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Experiments in Making and Storing Hay.

R. P. SPEER.

The report of the U. S. Department of Agriculture for 1888 shows that 3,600,000 acres of grass was cut for hay in Iowa in 1888. If the average yield was $1\frac{1}{4}$ tons of hay per acre, then the product of the state was 4,500,000 tons, which (at $4.00 per ton,) was worth $18,000,000. By general observation and from my own experience in feeding hay, I know that more than one-third of the value of each of our hay crops is lost on account of late cutting; exposure to rains, dews and the sun, and avoidable injuries after being stacked or stored in barns. If such great losses as that of $9,000,000 on our hay crop in 1888 were unusual, it would not be remarkable if we should give them but little attention; but as they are common annual losses, it is strange that greater efforts are not made to prevent them. I made from ninety to one-hundred tons of timothy and clover hay annually on my farm in Black Hawk county for twenty years; but I have learned long ago, that it is very difficult to cure grasses properly in Iowa when they are in the best condition for hay on account of unfavorable weather. It is but seldom that we do not have showers of rain; a very damp atmosphere; wet meadows, or heavy dews during haying times, which cause great losses even when good judgment and great care is used in performing the work. Many farmers begin to make hay at the proper time; but they let the work drag along until the greater part of their grass is ripe before it is cut. Others wait until their timothy and clover is ripe; because such grass is most easily cured, or because hay which is made from ripe grass is generally free from mould. The principal feeding value of hay is in the albuminoids and carbohydrates which it contains, and healthy growing plants are much richer in these substances than ripe plants of the same species. It has been proved also by chemical analyses and feeding experiments, that the grasses and clovers contain the largest quantities of available nutriment when they are in blossom. Properly cured hay is almost as digestible and valuable in every respect as grass; but the common shrinkage in the weights of well
protected cattle and horses during the winter seasons, is sufficient proof, that hay is generally much inferior to living grasses. Plants have the power to exclude air and unnecessary moisture from their internal parts; but when they are cut down and dried or only partially dried, they absorb water readily. Grasses cannot grow without water, air, heat and sunlight; but when they die, these are the agents which cause them to decay rapidly. On September 27th, a frost killed the leaves of several species of trees on the college campus, but it did not injure the leaves of others. Within a day or two after the frost, the color of ripe leaves changed from green to yellow; while the color of unripe tender leaves changed to a dull black within an hour after they were exposed to the sun. I gathered some of the yellow leaves when they began to fall from the trees and placed them on panes of glass and sprinkled them with water several times during the following afternoon. The next morning, I found a yellow substance like wet yellow ochre on the panes of glass under many of the leaves. After wetting and drying them several times I found also, that all of the soluble matter which they contained had been washed out, and that nothing was left, except worthless woody fiber. By exposing blades of orchard grass and millet and the firmer leaves of maple and cottonwood trees to the weather when it was showery, I found that the soluble parts of the grasses were washed out much more rapidly than the soluble parts of the leaves of the cottonwood and maple. It is well known, that green plants can be dried and kept in a dark room without any apparent change of color or substance for years, and that they fade and change rapidly in other respects when they are fully exposed to the sun. Such facts indicate that the common methods of making hay should be abandoned. Then, how can we make and store hay for future use without our sustaining considerable losses of albuminoids and other nutritive matter? I will answer the question by giving the results of experiments which I have tried at different times. The overdrying or sunburning of hay in clear hot weather, was my first mistake. I found that such hay did not heat or sweat in the stacks like good hay; that it lacked the odor of good hay, and that it did not supply the wants of my cattle and horses in a satisfactory manner. Generally, when I have cocked partially dried clover hay in ordinary haying seasons, to prevent its being injured by the sun and dews, I was compelled to spread it out again to dry and the result was usually that I had bleached or blackened hay of inferior quality. I have never known heavy rains to fall on
cured or partially cured clover hay, that did not reduce its value less than one half, even when well cocked.

The very common trouble which farmers have had in curing clover hay, is the principal reason why so little of it is grown. When hay is not spoiled in the meadows, it is generally injured more or less by the sweating process through which good hay passes in the stacks or barns. The mould or dust in hay which is caused by such sweating, is one of the principal causes of heaves in horses as well as other diseases of the domestic animals. Many years ago, I used salt to prevent the accumulation of mould in hay-stacks; the next year I tried slaked lime, and the third year I made long and narrow stacks; but nothing was gained by either of the experiments. Afterwards, it occurred to me that the heating and sweating of hay to the extent of causing mould, might be prevented by building the stacks around tall poles set in the ground, which would serve as conductors to carry off the hot vapor which would be likely to accumulate in the stacks. I tried the pole experiment on ten or twelve stacks and the result proved satisfactory. For a couple of days after the completion of the stacks, vapor could be seen ascending around the tops of the poles early in the morning, like smoke from the tops of chimneys. I used such stack poles for several years, or until I built a barn large enough to hold all of my hay. In 1889, I ordered one hundred wood pulp hay caps from the Fiberite Hay Cap Manufacturing Company of Skowhegan, Maine. The only objection that I could offer against the caps after trying them was, that the hay did not dry out quick enough under them.

Last spring I concluded that I could dry hay cocks rapidly by adopting the same method that I had used successfully for removing the sweat or vapor from hay stacks, and I ordered another one hundred wood pulp caps with a $1\frac{1}{2}$ inch hole in the top of each cap. I procured also $1\frac{1}{2}$ inch planks fourteen feet long, and had them cut into pieces $1\frac{1}{2}$ inches square and seven feet long with a rotary saw. Then with a suitable plane, I plowed a deep groove in one side of each piece and sharpened one end and rounded the other so that it would pass through the hole in one of the hay caps. By a few trials in the clover field, we found that it was best to build a hay-cock about two feet high, and then push the sharpened end of one of the little poles into it to the ground. Afterwards, the cock was completed by building the hay around the pole. We tried the grooved poles and caps on many hay-cocks during the haying season that were small,
large and of medium size, and on grass that was green and wet; well wilted, and partially dried, and the following are the results:—In very small cocks of partially cured hay and in large cocks of wet grass or hay the poles did not have the desired effect; because the small and the large wet cocks did not heat readily, while in large cocks of wilted or partially dried clover, they did have the desired effect when the surfaces of the leaves and stalks were dry. In every instance when the heating process began within a reasonable time, the hay dried rapidly without being injured in color or substance. I tested the grooved poles several times by building a half dozen large cocks of wilted clover, which had been cut only a couple of hours and using poles in one half of them and none in the others. At the end of two or three days, I always found the cocks which had the poles in them dry and cool; while the others were wet and generally hot. By the old methods of haying, we lost most of the leaves of clover before we could get it into the barn; but by our flue method and the protection which was given by the caps, we were able to put our clover hay in the barn almost as green and sweet as when it was cut.

I know that I can cure clover or the grasses in cocks when they are only well wilted by using the grooved poles and caps; but how much they should be dried before being cocked to produce the best results, I can not tell. It may be best for me to say here, that the weather was hot and that the atmosphere was very dry during the last haying season, and that the results of my experiments might have been different if the weather had been wet or the atmosphere had been very moist, but it is not probable.

Any thing may be used instead of our grooved pole that will serve as a flue to carry off the light hot vapor which accumulates in hay cocks when they are going through the sweating process, providing that it is open through its entire length on one side. The little flues will cost only a trifle, but the hay caps will cost more. Will it pay to buy them? is what many farmers will ask. My experience has proved that it will pay well. Animals will grow and keep fat on good green clover hay; while clover which has been blackened by rains or burned by the sun is but little better than oat straw. The one hundred wood pulp caps which I bought in Maine in 1889, were number one in every respect; but the one hundred caps which I bought from the same firm last spring were of inferior quality. They cost $37.50 in Maine, and the freight bill for bringing them to Ames, Iowa, was
$12.50, Last June I bought six fifty two inch hay caps for trial, which were made of ducking by the Des Moines Tent and Awning Company. The price paid for each cap was forty two cents with ropes, and ready for use. Hereafter, I will buy ducking caps; but for large hay cocks, they should be five feet square with a 1 1/2 inch hole in the center of each cap for the grooved poles which I described above. It is probable that such caps can be bought for less than $40.00 per hundred, and if they were soaked in a solution of sulphate of copper for a few hours to prevent their being injured by mildew, they would last many years. It should be remembered, that each cap can be used on several hay-cocks during a haying season.