Effect of triticale grain in feeding of dairy cows on their milk production and physiological state

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Abstract. Genetic potential of livestock can be revealed through organization of scientifically based feeding. Energy components of the ration, concentrates, are of special relevance. In recent years, triticale cereal crop has often been used as a concentrate for feeding cows. Triticale grain is virtually not used for feeding dairy cows, but its use in a mixture with other concentrates is of potential interest. The paper presents the results of the impact of triticale grain when it is introduced into a mixture of concentrates for feeding dairy cows in an amount of 2.7–3.7 kg on their milk production and physiological state. It was found that introduction of triticale grain into the diet of dairy cows did not have a significant effect on the physiological state of the experimental farm animals. In all experimental groups, the calcium content decreased, and in groups 1 and 2, the content of phosphorus decreased and that of triglycerides grew, which had a positive effect on fat synthesis increase. In the experimental groups, where triticale grain was used as concentrates, the amount of milk yield per lactation increased, and its quality characteristics improved. The cows from the experimental groups significantly surpassed their peers from the control group in milk yield per lactation by 21.3–37.3% at P≤0.01 and P≤0.001, respectively. The milk quality indicators were found to be better that increased amount of milk fat and milk protein. Despite the difference in milk yield, all cows were dairy animals and showed high milk yield rates ranging from 1,225 to 1,654.

1. Introduction

Provision of the population with a sufficient amount of domestically produced food, including milk and dairy products, is a priority for development of agriculture in general and in animal husbandry in particular [1–7]. Increased production of high-quality products is one of the most important tasks in the development of livestock farming worldwide. Development of dairy cattle breeding is of high relevance all over the world since milk is important as a food product, on the one hand, and as a raw material for processing, on the other hand [8–11]. An increase in milk production of cows is closely related to an improvement in the quality of milk, which has a significant impact on the quality of finished dairy...
products [12–19]. Milk production of cows and quality indicators of milk depend on many factors, including feeding. It is believed that manifestation of the genetic potential of production is 60% dependent on feed. Concentrates as energy components of the diet are of particular relevance. In recent years, triticale cereal has been frequently used as a concentrate for feeding cows. Triticale grain is virtually not used for feeding dairy cows. It contains 10–28% protein, 3.8% lysine, which is higher compared with wheat and rye grain, 2–4% fat. One kilogram of triticale grain contains 1.24 feed units, and one kilogram of its green mass contains 0.3 feed units, while one kilogram of winter wheat green mass contains 0.18 feed units. The study of using triticale grain for feeding dairy cows and its effect on their milk production and physiological state is relevant.

The aim of the study was to study the possibility of using triticale as feed in the amount of 2.7 and 3.7 kg in admixture with other concentrates for dairy cows and its effect on their milk production and hematological blood parameters.

2. Materials and methods
The studies were carried out on Holsteinized black-motley cows. For scientific and economic experiments, cows were selected by the method of balanced groups. The cows completed 3 lactations, 20 heads per group.

Animal care was similar and corresponded to zoo-hygienic standards. Rations were balanced in terms of nutrients and differed in the composition of the concentrated feed mixture only.

Cows from the control group received a basic ration (BR) which included local fodder (without triticale grain), energy and mineral feed supplements, and protein, vitamin and mineral supplements.

Cows from the control groups received the ration presented in table 1.

Table 1. Ration of cows from the control groups.

| Group No. | Triticale, kg | Wheat, kg | Barley, kg |
|-----------|---------------|-----------|------------|
| Control 1 | -             | 3.7       | 5.5        |
| Control 2 | 3.7           | 5.5       | -          |
| Control 3 | 2.7           | 3.7       | 2.8        |

Milk production was calculated by control milking. Physicochemical parameters of milk were assessed once a month in an average milk sample from each cow using conventional methods. Blood biochemical parameters were studied at the beginning and at the end of the experiment using standard techniques.

3. Results
The agricultural enterprise is engaged in breeding highly productive Holsteinized black-motley cattle of the Ural type. Figure 1 presents the indicators of milk yield and milk production of cows from the experimental groups.
The study showed that triticale grain introduced into the mixture of concentrates as a substitute for some other components increased milk production of dairy cows from the experimental groups. They exhibited improved indicators of milk quality and higher yield of milk fat and milk protein per lactation (figure 2).

A new type of forage introduced in the cow’s ration is always associated with an effect on the animal’s body. Therefore, the study of the physiological state of animals in the conditions of introducing triticale into the ration is relevant. It can be best assessed by blood biochemical parameters.

The results of scientific and economic experiment (changes in biochemical parameters) are summarized in table 2.

### Table 2. Biochemical blood parameters, n=5.

| Blood parameter     | Norm   | At the beginning of study | At the end of study |
|---------------------|--------|---------------------------|---------------------|
|                     |        | Group 1 | 2 | 3 | Group 1 | 2 | 3 |
| Total protein, G/L  | 62.0 – 82.0 | 80.92 | 82.32 | 77.38 | 77.96 | 79.02 | 78.02 |
| Albumin, G/L        | 29.0 – 38.0 | 30.34 | 31.22 | 32.74 | 34.52 | 35.46 | 35.48 |
| Globulin, G/L       | 30.0 – 45.0 | 50.58 | 47.10 | 44.64 | 43.44 | 43.56 | 42.54 |
| Calcium, mmol/L     | 2.2 – 3.1 | 2.20 | 2.16 | 2.20 | 2.10 | 2.08 | 2.00 |
| Phosphorus, mmol/L  | 1.4 – 2.7 | 1.38 | 1.68 | 1.30 | 1.32 | 1.54 | 1.42 |
The study revealed changes in biochemical parameters, but they varied within the physiological norm, that is, the use of triticale grain in forage did not have an adverse effect on the physiological state of cows (figures 3 and 4).

Blood tests showed an increased concentration of albumin, decreased concentration of globulin, and an insignificantly decreased amount of calcium in all groups of animals. In groups 1 and 2, the concentration of phosphorus was found to decrease as the amount of triglycerides grew (figure 4).
4. Discussion

Triticale grain introduced in the mixture of concentrates in an amount of 2.7–3.7 kg as a substitute for some other components resulted in the increased milk yield per lactation and improved quality of milk, and did not have a negative effect on the physiological state of dairy cows. Changes in blood biochemical parameters are associated with the course of lactation. Similar studies were carried out by N.V. Bogolyubova, V.P. Korotky, A.S. Zenkin, V.A. Ryzhov, N.P. Buryakov [24, 25], A. S. Gorelik, O. V. Gorelik, and S. Yu. Harlap [8].

5. Conclusion

The study shows that triticale grain used in ration of dairy cows in combination with concentrates increased milk production by 21.3–37.3%, fat content in milk by 0.35–0.52% and protein content in milk by 0.04–0.10% in absolute numbers. The use of triticale grain in cow feeding did not show an adverse effect on the physiological state of dairy cows.

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