

## Feeding piglets in alive mass of 20 – 40 kg at intensive production of pork

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**The purpose.** To study influence of all-in-one feed for piglets in alive mass of 20 — 40 kg with minimum norm of density of calcium and phosphorus and heightened norm of density of lysine, methionine +cystine and threonine upon change of alive mass of piglets in the age of 61 — 90 day and productivity of feedstuff.

**Methods.** Conventional zootechnical and analytical. **Results.** Use of all-in-one feed for piglets in alive mass of 20 — 40 kg with minimum norm of density of calcium and phosphorus and heightened norm of density of lysine, methionine + cystine and threonine ensures minimum alive mass of piglets in 90-day's age at the level of 40 kg in the age from 2 up to 3 months at daily average increase 650 g and conversion of 1,8 kg of feed compound for 1 kg of increase of piglets against 650 g and 2,1 kg at use of standard all- in-one feeds. **Conclusions.** The gained productivity indexes of piglets conform the requirements of intensive production of pork and are characterized by positive economic efficiency. Bibliogr.: 10 titles.

**Key words:** *piglets' feeding, all-in-one feed, lysine, methionine, threonine, conversion of feed compound.*

Regardless of pork production technology the system of piglets rearing and feeding significantly affects on the economic efficiency in the field of pig breeding.

The main criterion of piglets growth intensity and their development is their live weight. Piglets are believed to grow and develop normally when their live weight at birth is 1,2-1,5 kg, at the age of 30 days — 7,5-9,0 kg, at the age of 60 days — 18 to 20 kg or more [5].

When growing period is well organized, an average daily gain of weaned piglets should be 400-500 g and their live weight at the age of 30 days — 7-8 kg, at the age of 40 days — 10-12 kg, at the age of 60 days — 18-22 kg [6].

According to the existing intensive technology of pork production, suckling piglets are kept together with sows up to the age of 26-28 days then they are moved gradually to the production group of piglets at the age of 43-60 days with a live weight of 12-20 kg and they are fed by special rations, which include dried skimmed milk.

In accordance with the national standard concerning the complete mixed fodders for pigs, 1 kg of such feed for piglets at the age from 43 to 60 days must contain 11 MJ of metabolizable energy at least and 180 g of crude protein, 9 g of lysine, 6 g of methionine with cystine, and 2 g of tryptophan, not more than 45 g of crude fiber and 9 g of salt and 11-13 g of calcium, 8 to 10 grams of phosphorus [4].

According to the results of previously conducted researches it had been established that the use of complete feeds, balanced in terms of modern requirements and recommendations, provides to obtain the average daily gain of piglets at the age of 43-60 days with a live weight of 12-20 kg - 450 g when the conversion is 2,2 kg of mixed fodder per 1 kg of gain [8].

However when indicators of productivity of piglets with a live weight of 12-20 kg is sufficiently high, the feed conversion per 1 kg of gain in this group of piglets did not meet the requirements of modern intensive technologies of pork production.

That was the reason of our further researches to improve the technology of pigs feeding when animals have a live weight of 12-20 kg.

On the basis of conducted analysis of complete feed for piglets with a live weight of 12-20 kg as to the content of metabolizable energy, crude protein, amino acids, minerals, vitamins and other biologically active substances, we concluded that the main factor reducing the mixed fodder conversion per 1 kg of piglets gain is the increase of minimum content of essential amino acids such as lysine, methionine+cystine and threonine in 1 kg of complete feed.

Thus the level of lysine was increased to 10 g instead of 9 g, methionine with cystine — to 6,5 g instead of 6 g, threonine — to 7 g instead of 6,5 g, and similar content of other normalized components of pigs nutrition were included in 1 kg of improved composition of mixed fodder for piglets with a live weight of 12-20 kg.

Calculation concerning the accordance of high levels of lysine, methionine and threonine to modern recommendations of the essential amino acids optimal correlations in pigs diets, at the percent by lysine was also preceded by researches [1].

Optimal and factual correlations of essential amino acids in mixed fodders for piglets with a live weight of 12-20 kg were shown in table 1.

**Table 1. Optimal and factual correlations of essential amino acids in mixed fodders for piglets with a live weight of 12-20 kg, at the percent by lysine**

Indicators	Lysine	M+C	Threonine	Tryptophan	Isoleucine	Leucine	Histidine	P+T	Valine	Arginine
According to recommendations	100	60	66	19	60	110	39	120	75	42
Standard mixed fodder	100	67	72	24	76	141	47	151	86	114
Intensive mixed fodder	100	62	71	21	65	121	41	130	74	98

According to the data given in table 1 we can see that the increase in the composition of 1 kg improved complete feed for piglets with a live weight of 12-20 kg, the minimum level of lysine, methionine with cystine and threonine do not exceed recommended norms for the ratio of essential amino acids in mixed fodders for piglets and do not lead to the gap's expansion between amino acids.

The aim of the research was to investigate the effect of complete feed with a high content of lysine, methionine with cystine and threonine on the change of piglets live weight and on the feed conversion per 1 kg of piglets gain.

In order to solve this goal it was necessary to define age period for achieving the live weight of 12 kg and 20 kg, to establish the average daily gain of piglets with a live weight of 12-20 kg, to calculate the cost of feed per unit of gain in piglets live weight and to show the economic efficiency of the research.

The research was conducted in «Vladivske Podvirya» Ltd of Ivanivka District, Odessa Region.

Piglets with a live weight of 12-20 kg, complete feeds for piglets with a live weight of 12-20 kg were materials for the research.

For the experiment 100 heads of weaned piglets which were divided into 4 sections containing 25 animals each of them, were selected.

Complete impelled mixed fodders for piglets with a live weight of 12-20 kg were prepared from grain, soybean meal and 10 % of protein-vitamin additives made in «Ukrainian Technologies in Feeding Animals» Ltd of Ovidiopol District, Odessa Region.

**The results** of the research. In accordance with the latest achievements piglets with a live weight of 12-20 kg were fed at the age period from 41 to 60 days after birth or in 12 days after piglets weaning from sows at 28th days of age.

Since 41 days after birth piglets were fed from bunk feeders ad libitum but until complete consumption. Such feeders were filled with mixed fodders for piglets with a live weight of 12-20 kg one time a day.

The main requirement in the composition of complete feed for piglets with a live weight of 12-20 kg is the content of animal origin feeds (fish meal, dried skimmed milk, dried milk serum) and gradual transition to nutrition containing mainly with plant foods in pigs feeding.

The regulation of piglets feeding were based by the content of metabolizable energy, dry matter, crude protein, lysine, methionine+cystine, tryptophan, crude fiber, crude fat, salt, calcium, phosphorus, iron, copper, zinc, cobalt, manganese, iodine, selenium, A, D, E, B<sub>1</sub>, B<sub>2</sub>, B<sub>3</sub>, B<sub>4</sub>, B<sub>5</sub>, B<sub>6</sub>, B<sub>7</sub>, B<sub>8</sub>, B<sub>9</sub> and B<sub>12</sub>. Besides the increase of minimum amount of lysine and methionine with cystine in the composition of complete feed for piglets, the novelty of the research was also to conduct regulation of amino acid nutrition for piglets according to the content of threonine, its rate was determined on the basis of the optimal ratio of essential amino acids, in per cent by lysine.

Such factors as conversion of feed, the content of metabolizable energy in dry matter of feed, energy and protein correlation, the amount of crude protein per 1 MJ of metabolizable energy, the content of crude fibre in the dry matter of the ration, the ratio of lysine to metabolizable energy, the content of lysine, methionine+cystine and threonine in a crude protein (%), ratio of essential amino acids in per cent by lysine, the ratio of calcium to phosphorus, were taken into account in the analysis of complete feed for piglets with a live weight of 12-20 kg.

Feeding of piglets with a live weight of 12-20 kg in the age period from 41 to 60 days was conducted with the help of complete mixed fodder - starter which consists of easily digestible grain forages, plant protein concentrates dried skimmed milk, essential amino acids, mineral supplements, vitamin preparations and other biologically active substances.

It is known that in conditions of pig breeding intensification and its transfer on the industrial basis, the demands on complete pigs feeding significantly increase because of its insufficient level and forage quality and unbalanced diets lead to low growth and to the increase of costs per unit of gain.

The control of complete pigs feeding in the research process was carried out according to the impelled feed consumption per unit of live weight gain, to fatness and animals appetite.

Nutritional values of 1 kg of complete feeds for piglets with a live weight of 12-20 kg are shown in table 2.

**Table 2. Nutritional value of 1 kg of complete feeds for piglets with a live weight of 12-20 kg**

Indicators	Units of measurement	Mixed fodder for piglets:	
		standard	intensive
Mass of fodder	kg	1	1
Metabolizable Energy	MJ	14	14
Dry Matter	g	870	870
Crude Protein	g	180	180
Lysine	g	9	10,4
Methionine+Cystine	g	6	6,5
Threonine	g	6,5	7,4
Tryptophan	g	2,2	2,2
Crude Fibre	g	29	29
Crude Oil	g	35	35
Salt	g	5	5
Calcium	g	7,3	7,3
Phosphorus	g	5,3	5,2
Micronutrients, vitamins, enzymes, acidifier, antioxidant, adsorbent	-	+	+

According to the data presented in table 2 the nutritional value of 1 kg of standard feed stuff for piglets with a live weight of 12-20 kg is 14 MJ of metabolizable energy. 1 kg of mixed fodder contains 870 g of dry substance, 180 g of crude protein, 9 g of lysine, 6 g of methionine+cystine, 6,5 g of threonine, 2,2 g of tryptophan, 29 g of crude fiber, 35 g of crude fat, 5 g of sodium chloride, 7,3 g of calcium and 5,3 g of phosphorus.

1 kg of intensive mixed fodder for piglets with a live weight of 12-20 kg contains 14 MJ of metabolizable energy, 870 g of dry substance, 180 g of crude protein, 10,4 g of lysine, 6,5 g of methionine+cystine, 7,4 g of threonine, 2,2 g of tryptophan, 29 g of crude fiber, 35 g of crude fat, 5 g of sodium chloride, 7,3 g of calcium and 5,2 g of phosphorus.

The necessity of pigs with a live weight of 12-20 kg for trace elements, fat soluble and water soluble vitamins and other biologically active substances is achieved through using 0,5 % of starter premix, which is a part of protein-vitamin-mineral supplements.

Depending on the of provision of plant and protein components, 5 %, 10, 20 and 25 % of protein-vitamin-mineral additives in combination with the required amount of soybean meal were used at the experimental enterprise during feeding of animals that belong to different production groups.

The structure of 1 kg of intensive complete feed for piglets with a live weight of 12-20 kg are composed by 75 % of cereal grain forages (wheat, barley, corn), 15 % of soybean meal and 10 % of protein-vitamin-mineral additives, by weight.

Raw material for protein-vitamin-mineral additives production for piglets with a live weight of 12-20 kg, which are made in «Ukrainian Technologies in Feeding Animals» Ltd contains soybean meal, dried skimmed milk, dried milk serum, synthetic lysine, methionine, threonine, salt, feed chalk, feed limestone, monocalcium phosphate, sorbate, organic acidifier and 0,5 % of complex starter premix for piglets consisting of micronutrients, vitamins, enzymes complex, antioxidant and adsorbent.

Comparative characteristics of the nutritional value of 10 % of protein-vitamin-mineral additives for piglets with a live weight of 12-20 kg are presented in table 3.

In accordance with the data shown in table 3 it can be noted that 1 kg of standard protein-vitamin-mineral additives for piglets with a live weight of 12-20 kg contains 10 MJ of metabolizable energy, 900 g of dry matter, 280 g of crude protein, 27 g of lysine, 13 g of methionine+cystine, 16 g of threonine, 3,5 g of tryptophan, 35 g of crude fiber, 39 g of crude fat, 50 g of sodium chloride, 64 g of calcium, and 21 g of phosphorus.

Nutritional value of 1 kg of intensive protein-vitamin-mineral additives for piglets with a live weight of 12-20 kg contains 10,5 MJ of metabolizable energy, 900 g of dry matter, 290 g of crude protein, 41 g of lysine, 17 g of methionine+cystine, 25 g of threonine, 3,5 g of tryptophan, 33 g of crude fiber, 37 g of crude fat, 50 g of sodium chloride, 64 g of calcium, and 21g of phosphorus.

Standard and intensive protein-vitamin-mineral additives are balanced for the content of trace elements and vitamins, they contain enzymes, acidifier, antioxidant and adsorbent.

**Table 3. Comparative characteristics of the nutritional value of 10 % of protein-vitamin-mineral additives for piglets with a live weight of 12-20 kg**

Indicators	Units of measurement	10 % PVMA for piglets:	
		standard	intensive
Mass of fodder	kg	1	1
Metabolizable Energy	MJ	10	10,5
Dry Matter	g	900	900
Crude Protein	g	280	290
Lysine	g	27	41
Methionine+Cystine	g	13	17
Threonine	g	16	25
Tryptophan	g	3,5	3,5
Crude Fibre	g	35	33
Crude Oil	g	39	37
Salt	g	50	50
Calcium	g	64	64
Phosphorus	g	21	21
Micronutrients, vitamins, enzymes, acidifier, antioxidant, adsorbent	-	+	+
The rate of mixed fodder supply	-	10	10

The impact of complete feeds with the increased content of lysine, methionine and threonine on productive qualities of piglets with a live weight of 12-20 kg is shown in table 4.

**Table 4. The impact of complete feeds with the increased content of lysine, methionine and threonine on productive qualities of piglets with a live weight of 12-20 kg**

Indicators	Productive qualities of piglets:	
	Standard mixed fodder	Intensive mixed fodder
Live weight of piglets at the age of 40 days	-	12
Live weight of piglets at the age of 42 days	12	-
Live weight of piglets at the age of 60 days	20	20
Average daily gain of piglets with a live weight of 12-20 kg	450	400
Mixed fodder's conversion, kg/kg of piglets gain	2,2	1,75

From the analysis of materials shown in table 4, it becomes clear that if we use standard complete feed, an average daily gain of piglets from 43 to 60 days of birth and with a live weight of 12-20 kg is 450 g and the conversion is 2,2 kg of mixed fodder per 1 kg of gain. At the same time pigs feeding at the intensive pork production makes possible to reduce the transition period after piglets weaning from sows at 28<sup>th</sup> days of birth from 14 to 12 days, to obtain the live weight at 40<sup>th</sup> days of birth - 12 kg, at 60<sup>th</sup> days of birth – 20 kg with a daily gain - 400 g, the conversion 1,75 kg of mixed fodder per kg of gain.

It should be noted that the transfer of pigs at 41st days of age for feeding with complete feed for piglets with a live weight of 12-20 kg can reduce labor costs for pigs growing and the organization of piglets feeding at the periods from 41 to 50 days and from 51 to 60 days can be carried out, which is extremely important in pig breeding.

Economic efficiency of piglets feeding at the intensive technology of pork production are presented in table 5.

**Table 5. Economic efficiency of piglets feeding at the intensive technology of pork production**

Indicators	Economic efficiency:	
	standard mixed fodder	intensive mixed fodder
Mixed fodder's (standard) consumption, kg	18	-
Mixed fodder's (intensive) consumption, kg	-	14
Cost of 1 kg of mixed fodder (standard), UAH	10,80	-
Cost of 1 kg of the mixed fodder (intensive), UAH	-	11,20
Total funds of mixed fodder (standard) consumption, UAH	194	-
Total funds of mixed fodder (intensive) consumption, UAH	-	157
Conversion of the mixed fodder (standard), kg/ kg of gain	2,2	-
Conversion of the mixed fodder (intensive), kg/ kg of gain	-	1,75

From the data analysis shown in table 5, we can argue that the use of complete feed with the increased content of lysine, methionine and threonine in the organization of feeding of piglets with a live weight of 12-20 kg meets the requirements of intensive pork production and is characterized by the positive economic efficiency. So, in general, during the growing period the feed cost per 1 head is 14 kg or 157 UAH, at the conversion of 1,75 kg of feed per 1 kg of gain, and in the standard conditions of feeding 1 head consumes 18 kg of feed or 194 UAH at the conversion of 2,2 kg of feed per 1 kg gain.

### **Conclusions:**

1. Feeding of piglets with a live weight of 12-20 kg in the age period from 41 to 60 days with impelled complete mixed fodder, in which the lysine level increased from 9 g to 10 g, methionine with cystine — from 6 g to 6,5 g, threonine — from 6,5 to 7 g, with a similar content of other components of pigs normalized nutrition, provides to obtain 400 g of piglets average daily gain at the conversion of 1,75 kg of feed per 1 kg of gain.

2. The use of complete feed with the increased content of lysine, methionine and threonine in the organization of feeding of piglets with a live weight of 12-20 kg meets the requirements of intensive pork production and is characterized by the positive economic efficiency. So, in general, during the growing period the feed cost per 1 head is 14 kg or 157 UAH, at the conversion of 1,75 kg of feed per 1 kg of gain, and in the standard conditions of feeding 1 head consumes 18 kg of feed or 194 UAH at the conversion of 2,2 kg of feed per 1 kg gain.

Now the researches about piglets feeding program development are being conducted concerning piglets with a live weight up to 40 kg at the intensive pork production, namely feeding of suckling piglets, weaned piglets, pigs with a live weight of 12-20 kg and 20-40 kg.

## References

1. *Durst L.* Kormlenie selskohozyaystvennykh zhyvotnykh / L. Durst, M. Vittman / Pod red. I.I. Ibatullina, G.V. Provatorova. — Vinnitsa, Nova Kniga, 2003. — 384 s.
2. *Hodivlia silskohospodarskykh tvaryn: pidruchnyk* / [Ibatullin I.I., Melnychuk D.O., Bohdanov H.O. ta in.]; za red. I.I. Ibatullina. — Vinnytsia: Nova Knyha, 2007. — 616 s.
3. *Karunskyi O.I.* Naukove obgruntuvannia hodivli svynei: navchalnyi posibnyk / Karunskyi O.I., Dashkovska O.P., Riznychuk I.F. — Odesa, 2004. — 138 s.
4. *Kombikormy povnoratsionni dlia svynei. Tekhnichni umovy: DSTU 4124-2002.* — [Chyhnnyi vid 2004-01-01]. — K.: Derzhspozhyvstandart Ukrainy, 2003. — 14 s.
5. *Normy hodivli, ratsiony i pozhyvnist kormiv dlia riznykh vydiv silskohospodarskykh tvaryn: dovidnyk* / [Provatorov H.V., Ladyka V.I., Bodnarchuk L.V. ta in.]. — Sumy: TOV VTD «Universytetska knyha, 2007. — 616 s.
6. *Praktykum z hodivli silskohospodarskykh tvaryn* / [Ibatullin I.I., Chyhryn A.I., Otchenashko V.V. ta in.]; za red. I.I. Ibatullina. — Zhytomyr: Polissia, 2013. — 442 s.
7. *Rekomendatsii z normovanoi hodivli svynei* / [Bohdanov H.O., Rudenko Ie.V. Kandyba V.M. ta in.]; za red. Ie.V. Rudenka, H.O. Bohdanova, V.M. Kandyby. — K: Ahrarna nauka, 2012. — 112 s.
8. *Riznychuk I.F.* Yak hoduvaty porosiat pry intensyvnomu vyrobnytstvi svynyny / I.F. Riznychuk, O.K. Kyshlaly, A.T. Stepanenko, V.O. Riznychuk // *Tvarynnytstvo Ukrainy.* — 2015. - №10.
9. *Riznychuk I.F.* Vykorystannia povnoratsionnykh kombikormiv u hodivli svynomatok pry intensyvniit tekhnolohii vyrobnytstva svynyny / I.F. Riznychuk O.I. Karunskyi, O.K. Kyshlaly // *Zernovi produkty i kombikormy.* — 2015. - № 4 (60). — S. —47-50.
10. *Sviezhentsov A.I.* Normovana hodivlia svynei / Sviezhentsov A.I., Kravtsiv R.I., Pivtorak Ia.I. — Lviv: LNAVМ imeni S.Z.Gzhytskoho, 2005. — 386 s.