Grain of narrow-leaved lupine with inclusion of organic micronutrient complex OMC as an alternative to soybeans in protein concentrates

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Abstract. The article presents the research data on the use of high-protein extruded concentrates based on narrow-leaved lupine in the compound feed in combination with organic microelement complex OMEK-7 M (complex, microelement additive produced by CJSC "Bioamid", Saratov) in order to replace soybean. The studies were carried out on a cattle farm in the settlement of Novgorodskoe, Guryevskii district, Kaliningrad region (Temp LLC). The object of the research were calves of black-and-wheat breed.

It was found that due to the extrusion of lupine grain in combination with OMEC premix, a competitive, import-substituting soybean-based protein concentrate with a high degree of bioavailability of feed was obtained. It contains a sufficient protein content of 26% and a low fiber content of 4.05%, which is very important for calves in the dairy period.

Keywords: protein concentrate, extruded grain, OMEC micronutrient complex, lupine, soybean alternative, calves, growth, live weight.

1. Introduction and relevance of the topic

The results of scientific developments in fodder production of Kaliningrad NIISKh, V.R. Williams VIC and a number of other scientific institutions allow us to eliminate the deficit of fodder protein and energy in rations of farm animals. In this regard, we give great preference to forage alkaloid-free lupine varieties - as the main source of protein raw materials and an alternative to expensive soybeans. Lupins in the region are adapted and give good yields. And also proved themselves perfectly in feeding as part of compound feed for animals and poultry. 1. Fedorova Z. N. Protein concentrates based on extruded lupine grain, with the use of enzymes, in feeding calves and poultry // IOP Conference Series: Earth and Environmental Science. - 2021. - 663. - p. 012021. DOI: 10.1088/1755-1315/663/1/012021.

But, in addition to meeting the need for essential nutrients, animals are significantly influenced by the provision of minerals and vitamins. Numerous studies have proved that only complex additives of minerals and vitamins in animal diets, taking into account their content in feed and norms of need, have high biological and economic efficiency

2. Conditions and methods

The studies were conducted on calves aged from 1 to 3 months on one of the cattle farms of Temp LLC, Novgorodskoe village, Guryevsk district, Kaliningrad region, by the staff of the animal husbandry department of the Kaliningrad Research Institute of Agricultural Sciences, a branch of the V.R. Williams
Research Center (238631, Slavyanskoive village, Polessky district, Kaliningrad region). All observations, records and analyses were carried out according to generally accepted methods, statistical data processing was carried out using differential Student's analysis with the help of Microsoft Office Excel 2010 on a personal computer.

3. Results and discussion.
For a number of years, the task of the research has been to find a replacement for the expensive soybean as a protein component of mixed fodders. For this purpose we chose a variety of narrow-leaved lupine Vityaz (Table 1), well-proven for yield, content and yield of crude protein per hectare, and also selected a micronutrient complex OMEK 7 To conduct the research we calculated the recipe with lupine; prepared the energy-protein concentrate on the basis of lupine with addition of OMEK 7; selected animals for research.

| Table 1. Protein content and yield of narrow-leaved lupine of Vityaz variety, Kaliningrad NIISKKh |
|---------------------------------|---------------------------------|---------------------------------|---------------------------------|------------------------|
| Indicator                      | Mature seeds                    | 2018                           | 2019                           | 2020                   |
| Yield of variety, t/ha          | Vityaz                          | 3,5                            | 4,7                            | 3,9                    | 4,03                   |
| Crude protein content, %        |                                | 32,3                           | 34,6                           | 33,5                   | 33,4                   |
| Crude protein yield, t/ha       |                                | 1,18                           | 1,3                            | 1,1                    | 1,2                    |

Three groups of calves, one control and two experimental ones, were formed on the farm of LLC "Temp" of Guryeveskii district according to the principle of analogues (according to the method of A.I. Ovsyannikov, 1976). Calves were selected at the age of 15 days to 1 month, with body weight of 51-53 kg, n=10 heads in each group, black-pepper breed. Calves of all groups received - the main fodder ration: milk, milk replacer according to the scheme of drinking, hay - 2 kg per head. The differences consisted in the concentrate part and premix. Calves of the control group received milling of their own production with premix of standard formulation, calves of experimental group I received mixed fodder with protein concentrate based on lupine + premix of standard formulation, calves of experimental group II received mixed fodder with protein concentrate based on lupine + OMC - 7 M produced by CJSC "Bioamid" Saratov. The exchange energy in the mixed fodder for calves of the control group was 11,6 MJ/Kg, crude protein was 11,73%, the main portion in mixed fodder was taken by cereals - 94,4% and only 3% of legumes were fodder beans, so it had low crude protein content. The cost of 1 ton of mixed fodder is 13129 rubles. Recipe of mixed fodder in terms of nutrition does not meet the needs of calves of the dairy period, so for the experimental groups were calculated recipes for concentrate and mixed fodder with the inclusion of concentrate in its composition.

Calves of both experimental groups received concentrate mixed fodder containing 13.6 MJ/kg of exchangeable energy and 19.2% crude protein. Cereals account for 47.7%, sorghum - paisa - 10%, oilseed - flax - 9.7%, legumes - 30.0% lupine + fodder beans, so the quality parameters are high. The cost of 1 ton of mixed fodder is 18434 rubles. In this recipe of mixed fodder introduced energy-protein concentrate consisting of extruded components: lupine + fodder beans, oilseed flax and paisa in the ratio of 55+5%: 19,4 %: 20,6 %.

Analysis of the nutrient composition of feed formulas showed that a higher nutritional value of calves grown up to the age of 3 months can be ensured by feeding calf premixes based on extruded lupine grain and other grain components, with all seven grain components of the premix having been heat-treated. Organic salts in the form of OMC were added to the premix for the animals of the experimental group III elements. The experimental premix contained 10% of trace elements from the standard premix in the form of OMC: iron - 150 mg, iodine - 5 mg, copper - 50 mg, manganese - 100 mg, zinc - 200 mg, selenium - 20 mg, cobalt - 5 mg.
During the experiment, the most intensively developed juveniles of I and II experimental groups. At the end of experiment the Group I calves surpassed their counterparts of the control group by 18.97 kg or 30.57% on the live weight, the Group II calves surpassed their counterparts of the experimental group by 3.59 kg or 4.45% and by 22.56 kg or 36.5% compared to the control group. The gross live weight gain for the period of experimental testing of the dairy calves of the II experimental group, who received OR + extruded mixed fodder with lupine concentrate and premix OMC, was 84.20 kg, the gross gain of the I experimental group calves was 80.61 kg, the gross gain of the control group calves was 61.64 kg. The highest rate of growth intensity - one of the main attributes characterizing animal productivity - was found in the experimental group calves. The energy of growth of experimental calves was higher than that of the control and this is evidenced by such an indicator as the average daily gain of live weight. The highest average daily gain of live weight was obtained from the animals of experimental group II and amounted to 909 grams. The animals of experimental group I followed, and their average daily gain was 876.10 g., the smallest gain was 670.97 g, which was 238.03 and 205 g lower than in the control group II and experimental group I, respectively.

The increase in the average daily live weight gain of dairy calves in experimental group II can be explained by including a complete complex microelement additive based on organic compounds - OMC in the premix composition.

Thus, in our studies, the positive influence of feeding premixes containing inorganic compounds of elements with the replacement of iron, manganese, copper, cobalt, zinc by their organic forms in the composition of mixed fodders to calves during their breeding from 15 to 92 days of age was established.

Calculation of the cost of rations showed that it differed significantly by groups and was within 13129,00 rubles in the control, 18434,00 rubles in the I experimental and 18586,00 rubles in the II experimental. As a result of increasing the average daily and gross gain in animals of experimental groups, additional conditional profit was obtained in relation to the animals of the control group and amounted to 7500.00 rubles in the I experimental group and 9000.00 rubles per 1 head for the whole period in the II experimental group.

4. Conclusion

On the basis of the carried out researches it was established:

Due to the extrusion of narrow-leaved lupine grain of the Vityaz variety in combination with the OMEC premix, a competitive, import-substituting soybean-based protein concentrate with a high degree of bioavailability of feed is obtained. It has a high protein content of 26% and a low fiber content of 4.05%, which is very important for calves in the dairy period. Feeding mixed fodder containing protein concentrate in combination with premix OMEK allowed raising the gross live weight gain of calves during the whole period to 84.20 kg in group II while the control group added 61.64 kg.

At the same time, additional conditional profit, in relation to the control, was received for the amount of 7500 rubles in the I experimental group and 9000 rubles in the II experimental group.

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