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THE INFLUENCE OF ENZYME ADDITIVES ON PRODUCTION PARAMETERS IN PIGLET NUTRITION

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Piglets are the most sensitive category in the pig production. Property balanced diet, ecpecially vitamins, minerals and additives are very important in this production. Using enzymes as additives supports better digestibility and feed utilisation. The experiment was conducted with three groups. The group 1 did not have added additive. The group 2 and group 3 had additive, mixture of enzymes, 0,1 and 0.2%. The body weight, daily gain, consumption, conversion and production index were observed. The results showed that both additive concentrations had better productin performance.

Key words: pig; piglet; feed; enzyme; body weight; digestibility

ВЛИЈАНИЕ НА УПОТРЕБАТА НА ЕНЗИМИ ВО ИСХРАНАТА НА ПРАСИЊА ВРЗ ПРОИЗВОДНИТЕ ПАРАМЕТРИ

Прасињата во времето на одбивање се најосетлива категорија во свињарското производство. Поради тоа многу е важно приспособувањето на оброкот, при што значајна улога имаат минералите, витамините и адитивите. Користењето на ензими како адитиви во храната има за цел да го помогне искористувањето на хранливите материи од оброкот. Опитот беше поставен во 3 групи. Првата група прасиња немала додатни ензими во оброкот, додека за втората и третата група е додаван коктел на ензими во концентрација од 0.1 и 0.2%. Следени се следните параметри: телесна маса, дневен прираст, консумација и конверзија на храна и производни индекси. Утврдено е дека двете нивоа на додадени ензими дале позитивни ефекти на испитуваните производни параметри.

Клучни зборови: свиња; прасе; храна; ензим; телесна маса; сварливост

1. INTRODUCTION

Pigs are good food consumers and they make solid accession which, in particular, makes good effects in increasing fattening. An urgent need for animal protein in the diet is achieved by this way, which imposes intensifying of the production of pork to a higher efficient and profitable level of the rise.

Pork does not detour in preparation and implementation of various recipes and in the implementation of various synthetic enzyme preparations. This contributes to a better use of produced food and better programming results. The additives are the ones which rise the breeding to a profitable level, which reduces the level of feed consumption to less than 70%. Pigs reach the reproductive phase very early, which lasts less than 6 months of life, and early start with multiplication.

A number of farrowing is made possible due to genetics, as well as the increased production of offspring.

Proteins are the basic nutrients and they are a source of essential and non essential amino acids. If one of these essential acids is missing in the mixtures for pigs, it disrupts the proper synthesis of proteins, which are necessary for the animal. Because of this, additives are added in the form of proteolytic enzymes that improve digestibility of protein food.

Proteins from different nutrients have a different biological value, which depends on the content of essential amino acids. The quality of the concentrated nutrient mixture depends on the chemical composition, microbiological safety, energy values and the presence of various additives. Primarily it depends on the composition of proteolysis and cellulyte enzymes.

Enzymes are increasingly used in animal nutrition, especially with concentrated mixtures. These are, in fact, products with proteolytic (protease), amilolytic (amylase) and cellulytic effect (cellulose). These are physiologically active endogenous substances.

Enzymes like proteolytic and amilolytic enzymes have special importance for pigs on the rise.

2. REVIEW OF LITERATURE

Reviewing the nutrition of ruminants (pigs), we can state that in applying the concentrated mixtures the application of specific additives, including enzymes, is required.

As we have already mentioned, in pig and piglet breeding, this refers to the use of all types of enzymes. Considering the addition of enzymes in the meal for piglet, which consists of vegetable granular fertilizers (Tucher, 2000), this has significantly increased the consumption of food and its digestibility, and also made the utilization (conversion) more efficient. The growth of mass is therefore quite high. Increment and conversion of food are often the subject of consideration of researchers in animal husbandry. This depends on the formulation of a meal, but also on the mutual interactions that occur during the metabolism of the individual ingredients of food. The possible negative consequences of the inhibition of nutrients are overcome.

Amilolytic enzymes exhibit a role in the activity of alpha amylase and beta glucosylase.

Thus, Matošić-Čajavec, Vera (1987) in her research writes about harmlessness of adding amilolytic enzymes in prepared fodder mixtures, if the mixture is intended for breeding pigs on the rise.

In his work, Pierce, James L. (2002) points to the need for combination of the enzyme Allzyme Vegpro and fitase while using granular fertilizers in food for pigs.

Lindeman et al. (1997) performed a complete research in the application of enzyme (Allzyme Vegpro) in food for pigs and poultry, and they recommended its implementation.

Belić (1972) stressed the need to balance the meal for pigs, which are located as entering the fattening.

Researcher Pammer O. H. (1996) examined the participation of coxidiostatics and enzymes in combination of meals for pigs and poultry. In making concentrated mixtures they usually use those that are commonly used in breeding pigs. These are fitase, beta glucanase, gluconase, xylanase, cellulase, amylase and protease.

Some researchers (Jovanović et al. 2000) note that all enzymes have a constant efficiency. Enzymes in the body for digestion increase its catalytic role and the ability for adding synthetic enzymes.

Ševković et al. (1991) emphasize the use of enzymes as additives in the production of fodder mixtures with the reason that the economy can not be established without adding them.

In his research, Anastasijević (1967) states that there is no reaching of a high growth without application of biologically valuable protein supplements and enzyme preparations.

Milenković M. (2000) in his paper examined the impact of proteolytic enzymes as food additives, which are protein-rich diet in piglets, noting that the presence of enzyme in addition to improved consumption and food conversion, makes weight gain increased.

Radovanović, T. et al. (1990) propose the composition of a meal for pigs which includes proteins and enzymes. These meals contributed to the importance of efficiency and achievement of better results in the increase.

In his work, Officer D. J. (1992) following the economic performance of three different enzymatic preparations on food conversion and the amount of gain realized by piglets, concludes that each of them has a specific, but a positive effect. Increment of pigs ranged from 272–348 g / day, while the conversion of food was 1,49–1,87 kg / kg of growth.

Kovčin S. et al. (1999) researched the benefits of enzymes with soybean meal and effects on performance of curved piglets. In this paper, it was found that soybean meal with enzymes was used in the prestarter in the diet of piglets.

Grčak Dragana (2000) applied the enzyme cocktail for piglets and its influence on utilization of nutrients, and concluded that the cocktail facilitated the reduction of food, the conversion coefficient and it had a detox effect.

Lee et al. (2003) discuss the influence of enzyme cocktails on the digestibility of food in piglets, and state the need for continuous research with the aim to produce the most efficient enzymes.

Researchers Nyachoti et al. (2006) have found that beta glucose enzymes in combination with fitase as a supplement in food for piglets, prepared on the basis of barley and peas, improve the digestibility of nitrogen in the intestinal and fecal levels of curved piglets.

All we have said makes a practical way to achieve economy by adding enzymes and other additives with finding the optimal technological solutions to prevent adverse effects in terms of environmental pollution.

3. AIM AND TASK OF RESEARCH

The aim and task of this study was to determine the scientific data on the impact of the enzymes (Allzyme Vegpro, fitase, amylase, and cellulase) as food additives in concentrated feed mixtures for pigs in breeding, in quantity of 0.1% and 0.2% on the production performance mestizo F-1 generation (a Landrace × Yorkshire).

We made the study on the effect of the studied enzyme cocktails on the final weight of pigs grown on the rise, the average daily gain of body weight, conversion value and consumption of food.

The results provide the answer to the question of whether the application of an enzyme affects the production and economic justification for raising pigs.

4. MATERIAL AND METHODS OF RESEARCH

In order to determine the way that added enzyme affects the better utilization of food, it was necessary that the tasks include the following units:

– Chemical analysis and preparation of forage mixtures on the basis of the Rules of the quality of food and animal feed (Official Gazette. FRY No.: 20 / 2000 Fig. Gl. No: 38 / 2001).

– The establishment of a biological experiment by a group-control system and determining the mass of cultivated animals in the beginning, middle and at the end of the experiment.

– Organization of pigs according to the requirements of biological experiments.

– Making records on the consumption of food according to the groups and counting number of feeding days, based on statistical methods of processing the obtained data.

This study was performed on a mini farm, near Valjevo, from 01.02.2006 to 24.03.2006 (52 days). The research included 35 animals in each group (5 × 7 piglets). Groups were divided by diet, while the gender ratio was equal in each group.

– I was the control group (K), group = 35 animals.

– II experimental group was 0.1% (OI), group = 35 animals.

– III experimental group was 0.2% (O-II) group = 35 animals.

The length and width of each box was 1.30 × 1.30 cm. The surface of each box was 1.69 m^2, and 0.18 m^2 of useful space belonged to each animal. Under the walls were strings made of galvanized wire. The height of the fence was 0.60 m. Boxes were on the common channel, muck was swelling through the channel to the lagoon.

The animals were fed ad libitum. Food was given from the feeder with seven eating seats, and each pig had the space 18 cm wide.

The health of animals was controlled every day, especially the possibility of diarrhea.

Work plan

Piglets nutrition in the experiment went over the following scheme (Table 1):

8 – 15 kg

– Control (K) received a mixture of 20% of raw protein without the addition of enzymes,

– I experimental (IO) received a mixture of 20% of raw protein with 0.1% of enzymes,

– II sample (II-0) received a mixture of 20% of raw protein and 0.2% of enzymes.

15 – 25 kg

– Control group (K) received a mixture of 18% of raw protein without addition of enzymes ,

– I experimental (I-O) received a mixture of 18% of raw protein and 0.1% of enzymes,

– II sample (II-O) received a mixture of 18% of raw protein and 0.2% of enzymes.

Table 1 shows the composition of forage mixtures in the experiment, in %.

Table 1

Composition of forage mixtures in the experiment, %

Proteins	20			18		
Group	K	O-I	O-II	K	O-I	O-II
Enzymes	–	+	+	–	+	+
Corn	57.58	57.40	57.40	62.75	62.65	62.55
Animal meal	5.00	5.00	5.00	5.00	5.00	5.00
Soybean meal	13.5	13.5	13.5	13.2	13.2	13.2
Sunflower pellet	4.0	4.0	4.0	4.5	4.5	4.5
Alfalfa meal	2.0	2.0	2.0	2.5	2.5	2.5
Fish meal	5.0	5.0	5.0	4.0	4.0	4.0
Replacement for milk	10.0	10.0	10.0	5.0	5.0	5.0
Livestock chalk	0.6	0.6	0.6	0.6	0.6	0.6
Dicalcium phosphate	1.2	1.2	1.2	1.2	1.2	1.2
Salt	0.1	0.1	0.1	0.25	0.25	0.25
Premix	1.0	1.0	1.0	1.0	1.0	1.0
Enzyme	–	0.1	0.2	–	0.1	0.2
TOTAL	100	100	100	100	100	100

Chemical analysis

The chemical composition of used nutrients was determined by the following methods:

– raw protein by the method of Kjeldhal,

– raw fat by the method of Sohlet,

– raw cellulose by the method of Henberg and Stohman,

– calcium by the method of Papandopulo,

– phosphorus by the gravimetrial method.

The results were processed statistically (Hadživuković, 1969).

In the table the data were calculated using the following indicators: number of animals in the group (n), mean (X), standard deviation (S), coefficient of variance (CV) and index expressed in %. The experiment lasted 52 days.

5. RESEARCH RESULTS AND DISCUSSION

In the production of pigs, the breeding period, up to 25 kg of the body weight causes many problems that are manifested in lagging the rise, apparition of diarrhea, which usually occurs the first two weeks after curving. In order to prevent this different additives (enzymes, acids, probiotics, etc..) are used. The results that were the subject of the research are presented in this paper.

a) *Body weight of piglets*

Table 2 shows the body weight of piglets on the first day of the experiment.

At the beginning of the experiment pigs of all three groups were matched for average body masses, expressed the values of X, and the groups did not show any variations which is shown by similar coefficients of variation (Table 2), in I and II experimental group.

Table 2

Body weight of piglets on the first day of the experiment

	Measures of variation				
Group	n	x	S	Cv	Index. %
K	35	8.40	1.10	12.33	100.00
I-O	35	8.42	0.98	9.29	98.65
II-O	35	8.44	1.54	9.50	99.45

The control group is without enzyme, and I and II with enzymes 0.1 and 0.2%.

Body weight of piglets after 28 and 52 days of the experiment is shown in Tables 3 and 4.

There was no statistical significance, but there were differences in the relative indices (indexes). From the results we can see that the piglets did not lag.

Table 3

Body weight of piglets after 28 days of the experiment

	Measures of variation				
Group	n	x	S	Cv	Index. %
K	35	16.12	2.06	12.70	100.00
I-O	35	16.14	2.10	12.84	104.40
II-O	35	16.18	2.14	13.13	108.50

Table 4

Body weight of piglets after 52 days of the experiment

	Measures of variation				
Group	n	x	S	Cv	Index. %
K	35	24.95	3.20	12.45	100.00
I-O	35	25.72	3.54	16.50	105.74
II-O	35	26.54	3.62	16.45	106.51

Daily increase

Daily increase results are shown in Table 5 which shows the increase up to 52 days.

Table 5

Daily weight gain of piglets

	Measures of variation			
Group	n	x	Cv	Index, %
K	35	0.500	12.50	100.00
I-O	35	0.570	12.80	102.28
II-O	35	0.591	13.02	104.82

The increment is calculated from the beginning of the experiment up to 52 days of the experiment. There was no statistical significance, and differences in the indices were 2.28 and 4.82% compared to the control group. As the next factor we noticed the consumption of foods and differences in consumption which increased in the control group compared to the sample. The average daily consumption of food in piglets up to 52 days has been ranged as shown in the Table 6.

Table 6

Average daily food consumption

Group	n	x	S	Cv	Index, %
K	35	0.795	0.07	7.92	100.00
I-O	35	0.786	0.08	6.54	103.00
II-O	35	0.783	0.04	5.38	105.00

We did not notice statistical significance, but the index shows the differences of 3 and 5%. Conversion of feed consumption is shown in Table 7.

Table 7

Conversion / consumption of food for pigs up to 52 days / kg

	Measures of variance				
Group	n	x	S	Cv	Index, %
K	4	2,45*	0,12	4,52	100,00
I-O	4	2,20*	0,04	4,31	98,54
II-O	4	2,18*	0,05	4,24	98,72

There is statistical significance between control, I and II experimental group.

Comparing the results obtained in our study and bibliography we used, one could recognize the similarities as well as certain differences which are embedded in our research.

According to the data, Ševković et al. (1991) and other researchers, there is no modern pig breeding without proper nutrition, which is achieved by additives such as enzymes.

Radovanović and Rajić (1990 and 1997) in their research say about the proper source of nutrients and well balanced meals with the addition of enzyme additives which give high results.

Tucker (2000) spoke of the increasing consumption of food, and thus established a lower conversion (feed consumption), which fits with our research.

Matošić-Čajavec, Vera (1987) speaks of adding the necessary enzymes (amilolytic and proteolytic) in fodder mixtures if they are intended for pigs on the rise, which accords to our results.

Pierce (2002) points to the need of combining enzymes, particularly Allzyme Vegpro and fitase. For us, the application of Allzyme Vegpro is important and our results are identical to the results obtained.

Also, Lindeman et al. (1997) advise the use of enzymes in feeding pigs and poultry.

Anastasijević (1967) states that achieving high growth can not occur without the addition of biologically valuable proteins and enzyme preparations, which fits in our research.

Milenković (2000) in his paper examined the impact of proteolytic enzymes as food additives what we confirmed by our research.

In his research, Officer (1992) claimed to have added three enzymatic preparations and con-

cluded that each of them had a positive and specific effect, which fits with our research.

Also, Kovčin et al. (1999) have found that there are positive performances of curved pigs, which indicates what we have found in our research and that means that the enzyme should be added in the form of additives.

Grčak Dragana (2000) used an enzyme cocktail and analyzed its impact on the usability of the food which accords to our research.

6. CONCLUSION

The results of research and discussion, have led us to make the following conclusions:

– The application of enzyme cocktails as additives in feed mixtures for piglets has a positive impact on the productive performance of animals.

– The average weight of piglets was reflected in all analyzed periods. On the level and duration of experiment which lasted 52 days higher values in piglets that received 0.1 and 0.2% of enzyme cocktail were achieved.

– The experimental group of animals II 26.54 kg received the highest average body mass. On the next position was the sample group with 25.72 kg, and the smallest pigs were in the control group 24.95 kg.

– There was no statistical significance in this parameter, but the index differences were greater in the second group for 5.74 than the other experimental group, compared to 6.51 in the control group.

– The average daily gain was not significant but statistical indices in experimental group II were higher for 4.82, and the sample group to 2.28, compared to the control group.

– The daily food consumption was higher in group K for 3% and 5% in the first the sample group, compared to the second sample group.

– The average daily feed conversion showed statistic significance as follows: the experimental group II, 2.18, a sample 2.20 and a control group 2.45 kg. Indexes were lower for the conversion of 1.46% in experimental group II, and 1.28 in the sample, compared to the control group.

Therefore, the enzyme cocktails used as additives in feeding piglets lead to decrease of the average daily conversion rates and increase in growth so they should be used in feeding pigs.

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