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Hay Making: From Harvest to Storage

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Abstract

The process of hay making involves several steps that unavoidably lead to nutrient losses, although these can be minimized under favorable conditions. Losses primarily occur through shattering of leaves, oxidation of vitamins, fermentation, and leaching in rainy conditions. Legumes are particularly susceptible to nutrient loss through shattering, which reduces the overall nutritive value of the hay. Additionally, exposure to sunlight during drying can lead to bleaching and reduction of vitamin content. Overall, understanding and managing these factors are crucial for preserving the nutritional quality of hay during the curing process.

Introduction:

Hay is defined as the product obtained by cutting and curing the entire herbage of fine stemmed grasses or legumes so that the moisture content of the product is not more than 12-14%. The forage crop is cut before it is fully ripe and dried for storage as hay. Hay is more nutritious and palatable than straw.

Crops suitable for hay making:

Suitable crops for haymaking include slender grasses and legumes, which dry quickly compared to thicker stemmed fodders. Examples include grasses like cenchrus and cynodont, as well as legumes like stylosanthes, sunhemp, cowpea, berseem, and lucerne. However, if thicker stemmed fodders need to be dried rapidly, they should be chopped into smaller pieces or crushed between rollers.

Stage of harvesting the crop for hay making:

The stage of harvesting for haymaking is crucial for preserving the fodder's nutritional value. Early-stage plants have high protein and energy content but yield less dry matter per unit area. As the plant matures, the protein content decreases, and nutrient digestibility declines, especially when the crop is in full bloom. The ideal time for cutting crops for haymaking is when they are 1/3 to 1/2 in blossom for grasses and at the tender pod formation stage for legumes.

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Types of Hay:

a) Legume Hay: High-quality legume hay possesses numerous attributes that make it valuable for animal feeding. It contains a higher percentage of easily digestible nutrients and boasts a greater amount of digestible protein due to its elevated protein content. Moreover, the protein derived from legumes is superior in quality compared to that of other plants. Well-cured legume hays also exhibit higher levels of vitamins, particularly carotene and possibly vitamin D and E. Additionally, legume hays are notably rich in calcium and are generally appealing to animals.

b) Non-legume Hay: Non-legume hays are typically made from grasses and cereals. They tend to be less appetizing and contain lower levels of protein, minerals, and vitamins compared to legume hays, but they are rich in carbohydrates. Non-legume hays offer the advantage of higher yield per hectare and easier cultivation compared to legume hays. Hays derived from crops like oats and barley are particularly comparable to other grass hays.

c) Mixed Hay: Mixed hay is prepared from a blend of legume and non-legume crops. The nutritional composition of such hay depends on the ratio of different species within the mixed crop. Typically, mixed crops are harvested earlier due to variations in the germination time of the mixed crops. Early harvesting often results in cereals being richer in proteins.

Different methods of Hay Making:

Three methods of hay making. They are:1) Field curing 2) Barn drying 3) Artificial drying.

1. **Field Curing**: Field curing involves the natural drying of plants in the field to produce hay. The process includes several steps:
    - i. **Crop Cutting:** Plants are cut using either manual or mechanical methods, preferably in a uniform direction. The cut crop is left in swaths to partially dry.
    - ii. **Swath Drying:** Hay dries more rapidly in swaths than in windrows. However, prolonged exposure can lead to shattering and bleaching of leaves, diminishing hay quality. Swaths are left to wilt until moisture levels reach about 40%.
    - iii. **Raking:** After wilting to the desired moisture content, the forage is raked into loose cylindrical bundles called windrows. Raking is preferably done in the morning to minimize shattering caused by dew.
    - iv. **Cocking:** This involves forming larger heaps (cocks) from partially cured windrows. Cocks are sometimes covered with hay caps to protect them from rain. While optional, cocking can improve hay quality by preserving carotene content.

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v. **Baling and Storage:** Baling directly from windrows using tractor-mounted balers is the most efficient method. Alternatively, loose bundles can be stored in hay stacks where mechanized systems are unavailable.

2. Mow Curing (Barn Drying): Mow curing refers to the practice of further drying partially cured hay inside barns. Heated or unheated air is blown onto the hay until moisture levels reach 20-25%. Hay from field curing, with a moisture content of 35-40%, is transferred to barns and placed in mows for further drying. It typically takes 7-14 days with unheated air to fully cure the hay, whereas heated air accelerates the process. Hay dried in this manner tends to be greener, leafier, and of higher quality compared to field-cured hay.

3. Dehydration or Artificial Drying: This involves chopping freshly cut or wilted fodder and drying it in artificial driers.

Losses of Nutrients in Hay Making:

During the process of hay making, some nutrients inevitably undergo loss, although under favorable conditions, these losses are minimal. Drying green forage at normal temperatures reduces its digestibility, whereas drying without fermentation or bleaching preserves a higher percentage of nutrients.

1) **Losses by Shattering:** Significant loss occurs when leaves and finer parts shatter during hay making, particularly with legumes. Leaves are rich in digestible nutrients compared to stems, so minimizing shattering is crucial. To prevent this, hay should not be overdried or handled during warm periods, with preferred handling in the morning.
2) **Losses of Vitamins due to Oxidation:** The drying process leads to the bleaching of green coloring matter, which contains carotene. Sun exposure decreases the vitamin A content of hay, while sun-dried hays are rich in vitamin D2 (ergocalciferol).
3) **Losses due to Fermentation:** Plant enzymes act on soluble carbohydrates after harvest, producing CO2 and water, resulting in nutrient loss. This affects carbohydrate and protein content, with proteins hydrolyzed into amino acids, which may be lost through leaching in rainy conditions. Typically, about 5-9% of dry matter is lost during normal curing.
4) **Losses due to Leaching:** Exposure to heavy and prolonged rain can lead to severe losses through leaching. However, unless the rain saturates the material, losses are minimal, especially if the hay is in large windrows. Leaching causes loss of protein, soluble carbohydrates, and other nutrients.

Total Losses in Hay Making:

1. Loss of Dry Matter: 20-30% in legumes, 10-15% in grasses
2. Loss of Protein: 28%
3. Loss of Carotene: 90%

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4. Loss of Energy: 25%

Brown Hay:

In unfavourable weather conditions, hay may not dry properly using conventional methods. In such cases, hay is allowed to dry until about 50% of moisture is removed, then packed into stacks or piles. Fermentation occurs, causing the hay to become hot and turn brown, resulting in significant loss of nutritive value. Starches break down into sugar and alcohol, leading to a type of hay known as "Mow-burnt hay." Excess fermentation and heat can even cause hay stacks to spontaneously catch fire, emphasizing the importance of maintaining a moisture level of 12-14% before stacking.

Conclusion:

In conclusion, while hay making is essential for preserving forage for animal feed, it inevitably leads to nutrient losses due to various factors such as shattering, oxidation, fermentation, and leaching. By implementing proper techniques and management practices, farmers can minimize these losses and ensure that the hay retains as much nutritional value as possible.

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