



University of Idaho
College of Agriculture

UNIVERSITY OF IDAHO

Current Information Series No. 842

Cooperative Extension Service
Agricultural Experiment Station

Factors Affecting Alfalfa Hay Quality

Marvin H. Hall, Forage Agronomist

Today's hay market places greater emphasis on quality hay. As a result, market-minded alfalfa producers are becoming increasingly aware of the significance of their management decisions on hay quality.

Factors Affecting Hay Quality Before Harvest

Factors that affect alfalfa hay quality before harvest are frequently overlooked. This is unfortunate, because if the quality isn't present before cutting the alfalfa, it certainly won't be there when the hay is marketed.

High-quality hay is low in fiber (indigestible plant material) and high in crude protein and other digestible nutrients. Leaves seldom contain more than 20 percent indigestible material whereas older stems may contain as much as 70 percent indigestible material. Therefore, the higher the proportion of leaves, the higher the hay quality. Proportion of leaves and stems varies greatly between alfalfa fields and is affected by alfalfa variety, maturity and management practices including soil fertility, irrigation and control of weeds, insects and diseases.

Alfalfa Variety — Leafiness of alfalfa can be substantially reduced by disease infestation. Select alfalfa varieties that are resistant to diseases found in Idaho (anthracnose, phytophthora root rot, and bacterial, fusarium and verticillium wilt).

Varieties that are less winter dormant regrow slightly faster and reach maturity before more dormant varieties. The less dormant varieties also tend to be more susceptible to leaf diseases. Rapid regrowth of less dormant varieties is a desirable characteristic; however, these varieties require more careful management to ensure that they are harvested before their quality is reduced by maturity and leaf loss caused by diseases.

Soil Fertility — Poor soil fertility reduces leaf development and growth, which in turn reduces alfalfa quality. The reduction in forage quality caused by poor soil fertility is usually overshadowed by a reduction in yield. Potassium is important in maintaining alfalfa plant health and quality. Potassium fertilization is therefore important since each ton of alfalfa will remove about 60 pounds of

potassium from the soil. Regular soil testing is recommended to maintain adequate soil fertility and optimize forage yield and quality. For additional information about alfalfa fertilization, see University of Idaho Current Information Series No. 447, *Northern Idaho Fertilizer Guide: Alfalfa*, and No. 827, *Idaho Fertilizer Guide: Irrigated Alfalfa in Southern Idaho*.

Irrigation — Timely application of water to maintain soil moisture levels between field capacity and 50 percent depletion is critical to the production of high-quality alfalfa. Alfalfa is generally considered to be drought tolerant because it can survive extended periods of water stress, but alfalfa will not continue to produce dry matter during these periods. Therefore, periods of water stress between irrigations will reduce alfalfa yields. As the plant matures, however, alfalfa quality remains higher under water-stress conditions than under nonstressed conditions. The relatively higher quality of mature water-stressed alfalfa is the result of reduced stem growth and normal leaf growth during periods of water stress. Withholding water to stress the alfalfa plant and to improve alfalfa quality is not recommended, however, because of the concurrent reduction in yield.

Growers also should not irrigate alfalfa excessively. Excessive soil moisture (greater than field capacity) will weaken alfalfa plants, reduce yield and create ideal conditions for disease infections and subsequent leaf loss.

Irrigating alfalfa within 5 days of cutting may also reduce hay quality and future yield. Wet soil conditions at cutting slows hay drying, stimulates regrowth before the cut hay is removed and contributes to plant damage during harvesting. Irrigating immediately after the hay is removed will minimize losses in hay quality and yield associated with wet soil at cutting.

Weed, Insect and Disease Control — Since few plants are as high in quality as alfalfa, production of high-quality alfalfa hay requires excellent control of undesirable plant species in the stand. Control of undesirable plants is best done before the alfalfa is established because chemical control is expensive and only a limited number of herbicides can be used on established alfalfa stands.

Many alfalfa insects and diseases damage the leaves. If allowed to go unchecked, these pests can seriously lower the yield and quality of alfalfa (Table 1). Selecting disease- and insect-resistant alfalfa varieties is the best method to avoid disease related reductions in quality. For a listing of disease and insect resistance of varieties grown in the region, see PNW Extension Bulletin No. 244, *Selecting Alfalfa Varieties for the Pacific Northwest*.

At Harvest

Harvest Scheduling — Delays in harvesting alfalfa after flowers have appeared will slightly increase yields but will also reduce quality. To produce top quality hay, alfalfa should be harvested before flowers appear. Unfortunately, this harvest schedule will also increase plant stress and potentially will reduce stand persistence. Market premiums for high-quality hay should, however, offset the cost of establishing stands more frequently as a result of more frequent harvest (Table 2).

Curing Hay — At the time of cutting, alfalfa will contain about 75 percent moisture. Hay can be successfully baled and stored without preservatives when the moisture content is below 20 percent. While drying in the field, alfalfa is vulnerable to environmental and climatic conditions that reduce its quality. Alfalfa can lose as much as 22 percent of its leaves and 12 percent of its protein while drying in the field.

Alfalfa stems contain more fiber than leaves and consequently dry slower. Proper crimping or "conditioning" of alfalfa at cutting time will hasten drying, reduce the total curing time and make both stems and leaves ready for baling at the same time. The unavoidable losses associated with field curing are small compared to losses associated with rain on field-cured hay. Rainfall during

Table 1. Yield comparison of alfalfa varieties resistant and non-resistant to pea aphid.

Harvest	Variety	
	Resistant	Nonresistant
	(tons/acre)	
1	2.9	1.4
2	2.0	1.1
3	0.7	0.7
4	1.2	1.0
Total	6.8	4.2

field curing reduces forage quality by increasing leaf loss and leaching soluble nutrients from those leaves which remain attached. Additional reductions (16 to 23 percent) in digestibility of hay have been observed when hay was exposed to 1 inch of rain while curing.

Harvest Equipment — Each trip through the field with haying machinery will reduce alfalfa quality. The quality losses attributed to each machinery operation must be weighed against the necessity of the operation. Handling dry hay (moisture less than 15 percent) tends to cause greater quality losses than handling wetter hay, mainly because leaf loss is greater at lower moisture levels. Rakes and balers can cause substantial losses in quality due to leaf shatter and blowing. Harvest losses of field cured hay under normal weather conditions have been estimated to be between 15 and 25 percent of the total dry matter present at cutting.

After Harvest

Losses in alfalfa quality during storage can be enormous if inadequate storage methods are used. If the hay has been baled at a proper moisture level, minimal storage losses will occur when the hay is stored in a dry location. Total digestible nutrient content of hay stored outside can be 20 to 30 percent less than hay stored inside. This loss in hay quality is reflected in the decreased market value of hay stored uncovered. These losses highlight the necessity of covered storage if high-quality hay is to maintain its quality and market value during storage.

Table 2. Average price reported in California for alfalfa hay graded Fair (TDN greater than 50 percent) and Premium (TDN greater than 55 percent).

Year	Hay quality		Difference
	Premium	Fair	
	(\$ per ton)		
1978	\$ 63.50	\$53.00	\$10.50
1979	85.00	78.50	6.50
1980	100.00	88.50	11.50
1981	84.00	75.00	9.00
1982	94.00	78.50	15.50
1983	106.00	84.50	21.50
1984	98.50	77.50	21.00
1985	97.50	78.50	19.00
1986	85.00	65.00	20.00
1987	90.00	73.50	16.50
Average	\$ 90.35	\$75.25	\$15.10