PACKAGING HAY AND SILAGE WITH A COTTON MODULE BUILDER

Bob Sheesley and Aaron Nelson

Farm Advisors, University of California Cooperative Extension, Fresno

Alfalfa hay, alfalfa silage, barley silage and hay-fruit silage have all been packaged successfully in Fresno County using cotton module builder equipment. Depending upon the crop or products moduled, this process can provide certain advantages to growers and livestock owners. These include: 1) Spreading module equipment investments costs over twelve months of the year by utilizing other crops in addition to cotton; 2) Providing for mechanized feeding while reducing incidence of "hardware disease" from baling wire; 3) Storing excess cull fruit for later feed usage; 4) Improving poor-quality roughage feeds when ensiled with cull fruit; 5) Providing a method of making a relatively small volume of silage with minimum spoilage.

Dry hay modules, weighing ten to twelve tons each can be picked up, hauled and set down using conventional cotton module moving equipment. Silage modules, weighing 25-34 tons each, can be uncovered and fed with a front-end loader scoop, but are too heavy to move as a single package.

The module builders used in the Fresno area are typically 32 feet long, 8 feet high, and tapered in width from 6½ feet at the base to 5½ feet at the top. A hydraulic ram spreads and compresses the product being moduled inside the builder. The downward extension length of this ram helps determine the product density in the bottom portion of a hay or silage module. Both 5 feet and 6½ feet length rams were used in the Fresno project work. The 6½ foot ram proved more satisfactory in obtaining uniformly higher density in the module.

Air-Tight Seal is Needed on Silage Pack

Moduled silage was made from wilted alfalfa forage and from volunteer barley clipped from alfalfa seed fields during March and early April. This forage was successfully ensiled by moduling at moistures ranging from 55% through 70%. Temperatures were monitored inside of both covered and uncovered modules at 12 inch and 30 inch depths from the top of the modules (Fig. A). Forage temperatures inside of the covered and sealed module remained within eight degrees Fahrenheit of the original temperature. It was excellent, palatable feed when used.

Temperatures inside of an uncovered alfalfa silage module climbed from 75°F to over 145°F, and the silage was spoiled and unusable. This demonstrates the need and effectiveness of excluding air with a single 6 mil plastic cover tightly sealed at the base of the module. Soil and used tires piled on the plastic tarp edges next to the module base provided an adequate seal against air intrusion. When short remnants of plastic tarp were overlapped, and weighted with tires on top of a module, the seal was not complete and spoiled feed resulted in the area of the splice.

Timely Sheep Feed Source

Alfalfa seed growers in this area clip seed fields in the spring for two reasons: 1) to bring plants into bloom uniformly when temperatures are warm enough for honeybee flight and pollination activity, and 2) to delay seed set until alfalfa seed chalcid emergence is over, so that seed pods will not be infested with chalcid. If clipping is delayed beyond April 25, seed yields will generally suffer significantly. Sheep feed is scarce in this area for a five to seven week period between grazing of seed fields and grain stubble field grazing. Making alfalfa silage modules can help seed growers move sheep off of seed fields before April 25 and still provide good sheep feed before and during the grain stubble grazing period. Sheep accepted the silage well during the 1980 and 1981 seasons.

Modules of alfalfa or grass silage can be a solution for harvesting small fields during potential rainy periods without incuring rain-damage during field drying operations. Modules of 65% alfalfa silage weigh about 32 tons each, so they must be placed near the feeding location.

Cull Fruit Storage Method

Cull fruit (peaches, nectarines and plums) has been ensiled with dry chopped alfalfa hay using the cotton module equipment. The surface of the plunger ram was equipped with angle iron ridges to help break the fruit and expel fruit juices into the dry hay. To make 65% to 70% moisture silage the fruit-to-dry-hay ratio is approximately 3 to 1 (Table 1).

Fruit and hay silage was made successfully with both short-chopped hay (1" to 3") and sliced long hay (6" to 18"), however more air was entrapped in the longer hay silage module. Temperatures within fruit-hay silage modules were monitored for three months at 12 inch and 30 inch depths from the top of the modules. All modules were covered and sealed with 6 mil plastic covers. Silage temperatures started at about 82^{0}F, and at the end of three months were 91^{0}F for the short-chopped hay mix and 95^{0}F for the sliced long-hay mix. Peak temperatures in both modules were reached two weeks after moduling. These peaks were 101^{0}F and 108^{0}F respectively for short and long hay mixes. Feed quality and animal acceptance was very good from both modules.

Costs and Practicality

The costs involved in moduling and feeding dry-chopped alfalfa are greater than simply dry-chopping for direct feeding with a short haul. Ten to twelve ton modules can be moved on cotton module trailers or in a van equipped with a live-tilt-bed. Unless two modules are hauled at once, it will be difficult to compete with long haul costs for baled alfalfa hay. Providing a grower already owns a cotton module builder, and not a hay baler, it may pay to module dry hay for nearby feedlot or dairy markets who are interested in mechanized feeding of short hay.

Costs of moduling cull fruit and hay together should be closely examined and compared with alternative feed source costs and qualities. Although efficiencies of scale could be improved from the Fresno project experience, costs of this silage moduling operation were approximately $8 per ton of silage above all feed costs on an estimated "as fed" tonnage basis. The cost of fruit, hay and hauling is not included in this figure. If the livestock owner is receiving more cull fruit than can be fed fresh, moduling is one way of storing that feed with little or no fly or odor problems resulting. This system is adaptable for small or large sheep, dairy or feedlot operations.

Figure A

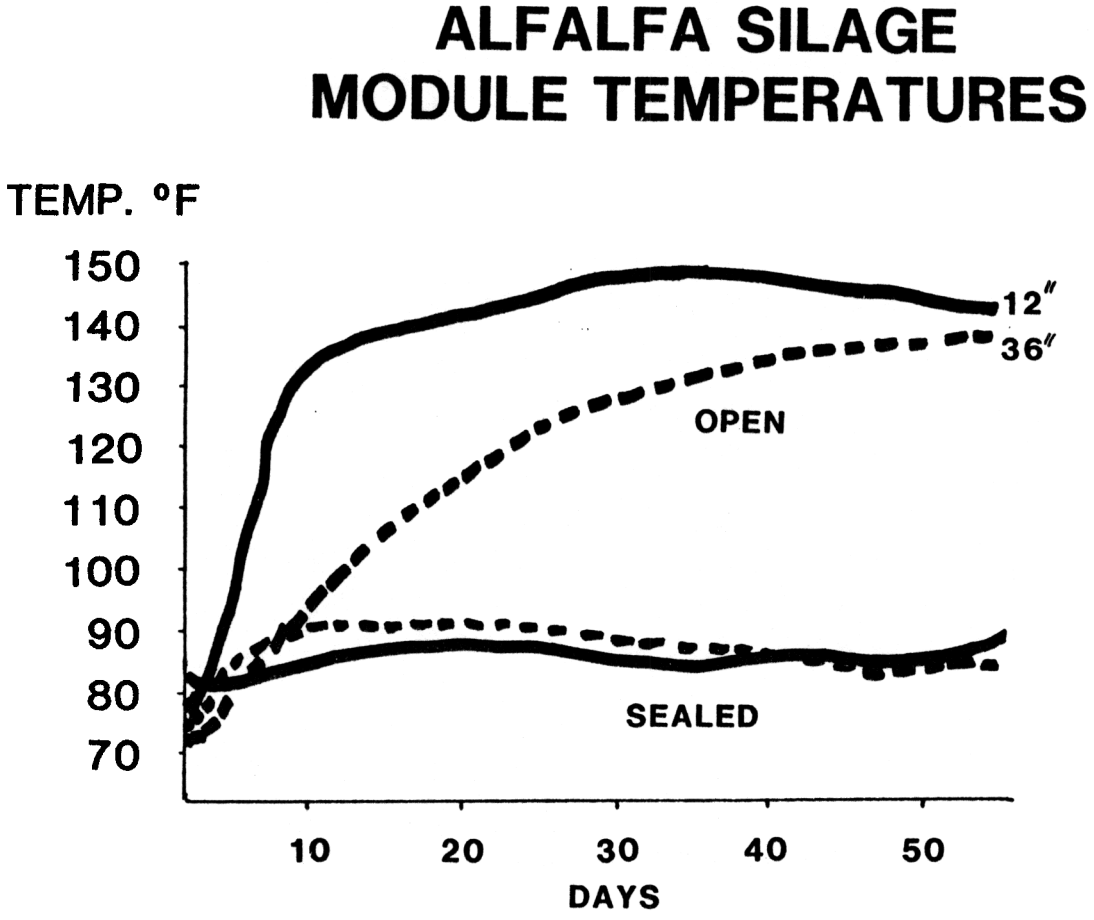

Table 1

Constituents in 100 lbs. of Fresh Fruit

	Peach-Nectarine	Plum
Wet flesh weight	95	99
(Dry flesh wt.)	(11.5)	(19)
(H_2O in flesh)	(83.5)	(80)
Wet pit wt.	5	1
(Dry pit wt.	3.9)	0.7)
(H_2O in pit)	1.1)	0.3)

To make 67% moisture silage:

Fruit: hay ratios		
Using 10% moisture hay	77:23	81:19
Using 16% moisture hay	75:25	80:20