Use Effect of Unconventional Feed and Mineral Additives on Animal and Poultry Productivity

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Abstract. The possibilities of increasing productivity of animals and poultry by using an additive containing selenium, rapeseed cake and complex mineral additive have been studied. An addition of the preparation "Kartsesel" in mixed fodder promoted the increase in digestibility of nutrients, the increase in erythrocytes, hemoglobin in blood, output of conditioned youngsters, profitability of production. Conditioned young growth was obtained more by 19-22%. Inclusion in mixed fodder at cultivation of goose rapeseed presscake of Siberian selection positively affected the increase of live weight, yield of gutted carcass. Goose of the first experimental group surpassed the control group by live weight by 3.4%, and the second experimental group by 6.1%. Output of gutted carcass of goose receiving rapeseed meal and rapeseed meal in combination with rapeseed oil is 286.13 g and 388.48 g more. Complex mineral additive in the diet of bulls contributed to the increase of live weight of bulls in 15 months of age, slaughter output, profitability of production and improvement of meat quality. The live weight of the control group of bulls not receiving the feed additive made 459.50 kg, and the experimental group made 11.00 kg more. At the same time the level of profitability of production on steers of the experimental group receiving a mineral additive amounted to 13.77% instead of 10.24% in the control group.

1. Introduction

Increased animal and poultry productivity is the most important factor of the intensification and production efficiency [1; 2; 8; 9]. The world practice shows the possibilities to increase the production by using production wastes, poorly studied elements, minerals, feed and additives of local origin [4; 7]. Thus, selenium as a feed additive attracts attention of scientists and practitioners increasingly as a biotic element that performs the important functions in small quantities. Due to its high chemical activity it is able to form complex organic compounds involved in all biochemical processes of a living organism. Selenium is a vital microelement with unique biological functions and a wide range of biological action of its compounds [10, 12]. Selenium has an immunostimulating effect even in small doses. It increases antibody synthesis, resistance to the infections (both viral and microbial) and enhances phagocytosis [15]. In world practice a considerable share in mixed fodders is occupied by the processing products, production wastes. Rapeseed processing wastes (presscake, meals) are the most important sources of the essential amino acids (lysine, methionine, tryptophan, etc.), essential fatty acids (linoleic, linolenic, arachidonic, oleic, etc.). The organization of full feeding is of great importance in increasing the productivity of farm animals and reducing the feed costs per unit of production. Mineral feeding plays a significant role among the main factors of adequate feeding. Their deficiency in a diet causes metabolism disorder, productivity decrease [15; 18].
2. Methodology

The experiments were carried out on goose of parental flock, on young cattle of Aberdeen-Angus breed. Selenium-containing additive "Kartsesel" was added to the feed of goose of parental flock at the rate of 1 l/t and 1.5 l/t. The goose of the control group received the compound feed without the additive. Growing goose in the first experimental group Siberian rapeseed was added instead of sunflower meal, in the second group - rapeseed presscake and rapeseed oil instead of sunflower part presscake and soybean oil. The experiments on geese were conducted at the "Makhalov Tribal Plant" LLC, on geese at the scientific and educational base of the FSBEI of HE "Kurgan State Agricultural Academy by T.S. Maltsev". The use of the complex mineral additive (KMD) on bulls of the Aberdeen-Angus breed was carried out in LLC "Luch" of Lebyazhyevskiy district.

3. The results

The use of the preparation "Kartsesel" which contains selenium in the mixed fodder for goose of the parental flock at the rate of 1 l/t had a positive effect on productive and economic indicators (Tables 1, 2).

This given mixed fodder provides goose with the necessary nutrients in a productive period according to the norms of feeding in poultry farming. Thus the gross output of eggs, quantity of conditioned youngsters, profitability of production has increased.

Gross egg output in the 1st trial group increased by 12.11%, in the 2nd group by 12.58% compared to the control group. In the experimental groups the quantity of conditioned youngsters increased by 4,32 and 4,49 thousand heads, from realization of youngsters from the experimental groups it is received on 410,40-426,55 thousand roubles more. Profitability of production in the first experimental group using the preparation in 1 l/t dose was higher and made 32,62 % instead of 14,36 in the control one. The increase in the dose of the preparation to 1.5 l/t had no significant impact on profit and profitability compared to the first experimental group.

Table 1. Recipe and nutritional value of mixed feed for geese of parental flock.

| Component                                | % input rate | Component                                | % input rate |
|------------------------------------------|--------------|------------------------------------------|--------------|
| Wheat                                    | 54,00        | Wheat mixed feed                         | 6,00         |
| Pea                                      | 19,15        | Feeding methionine                       | 1,45         |
| Grass meal                               | 5,12         | Feeding leaven                           | 0,23         |
| Sunflower protein meal                   | 7,03         | Precipitated superphosphate              | 1,22         |
| Full fish meal                           | 1,50         | Lime dust                                | 0,80         |
| Vegetable oil                           | 3,15         | Salt                                     | 0,35         |

Food-value of complete all-mash

| Metabolic energy in 100 g | 265 kcal, or 1107 kJ |
|---------------------------|----------------------|
| Crude protein             | 16,29                |
| Crude fibre               | 5,80                 |
| Linolic acid              | 1,40                 |
| Lysin                     | 0,68                 |

| Methionine + cystine       | 0,60                 |
| Ca                        | 1,22                 |
| P                         | 0,60                 |
| Na                        | 0,34                 |

Table 2. Economic indicators of selenium-containing preparation "Kartsesel" use.

| Component                      | Group          |              |              |
|--------------------------------|----------------|--------------|--------------|
| Average goose flock, head      | control        | 1 experimental | 2 experimental |
| Gross egg output, thousand/pcs.| 1087           | 1091         | 1089         |
| Hatching egg yield, %          | 94,10          | 96,75        | 96,83        |
Received conditioned youngster, thousand of heads.  
Feed consumption for the period of poultry operation, kg  
Feed consumption per 1000 pcs. of eggs, kg  
Proceeds from the sale of daily youngsters, thousand rubles  
Burden, thousand rubles  
Profit on sales from daily young stock, thousand rubles  
Cost-effectiveness, %  

| Received conditioned youngster, thousand of heads | 22.53 | 26.85 | 27.02 |
|------------------------------------------------|-------|-------|-------|
| Feed consumption for the period of poultry operation, kg | 37470 | 37400 | 37430 |
| Feed consumption per 1000 pcs. of eggs, kg | 1166.93 | 1039.76 | 1035.41 |
| Proceeds from the sale of daily youngsters, thousand rubles | 2140.35 | 2550.75 | 2566.90 |
| Burden, thousand rubles | 1871.60 | 1923.35 | 1953.90 |
| Profit on sales from daily young stock, thousand rubles | 268.75 | 627.40 | 613.00 |
| Cost-effectiveness, % | 14.36 | 32.62 | 31.37 |

The application of the selenium-containing preparation "Kartsesel" had a beneficial effect on digestibility and nutrient use. The best results on digestibility of nutrients were received at a dosage of 1 l/t of the preparation "Kartsesel" therefore, goose in a productive period absorbed nutrients better from the compound feed.

Table 3 shows the morphobiochemical indices of goose blood of the parental flock during the productive period. The number of erythrocytes, leukocytes and hemoglobin in the blood of the experimental groups increased with a reliable difference. The number of erythrocytes in the first experimental group increased by 16.60 % (P≤0.05), in the second experimental group by 12.15 % in comparison with the control group. The number of hemoglobin in the first experimental group increased by 8.04 % (P≤0.001), in the second experimental group by 7.88 % (P≤0.001) in comparison with the control one, which indicates more intensive processes in the organism of birds in experimental groups.

Table 3. Morphological and biochemical blood indicators of goose (X±Sx).

| Significative | control | 1 experimental | 2 experimental |
|---------------|---------|----------------|---------------|
| Erythrocytes, 10^12/l | 2.47±0.07 | 2.88±0.11* | 2.77±0.12 |
| Leukocytes, 10^9/l | 21.46±0.30 | 22.74±0.29* | 22.66±0.25* |
| Hemoglobin, g/l | 117.19±0.86 | 126.61±0.28*** | 126.43±0.58*** |

*P≤0.05 ***P≤0.001

Thus, the use of the selenium-containing preparation had a positive impact on the production rates of goose during the productive period.

Such unconventional feeds as rape-cake and rapeseed oil at partial replacement of sunflower cake and soybean oil showed positive effect. Thus, mixed fodder for hounds of all groups on the content of nutrients and exchange energy in 100 g of feed mixtures practically did not differ.

In order to control productivity, goslings were weighed before the start of the experiments at the daily age, after 10, 20, 30, 50 and 60 days. Live weight of the control and experimental groups of goslings at 60 days of age is presented in Table 4.

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Table 4. Change of goose live weight by periods, d (X±Sx).

| Age of the bird, days | Group         |                     |                     |                     |
|----------------------|---------------|---------------------|---------------------|---------------------|
|                      | control       | 1 experimental     | 2 experimental     |
| 1                    | 99,90±1,18    | 100,33±1,39         | 100,53±1,53         |
| 10                   | 437,30±17,26  | 525,88±17,20        | 491,50±19,80        |
| 20                   | 1220,00±19,90 | 1252,00±17,30       | 1275,00±14,20       |
| 30                   | 2417,74±36,50 | 2550,00±22,70       | 2590,00±27,20       |
| 50                   | 3403,10±50,79 | 3507,03±63,40       | 3646,6±76,40        |
| 60                   | 4103,29±113,53| 4241,59±91,90       | 4350,61,4±72,40     |

At the daily age goslings were slightly different in live weight. At 10 day-old age the live weight of gosling in the first experimental group was 525.9 g, which is 88.6 g higher than the live weight of goslings in the control group. Goslings of the second experimental group surpassed the control group by 54.2 g live weight. The tendency of greater growth in the experimental groups remained up to 60 days old. Goslings of the first experimental group surpassed the control group by 3.4% in live weight, and the second experimental group by 6.1%. In general, the results of weighing show high growth intensity of goslings of all groups.

To determine the meat productivity of goslings at 60 days of age, control slaughter of goslings and anatomical cutting of carcasses were performed (Table 5).

Table 5. Results of goslings slaughter (X±Sx).

| Significative                          | control                    | Group | Group |
|----------------------------------------|----------------------------|-------|-------|
|                                        |                           | 1     | 2     |
|                          |                           | 1 experimental | 2 experimental |
| Preslaughter weight, g                | 3988,10±28,86             | 4274,23±39,63 | 4339,45±49,39 |
| Mass of semieviscerated poultry, g    | 2982,31±34,41             | 3280,53±39,53 | 3370,79±47,12 |
| Outcome of semieviscerated poultry, % | 74,80±041                 | 76,75±054   | 77,67±0,62  |
| Without gibbets mass, g               | 2456,15±41,27             | 2680,17±58,20| 2753,89±37,76|
| Without gibbets outcome, %            | 61,59±0,85                | 62,71±0,97  | 63,46±1,03  |

The weight of the semieviscerated poultry was higher in the experimental groups receiving rapeseed cake and rapeseed cake in combination with rapeseed oil, and exceeded the weight of the control carcass by 286.13 g and 388.48 g, respectively. The without gibbets mass was also higher in the experimental groups.

Unconventional feed with high vitamin content helps to increase gosling appetite and better assimilation of mixed fodder. Cabbage leaf used in the experience is a waste material for cabbage growing, nettle grows in sufficient quantities in natural conditions. Feed consumption per 1 kg of growth when using rapeseed cake and partial replacement of soybeans with rapeseed oil was 9.2% less.

One of the most important problems at the current stage of the Russian agro-industrial complex development is the increase in meat production [3; 5; 6; 8; 11]. The solution of this problem can be achieved through the realization of genetic potential the growth of animal productivity through the improvement of feeding technology [9; 13; 14; 16; 20]).

The Academy's feed mineral additive (KMD) was used in the cultivation of Aberdeen-Angus bulls.

The ration adopted in the farm was used for young animals on feeding of the control group, in the experimental farm with KMD additive in a dose of 150-200 years. Giving the additive to the young animals is regulated taking into account the live weight of the animals. The feeding period of the additive is 100-120 days when the live weight of animals is at least 420 kg.
At the age of 13-14 months the diet contained 98.4 MJ of exchange energy and at the age of 15 months - 105.0 MJ. The diet for the final growing period is shown in Table 6.

**Table 6.** Feeding diet of Aberdeen-Angus calves with live weight of 430-470 kg (age 14-15 months).

| Significative                                      | Control group | Experimental group |
|---------------------------------------------------|---------------|--------------------|
| Haylage from cereals and legumes mixture, kg      | 15            | 15                 |
| Boneless hay, kg                                  | 3             | 3                  |
| Wheat (grain), kg                                 | 0.5           | 0.43               |
| Barley, kg                                        | 2.0           | 2.0                |
| Oat, kg                                           | 1.0           | 1.0                |
| Feed Mineral Additive (KMD), g                    | -             | 200                |

| Content in the diet                               |               |                    |
|---------------------------------------------------|---------------|--------------------|
| Metabolic energy, MJ                               | 105,0         | 105,0              |
| Dry substance, kg                                 | 11.7          | 11.7               |
| Digestible protein, g                             | 844,0         | 844,0              |
| Raw fiber, g                                      | 2492.6        | 2492.6             |
| Sugar                                             | 463.0         | 473.6              |
| Ca, g                                             | 76.2          | 76.2               |
| P, g                                              | 40.7          | 53.8               |
| Mg, g                                             | 25.0          | 43.6               |
| K, g                                              | 154.0         | 154.0              |
| Fe, g                                             | 2352.0        | 2352.0             |
| Mn, mg                                            | 761.0         | 761.0              |
| Cu, mg                                            | 55.2          | 164.2              |
| Zn, mg                                            | 292.0         | 884.0              |
| Co, mg                                            | 3.7           | 11.1               |
| Se, mg                                            | 0.2           | 1.98               |
| J, mg                                             | 1.8           | 4.4                |

Introduction of 200 g of KMD in the diet of the experimental groups of animals allowed to meet the needs of bulls on such elements as phosphorus, magnesium, copper, zinc, cobalt, iodine. Sugar supply has been slightly improved.

The dynamics of live weight of Aberdeen-Angus bulls is presented in Table 7.

**Table 7.** Live weight dynamics, kg (X±Sx).

| Significative                                      | control      | experimental |
|---------------------------------------------------|--------------|--------------|
| Beginning of the experience                        | 395.30±2.45  | 401.40±7.94  |
| Midpoint of the experience                         | 424.70±2.45  | 432.10±5.92  |
| End of the experience                              | 459.50±4.54  | 470.50±4.26  |

In the middle of the experience the animals of the experimental group outnumbered the young of the control group by live weight by 7.40 kg (1.74%). In the subsequent period the experimental group had a live weight of 470.50 kg, which is 11 kg more than the control group animals.

The slaughter quality is presented in Table 8. The preslaughter weight of Aberdeen-Angus calves was 11.00 kg (2.39 %) more in the experimental group than in the control one. The carcass mass changed in the same sequence. The animals in the experimental group had carcass weights of 290.03
kg, which was 7 kg (2.47 %) greater than in the control group. The slaughter yield varied from 61.68 to 61.72%. No great difference was observed in the groups.

Table 8. Slaughter qualities of youngsters (X±Sx).

| Significative                  | Group           |  
|-------------------------------|-----------------|
|                               | control         | experimental  |
| Preslaughter weight, kg       | 459,00±6,65     | 470,00±0,57   |
| Mass of carcass, kg           | 283,03±3,72     | 290,03±1,15   |
| Slaughter yield of meat pulp, %| 61,68±0,10      | 61,72±0,14    |

Analyzing the morphological composition of carcasses of slaughtered animals it was found out (Table 9) that the muscle tissue in carcasses of young experimental group is 1.32% more than in the control group.

Table 9. Morphological composition of carcass tissue, % (X±Sx).

| Significative | Group          |  
|---------------|----------------|
|               | control         | experimental  |
| Muscular tissue | 79,00±1,00     | 80,32±0,43   |
| Fat tissue    | 5,11±0,01      | 4,91±0,04    |
| Bone tissue   | 12,70±0,35     | 13,21±0,02   |

Fat tissue in the control group of animals was 0.20% more than in the experimental group. Bone tissue contained less amount in carcasses of the studied animals of the control group accordingly 0.51% in comparison with the experimental group.

It should be noted that the meat of the experimental group received the overall quality assessment "Excellent", while in the control group - "Very good". The broth was transparent and aromatic when the sample was brewed. On the surface of the broth fat was collected in the form of coarse drops from all the experimental samples of meat. Organoleptical evaluation of the broth was conducted on a 9-point scale. The overall evaluation of the broth quality ranged from 8.30 to 8.80 points.

Thus, the meat and broth from the animals that consumed the additive received a higher score as they were more aromatic and boiled. In general, the meat from the animals under study is delicious and of high quality.

Table 10. Economic indicators of feed additive use in the experiment on male calves of Aberdeen-Angus breed.

| Significative                          | Group           |  
|----------------------------------------|-----------------|
|                                        | control         | experimental  |
| The number of youngsters in the experience, head. | 10              | 10           |
| Live weight of 1 head at the beginning of the experience, kg | 395,30          | 401,40       |
| Live weight of 1 head at the end of the experience, kg | 459,50          | 470,50       |
| BWG of 1 head in the period of experience, kg | 64,20           | 69,10        |
| Total live weight gain, kg | 640,20          | 690,10       |
| Cost value of 1 kg of growth, ruble. | 75,20           | 75,20        |
| Total Cost value of 1 kg of growth, ruble. | 48143,04        | 51895,52     |
| General expenses of production, ruble | 42908,45        | 45615,75     |
| Profit | 43934,59        | 6279,77      |
| Level of profit margin, % | 10,24           | 13,77        |
Feeding of complex mineral additive together with the basic ration accepted at a farm bringing up bull calves of meat direction of productivity promoted reception of the big gain of live weight and increase of manufacture profit margin. Level of profit margin at growing of bull calves of the experimental group made up 13.77 %, in control one 10.24 %.

4. Conclusion
Based on the above studies the use of unconventional feeds and additives, poorly studied elements and complex mineral additives has a positive influence on improving the animal and poultry productivity and production efficiency.

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