Abstract. The results of wholesale on the use of waste of vegetable crops and sunflower when fattening gobies of the black-and-white breed are given. Six groups of uncastrated bulls were formed: control, I experienced, II experienced, III experienced, IV experienced and V experienced (on the principle of analogous groups, taking into account age and body weight and origin). All gobies (control and experimental groups) were given 17.2 kg of silage from cereal perennial grasses and 3.65 kg of mixed feed and 9.5 kg of brewer's grain, 80g of fodder chalk each. The gobies of the experimental groups were given various wastes of vegetable crops and sunflower (at 30 g / head / day): I experienced — did not feed them, II experienced — pepper stalks, III experimental — sunflower stalks, IV experimental — cucumber stalks, V experimental — stalks tomatoes (in the form of flour). The live weight of bulls when removed from fattening for the control group is 297.0 ± 0.19 kg, the experienced ones — from 304.6 ± 0.12 kg (hay with KKS and without feed additives) to 317.7 ± 0.24 kg (114.7%, tomato stalks). Average daily gains in live weight are from 801 ± 14.6 g (hay with CCR) to 874 ± 16.7 (tomato stalks, P <0.001) versus 762 ± 16.4 g in the gobies of the control group.

1. Relevance of the topic
In the current economic environment, the problem of providing the population with a sufficient amount of environmentally friendly agricultural products, especially cattle, remains unsolved [1-3]. To further increase the volume of beef production, the creation and sale of a solid forage base with the use of a reserve fund during the entire calendar year is of exceptional importance.

To obtain environmentally friendly beef and other livestock products at specialized sites, farms and complexes, it is advisable to maximize the use of vegetable waste and sunflower, especially near large greenhouses, enterprises, during the harvest period [4-6].

Waste vegetable crops: pepper, cucumber, tomato, and tilled crops — green mass (sunflower stalks), ground into flour (separately) is used in a mixture with grain concentrates or mixed feed [7, 8]. Based on experimental studies, it was proved that the stalks of pepper, cucumbers and tomatoes, as well as the stalks of sunflower (separately) have high antioxidant and sorption properties. Therefore, feed additives in the form of flour from the stems of pepper, cucumbers, tomatoes and sunflower (separately) can serve as an additional plant resource in the system for optimizing fattening steers, increasing the productivity and environmental friendliness of meat products [9, 10].

2. Objective
To study the effect of flour stalks of pepper, cucumbers, tomatoes and sunflower in the composition of the feed on the degree of heavy metals in beef gobies. The tasks were to study the effect of the used
antioxidant and sorption feed additives in the calves rations to reduce the degree of contamination of the organism with heavy metals.

3. Material and research methods
Scientific, economic, and physiological experiments were carried out on uncastrated bulls of black-and-white breed on the farm of the agrotechnical technical school Novgorodsky, Novgorod region. Groups of gobies are formed by methods of analog groups, taking into account age, body weight, origin, in accordance with the research scheme (Table 1). The studies were carried out in accordance with the Ovsyannikov’s methods [5] in the Acron central chemical laboratory of the Novgorod region and in the laboratory of agricultural products quality at the Institute of Applied Chemistry of the Pr Navgou method of atomic absorption spectrophotometry (Jerkin Elmer USA, Analyst 400).

Average daily rations of feeding were formed from actually eaten feed and additives. Per 1 ECA accounted for 105.6 g of digestible protein. The diets contained 4.49–4.52% fat, 28.2% fiber (dry matter). The unit of dry matter contained 0.78 ECA. The structure of rations included the following types of feed (%): hay-29, silo-22, feed 26, beer pellet-23. The energy nutritional value of the rations was 11.2 OKE exchange energy (112 MJ).

Table 1. Scheme of scientific and business experience

| Group of gobies          | The number of gobies in groups, goal | Live weight of 1 bullhead before setting experience, kg | Breed of gobies | Feeding conditions                      |
|-------------------------|-------------------------------------|--------------------------------------------------------|-----------------|----------------------------------------|
| Control                 | 10                                  | 168.1±0.24                                              | Black and white | PR (basic ration) without additives   |
| I experienced           | 10                                  | 168.4±0.24                                              | Black and white | PR + hay with KKS without additives   |
| II experienced          | 10                                  | 167.9±0.19                                              | Black and white | PR + 30 g flour stalks of pepper      |
| III experienced         | 10                                  | 169.7±0.28                                              | Black and white | PR + 30 g flour stalks of sunflower   |
| IV experienced          | 10                                  | 168.4±0.13                                              | Black and white | PR + 30 g flour stalks of cucumbers   |
| V experienced           | 10                                  | 169.1±0.16                                              | Black and white | PR + 30 g flour stalks of tomatoes    |

The animals were fed with hay concentrate type directly in the room, on a leash. The degree of contamination by heavy metals of bull rations before slaughter is presented in Table 2.

Table 2. The concentration of heavy metals in the diets of feeding bulls of the black-and-white breed, mg

| Heavy metal name | Based on 1 kg of CB | Based on 1 ECA |
|------------------|---------------------|----------------|
| Lead             | 5.5                 | 7.1            |
| Cadmium          | 1.3                 | 1.7            |
| Chromium         | 42.2                | 54.3           |
| Nickel           | 7.3                 | 9.3            |
| Titanium         | 3.3                 | 4.3            |
| Aluminum         | 278.1               | 357.6          |
| Tin              | 488.4               | 628.0          |
| Strontium        | 36.0                | 46.3           |
In these rations per 1 kg of dry matter, a high concentration of tin (488.4 mg), aluminum (278.1 mg), chromium (42.2 mg) and strontium (36.0 mg) was noted. A similar tendency of contamination of bull rations with these heavy metals was observed per 1 ECA.

4. Effect of feed additives on the dynamics of body weight and average daily gains of fattening gobies

Inclusion in the rations of bull-calves hay with KKS and additives from flour of stalks of vegetables and sunflower had an inadequate effect on the average daily gains of body weight. In all groups of fattening gobies, where hay was used with KKS and additives from flour of vegetable and sunflower stalks, the average daily gains were higher than in the control group (hay without KKS) by 5.1-14.7% (P> 0.05), that is, the introduction of calcium carbonate into the soil under grass for hay, had a positive effect on the increase in average daily gains of live weight of gobies (Table 3). Flour of vegetable crops and sunflower stalks was used to reduce the degree of contamination of meat and other animal products with heavy metals, and they also had a beneficial effect on the increase in live weight of bulls by 5.1-14.7%. Duration of growing and fattening was 170 days.

Table 3. Live weight and average daily gains of fattening gobies

| The group of gobies and the name of the additive | Live weight 1 goal, kg | Average daily gain in live weight 1 goal, G (for the whole experience) | Change in average daily gains in comparison with control, % |
|-----------------------------------------------|------------------------|------------------------------------------------------------------------|----------------------------------------------------------|
| Control (PR) without additives                 | 168.1±0.24             | 297.0±0.19                                                             | –                                                        |
| I experienced (PR + hay with KKS) without additives | 168.4±0.24             | ***                                                                   | 801±14.6                                                | 105.1                                                   |
| II experienced (OR + 30 g flour stalks of pepper) | 167.9±0.19             | ***                                                                   | 304.6±0.12                                              | 826±15.4                                                | 108.4                                                   |
| III experienced (PR + 30 g flour stalks of sunflower) | 169.7±0.28             | ***                                                                   | 308.3±0.18                                              | 833±16.3                                                | 109.3                                                   |
| IV experienced (RR + 30 g flour of cucumber stalks) | 168.4±0.13             | ***                                                                   | 311.3±0.27                                              | 840±15.9                                                | 110.2                                                   |
| V experienced (PR + 30 g flour stalks of tomatoes) | 169.1±0.16             | ***                                                                   | 311.2±0.21                                              | 874±16.7                                                | 114.7                                                   |

***P <0.001

The inclusion of phytogenic feed additives (stems of pepper, sunflower, cucumbers and tomatoes) in the rations of bulls at a dose of 30 g per head per day with sorption and antioxidant properties allowed them to fully realize their fattening qualities, which manifested itself:
- in the increase in average daily gains in live weight compared with the control group from 8.4 to 14.7% with the use of components of vegetable crops and 9.3% - sunflower, respectively;
- in the economical expenditure of digestible protein rations per 1 kg of increase in live weight - 8.68 g when using hay with KKS; 8.42 g - flour of pepper stalks, 8.35 g - sunflower, 8.28 g - cucumbers and 7.96 g - tomatoes against 9.17 g, in the control variant;
- in a significant increase in the functional activation of the digestive system of the body of bulls with a live weight in excess of 300 kg;
- in increasing the concentration of reserve alkalinity in serum by 3.0% - when using the stalks of sunflower, by 9.3% - pepper; total protein - by 4.9% of cucumber stalks and 5.0% of tomato stalks; carotene - by 31.8% compared with the control variant.
5. Influence of feed additives with antioxidant and sorption properties on the concentration of heavy metals in bull meat

In farms, joint-stock companies, personal subsidiary farms in the Russian Federation, the CIS and abroad, the production and processing technologies for beef meat do not control the content of heavy metals in it: aluminum, titanium, strontium, nickel, cadmium chromium, tin and lead.

A person is forced to eat foods contaminated with toxic heavy metals.

Therefore, along with the solution of the problems of the production of environmentally friendly meat and other food products, a search is needed for means that could cleanse the body of toxic elements, including carcinogenic metals (Table 4).

CCS, as an improved, is able to enrich the daily diet with calcium through the soil and forage crops. Livestock breeders are well aware that at present a large deficit for all types of farm animals, including growing ones, is fodder chalk, especially for balancing their diets for calcium. Therefore, feeding rations, especially for fattening gobytes, must be controlled by the content of not only calcium but also strontium stable.

| Group of cows | Lead mg /kg | Cadmium m g /kg | Chrom mg /kg | Nickel mg /kg | Titanium mg /kg | Alumlnum mg /kg | Mg /kg | Strontium mg /kg | The amount of heavy metals, mg /kg |
|---------------|-------------|----------------|--------------|---------------|----------------|----------------|-------|----------------|----------------------------------|
| Control PR (main ration) without additives | 0.10±0.00 | 0.06±0.00 | 0.093±0.00 | 0.26±0.00 | 9.86±0.00 | 6.19±0.00 | 0.16±0.00 | 16.72±1.00 |
| I experienced (PR + hay with KKS) without additives | 0.13±0.00 | 0.11±0.00 | 0.14±0.00 | 0.15±0.00 | 8.41±0.00 | 6.68±0.00 | 0.12±0.00 | 15.74±1.00 |
| II experienced (OR + 30 g flour stalks of pepper) | 0.50±0.00 | 0.058±0.00 | 0.20±0.00 | 0.34±0.00 | 1.81±0.00 | 12.54±0.00 | 8.21±0.00 | 1.40±0.00 | 25.06±1.80 |
| III experienced (PR + 30 g flour of stalks of sunflower) | 0.13±0.00 | ±0.10±0.00 | 0.13±0.00 | 0.31±0.00 | 14.24±0.00 | 8.15±0.00 | 0.22±0.00 | 23.29±1.90 |
| IV experienced (RR + 30 g flour of cucumber stalks) | 0.11±0.00 | ±0.050±0.00 | 0.07±0.00 | 0.03±0.00 | 3.33±0.00 | 5.04±0.00 | 0.13±0.00 | 8.78±1.15 |
| V experienced (PR + 30 g flour stalks of tomatoes) | 0.17±0.00 | 0.090±1.10 | 0.20±1.20 | 4.87±0.00 | 5.32±0.00 | 0.30±0.00 | 11.06±1.7 |

*p<0.05, **p<0.01, ***p<0.001

With the inclusion of KKS in the soil, the concentration of strontium in meat (0.12 ± 0.01 mg / kg versus 0.16 ± 0.02 mg / kg) and aluminum (8.41 ± 0.17 mg / kg against 9.86 ± 0.31 mg / kg), titanium (0.15 ± 0.02 mg / kg versus 0.26 ± 0.01 mg / kg) and, on the contrary, nickel (0.14 ± 0.01 mg / kg versus 0.093 ± 0.004 mg / kg), tin (6.68 ± 0.61 mg / kg versus 6.19 ± 0.76 mg / kg), lead (0.13 ± 0.01 mg / kg versus 0, 10 ± 0.01 mg / kg) and cadmium (0.0075 mg / kg against zero compared with the control variant.

Some increase in the concentration of these heavy metals in meat, in comparison with the control, did not go beyond their maximum permissible concentrations (MPC). So, for example, in meat, the lead of the MPC is 0.5 mg / kg, and in the case of the use of CCS, only 0.13 mg / kg, which is 3.8 times less.
Meat contained, as is known, 0.0075 mg / kg of the carcinogenic element cadmium, and the MPC for this element is 0.05 mg / kg. Consequently, in this case, the meat accumulated in beef is 6.7 times less. And for nickel, chromium and tin, their maximum allowable concentration in beef meat has not been developed.

With the addition of pepper stalks to the ration of flour, the concentration in beef nickel (1.3%), lead (2%), strontium stable (5.6%), titanium (7.2% of the amount of heavy metals) increased. Due to the feeding of cucumber stalks flour, it was possible to eliminate the content of the most dangerous carcinogenic element cadmium in it, to reduce titanium (0.3%) and aluminum (38.0% of the amount of heavy metals).

Flour stalks of sunflower in the composition of diets contributed to a decrease in the concentration in meat of lead (0.5%) and nickel (0.5% of their total amount). However, this type of flour has the properties to accumulate aluminum carcinogenic element in meat of beef. When using flour of stalks of sunflower, 61.1% of aluminum (of the sum of heavy metals) was accumulated in this food product.

Thus, the degree of contamination of beef meat with heavy metals in a decreasing sequence has the following form: aluminum> tin> titanium> strontium> lead> nickel> chromium> cadmium.

A similar trend in the distribution of these heavy metals in meat was observed when hay harvested in the field was harvested in the field after calcium carbonate was introduced into the soil.

6. Findings
Consequently, calcium carbonate introduced into the soil does not affect the accumulation of heavy metals, including stable strontium, in the beef food product. Moreover, it protects beef meat from excessive accumulation in it of not only strontium stable, but also aluminum, titanium.

The highest antioxidant and sorption properties among vegetable crops were stalks of cucumbers (8.78 ± 1.15 mg / kg) and tomatoes (11.06 ± 1.70 mg / kg against 16.72 ± 1.36 mg / kg in the control variant), which leads to a significant decrease in the amount of the concentration of heavy metals by 1.9 times and 1.5 times, respectively. And it is advisable to use these feed additives in mixtures with compound feeds in the composition of diets of bulls to cleanse their body of heavy and toxic metals.

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