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ANALYSIS OF METHODS OF HARVESTING HIGH QUALITY HAY

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Physiological and economic bases of hay harvesting. The simplest way to preserve feed - drying by natural dehydration of herbs - has not lost its relevance today due to its availability, simplicity, minimal cost, high quality feed. However, the drying of grass in the field is associated with a large loss of nutrients, and sometimes a deterioration in the digestibility of nutrients, especially protein. Therefore, it is necessary to improve the technology of hay harvesting in order to reduce its physical losses and improve quality [1,2].

In the fodder balance of farms that have all the main types of livestock (cattle, pigs, sheep, poultry), the share of roughage is 10–14%. On large farms engaged in rearing and fattening cattle, it is higher – 15–20%, including about 1/3 of hay. On dairy farms, the share of hay in the total amount of roughage should be 50-60%. When harvesting 800-1000 kg of quality hay per one dairy cow with an average annual milk yield of 5 thousand liters of milk, hay should be 10–12% of the nutritional value of the annual diet in the presence of pasture or well-organized green conveyor, when animals are fed enough fresh for 180–200 days. green and succulent feed. It is advisable to feed cattle with hay in the summer to replenish rations with dry matter with some increase in water content of green fodder (dry matter content in the feed is less than 20%) [3,4].

High-quality hay is harvested from legumes and cereals of perennial and annual grasses, from grass mixtures and meadow grasses. The most valuable hay is from sown and yellow alfalfa, meadow clover, sainfoin, horned lollipop, from cereals - rhizome and creeping wheatgrass, meadow fireweed, boneless and straight stalk, fenugreek, meadow timothy, ryegrass and mixtures thereof. From annual grasses it is possible to allocate vyku ravine in mixes with oats, ryegrass an annual multi-slanted, Sudanese grass. Not bad, but hard hay from Italian mogar. Sheep eat hay well from a mixture of sainfoin and blackhead.

Since the protein is contained mainly in the leaves of grasses, when harvesting hay should try to keep the maximum number of leaves, and the

drying process in mowing and rolling to reduce to a minimum. Harvest hay is dried by solar drying with drying with active ventilation in bales, rolls, in the form of chips. Especially large are the losses of nutrients when harvesting hay naturally dried - up to 60% due to the fact that when drying in rolls, it often falls in the rain. In addition, such hay loses many leaves during transportation, its color is brownish-yellow [5,6].

Shredded hay is stored in mesh towers. In the steppe areas, hay (alfalfa) used to be harvested in stacks of stacked green mass and straw. Currently, this method is not used, although it deserves attention.

When harvesting grasses in wet weather, the quality of hay deteriorates due to leaching of nutrients from them, and in dry weather – due to the rapid loss of leaves. To reduce the loss of leaves, the green mass of some herbs – alfalfa and yellow, its mixtures with clover during harvesting should be flattened, then it dries 1.5–2 times faster than unglazed, but in rainy weather, this method does not give positive results, but only intensifies the leaching of nutrients from the feed mass. It is impractical to flatten cereals, because their hollow stems dry quickly without it. On unproductive steppe hayfields it is better to mow the grass in rolls, and in the Forest-Steppe and Polissya - to leave it in the swaths and, if necessary, shake it.

In all zones effective drying of hay by active ventilation under canopies or in skirts. It is not necessary to heat the air, as warm air can increase the self-heating of the dried mass. Ventilate (blow) the mass with a humidity of 35–40%. Fans are placed on both sides of the shed, when drying hay under the canopy – perpendicular to the canopy. Hay bales are dried in the same way (passages are left between the bales for this purpose). The fans are switched on periodically until the humidity of the hay is reduced to 20–22% (so that the bales are not covered with mold). In the future, due to the passes, the humidity of bales is reduced to 16–18%.

For some time, the mown plants, which are in the light and retain turgor, lose little weight, they even undergo photosynthesis. This does not happen in the dark, so the weight loss is greater (Table 1).

Table 1.

Loss of nutrients in meadow clover during drying in light and in the dark

Drying conditions (period after mowing)	humidity, %	losses, %				
		dry matter	water-soluble carbohydrates	starch	total nitrogen	protein nitrogen
In the dark (24 hours)	63,7	4,8	2,8	11,6	11,8	-
In the light (24 hours)	57,8	2,1	+10,65	4,7	6,0	-
In the dark (18 hours)	15,0	10,0	11,7	13,5	15,8	31,61

In the light (18 hours)	28,6	3,1	5,5	30,0	7,5	6,5
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Starvation metabolism and autolysis, food loss due to these processes. After mowing the grass in parallel with the loss of moisture is the so-called "hungry" exchange. Accumulated nutrients are spent on maintaining life in cells. As nutrients are no longer supplied, plants quickly deplete their reserves and "lose weight". If the humidity is below 65%, the natural physiological processes associated with starvation metabolism and enzyme activity cease, and autolysis (self-decomposition) begins. It is also a partially enzymatic metabolism. It occurs under the influence of enzymes that are still active, but act separately. Autolysis reduces the nutrient content of hay. If the drying conditions are unfavorable, it rains, fungi develop, mold, food is denatured and becomes non-standard.

In the process of rapid drying in the sun, nutrient losses do not exceed 5% of dry matter. Therefore, hay should be dried quickly in mowing and then in rolls, then immediately collected in sheds or under canopies and dried with active ventilation. According to VA Borynevykh, in the process of plant autolysis, when the grass is dried in mounds, haystacks and even in rolls, it accumulates aromatic substances that determine the quality of hay, its characteristic odor. Protein hydrolysis also occurs after some time.

It should be noted that the process of drying grass in the wild is quite long, so starvation metabolism in cells and autolysis are combined with the leaching of residual nutrients, resulting in increased losses. First of all, non-protein nitrogenous substances are lost, and only in the dark after 48 h there is a significant loss of total, in particular protein, nitrogen. As the grass dries, the hydrolysis of the protein decreases sharply, and then stops altogether. Decomposition of protein to amino acids and change in their ratio are observed, according to S.Ya. Zafrena, in the first stage of starvation exchange. This may increase the content of tryptophan and lysine. With a deeper starvation metabolism, according to this author, asparagine and ammonia accumulate. In the presence of sugar, some of them at the beginning of formation can participate in synthetic processes and again be converted into amino acids and even protein. However, these processes do not always occur, as evidenced by the experiments of Davis. In General, with rapid drying, the protein composition changes slightly. However, slow drying of hay is unacceptable. However, drying herbs indoors leads to greater losses than in the sun (Table 2).

It is not recommended to keep hay in swaths and rolls for a long time, despite the useful changes that occur in it under the influence of sunlight. As a result of overdrying, the loss of its most valuable part - the leaves - increases.

Digestibility of grass leaves is 90–95%, while the total digestibility of plants – 70–75%. Therefore, the nutrient content of the lost part of the crop is higher than the average nutritional value of feed, and the losses, expressed in feed units, are greater than the loss of dry matter [7,8].

Table 2.

Nutrient losses of meadow clover depending on the drying rate

Drying method	Drying time	Final humidity	losses, %				
			dry matter	water-soluble carbohydrates	starch	total nitrogen	protein nitrogen
A thin layer in the sun	72	26	11	27,6	15,7	10	15,7
Also indoors	144	28	11,5	51,1	31,8	11,1	25,1
A thick layer indoors	192	30	18,8	75,2	52,1	28,1	37,9

Drying of hay in skirts by active ventilation should be organized so that the dried mass enters the drying in small quantities, which will avoid its self-heating. With large feed flows, this is difficult to do. Therefore, make several skirts and place, if necessary, in long skirts (up to 50 m) fans on both sides. The same is done when drying the dried mass under the canopy: install the fans from the ends or at a certain distance from each other across the skirt.

Brown hay. Hay acquires brown color in the shed due to self-heating. Such hay was prepared in the 30s of the last century. The so-called "burnt" hay was also prepared by self-heating: the haystack was quickly scattered, and it dried up, because the heat formed in it accelerated the removal of moisture from the plant mass. Nowadays, in practice, there are known methods of hay harvesting in the 1980s, which were called Mikhailovsky, Crimean, Kherson, and others. in the trench, compacted. However, it is not always possible to compact the grass in such a way as to prevent it from self-heating. Therefore, the hay harvested in this way is almost also brown. It is better in this case to prepare quality haylage.

Chemical analysis has shown that the preparation of hay by self-heating is associated with large losses of its nutrition and quality. In the process of melanization, which occurs (combination of sugars and carbohydrates with proteins), indigestible or completely indigestible compounds are formed, as a result of which the hay becomes brown. In the case of self-heating of hay, the digestibility of the protein decreases sharply or it can become indigestible.

Salting and treatment of hay with preservatives. Sometimes slightly moistened mass (22–24%) when laying in the skirt salt (from 0.5 to 2% salt per 1 ton of hay). This is effective only when the moisture content of the grass mass is not more than 25–26%. At higher humidity (26–28%) you need more salt, which can not be allowed.

According to the latest scientific data, the treatment of wet hay with ammonia is considered impractical. The need to treat it with other drugs,

especially propionic acid, has not been completely proven. This measure significantly increases the cost of feed (this is discussed in a special section).

High-quality hay is prepared depending on the type of grass, weather conditions and available equipment. Prepare loose or baled hay, hay chop or collect it with a roller sorter. The latter method is best used for harvesting hay from cereals and legumes.

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