



High Quality Alfalfa Hay For Meal Production

Quality in alfalfa hay, and consequently in the meal made from it, is determined mainly by the stage of growth at time of cutting, curing and handling practices, and weather conditions at harvest time.

Stage of Growth in Relation to Quality of the Meal

Analyses of alfalfa hay cut at different stages of growth clearly show that the protein decreases and the fibre increases after blossoming begins. Therefore, the first step in the production of high quality alfalfa meal is the cutting of the hay crop at the proper stage of growth. Some indication of the nutritive value of alfalfa harvested at different stages is shown in Table I.

TABLE I.—CHEMICAL ANALYSES OF ALFALFA CUT AT DIFFERENT STAGES OF GROWTH*

| Stage at Cutting | Percentage composition dry matter basis | | | |
|----------------------------------------------|-----------------------------------------|-------------|---------|------------|
| | Protein | Crude fibre | Calcium | Phosphorus |
| Buds appearing—no blossoms showing..... | 23.3 | 26.5 | 2.15 | 0.270 |
| First blossoms appearing..... | 23.0 | 27.3 | 1.93 | 0.255 |
| Full bloom..... | 17.5 | 26.6 | 1.63 | 0.240 |
| Past full bloom—green seed pods showing..... | 17.2 | 38.2 | 1.44 | 0.235 |

* Data in Table I are based on alfalfa cured without loss of leaf. For purposes of comparison analyses of 35 samples of field cured commercial alfalfa made in 1943 showed an average of only 13.7 per cent protein, and 28.9 per cent crude fibre.

The percentage of protein drops rapidly after the first blossoms appear and the crude fibre content increases with advancing maturity. In addition, there is a loss in nutritional value due to a decrease in calcium and phosphorus. The vitamin content also decreases after the first blossoms appear. Alfalfa cut when 10 per cent in bloom contained over 90 per cent more vitamin A (carotene) than when cut in the full bloom stage.

Experiments show that yield of hay per acre increases with maturity, reaching its maximum about full bloom stage. On the other hand, the total yield of protein per acre has been greatest when the crop was cut for hay shortly after blossoming began. Furthermore, when the cutting of the first crop is delayed beyond the early blossoming stage the yield of hay from the second cutting is reduced.

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All factors considered, the highest quality hay and the highest total yield per acre is most likely to result when alfalfa is harvested soon after the first blossoms appear.

Curing the Alfalfa Hay Crop

It is well known that alfalfa hay should be cured as quickly as possible after cutting, and with a minimum of exposure to the weather. This fact takes on added significance when the hay is to be used for such a high quality product as alfalfa meal.

The leaves of alfalfa make up slightly over one half of the total green weight of the crop, and approximately 38 per cent of the total dry matter. The leaves contain about 3 times as much protein and approximately 17 per cent more total digestible nutrients than do the stems. It is, therefore, important to conserve the leaves as much as possible, and these are the most difficult part of the plant to retain, since they dry more rapidly than the stems, become brittle and drop off.

Loss in Curing.—Trials at Ottawa with various methods of handling hay showed that an average of 11 per cent of the dry matter was lost and 37 per cent of this was loss of leaf. This was under relatively favourable conditions. In other tests, under less favourable conditions, there was a loss of 16 per cent in dry matter, 70 per cent of which was loss of leaf. One test was included in which the hay was cured entirely in the swath. The loss in dry matter in this instance amounted to 33 per cent, largely leaves. These trials indicate the difficulty which may be encountered in saving the leaf, and the necessity of adopting curing and harvesting methods which will facilitate handling as carefully and quickly as possible.

Rate of Drying.—Tests conducted in 1941 showed considerable difference in the speed of curing by different methods and the resulting quality of hay by these methods was also quite variable. In curing hay it is necessary to reduce the moisture content from approximately 75 per cent in the green crop to about 25 per cent in the cured hay. Under favourable weather conditions it was found that alfalfa hay yielding $1\frac{1}{4}$ tons per acre could be cured completely in the swath in 26 hours. Wilting in the swath and curing in the windrow required 46 hours. Wilting in the swath and curing in ordinary cocks required 93 hours, and with a larger bulk of hay put on tripod cocks the time of curing was increased to 151 hours.

Comparing the rate of curing alfalfa by different methods at about the same time of day, when the sun was shining brightly, and when the crop contained approximately 45 per cent of moisture, showed a reduction of 5 per cent moisture per hour in the swath, $2\frac{1}{2}$ per cent in the windrow and one half of 1 per cent in the cock. This was the rate with a yield of only $1\frac{1}{4}$ tons per acre. With a heavier yield of $3\frac{1}{2}$ tons per acre, curing in the swath was slower, and the reduction in moisture was at the rate of only $2\frac{1}{4}$ per cent per hour. Drying proceeds more rapidly in the early stages of the curing process when the moisture content is relatively high than it does later when the hay is drier. Generally speaking, it is desirable to cure the hay as rapidly as possible.

Curing in the Swath.—Speed of drying, however, is not the only consideration. Curing entirely in the swath is the most rapid method, but produced a poor quality of hay. Extreme exposure to the sun bleaches the hay, resulting in a poor colour, and the leaves dry so rapidly that they become brittle and shatter very easily when raking and loading. Thus excessive loss of the most nutritive portion of the crop takes place, and this system of curing is not recommended.

Curing in Swath and Windrow.—Partial curing in the swath until the crop has wilted considerably, and then completing the curing in the windrow, is probably the ideal method of field curing alfalfa if weather conditions are favourable. By this method the hay is raked before the leaves are dry enough to shatter. If a side delivery rake is used, and this type is recommended, the leaves are rolled into the centre of the windrow and the coarser ends of the stems are left to the outside. This provides conditions whereby the stems are exposed to wind and sun, thus permitting their more rapid drying, while the drying of the leaves is retarded. Therefore, the various parts of the plant cure more evenly. This method also ensures less bleaching and greater saving of leaves and vitamins. The curing process is fairly rapid, and a hayloader can be used for loading, thus eliminating much of the labour. The hay can be handled in a short time, reducing the danger from weathering. This is the recommended method of handling hay when weather conditions are favourable.

Curing in Cocks.—In seasons when rainfall is frequent and heavy, windrow curing becomes very difficult, and under severe conditions almost impossible, since the rain will penetrate through the entire mass of hay in the windrow, and weathering, bleaching, spoilage and loss of valuable feed nutrients become excessive. Under such conditions it is impossible to produce a good quality of hay for grinding by any known field method of curing. The loss can be reduced, however, and the quality improved by cocking in ordinary 60 to 100 pound cocks, by cocking and covering with waterproof caps, or by cocking on tripods each carrying 500 to 1,000 pounds of hay. These are rather laborious methods, but allow for building the hay into more or less waterproof piles before it has become so dry as to disintegrate easily and thus lose leaves. Care should be taken not to cock the hay when so moist that it will mould in the cock. Properly built cocks will shed water reasonably well and will save a large proportion of the hay in fairly good condition under relatively unfavourable haying conditions.

Curing on Tripods.—Undoubtedly, curing hay on tripods under adverse weather conditions will produce a better quality of hay than the other field curing methods. Even under good drying conditions the quality is usually somewhat superior. It is more laborious and costly. Some manufacturers of alfalfa meal, however, are willing to pay a premium on the higher quality of hay produced in this way, and this premium is often sufficient to pay for the extra cost of handling. For more detailed information regarding the various methods of curing, see Publication No. 735, of the Dominion Department of Agriculture, "Alfalfa for Hay, Silage and Pasture".

Since long range weather forecasting is impossible, weather conditions for any particular season cannot be pre-determined. The one method which can be recommended for making good quality of alfalfa meal under almost any weather conditions is by artificial drying. The installation of a drying system as at present developed is rather expensive, but any manufacturer contemplating the production of alfalfa meal on a large scale, and who will necessarily require material for grinding which is of uniformly high quality, would do well to consider the installation of a modern drying and cutting unit.

Utilization of Alfalfa Meal

For Hogs.—Being a source of proteins, minerals and vitamins, alfalfa meal is very useful in supplementing animal rations consisting largely of grain. In hog rations such as pig starters and pig growers, alfalfa meal is particularly useful. It can also be used in sow rations, but with sows, as with other classes of live stock, such as dairy cattle, alfalfa hay as such is more often used, since it can be handled to advantage by these animals.

With young weaned and growing pigs, low fibre content of the ration is very desirable. Further, the nutrients contained in alfalfa are valuable and thus, where alfalfa meal is used, it is imperative that it be of good quality, in order to justify incorporating it in the grain mixture. In addition to the proteins and minerals the vitamins of alfalfa meal are valuable. The vitamin content depends largely on the method of curing the hay and the length and type of storage of hay and of meal. Alfalfa hay cured quickly, so as to retain a high proportion of the leaves and to hold its bright green colour, will likely contain considerable vitamin A. On the other hand, the amount of vitamin D is determined largely by the extent of sun curing.

The amount of alfalfa meal to include in the swine ration will vary under different conditions. The main purpose in feeding it is to utilize it as a substitute for similar but higher costing nutrients from other sources. Generally, 5 per cent alfalfa meal is the amount included in feed mixtures for starting and for growing pigs. In the feeding of sows there is some evidence that a higher percentage is an advantage. Thus, for sow rations 10 per cent alfalfa meal can be used and even 15 per cent has been tried with reasonably good results.

For Poultry.—Alfalfa products are very valuable for poultry feeding purposes and are used in poultry feeds largely as a source of vitamins. If the vitamin content is low the meal is of little value, because it is relatively high in fibre, which poultry can utilize only to a limited degree. Usually alfalfa products are not higher in protein than the plentifully available by-products of the milling industry. This being the case, quality in alfalfa meal is paramount. The best quality meals are secured from hay which has been harvested at an early stage of growth, artificially dried, or which has been sun-cured under favourable weather conditions and handled in such a way that the loss of leaf has been reduced to a minimum.

While poorly cured or bleached alfalfa hay may not be reduced in protein value to any marked degree, its vitamin content will be negligible, and since the poultryman is counting upon this product as a source of vitamin A and riboflavin (B₂), serious difficulties will be encountered in the use of such an inferior product. If an artificially dehydrated alfalfa meal is not available, alfalfa meal from sun-cured hay may be used if it is high in protein and low in fibre. While the degree of greenness is not a positive indication of high vitamin content it is almost so, and green material of high carotene (vitamin A) content will invariably be high in riboflavin since the former is much more easily destroyed in curing than the latter. For satisfaction in the use of alfalfa meal for poultry feeds, therefore, it should be purchased on a carotene guarantee or on protein and fibre analysis, and degree of greenness. Alfalfa meals which are not satisfactory as measured by these criteria should not be used for feeding poultry, but preferably for the use of larger farm animals which are capable of more complete digestion of fibre, and for which the protein of this product is of greater importance.