

Preservatives for Alfalfa Hay
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The preservatives studied are chemical and biological compounds which are intended to allow the producer to bale alfalfa hay at higher moisture concentrations than is possible without the preservatives. By using preservatives the operator can reduce curing time and possibly avoid weather damage to the crop. The Pecos River Valley area of New Mexico produces approximately 552,000 tons of alfalfa hay each year or 42 percent of the hay produced in New Mexico. Each year 20-40 percent of the crop is damaged due to rainfall during the curing process.

The objectives of the research project are to evaluate commercially available preservatives, study application methods and effects of preservatives on alfalfa hay quality.

Preservative trials were first conducted in July 1980 at the N.M.S.U. Agricultural Science Center at Artesia. Since that time fifty-one different preservative trials have been conducted at the Science Center and on cooperator's farms in the Artesia, N.M. area. Most of these trials have been conducted on alfalfa hay packaged in the standard sized bale measuring 14 X 18 X 36 (inches). Studies have also been done with preservatives applied to alfalfa packaged in the 4 X 4 X 8 (feet) bale produced by a Hesston 4800^{1/} baler.

Preservatives evaluated in one or more trials during the past three growing seasons are

<u>Manufacturer's Name</u>	<u>Brand Name</u>	<u>Type of Preservative</u>
American Farm Products, Inc.	PROTEX II	Liquid propionic acid + additives
Anchor (Philips Roxane, Inc.)	IMAZALIL	Unknown
"	SILAGE INOCULANT 160X	Water soluble Lactobacilli prod.
"	SILA-LATOR 2X	Dry Lactobacilli prod.
Chr. Hansen's Lab. Inc.	BIOMAX SI	Water soluble Lactobacilli prod.
Domain, Inc.	CROP CURE	Dry sodium diacetate compound
Germain's, Inc.	HAY PRESERVER GRANULAR	Dry Lactobacilli prod.
"	SILAGE INOCULANT 300	Water soluble Lactobacilli prod.
Kemin International, Inc.	HAY-TREET	Liquid propionic acid + additives
"	EXPERIMENTAL 11882	Liquid (components unknown)
"	EXPERIMENTAL 61683	Liquid (components unknown)
McNeill's of Iowa	HAY-M-MOR	Liquid propionic acid + additives
P.D.Q., Inc.	HAY-X-PERT	Dry propanate compound + add.
Swiftwater Ag, Inc.	EXPRESS	Dry Lactobacilli prod.
Transagra, Inc.	CULBAC	Liquid Lactobacilli product
"	DRIED HAY & SILAGE MAKER	Dry Lactobacilli product

The preservatives were applied in the manner suggested by the product's manufacturer and at the recommended rates in some of the trials. Studies were also conducted applying the preservatives at different rates and/or using different application methods. The different methods of application used were:

<u>Formulation</u>	<u>Application Method (and source of equipment)</u>
Dry	Metered from 2-outlet Gandy box directly into gathering chamber of baler just before compression chamber.
	Metered from 2-outlet Gandy box through air manifold and blown into gathering chamber of baler just before compression chamber (equip. furnished by Domain, Inc.)
	Metered from Mellinger Chemical Dispenser directly into gathering chamber of baler just before compression chamber. (equip. furnished by Germain's).
Liquids	Sprayed on alfalfa as it enters the baler across pickup. The liquid is moved using small electric pump(s) and applied through:

1/ Trade names are used in this publication to simplify the information presented. Use of trade names does not imply an endorsement of the product nor criticism of similar products that are not mentioned.

- a. Two fan tip nozzles positioned above baler pickup.
- b. Two fan tip nozzles positioned above baler pickup and one fan tip nozzle under the baler pickup
- c. Micron, Inc. MICROMAX CDS applicator positioned to apply the liquid into the gathering chamber and to the top of the windrow as it is picked up.
- d. MICROMAX unit as in (c) above plus wide-angled fan tip nozzle under the pickup of the baler.
- e. Three flood tip nozzles mounted on bar above baler pickup and adjusted to apply the liquid to hay in the gathering chamber.

Bale moisture was estimated using the Delmhorst Moisture Meter equipped with a 10 inch probe and by core sampling each bale and oven drying the sample. Small bales were probed six times along the tight side with the Delmhorst. The probe is inserted into the bale at a 45 degree angle in the direction of the long axis of the bale. All Delmhorst readings are taken within 15 minutes after the bale is formed. Core samples are taken to a depth of 18 inches with a Penn. State Univ. core sampler. The small bales are sampled at right angles to the surface, about the center of each end. The "one ton" (Hesston 4800 bales) are core sampled five times on each end and three times on the left side facing the fore end ("fore" end = first end of bale formed, "butt" end = tie end or last end formed).

RESULTS

Bale density, stem moisture, and the preservative used had an effect on results obtained in all studies. Application rates recommended by the manufacturers vary between the different products and it is not possible to say that one is better than the others. At the lowest recommended rates the propionic acid and sodium diacetate compounds were effective at preventing spoilage in the small bales when stem moisture was 25 percent or less if the bale density was no more than 19 lbs. per cubic foot. At the lowest recommended rates the Lactobacilli compounds were effective at preventing spoilage in small bales when stem moisture was no higher than 22 percent at bale densities up to 19 lbs. per cubic foot. Only IMAZALIL was ineffective at the lowest rate tested.

Kemin International, Inc. EXPERIMENTAL 61683 prevented spoilage in alfalfa hay bales up to 33 percent moisture in some of the tests conducted in 1983. A mixture of Transagra Inc. CULBAC at the lowest recommended rate and either SILAGE INOCULANT 160X or BIOMAX SI at the lowest recommended rate was effective at preventing spoilage in small bales at up to 33 percent in two trials conducted in 1983. This mixture was applied using a MICROMAX CDS applicator and the two products were not tank mixed. The MICROMAX is equipped with two inlets so the mixing did not occur until the products entered the applicator.

Only two products have been tested on the "one ton" bales (Hesston 4800 baler). Kemin International, Inc. EXPERIMENTAL 11882 and Anchor (Philips Roxane, Inc.) SILAGE INOCULANT 160X (Germain's SILAGE INOCULANT 300) were used in trials conducted in 1983. At the recommended rates both compounds were effective when the average moisture did not exceed 22-23 percent and reduced mold growth and heating at up to 26 percent moisture.

Application of the liquid formulation preservatives to hay baled with the Hesston 4800 baler was more difficult than with the small balers. The configuration we found to work best was:

- a. A fan tip nozzle on each side of the pick-up just above the screw conveyor.
- b. A 150 degree angle fan tip nozzle under the pick-up.
- c. A MICROMAX CDS applicator under the tongue of the baler just in front of the hold-down tines.
- d. Shielding the bottom of the flywheel to reduce wind currents above the windrow as it comes up over the baler pick-up.

A study was done in 1982 to determine the effect of prolonged curing time on crude protein content of alfalfa hay. Preharvest samples of the alfalfa were taken, the field was harvested and windrow samples were obtained every four (4) hours until the plots were baled. The bales were core sampled and crude protein determination of all samples was done by the microkjeldahl method. Part of the crop was baled, with and without, preservative 48 hours after harvest when the alfalfa had dried down to 25 percent moisture or less. The remainder of the field was baled 96 hours after harvest when the hay had dried to less than 15 percent moisture and enough dew was present to reduce leaf shatter. Chart 1 shows

the percent protein of the samples. The standing alfalfa crop contained 21 percent protein (oven dry basis) while that hay baled 48 hours after harvest had an average of 19 percent protein (oven dry basis). The part of the crop which was allowed to cure until it had less than 15 percent moisture had only 13 percent protein (oven dry basis).

Chart 1: Crude Protein Content of First Cut Alfalfa Hay. Hay Preservative Study. Agricultural Science Center at Artesia, N.M.. May 1982.

