June 15</u>	<u>July 17</u>
AgBlend + 10-34-0	6 qts **	1 1, 2	24.8a	26.1a	28.8ab
HydraHume™ + 10-34-0	1 gal **	1, 2 1, 2	24.4a	26.0a	29.0 b
HydraHume™ + Asset® RS + 10-34-0	1 gal 24 oz **	1, 2 1, 2 1, 2	24.6a	25.7a	27.1a
HydraHume™ + Asset® RS + 10-34-0	1 gal 48 oz **	1, 2 1, 2 1, 2	24.5a	24.9a	27.4ab
10-34-0	7 gal	1	23.8a	25.25a	28.3ab

* Dates of application: 1 = May 11, 2 = June 4; 1, 2 = applied on both dates.

** Rate of 7 gpa at first application (1) May 11, and 10 gpa on June 4 (2).

Means in columns followed by the same letter are not statistically different at the $P \leq 0.05$ level (Fisher's LSD test).

Table 8. Relative feed value of alfalfa hay from May-July 2004 cuttings

Treatment	Rate/acre	Date* Applied	Cutting date		
			May 18	June 15	July 17
AgBlend + 10-34-0	6 qts **	1 1, 2	141.2a	128.1 b	113.5 c
HydraHume™ + 10-34-0	1 gal **	1, 2 1, 2	141.0a	128.3ab	116.2 bc
HydraHume™ + Asset® RS + 10-34-0	1 gal 24 oz **	1, 2 1, 2 1, 2	140.7a	130.2ab	123.6a
HydraHume™ + Asset® RS + 10-34-0	1 gal 48 oz **	1, 2 1, 2 1, 2	140.5a	136.9a	122.6ab
10-34-0	7 gal	1	146.2a	133.9ab	115.3 c

* Dates of application: 1 = May 11, 2 = June 4; 1, 2 = applied on both dates.

** Rate of 7 gpa at first application (1) May 11, and 10 gpa on June 4 (2).

Means in columns followed by the same letter are not statistically different at the $P \leq 0.05$ level (Fisher's LSD test).