

INCREASED DIGESTIBILITY AND NUTRITIONAL VALUE OF ROUGHAGE

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Influence of chopped straw ammoniation from winter wheat, also stalks and ears of corn after threshing grain on their digestibility and nutritional value is studied. It is proved that the use of feed increases the energy growth of calves for fattening.

Keywords. *Straw, stalks and cobs of corn, ammoniation, digestibility, nutritional value.*

Agricultural enterprises of Dnipropetrovsk region obtain each year as a by-product of crop, more than 3 million tons of straw, threshed cobs and corn stalks. Their forage value thanks to the fiber (hemotselyulozy, cellulose and lignin) is more than 600 thousand tons of feed units. This amount of energy is enough to produce about 500 thousand tons of milk, or 75 thousand tons of beef.

However, the safety of these feeds is bad because of high moisture content. In addition, they lack nutritional value of protein, and the presence of pulp-lignin complex reduces digestibility. That is why it is impossible to use them extensively in the diets for cattle.

Winter wheat straw, corn cobs and stalks have after harvest grain 0,20–0,22; 0,11–0,12 and 0,35–0,37 feed units in 1 kg respectively. But the digestibility of organic matter in them is only 42–45 %. Also digestibility of lignin is even lower, less than 24 %. This affects negatively on the digestibility of the whole fiber, protein and nitrogen free extract (MAR), and therefore, on the conversion and the total diet.

Lignin consists of polymerized dehydrogenation of coumaric and coniferyl alcohols. In different phases of vegetation ratio fractions of pulp-lignin complexes varies. During aging of plants and ripening of straw the proportion of soluble fractions of neutral detergent fiber reduces. And also the amount of insoluble in water fractions and weak acid solutions (acid detergent fiber) increases. This causes reduction of vegetative forage digestion with increasing of lignin content in it.

To improve the nutritional value of forage, many native and foreign scientists examine the influence of training fodder for feeding, including ammoniation, on their digestibility and productive performance. They offer different solutions to these problems [1, 2, 3]. But no reports of wide-spread implementation into practice the complete way of ammoniation of side feed raw of grain corn (stalks and cobs) and straw cereals.

We consider the relevance of finding ways to improve the nutritional value and productive action of roughage that make up a significant share of fodder balance in the steppe zone of Ukraine. So we conducted research to study the effect of different doses of ammonia cleavage of carbon-lignin complex in straw, stalks and ears of corn after harvest it for obtaining the grain. Also we identified a concrete proportion of different fractions (soluble and insoluble).

For this purpose two experiments are conducted, the laboratory and working conditions. In the first experiment the samples of forage were treated with ammonia (25 % solution) at the rate of 3 % of anhydrous ammonia to weight of feed, maintained it in the conditions of ammonia during 10 days, then weathered during 3 days. After that soaked in weakly acidic medium research (ammoniated) and control (untreated) samples at pH 6,75–6,85 (close to this figure in the rumen of ruminants). After their reduction to air-dry state we investigated the content of lignin and spent zootechnical chemical analysis of feeds by standard methods. We measured an increase in the soluble fraction of lignin due to ammoniation on the difference between the lignin content in ammoniated and native samples.

In the working experiment we treated the winter wheat straw, stalks and cobs of corn with 25 % aqueous ammonia at the rate of 1.5 % anhydrous ammonia or 6 % ammonia solution

to weight of the feed. Then we kept it under cover during 20 days, after that weathered for 2 days and then examined the food.

It was settled that in 1 kg of winter wheat straw contained 118 g ballast (insoluble) lignin fraction or 90 % of the total amount, 42 g and 53 % in the cob of corn, 28 g and 46 % in the stems.

During studying the action of ammonia on the ratio of fractions of lignin complex in different roughage, its unequal impact on solubility of insoluble lignin fractions of different raw materials was found. Thus, in laboratory experiments in the straw under the influence of ammoniation the amount of soluble lignin fraction increased by 2,4 times: by 1,05 in the corn and by 2,3 times at the stems.

In the production experiment, as in laboratory experiments, the most effective ammoniation was concerned corn stalks under cover, here the number of soluble lignin fraction increased by 2,5 times, in cob by 1,03 and in straw by 2,3 times.

Thus, the data obtained in the experiments indicates that influence of ammoniation decreases the amount of ballast and increases the soluble fraction of lignin in forages, which is a significant reserve of increase of nutritional action in cattle rations.

In order to determine the effect of feeding ammoniated roughage on productive qualities of cattle, we have formed 6 groups of calves on fattening (14 months old) of the Ukrainian black and white dairy breed by the method of analogous (5 animals in each group).

The animals were kept in the same room, on a leash, drinking was carried out from auto-drinking bowls PA-2. Daily nutrient intake was 5,2–5,6 feed units (it was increased according to animals' age), the proportion of roughage was 18 %, feeding space 0,9 m.

The first group received a diet of untreated chopped straw of winter wheat, the second group received ammoniated chopped straw, the third – not processed chopped corn cobs after grain threshing, the fourth – ammoniated chopped cobs, the fifth – chopped, not ammoniated dry corn stalks, the sixth – ammoniated ground stalks of corn. The experiment lasted from november to april inclusively (180 days). Eatability of the feeds was at the level of 97–98 %. The research results are presented in Table 1.

The effectiveness of feeding the ammoniated roughage for bull-calf

Group of animals	The average live weight of 1 animal, kg		The absolute increase in 1 animal for the period of the experiment, kg	The average increase 1 animal, g	
	at the beginning of the experiment	at the end of the experiment		at the beginning of the experiment	at the end of the experiment
1	209	451	242	461	576
2	208	476	268	458	637
3	213	449	236	467	562
4	211	465	254	462	604
5	212	463	251	459	597
6	210	491	281	460	668

All animals that eated ammoniated roughage feeds by enrichment of diet with nitrogen and partial cleavage of carbon-lignin complex, showed more energy growth compared with the analogues who received normal feed.

With age of the buff-calves their average daily gain was also growing. During the period of the experiment in the first, third and fifth groups on diets with normal roughage it increased respectively by 25, 20 and 30 %, and in the second, fourth and sixth groups using ammoniated feed by 39, 31 and 45 % respectively. The calves which were fed with ammoniated chopped dry corn stalks had the biggest difference, average and absolute increase (+ 11,9 %), the smallest difference and growth – when fed ammoniated crushed corn cobs after threshing grain (+ 7,5 %) as their nutritio-nal value is 2 times lower than that of straw and dry corn stalks, and as for lignin vice versa. The animals whose diet has ammoniated straw, showed the average results (+ 10,6

%). The advantage of the effectiveness of the diet with dry corn stalks is explained with the best digesting this food due to the smaller amount of lignin.

Conclusion. Ammoniation of roughage enrich rations of livestock by nitrogen (rumen microflora), and due to the splitting of carbon-lignin complex increases the soluble fiber fraction (neutral detergent part) and increases its digestibility and nutritional value, that positively affects energy growth of bull-calves.

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