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# Biotechnical aspects of the feeding heifer full-purpose courses of different granulometric composition

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The world pace of livestock development is one of the highest in the world, leading to a deterioration of the ecological state as a whole. It is known that livestock breeding emits up to 9% of carbon dioxide into the atmosphere. Therefore, the environmental costs of livestock production should be reduced at least several times. Following the European Commission Decree No. 2017/302, which stipulates the development of the best available technologies for harvesting of forages and growing of animals, we have investigated the efficiency of using full-range fodders of different degree of grinding in the growing of heifers after the dairy period.The influence of feed of different physical structure on the growth and development of heifers was determined. Experimental studies have confirmed that the provision of moderate-intensive growth of heifers for repair is achieved by feeding full-range fodder mix with the following particle ratio of feed in the daily dosage (%): 0-1 cm - 37.6; 1-2 cm - 30.7; 2-3 cm - 14.3; 3-4 cm - 11.4; 4-5 cm - 4.5; >5 cm - 1.5%. At the same time, feed intake is increased by 5% compared to the age group of the control group, the time spent on the cucumber is reduced by 4.3%, which makes it possible for the group III heirs to stay ahead of the elders of other groups in live weight at 16 months by 12-20 kg ($P \geq 0.95$). It is shown that optimization of the granulometric composition of full-fodder feed improves the timing of the arrival of heifers in hunting and their productive use. Thus, there is reason to assert that the use of full-fodder fodders of a specific granulometric composition is a profitable technological method for preparing forage and feeding heifers, since it enables to increase the consumption, productive effect of feed and obtain a live weight of 371-382 kg at the age of 425-430 days and accelerate the onset of economic maturity of animals for 20-25 days.

**Keywords:** Technological preparation; degree of shredding; granulometric composition; heifer; fuel and lubricants

## Introduction

Ensuring the population of the country biologically high-grade, environmentally friendly food products in sufficient quantities was and remains one of the most urgent problems of agricultural science and production. Reducing production costs is the only way to survive dairy farms in a market economy. This formula has been, is and will be the main one for the producers over the next 50-60 years in most farms producing milk in the countries of Western Europe as well as abroad (Berry et al., 2016; Gusarov et al., 2018; Paliy et al., 2015).

The practice of world livestock breeding has proven that the profitability of the modern dairy industry is linked to the productivity of cows. Therefore, livestock with different zootechnical and engineering methods of forage preparation seek to increase their productive effect.

Different feeding conditions (the full value of the diet, the mode of feeding it, the technique of preparing feed for feeding, etc.) in the cultivation of repair heifers can change the processes of growth and development of animals, structure of the body, the nature of the exchange of nutrients and thus affect the formation of future milk production cows (Osipenko et al., 2018).

Growing the repair stock of cattle is one of the most important components of milk production. The intensity of heifers for healing purposes should ensure their maximum milk yield, which influences the economic efficiency of dairy farms (Podobed et al., 2007).

The estimation of aggregate expenditures of energy resources, which is given in the scientific literature, shows that along with a significant share of energy intensity of feed, the amount of energy consumption is largely influenced by the way of keeping and servicing animals (Palii & Palii, 2019).

As the analysis of the current state of livestock in Ukraine, in particular dairy farms and farms, an important prerequisite for increasing milk production is the increase in the genetic potential of milk production in cows and the improvement of feeding

and livestock feeding technologies (Neja et al., 2017). The intensity of the growth and development of heifers intended for the herd's repair should ensure the maximum milk productivity of future high-yielding cows (Bell et al., 2011; Paliy, 2016).
One of the expense types of work on dairy farms is the preparation, delivery and distribution of pet food. Its share accounts for 20-30% of all labor costs (Lams & Wisitiporn, 2015). To reduce the energy efficiency of the process and increase the productive effect of feeds scientists in Western Europe are developing a variety of mobile feed shredders-mixers-distributors. Their wide application is conditioned both by the advantages of feeding feed mixtures, and by the perfect construction of machines that provide load, crushing, mixing and distribution of feed with minimum labor costs (Boyko & Novytsky, 2010; Paliy et al., 2018).
However, the time consuming time for performing basic processing operations for the preparation and distribution of feed fodders by such machines is often fragmentary in nature, which does not allow it to be used adequately, in particular, in the cultivation of young heifers of heifers (Cheeke, 1999; Pechura, 2006).
According to the results of the tests by the specialists of UkrNIDIPVT them. L. Burned concluded that new technologies for the preparation and distribution of feed using mobile feeders-mixers are resource-saving. They allow to reduce the costs of preparation and distribution of feed mixes by almost 2 times. They allow to reduce the costs of preparation and distribution of feed mixes by almost 2 times. The uniformity of feed mixing in these aggregates is 91.3-98.4%, and the uniform distribution of feed is at the level of 94.8-97.0%. However, the authors do not give an optimal fractional composition of feed mixes, there is also no definition of the level of consumption of their animals and the payment of feed productivity (Greter et al., 2013; Meseret, 2016).
The results of shredding and mixing affect both the productivity of animals and the preservation of feed. This operation requires additional energy costs, which affects the cost of food (Paliy, 2017; Palkin, 2004).
With the increased use of modern feed technology in Ukraine by farms, the problem of determining the optimal degree of shredding and the timing of mixing of dietary components in mobile mixers (Miller-Cushon & DeVries, 2017; Nikkhali et al., 2012) before feeding them to animals was a matter of urgency.
It is known that the cost of livestock production is largely determined by the cost of feed (up to 65%), fuel and lubricants (up to 20%), depreciation charges (up to 10%), maintenance costs for machinery and equipment (up to 10%) (Borodulin, 2008).
The analysis of technical data of forage equipment, which enters the domestic market, suggests that the terms of preparation and granulometric composition of feed mix should be optimized primarily for the physiological needs of the gastrointestinal tract of animals. We decided to experimentally determine the optimum physical structure and substantiate the economic feasibility of using full-range feed mixes when growing heifers before they were transferred to a group of non-cells.
The study of the effectiveness of fodder mixes of different granulometric composition in growing heifers and their effect on growth, development, formation of the body type, animal behavior and the age of the first insemination and became the subject of our research.

## Materials and methods

The purpose of the research was to increase the productivity of the repair heifers of Ukrainian black-and-white milk after the dairy period of cultivation by improving the technological acceptance of preparation and optimization of the granulometric composition of full-fodder feed mix.
To achieve this goal, the following tasks were addressed:
- determine the optimal mode and the term of the grinding of feed in the Mobile Distributor-mixer MultiMix, and determine the effect of its physical structure on consumption, payment of feed for growth of live weight, growth and development of heifers after the dairy period;
- determine the effect of the degree of grinding of the components of the diet on the fodder behavior of heifers after the dairy period of cultivation and on the age and live weight of their first insemination and fertilization;
- calculate economic expediency and economic efficiency of the proposed technological use of grinding fodder mixed with feeding heifers after the dairy period of cultivation.
For the experimentation, weeded heifers of Ukrainian black-and-white dairy breed were divided into 4 groups by the method of analogue groups, and the experiment itself was preceded by a period of equalization, which allowed, upon its completion, to finally form groups of analogues for the accounting period.
Preparation of feed mixes for feeding was carried out with the help of mobile strain-mixer-distributor StrautmannMultiMix 900. The essence of the research was that repair heifers of different groups according to the experimental scheme (Table 1) fed full-fodder corn mixes of different granulometric composition, which were prepared in a mobile feeder-mixers.

**Table 1.** Scheme of experiment, n=8.

| Group animals | Duration of mixing and grinding of feed, min. | Live weight of animals, kg | | Age of heifers, months | |
|---|---|---|---|---|---|
| | | When staged on an experiment | At the end of the experiment | At the beginning of the experiment | At the end of the experiment |
| I (control) | 4 | 250 | 370 | 10 | 16 |
| II (experiment | 6 | 250 | 370 | 10 | 16 |

| | | | | | |
|---|---|---|---|---|---|
| al) | | | | | |
| III (Experimental) | 8 | 250 | 370 | 10 | 16 |
| IV (Experimental) | 10 | 250 | 370 | 10 | 16 |

In this case, the energy and protein nutrition of fodder mixes for heifers of all groups was the same. Rations were balanced by a set of nutrients, minerals and biologically active substances in accordance with the rules of feeding (Schingoethe, 2017).
During the accounting period of the experiment, weighing and analysis of the distributed feed, as well as its residues in the feeders in the beginning, middle and at the end of the research, were carried out in a day. On the basis of the analysis, the cost of feed (in feed units) and digestible protein per kg of live weight gain were determined.
The live weight of heifers was determined by the method of monthly individual weighing 1-2 hours before morning feeding. The rate of passage of the forage through the gastrointestinal tract was determined using colored polyethylene granules, which were added to the feed mix at the beginning, in the middle and at the end of the experiment. The calculation of the economic efficiency of heifers was determined by taking into account the actual costs of growing heifers and fixing the age of the first hunting and insemination.

## Results and discussion

Determination of the optimal degree of feed shredding in a mobile mixer distributor. It is established that one of the promising ways to increase the productivity of cattle is the so-called identical feeding. The peculiarity of this feeding is the year-round feeding of animals of crushed feed mixtures from silage, haymaking, hay, straw and concentrates. Such a technology of cooking and feeding fodder to animals provides not only the uniformity of the supply of nutrients and biologically active substances to their digestive organs at any time of the year, but also provides a high level of mechanization of the process of preparation and distribution of feed (Schingoethe, 2017; Wathes et al., 2008).
As a result of the research, it was found that the time spent on crushing and mixing the components of feed mix significantly affected the granulometric composition of the feed, the level of consumption of its animals, and the productive effect of the feed. The data in Table 2 indicate that the degree of grinding of the feed mix was different and depended on the duration of mixing the components when preparing the feed mixture in the mixer distributor. So, animals of the 1st group distributed fodder mix with a degree of shredding of particles 1-2 cm - 30.6%, somewhat smaller particles with sizes 0-1 cm - 25% and 2-3 cm - 23%.
Animals of the second group received the most corrosive mixtures with particle sizes 0-1 cm - 30.8%, 1-2 - 29.4%, 2-3 cm - 17.7% and less than 4 cm - 13.3%.
As the mixing and shredding time increased, the proportions of the food particles decreased and the percentage of the food was changed in the mixer distributor. Thus, the animals of the III group received feed mix of the following granulometric composition: from 0 to 1 cm - 37.6%; 1-2 cm - 30.7 and two and less - 15% (Table 2).

**Table 2.** Granulometric composition of full-fodder feed mix, %.

| **Group** | **Particle Size, see** | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **When distributing in the feeder** | | | | | | **The remains in the feeder after 24 hours** | | | | | |
| | <1 | <2 | <3 | <4 | <5 | 5> | <1 | <2 | <3 | <4 | <5 | 5> |
| I (duration of crushing 4 minutes) | 25 | 30.6 | 23 | 12.2 | 5.9 | 3.3 | 25.1 | 37.6 | 11.8 | 16 | 5.7 | 3.8 |
| II (length of shredding 6 minutes) | 30.8 | 29.4 | 17.7 | 13.3 | 6 | 2.8 | 15 | 22.4 | 26.1 | 18.4 | 14.1 | 4 |
| III (length of shredding 8 minutes) | 37.6 | 30.7 | 14.3 | 11.4 | 4.5 | 1.5 | 12.9 | 26.5 | 19 | 22 | 16.6 | 3 |
| IV (shredding time 10 min) | 44 | 34.7 | 12.7 | 6.3 | 2 | 0.3 | 16.1 | 26.8 | 22 | 23.9 | 8.2 | 3 |
| feed without preparation for feeding | 11.3 | 20.3 | 19.4 | 14.3 | 14.2 | 20.6 | – | – | – | – | – | – |

The heifers of group IV (particle size of 0-1 cm and 1-2 cm, respectively, 44 and 34.7%, respectively) were obtained from the finest feed mixture. The obtained data testify that when using the fodder-mixer-shredder the optimum for growing heifers of Ukrainian red-rye milk after the dairy period is a full-fodder fodder mix of the following particle size distribution (%): 0-1 cm – 37.6; 1-2 cm - 30.7; 2-3 cm - 14.3; 3-4 cm - 11.4; 4-5 cm - 4.5; >5 cm - 1.5%. The feeding of such feed provided the average daily increments of animals at the level of 728.21 g, which is 17% more compared with the I (control) group. In determining the cost of feed to receive a unit of increase in live weight of heifers, individual scientists found that excessive feeding or lack of nutrition negatively affects the health of animals and the time of the first calving. Thus, for example, the consumption of high energy in heifers during the period of growth and development of a young organism until they reach puberty negatively

affects the development of reproductive organs, the mammary gland and subsequent milk production (Gnoevoy et al., 2017). Therefore, most specialists tend to moderately intensive feeding heifers of repair purpose (Pahl et al., 2015; Tolkamp et al., 2000).

Analysis of the dynamics of consumption of feed forage animals in experimental animals (180 days) at the beginning, at the middle and at the end of the reference periods (Table 3) shows that in the first 30 days of the reporting period, the animals of all groups consumed almost the same amount of feed - 127-133 kg, which, in terms of 1 head, was 16.01-16.65 kg per day. After 90 days from the beginning of the test period, the animals consumed most fodder mixtures of the third group - 21.36 kg, which is 0.73 kg more than IV and 0.96 kg from the age of I and 0.90 kg - from group II, respectively.

**Table 3.** Dynamics of feed consumption by test heifers.

| **Feed consumption, kg** | **Group** | | | |
|---|---|---|---|---|
| | **I (control) n=8** | **II n=8** | **III n=8** | **IV n=8** |
| **30 days after the start of the experiment** | | | | |
| Food distributed | 183.75 ± 13.12 | 166.38 ± 6.44 | 163.75 ± 9.16 | 143.50 ± 7.46* |
| Balance in feeder | 55.0 ± 10.16 | 38.5 ± 4.71 | 30.50 ± 6.79 | 16.25 ± 3.85 |
| Consumption of feed | 128.88 ± 3.35 | 127.88 ± 4.91 | 133.25 ± 4.73 | 127.38 ± 4.91 |
| 1 head per day | 16.11 ± 0.42 | 15.98 ± 0.61 | 16.65 ± 0.59 | 15.93 ± 0.61 |
| **90 days after the start of the experiment** | | | | |
| Food distributed | 192 ± 8.33 | 184.67 ± 5.46 | 206.56 ± 7.19* | 199.44 ± 6.92 |
| Residue in feeder | 30.78 ± 6.90 | 20.89 ± 3.27 | 35.78 ± 4.49* | 34.56 ± 5.91 |
| Consumed feed | 161.33 ± 4.73 | 163.78 ± 3.72 | 170.78 ± 3.83 | 164.89 ± 3.24 |
| 1 head per day | 20.4 ± 0.63 | 20.46 ± 0.46 | 21.36 ± 0.48 | 20.63 ± 0.41 |
| **At the end of the accounting period of the experiment** | | | | |
| Feed distributed | 204 ± 2.69* | 216.67 ± 4.36 | 234.67 ± 10.29 | 221.11 ± 6.15 |
| Residue in the feeder | 7.56 ± 1.85 | 14.89 ± 4.08 | 24.33 ± 8.87 | 19.56 ± 5.72 |
| Consumption of feed | 196.44 ± 2.51 | 201.78 ± 2.33 | 210.44 ± 3.82* | 201.56 ± 2.92 |
| 1 head per day | 24.56 ± 0.32 | 25.23 ± 0.29 | 26.31 ± 0.48* | 25.21 ± 0.36 |
| On average 1 head per day, kg | 20.3 | 21.29 | 23.27 | 21.3 |
| feed. unit | 6.06 | 6.35 | 7.1 | 6.36 |
| digestible protein, g | 579.96 | 607.96 | 679.18 | 608.62 |
| Feed costs per 1 kg of growth: feed. unit | 9.4 | 8.9 | 8 | 8.96 |
| digestible protein, g | 901.4 | 858.5 | 768.5 | 857.5 |
| The ratio of digestible protein to 1 feed. | 95.9 | 96.5 | 98.3 | 95.7 |
| Nutrition 1 kg of corn mix, feed. unit | 0.3 | 0.3 | 0.3 | 0.3 |

Note: * - P ≥ 0.95 compared with the control group

At the end of the accounting period, the hens of group III consumed the largest amount of fodder mix per 1 head (26.3 kg), which is 1.08 kg more than the age group II and IV groups and 1.75 kg - from heifers I (control group).

On average, 1 head of the animal group I consumed 20.3 kg of feed mix of the smallest degree of shredding, which was 6.06 feed units and 579.9 g of digestible protein, which affected their average daily gain of live weight - 621.8 g.

Based on the results of the research, the optimal fodder mix from the positions of physiology of digestion of the young body of repair heifers was a mixture that fed the animals of the III group. The heifers consumed it an average of 23.27 kg per head per day (7.10 livestock units), which is 0.75 livestock. unit more in comparison with groups II and IV and 1.04 in feed. unit - compared with the group (control). The average daily moisture content of these groups was 728.2 g.

In studying the payment of feed for growth of live weight of heifers, it was found that the largest feed for 1 kg of growth was spent on animals of the I group – 9.4 forage. units and 901.4 g of digestible protein.

Animals of Group III spent 1 kg of growth on 8.0 feed units and 768.5 g of digestible protein, which is 1.4 pounds. unit and 132.9 grams of digestible protein less than that of the I (control) group.

In the heifers of groups II and IV, feed costs per kg of gain were approximately the same (correspondingly 8.9 and 1.858 g). The rate of passing of the forage through the gastrointestinal tract. It is known that the physical form of the feed (granulometric composition) consumed by the animal has its own specific effect on the speed of its progression along the digestive tract, on its processes of hydrolysis and on the intensity of absorption of nutrients and mineral substances in the bloodstream (Gonzalez et al., 2008; Zaitsev et al., 2015).

Considering the importance of this indicator for assessing the nature of the digestion of full-range fodders of different fractional composition, we determined the rate of passage of the forage through the gastrointestinal tract of the test calves (Table 4).

**Table 4.** The rate of passing of the forage through gastrointestinal tract, min/hour.

| Number of days from the beginning of the accounting period of the | Group | | | |
|---|---|---|---|---|
| | I (control) (n=3) | II (n=3) | III (n=3) | IV (n=3) |
| 30 | 4685±8.19 / 78.1 | 4656±8.33 / 77.6 | 4661±8.66 / 77.7 | 4644±4.04*** / 77.4 |
| 120 | 4650±6.35 / 77.5 | 4560±4.04* / 76.0 | 4503±2.08* / 75.1 | 4442±5.86* / 74.0 |
| 180 | 4674±8.89 / 77.9 | 4521±6.11*** / 75.4 | 4384±6.81*** / 73.1 | 4328±6.08*** / 72.1 |

Note: * - P ≥ 0.95; *** - P ≥ 0.999 compared with the control group. Over the rice - minutes; under the watch - hours

It was established that 30 days after the start of the experiment, the rate of passage of the forage in the control group hens was 4685 minutes, and in the experimental - an average of 4656-4661 minutes.

In the middle of the trial period (after 120 days), the length of passage of the forage in calves of group II increased by 96 minutes, and in animals of groups III and IV, respectively, at 158 and 202 minutes.

At the end of the test period, the rate of passage of the forage in the calves of the I group was almost unchanged compared with the start of the experiment (4674 min). This indicator decreased by 2.9% in heifers II and by 5.9 and 6.8% in animals of groups III and IV.

Graphic representation of the duration of passage of a forage mixture of various degrees of crushing through the gastrointestinal tract is shown in Figure 1.

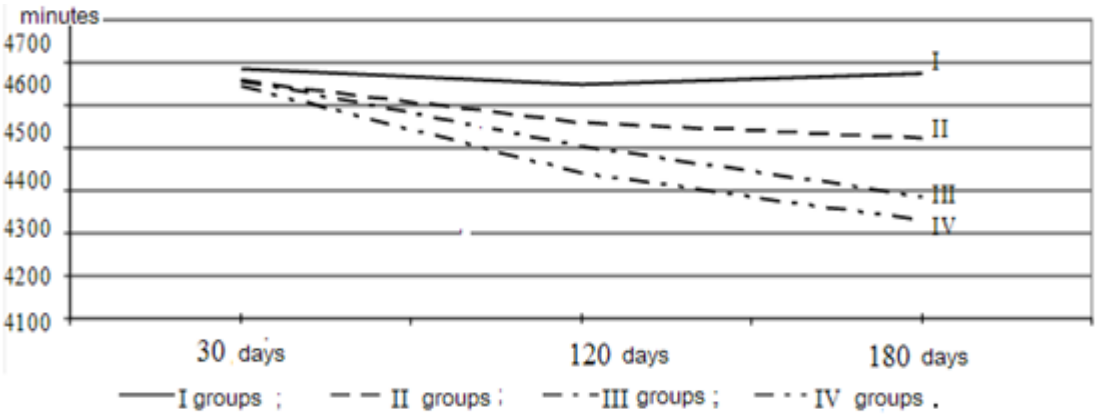


**Figure 1.** Time of passing of the forage through the gastrointestinal tract, min.

The heifers of the (control) groups consumed the feed with the least shredded lobules, resulting in more time (4674 min) for chewing and passing the feed masses through the intestine. At the same time, the fastest passage of food was observed in the animals of the third and fourth groups - 4384 and 4328 minutes, respectively (P ≥ 0.999) where the cormose mixture had finer particles, although excessive grinding of the feed, in our opinion, may also cause certain problems in the intestine.

Dynamics of live weight, monthly and average daily gain of heifers. Moderately intensive growth of young cattle is based on the ability of the young organism to grow rapidly. Correctly organized technology makes it possible, in a shorter time, to reach the paraining mass of heifers (at least 75% of full-age cows) with lower costs for their maintenance.

The degree of grinding of full-fodder feed in the mixer distributor has had a different effect on feed consumption and, accordingly, on the growth rate of test heifers (Figure 2).

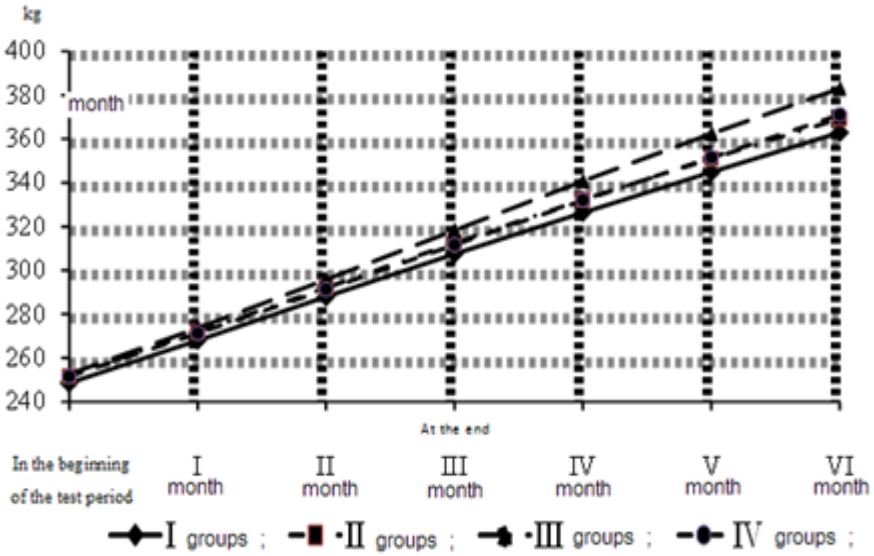


**Figure 2.** Dynamics of live weight of heifers.

In the beginning of the test period, the average live weight of calves in all groups was within 250 kg with slight variations (from 1.45 to 2.69 kg), that is, the animals were analogs for live weight.

The growth of experimental animals during the 180-day record period indicates that the heifers were characterized by moderately intense growth energy, but it should be noted that the animals of group III exceeded the control group (I) of the control group (I) for a live weight of 20 kg, while the second and fourth experimental groups - by 13 and 12 kg respectively ($P \geq 0.95$).

At the end of the accounting period, the animals of the III group had an average live weight of 382 kg, which is 12 kg more than in the IV group hens and 14 and 20 kg more than in the same age group II and I groups respectively. It was established that during the experiment the animals with the third group - 130.29 kg, which was 13.9% more than the control group (I) - had the greatest absolute growth. In heifers of groups II and IV, the absolute increase was 2.6 and 4.4 percent higher than control.

An analysis of the average monthly gain of live weight of heifers (Figure 3) indicates that at the end of the first month of the accounting period, the animals of the third group had the largest absolute increase of 21 kg, which exceeded 5-7% of the age of the elderly. Starting from the second month, the animals in the III group observed an increase in absolute growth by 11% compared with the control and by 9% compared to the peers of the II and IV groups, respectively.

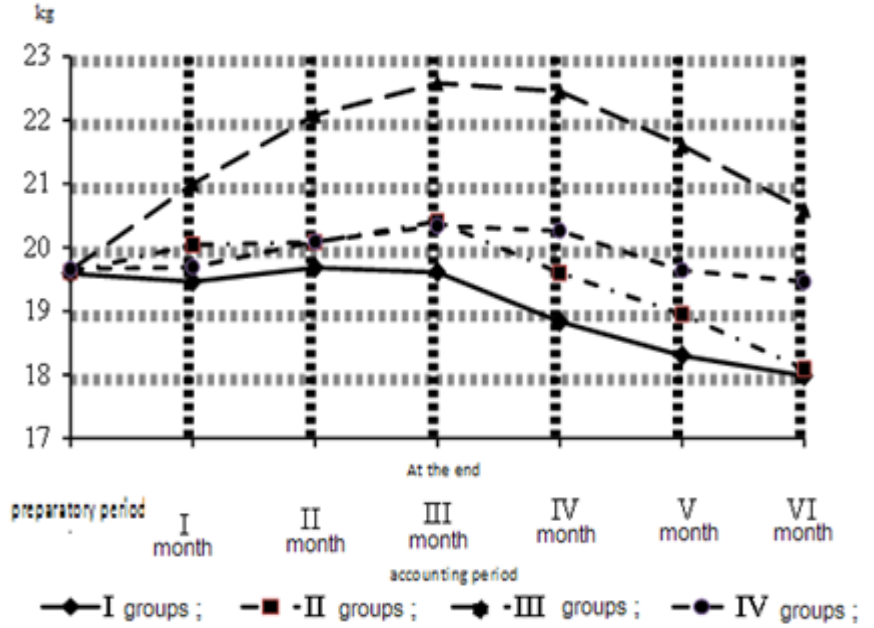


**Figure 3.** Dynamics of absolute increments of heifers.

The average increase for the whole experiment was the highest in animals of the III group - 21 kg, which is 13% more than in control group hens and 10-8% - in comparison with II and IV experimental groups. Thus, the lowest increments of live weight were in animals of the control group - 18.98 kg, and the highest - in animals of the III group - 21.72 kg ($P \geq 0.999$).

After analyzing the live weight and absolute increments during the experimental period, we determined the dynamics of average daily increments in the living mammals (Figure 4).

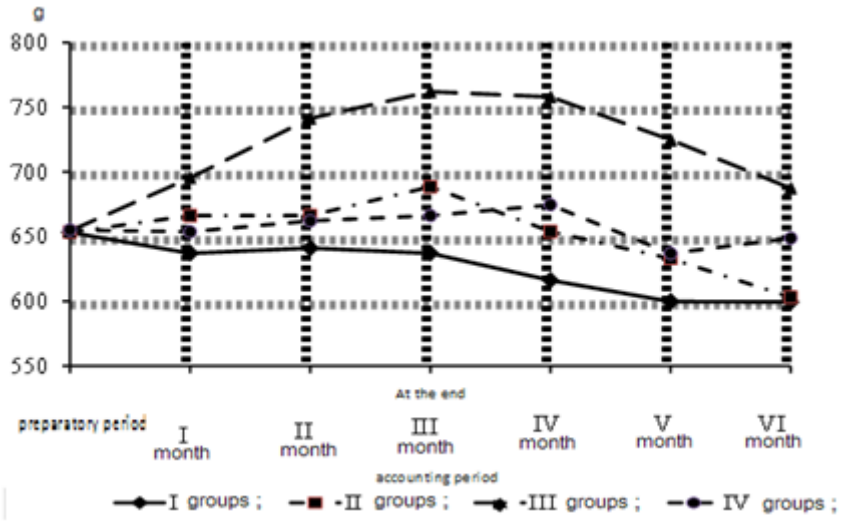


**Figure 4.** Dynamics of average daily gain of heifers.

It was established that at the beginning of the experimental period, the growth rate of the heifers of all groups was the same (average daily increments of live weight were within 653-655 g). At the end of the accounting period, the highest average daily increments were characterized by animals of the III group - 687.5 g, which is 88 g more than in the I (control) group, and in groups II and IV, respectively, at 84 and 38 g.

During the six months of the summer-autumn experimental period, the highest average daily gain was recorded in heifers of group III (728.2 g), it was 17.1% higher than that of the animals of the I (control) group ($P \geq 0.999$). The heifers of groups II and III had an average daily gain higher by 4.8 and 5.6% compared to control.

Thus, the data obtained show that the change in the granulometric composition of the feed mixture before feeding in different ways influenced its consumption and the increase in live weight of heifers.

The lowest average daily increments were observed in the control group heifers - 621.84, and the highest - in the III group - 728.2 g.

Features of reproductive capacity of heifers grown. The main criterion for the success of rearing heifers is the age of their arrival in hunting, the first insemination and fertilization when achieving optimal live weight (Halachmi et al., 2004). Table 5 shows the age of the first insemination and fertilization of heifers.

**Table 5.** Age of first insemination and fertilization of heifers.

| Age of heifers, month | Decade of the month | Indicator | Group | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Control, n=8 | | II, n=8 | | III, n=8 | | IV, n=8 | |
| 15 | first | insemination | – | – | – | – | 1 | – | – | – |
| | | fertilization | – | – | – | – | – | 1 | – | – |
| | second | insemination | – | – | – | – | 3 | | 2 | – |
| | | fertilization | – | – | – | – | – | 2 | – | – |
| | third | insemination | – | – | – | – | 3 | – | 3 | – |
| | | fertilization | – | – | – | – | – | 2 | – | 2 |
| 16 | first | insemination | – | – | 1 | – | 1 | – | 1 | – |
| | | fertilization | – | – | – | – | – | 2 | – | 1 |
| | second | insemination | – | – | 1 | – | – | – | 1 | – |
| | | fertilization | – | – | – | 1 | – | 1 | – | 2 |
| | third | insemination | 1 | – | 4 | – | – | | 1 | – |
| | | fertilization | – | – | – | 2 | – | – | – | 2 |
| 17 | first | insemination | 1 | – | 1 | – | – | – | – | – |
| | | fertilization | – | 2 | – | 2 | – | – | – | 1 |
| | second | insemination | – | – | 1 | – | – | – | – | – |
| | | fertilization | – | – | – | 1 | – | – | – | – |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | third | insemination | 3 | – | – | – | – | – | – | – |
| | | fertilization | – | 3 | – | 2 | – | – | – | – |
| 18 | first | insemination | 2 | – | – | – | – | – | – | – |
| | | fertilization | – | 2 | – | – | – | – | – | – |
| | second | insemination | 1 | – | – | – | – | – | – | – |
| | | fertilization | – | 1 | – | – | – | – | – | – |
| | third | insemination | – | – | – | – | – | – | – | – |
| | | fertilization | – | – | – | – | – | – | – | – |

The use of fodder mixes of a certain degree of shredding during feeding of heifers made it possible to increase their live weight for a shorter period of development, resulting in the first hunting of animals of group III (in the first decade of 15 months) came upon reaching the living weight of 362.26 kg. Most animals of the third group were osmenilized in the second and third decades of the 15th month - 37.5%.

Inspection of animals of IV group began in the 2 decades of the fifth month - 25% and in the third - 37.5% when they reached the live weight of 351.5 kg.

Somewhat later, animals of the 1st and 2nd groups reached the optimum for insemination of live weight - at 16 and 17 months of age. In the future, this will lead to more late calving and lower profitability of milk production.

Economic efficiency of growing heifers. When weighing heifers over six months of age and using full-grain feed mixes of various degrees of grinding in a mobile mixer distributor we have established (Table 6) that the cost per 100 kg of growth was the lowest in heifers of the III group - 2186.3 UAH and the cost of feed - 1064.9 UAH, it is 3% and 13.9% less than the control.

**Table 6.** Economic efficiency of growing heifers.

| **Indicators** | **Group of Animals** | | | |
|---|---|---|---|---|
| | **I** | **II** | **III** | **IV** |
| Absolute growth during the growing season, kg | 114 | 117 | 130 | 119 |
| Average daily increment per experiment, g | 621 | 651 | 728 | 657 |
| Feed costs per head, feed unit. | 6.06 | 6.35 | 7.1 | 6.36 |
| digestible protein, g | 579.96 | 607.96 | 679.18 | 608.62 |
| Feed costs per 1 kg of growth: feed. unit | 9.4 | 8.9 | 8 | 8.96 |
| digestible protein, g | 901.4 | 858.5 | 768.5 | 857.5 |
| Consumed feed per head per day, kg | 20.3 | 21.29 | 23.27 | 21.3 |
| Cost of 100 kg of gain, UAH | 2255.25 | 2191.86 | 2186.34 | 2245.16 |
| in. inc. feed costs | 1213.06 | 1181.76 | 1064.93 | 1161.48 |
| cost of labor | 451.05 | 438.37 | 437.27 | 449.03 |
| energy carriers | 349.31 | 368.58 | 415.72 | 403.57 |
| other expenses | 241.83 | 203.15 | 268.42 | 231.08 |
| Labor costs per 100 kg of growth, person / year | 30.04 | 29.26 | 26.37 | 28.76 |
| Age of first insemination and fertilization of heifers, days | 475 | 455 | 425 | 435 |
| T.T. from the beginning of the accounting period | 170 | 150 | 120 | 130 |
| Cost of 180 days of heifer cultivation, UAH | 2579.56 | 2573.46 | 2848.59 | 2682.07 |
| Net profit, UAH | 2744.7 | 2808.1 | 2813.7 | 2754.8 |
| Profitability of cultivation, % | 21.7 | 28.1 | 28.7 | 22.7 |

The highest cost of growing 100 kg of gain were heifers of the I group - 2255.3 UAH. We also defined the age of the first insemination and fertilization at reaching the planned live weight (not less than 70 percent of full-age cows). So, they quickly reached the planned live weight of heifers of the III group - at the age of 425 days and with a live weight of 362.39 kg, which is 50 days faster compared with the control group. The heifers of the II and IV experimental groups began to hunt, inseminate and fertilize 435-455 days when they reached a live weight of 369-371 kg, which is 20 and 40 days faster than control.

The heifers of the I group became pregnant and impoverished at the age of 16-18 months, which subsequently led to more late lambs and a decrease in the profitability of growing cows.

During the research period, the lowest cost of growing heifers for 180 days were animals of the 1st and 2nd groups (2579.5-2573.5 UAH), with an absolute increase of 114 and 117 kg for the accounting period.

The highest cost of cultivation was in the heifers of the III group - 2848.6 UAH and the absolute increase of 130 kg and in their age group IV group - 2682 UAH (119 kg).

When using full-fodder corn mixes of different degree of grinding during the cultivation of repair calves, the lowest profitability was observed in animals of group I - 21.7%, which is less than in the II and III groups by 6.4-7.0%, and compared with IV - 1%.

As a result of the carried out researches it was established that the optimum fodder mixture for feeding heifers of Ukrainian red-bream dairy breed after the dairy period can be considered a full-fodder feed mix (Table 7).

**Table 7.** The effectiveness of the proposed technology.

| Indicator | Group | | | |
|---|---|---|---|---|
| | I | II | III | IV |
| Absolute growth during the growing season, kg | 114 | 117 | 130 | 119 |
| Daily increment for experiment, g | 621 | 651 | 728 | 657 |
| Feed costs for 1 head, feed. unit | 6.06 | 6.35 | 7.1 | 6.36 |
| Digestible protein, g | 579.96 | 607.96 | 679.18 | 608.62 |

The obtained data indicate that when using a feeder-mixer-shredder, the optimal time of mixing and shredding of feed before feeding it to heifers can be taken as 8 minutes. The specified time of cooking is ensured by the following granulometric composition of full-fodder fodder mix with the following ratio of particle feed in the daily dosage (%): 0-1 cm - 37.6; 1-2 cm - 30.7; 2-3 cm - 14.3; 3-4 cm - 11.4; 4-5 cm - 4.5; >5 cm - 1.5%.

Studies were conducted in PSP "Pleshkani" Zolotonosha district of Cherkasy region in the spring and summerperiod. On the basis of the investigations was prepared and handed over to the management of the economy, recommendations on the feasibility of optimizing the cooking regime and the granulometric composition of full-fodder fodder mixes when growing cubes of repair purpose of the Ukrainian red-bream dairy breed until they reach pair years.

## Conclusion

The use of full-fodder fodders of a specific granulometric composition and developed methods of feeding them is a profitable technological technique, since it enables to increase the consumption, productive effect of feed and to receive live weight of heifers of repair purpose 371-382 kg at the age of 425-430 days and accelerate the onset of economic maturity animals for 20-25 days.

Provision of moderately-intensive growth of heifers for repair is achieved by feeding the full-range fodder mixture with the following particle ratio of the feed in the daily dosage (%): 0-1 cm – 37.6; 1-2 cm - 30.7; 2-3 cm - 14.3; 3-4 cm - 11.4; 4-5 cm - 4.5; >5 cm - 1.5%.

The use of full-fodder fodder of certain physical parameters provides an improvement of 5% of its consumption compared to the control group's peers, and a decrease of 4.3% of the time for chewing feed, which allows the heifers of Group III to stay ahead of the elders of other groups in live weight at 16 months on 12-20 kg ($P \geq 0.95$).

Optimization of granulometric composition of full-fodder fodder mix and the mode of feeding it to the heifers of Ukrainian black-and-white milk after the dairy period of cultivation provides moderate-intensive growth and development, acceleration of their coming into hunting and productive use.

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