**УДК 621.331**

# ON THE ISSUE OF INCREASING THE COMPLETENESS OF FEEDING HIGHLY PRODUCTIVE COWS

Boltianska N.[1], c.t.s.
Dr hab. inż Izdebski W.[2], prof.
[1]*Dmytro Motornyi Tavria state agrotechnological university, Melitopol, Ukraine*
[2] *Wydział Zarządzania PolitechnikaWarszawska, Warsaw, Poland*

Further progress in animal husbandry is possible only with full feeding of animals, when the diet has enough energy, protein, vitamins and minerals [1,2]. Currently, the protein deficiency in the diets of cattle is 25–30%. This reduces the efficiency of feed use, increases their cost per unit of output, and reduces the resistance of animals to disease and the profitability of animal husbandry. In most farms, feed consumption per 1 quintal of live weight gain of cattle is 14.5 quintals of energy feed units, milk – 1,3 quintals, which is 1.5–2.0 times higher than the normative ones [3,4].

In recent years, in our country and abroad, close attention has been paid to the issue of protein nutrition of ruminants. Along with developing ways to increase feed efficiency, increasing the production of high quality protein feeds is no less important. Studies have shown that solving the problems of animal nutrition is impossible without sufficient knowledge of the processes of decomposition of feed protein and the synthesis of microbial protein in the rumen. Particular importance is attached to this in the development of scientifically sound feeding of highly productive animals. The need of low-yielding animals in protein can be met by the synthesis of microbial protein in the rumen, and the qualitative composition of feed protein does not play a special role. The need for highly productive animals is met by both microbial protein and high-quality feed protein that is not broken down in the rumen [5-7]. Protein deficiency in feeding can be eliminated by expanding legume crops to grain, perennial and annual legume–cereal mixtures. It is possible to balance the diet of protein and amino acids for ruminants in the case when legumes will be at least 13 – 15% of the total structure of feed, and now they are about 5%. Legumes have a high content of crude protein, which is well soluble in water and salt solution. Compared to cereals, legumes contain 2–3 times more protein and 3–5 times more lysine. Lupine in the feeding of cattle in the non–chernozem zone is an important source of protein. The protein content in the seeds of narrow–leaved lupine ranges from 29 to 38%, white lupine – from 29 to 40% and yellow lupine – from 38 to 46% [8].

In its quality, lupine protein, in accordance with accepted International Standards, is equivalent to the feed and food industry soy protein. The coefficient of digestibility of lupine is 80–89%, soybean – 76–84%, and the

coefficient of biological value of lupine – 67–78% and soybean 64–80% (fluctuations taking into account varietal characteristics).

The amino acid composition of lupine protein contains the largest amount of glutamic (15–26%) and aspartic acids (7–13%), the limiting ones are tryptophan and methionine (0,6–1,3%). The amount of essential amino acids ranges on average from 35 to 50% of the protein of lupine seeds. The largest number of essential amino acids is accounted for by arginine (8–12%) and leucine + isoleucine (9–12%). The content of lysine in the protein of yellow and narrow–leaved lupine seeds is in the range of 4–7%, and in some years reaches 7–9%. The amount of fat in white lupine seeds is from 6 to 12,0%, yellow and narrow-leaved – 4,5–6% of fat. Lupine fat consists mainly of unsaturated fatty acids. Linoleic and oleic acids account for 50–60 and 20–30% (respectively) of the total amount of acids in yellow lupine seeds. White lupine contains 55% oleic acid, and narrow-leaved – 34–43%. Compared to cereals, lupine grain accumulates more calcium, phosphorus, potassium and magnesium, and trace elements – manganese, zinc, copper, molybdenum and cobalt. The main anti–nutrients contained in legumes and have an adverse effect on animals are protease inhibitors, hemagglutinins, tannins, glycosites and alkaloids.

Alkaloids are toxic substances and in high concentrations are dangerous to animals. These are active heterocyclic bases containing nitrogen, they belong to the group of pyridine derivatives. In the seeds of narrow–leaved lupine, 57% of alkaloids are lupine, 26% – hydroxylupanin, 16% lupine and undetected sparteine. White lupine grain contains 47% of lupine, 42% of hydroxylyupin, 10% of sparteine, and no lupine.

When using lupine grain in animal feed, it is necessary to take into account not only the total content of alkaloids, but also the absolute amount of each of them. According to the level of alkaloids in seeds, they are classified according to the following scale: very low <0,025%, low 0,025 – 0,099%, medium 0,100–0,399%, high 0,400–1,00%, very high> 1,00%. Lupine, containing in its seeds less than 0,01% of alkaloids, are sweet, from 0,01 to 0,025% – to non–alkaloids, from 0,025 to 0,1% – feed, from 0.3 to 1,0% – bitter and more than 1,0% – alkaloid. The level of alkaloids in seeds up to 0.06% is considered safe. For forage purposes sow only non–alkaloid and low-alkaloid, and in the seed should not be more than 5% of alkaloid seeds. In the diet of cattle, the amount of alkaloids that comes with feed should not exceed 0,2–0,4 g per 100 kg of live weight. The toxic dose of alkaloids for these animals is 20 milligrams per 1 kg of body weight, and lethal – 30 milligrams / kg. Lupine alkaloids are partially destroyed under the influence of high temperatures. Treatment of lupine seeds at 60°C for 60 minutes leads to a decrease in alkaloids by 4,5%; at 100°C for 10, 30 and 60 minutes reduces the content of alkaloids by 9 – 13,4 and 21,4%, respectively. Increasing the processing temperature to 150°C at an exposure of 10 minutes can reduce the content of alkaloids by 29,5%. A further increase in exposure to 30 and 60 minutes leads to a decrease in the content of alkaloids by 30.3

and 34,0%. Removal of alkaloids from lupine seeds is achieved by soaking it in cold or warm water, followed by steaming for 1 hour and washing in water. Legume protein is well soluble, which reduces the efficiency of its use by ruminants. During heat treatment, the solubility of peas for ruminants is reduced from 89 to 20% (at 140°C). Extrusion reduces the solubility of lupine protein from 87 to 30%.

Modern varieties of fodder lupine, even in unfavorable climatic conditions, contain less than 0,1% of alkaloids and can be used without pre–treatment in the amount necessary to balance the diets of farm animals for protein. Studies have shown that the replacement of 25% of the concentrate part of the diet of first–calves with natural bran of narrow–leaved lupine allowed to increase hopes from 16,5 to 17,7 kg, milk fat – from 3,51 to 3,92%, protein content – from 3,07 to 3,10%. Heat treatment of derti lupine (extrusion) contributed to a further increase in milk yield to 18,6 kg, protein content in milk up to 3,13%. At the same time, feed costs per 1 kg of milk decreased from 1,08 to 0.92 and 0,83 hp, and concentrates from 387 to 336 and 305 grams. It is known that in the structure of costs for dairy products feed is 40–45%, and for meat – 55–57%. Therefore, in recent years, the structure of fodder production has changed significantly in the direction of grassland development to meet the needs of animals mainly through fodder from field and meadow crop rotations. Grain concentrates should be an additional source of energy and nutrients.

It is necessary to take into account the biological feature of ruminants, the evolutionary adaptation of their complex stomach to the neutral–alkaline (herbal) type of feeding. Due to microbial fermentation in the rumen, the need of ruminants for energy up to 80%, protein 30–50%, to a large extent macro– and microelements and vitamins is satisfied. The microflora of the rumen digests from 50 to 70% of the crude fiber in the diet. The composition of the rumen microflora of ruminants varies widely depending on the type of food: ciliates – from 200 thousand to 2 million / ml, bacteria – from 100 million to 10 billion / ml. The selection of feed can stimulate the synthesis of microbial protein in the rumen of ruminants.

It is established that as a result of long feeding of a large amount of corn silage in a rumen the quantity of dairy, acetic, etc. increases. organic acids, which change the reaction of what is in the rumen to the acidic side. This leads to a chronic violation of digestive processes, the accumulation in the rumen of underoxidized fermentation products, harmful to animals. Corn silage contains very little soluble carbohydrates, which in the process of its preparation are converted into organic acids. The acidic reaction of the environment in the rumen during feeding with corn silage suppresses the reproduction of the rumen microflora – an important source of protein, macro– and microelements, vitamins.

When using a large amount of corn silage in the feeding of ruminants, there is a double overuse of concentrates, the fattening period is doubled, the quality of products deteriorates. The genetic potential of animal productivity

is half used. The harm of feeding ruminants a large amount of corn silage and concentrates in the absence of sugars in the diet is manifested in the birth of weak, non-viable offspring (from 50 to 90% of young animals suffer from dyspepsia, respiratory diseases), and high fetal mortality.

When feeding large amounts of concentrated grain feed without a sufficient amount of herbal feed in the diet increases the accumulation of acidic products, reduces the body's alkaline reserve, animals have metabolic disorders (mineral, protein, carbohydrate, vitamin) with acidosis, ketosis, hepatosis in cows, gastrointestinal disorders in calves. With the introduction of green mass of clover-thymophytic, alfalfa-oyster, age-oat grass mixtures, as well as clover and alfalfa instead of 50% concentrates, there is an increase in the number of bacteria – 6 times, ciliates – 3–4 times and daily live weight gain up to 1000–1200 rubles

Herbal mixtures with a high content of nitrogen, protein, fat stimulate the growth and reproduction of the rumen microflora in comparison with corn silage. Consumption by cows of green mass of grass mixtures, hay, haylage and silage from cereals and legumes promotes intensive reproduction of microorganisms of a rumen, acetic acid type of fermentation and pH of the environment close to neutral (6,6 – 6,9), crude fiber of forages is better digested. Less favorable feed substrates are characterized by the propionic-oil type of fermentation in the rumen and a more acidic reaction of the medium (pH 6.2 – 6.5). At the same time the big additional loading on neutralization of sour cicatricial contents falls on salivary glands.

***References***

1. Komar A. S. Processing of poultry manure for fertilization by granulation. Abstracts of the 5th International Scientific and Practical Conference «Innovative Technologies for Growing, Storage and Processing of Horticulture and Crop Production». 2019. Uman. 18–20.

2. Sklar O. G. Mechanization of technological processes in animal husbandry: textbook. manual. Melitopol: Color Print. 2012. 720 p.

3. Skliar A., Boltyanskyi B., Boltyanska N. Research of the cereal materials micronizer for fodder components preparation in animal husbandry.Modern Development Paths of Agricultural Production. Springer Nature Switzerland AG. 2019. P. 249–258.

4. Komar A. S. Development of the design of a press-granulator for the processing of bird manure. Coll scientific-works of Intern. Research Practice Conf. «Topical issues of development of agrarian science in Ukraine». Nizhin, 2019. Pp. 84–91.

5. Komar A. S. Analysis of the design of presses for the preparation of feed pellets and fuel briquettes. TDATU Scientific Bulletin. 2018. Issue 8. Vol. 2. Pp. 44–56.

6. Boltyanskaya N.I. The development of the pig industry and the competitiveness of its products. MOTROL: Motoryzacja i Energetyka Rolnictwa, 2012. Vol. 14. No3b. 164–175.