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Increasing the productivity of young pigs in the context of overcoming technological stress

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Abstract. Production activities are mandatory elements of the technological cycle and cause various types of animal stress. The use of feed additives based on plant extracts in a liquid composition for pigs is an important strategy for developing their stress resistance and increasing productivity. The purpose of the experiment is to investigate the optimal duration of drinking a liquid feed additive in different periods of technological stress on pig productivity parameters. In farm conditions, 90 crossbred pigs were randomly divided into three groups according to generally accepted zootechnical methods. Animals of the I group (control) were fattened according to the basic technology; animals of II experimental group – BT+ administration of liquid feed additive three days before and three days after the technological action, and pigs of III experimental group – BT+ administration of liquid feed additive seven days before and seven days after. Swine of the III research group at the age of 11-26 weeks probably exceeded their counterparts in live weight by 1.70-5.43 kg, in average daily gains in the period from 14-22 weeks – by 20.0-82.5 g. According to the precocity indicator, pigs of the III group reached a live weight of 100 kg 6.1 days earlier and 120 kg 7.3 days earlier. The values of average daily gains in pigs of the III group were probably higher by 51.9 g – for a live weight of 100 kg and 38.1 g – for 120 kg. Pigs of III group had the lowest level of feed conversion – 0.11 kg at 100 kg and 0.14 kg at 120 kg. It has been established that in order to increase the productivity of pigs, it is worth drinking LFA 7 days before and 7 days after the period of technological stress during the entire growing period. The practical significance of the experiment is to identify the optimal duration of the use of liquid feed additive to increase the stress resistance and productivity of pigs

Keywords: fattening; weight condition; liquid feed additive; stress corrector; technology

Introduction

The production of pork on an industrial basis is aimed at obtaining the maximum benefit in the shortest possible time, and is also based on the principle of a technological conveyor, which does not sufficiently take into account the biological needs and capabilities of pigs (Povod *et al.*, 2021). The body of pigs is affected by numerous factors: the physiological state of sows, the presence of various diseases, the process of weaning piglets from the sow (Ramirez *et al.*, 2022), the process of transportation to the point of slaughter, sharp changes in temperature regimes in the room for keeping animals (Yang *et al.*, 2021), inappropriate behaviour, aggressive behaviour (Nielsen *et al.*, 2022), which cause psychological and physical distress (Nazarenko, 2023) and, as a result, maladaptive behaviour of pigs and a decrease in productive characteristics. And therefore, without proper support of the pig body with stress correctors, a number of biomarkers are produced, in particular: reactive oxygen species, malonic acid dialdehyde, cortisol and immunoglobulins causing diarrhoea and growth retardation in pigs (Upadhaya & Kim, 2021), reduce the reproductive characteristics of middle-aged pigs, and due to accelerated muscle glycogenolysis, the moisture-retaining capacity of meat decreases (Gonzalez-Rivas *et al.*, 2020) as a result of which there are economic losses in the pig industry.

Feed "interventions" are effective strategies in combating the consequences of stress factors in pig farming, such as: deterioration of health, loss of live weight and growth parameters, deterioration of meat quality, etc. (Lauridsen, 2020). Feed additives based on plant extracts are of increased interest in the production of animal feed. There are 250,000 to 500,000 species of plants on earth; however, only a small fraction (1-10%) is used for human consumption or for the production of animal feed. Recently, more attention has been paid in pig farming to stress-correcting supplements, functional amino acids, low-protein feed, plant extracts, organic acids, prebiotics, probiotics, minerals, and vitamins. These measures demonstrate the potential and vector of changes in the composition of the intestinal microbiota, improvement of its barrier function, assimilation of nutrients and, as a result, an increase in pig productivity (Bomko *et al.*, 2023).

As noted by a number of researchers, the intestine is the main organ of digestion and absorption of feed (Hao *et al.*, 2021). The physical, chemical and immune layer of the intestinal mucus acts as a defence against the invasion of bacteria, endotoxins, and antigens in response to stress (Li *et al.*, 2018). In this regard, in practical pig farming, two main methods of delivering target components (stress correctors) to the body are used – with feed (added during the production of compound feed in the form of premixes) and with water (through medicators to the watering system). The way through feeding was the most common and tested in many experiments (Povod *et al.*, 2021), and various methods and functional feeds with increased concentrations of various antioxidants were developed for use in stress conditions. However, it was later found out that using such functional feeds and additives in production conditions is technologically quite difficult. And most importantly, in a state of stress, the animal consumes much less feed.

Therefore, in such production conditions, the need for vitamins, minerals, and a number of other substances increases, and their supply with feed decreases. And as a result, even more strengthening of the negative effects of stress. The dosing devices at watering system has firmly entered the technology of pork production. Currently, medicinal products, probiotics, vitamins and other drugs are administered through the system of dosing devices. Therefore, when developing technological maps of production in pig farming and combating stresses of various origins, practitioners proceed from the fact that the inclusion of the drug in the drinking system through the medicator is the most effective way to achieve the goal. And this approach makes it possible to quickly respond to a stressful situation as a whole (Lykhach et *al.,* 2022).

Therefore, there is an important scientific and practical task of researching the optimal duration of the influence of the liquid fraction of the feed additive when it is introduced into the feeding system with the help of a medicator on the fattening characteristics of pigs. Therefore, the purpose of the work is to study the duration of the effect of a liquid feed additive on the productive qualities of fattening young pigs of different weight conditions for use in periods of significant technological stress (weaning, transfer of young animals to rearing and fattening, change of rations, etc.).

Materials and Methods

Experimental studies were carried out during 2023 in the conditions of the agricultural production cooperative "Agrofirma" "Mig-Service-Agro" of the Mykolaiv region. The production of pig products in the conditions of the enterprise met the conditions of industrial technology with the appropriate organization of technological processes. As part of the scientific and economic experiment, 90 heads of fattening young pigs of the combination ♀ (VB×L)×♂ were used Maxter, which were kept in the conditions of the specified farm.

The experimental young were randomly divided into three groups: I – control group, II and III – experimental groups, according to the scheme of the experiment (Table 1). Liquid feed additive "*LIPTOTRAN L*" (*Lipidos Toledo S.A.*, *Liptosa*, Spain (registration certificate AA-08631-04-19 dated 06.08.2019) (Product registration certificate Liptotran L) was introduced into the water supply system using the medicator "Dozatron" (France) at a dose of 1 l per 1000 l of drinking water in the corresponding fattening periods.

***Table 1.** Scheme of a scientific and economic experiment*

No.	Group	Elements of the technological map of raising young pigs
I	**control**	**BT***
II	experimental	➤ BT + introduction of LFA** three days before weaning and three days after weaning (week 4); ➤ BT + introduction of LFA** three days before transfer to fattening (11 weeks) and three days after; ➤ BT + introduction of LFA** three days before transfer to final fattening (16 weeks) and three days after.
III	research	➤ BT + administration of LFA** seven days before weaning and seven days after weaning; ➤ BT + introduction of LFA** seven days before transfer to fattening and seven days after; ➤ BT + introduction of LFA** seven days before transfer to final fattening and seven days after.

Notes: *BT – the basic technology for growing young pigs, which is adopted and approved in this experimental farm; ** – LFA – liquid feed additive "LIPTOTRAN L" manufactured by Lipidos Toledo S.A., Liptosa, Spain
Source: author's development

The composition of 1 kg of liquid feed additive "LIPTOTRAN L" contains the following active components (%): magnesium chloride – 1.00; sodium chloride – 0.50; propylene glycol – 1.50; propionic acid – 1.60; ammonium propionate – 0.32; flavourings (Esholtia Californian, valerian and lemon balm) – 5.0; excipient (water) – up to 100% (Liptotran L – product information). The components of the specified feed additive, in particular: magnesium chloride – the main intracellular cation and important K-factor for many enzymes, participates in several biochemical and physiological processes that are important for the functioning of muscles and the formation of bone tissue. Propionic acid and ammonium propionate suppress the development of pathogenic microorganisms in the intestine, prevent the development of digestive tract diseases and have an antifungal effect, reduce the *pH value* of the intestinal contents, create optimal conditions for the development of propionic and lactic acid bacteria and inhibit the reproduction of pathogenic microflora. Sodium chloride is the main source for the formation of hydrochloric acid in gastric juice, it is well absorbed from the gastrointestinal tract when taken internally and has a selective effect on tissues and organs. Extract of California escholzia *(e schscholzia californica),* has a calming effect on the entire nervous system, is a gentle and mild tonic for the nervous system when it is under stress, providing soothing, analgesic and antispasmodic activity, promotes sleep and inhibits motor activity, contains alkaloids berberine, protopine, californidin, allocryptopine, which belong to the group of benzylisoquinoleins, flavonoids, cyanogenetic heterosides and carotenoids. Melissa extract *(m elissa officinalis)*, due to the presence of maltol and ethyl maltol, has a sedative and tranquillizing effect on the central nervous system, has anticonvulsant, analgesic and anxiolytic effects. *Valerian extract (valeriana officinalis)* exhibits antispasmodic properties, which affects the relaxation of smooth muscles (related to the content of valenol and valeric acid) – hypnotic and anticonvulsant properties. Its activity is due to the synergism between serkiterpenes (valeric acid), GABA (gamma- aminobutyric acid), glutamine and flavonoids. This reduces the degradation of GABA, increasing its release into synaptic spaces and reducing its reuptake, causing a sedative effect. It contains glutamine, which can be transformed into GABA in the body (Chudak *et al.*, 2021).

Conditions for keeping experimental animals are organized according to Departmental norms of technological design Pig enterprises (2005) and recommendations of genetic companies on maintenance. Superstarter feed and protein-mineral-vitamin supplements and premixes produced by Cowdais Ukraine LLC were used to feed suckling piglets and balance the rations of young animals during rearing and fattening.

In experimental animals using liquid feed additive "*LIPTOTRAN L*", the following were studied: live weight (kg), average daily gain (g) according to methods generally accepted in pig breeding (Ibatulin & Zhukorskyi, 2017). The study of fattening characteristics (age of reaching live weight of 100 and 120 kg (days), average daily gain during fattening (g), feed conversion (kg) of experimental animals when they reach pre-slaughter live weight of 100 and 120 kg was carried out according to appropriate methods (Povod *et al.*, 2021; Ladyka & Khmelnychiy, 2023). The conditions of feeding, watering, keeping, care and prevention of the animals in the experiment took place in accordance with the European legislation on the protection of animals and their comfort (Council Directive 91/630/EU, 2008/120/EU, 2008; Council Directive 98/58/EU, 2008; Council Directive 2010/63/EU, 2010).

Experimental data were processed by the method of variational statistics using computer equipment and *MS Excel* 2000 and *Statistisa* V.5.5 application software packages.

Results and Discussion

In the conditions of an experimental farm a four-phase system of growing young pigs was implemented, according to which piglets after weaning (4 weeks) are transferred to the rearing shop, where they remain until they reach a weight of 30 kg, and then move to the fattening shop (11 weeks) with a division into fattening periods: I period (30-60 kg) and II period (60-120 kg), in which they are kept until delivery to the meat processing plant. According to literary data (Lykhach *et al.,* 2022) this method of cultivation is physiologically difficult for animals and causes stress during two regroupings, which reduce the productivity of animals, but from an economic point of view, it is the most justified.

Thus, taking into account the active composition of the liquid feed additive in the production conditions of the basic pig complex, its influence on indicators of live weight and average daily growth of young pigs was investigated (Table 2).

Table 2. *Productive characteristics of experimental groups of pigs (n=30),* $\overline{X} \pm S_{\overline{X}}$

Sign	Group/Age		
	I – control	II – experimental	III – experimental
4 weeks			
Live weight, kg	8.00±0.111	8.14±0.112	8.23±0.119
11 weeks			
Live weight, kg	32.63±0.273	33.70±0.359*	34.33±0.241***
Average daily gain, g	502.8±4.60	521.6±5.82**	532.7±3.89***
14 weeks			
Live weight, kg	46.67±0.344	48.13±0.328**	50.10±0.308^{***s}
Average daily gain, g	668.3±14.35	687.3±10.76	750.8±5.43^{***s}
17 weeks			
Live weight, kg	63.40±0.382	65.90±0.391***	68.03±0.394^{***s}
Average daily gain, g	796.8±10.79	846.0±11.34**	854.0±12.69***
22 weeks			
Live weight, kg	94.00±0.432	97.10±0.385***	99.33±0.471^{***s}

Table 2. Continued

Sign	Group/Age		
	I – control	II – experimental	III – experimental
Average daily gain, g	874.3±8.18	891.4±6.03	894.3±5.62*
26 weeks			
Live weight, kg	115.17±0.356	118.87±0.287***	120.60±0.228***s
Average daily gain, g	755.9±13.16	777.4±11.95	759.5±15.12

Notes: * – p<0.05; ** – p<0.01; *** – p<0.001 (in comparison with animals of the control group – Group I); a – p<0.05; b – p<0.01; s – p<0.001 (comparing animals of experimental group III with analogues of experimental group II)
Source: author's calculations

It was established that during the period of fattening from weaning (4 weeks) to a live weight of 120 kg (26 weeks), the young animals of the experimental groups probably outperformed the control counterparts in terms of productive characteristics. Thus, at the age of 4 weeks, young pigs of the II and III experimental groups exceeded the control animals by 0.14 kg and 0.23 kg, respectively, according to the live weight indicator, but the difference is statistically not significant. At the age of 11 weeks, young animals of the III experimental group, which already received a feed supplement twice during the growing period (Table 1), significant exceeded the control group (I) in terms of live weight by 1.7 kg (p<0.001) (Table 2). The animals of the II experimental group during the shorter period of use also exceeded the control peers by 1.07 kg in live weight (*p*<0.05). In this age period, not significant difference was found between the experimental groups. Regarding the index of average daily gains, a similar trend is noted, their values were higher in the animals of the experimental groups. The fact that the live weight and average daily growth rates of the experimental groups were higher than those of the control group was due to the presence in the feed supplement of functional components with a calming effect, which allowed the animals of the experimental groups to resiliently overcome the manifestations of technological stress: veterinary preventive vaccinations, weaning, transition from pre-starter compound feed to starters, not reducing, but, on the contrary, increasing indicators of productive signs.

Similar studies were obtained by R. Faustov *et al.* (2022) on fattening pigs, which were fed the complex drug "Hepasorbex" together with the main diet. The scientists found that pigs in the third experimental group for 14 weeks, consuming this feed additive, probably exceeded the animals of the control group in terms of live weight by 1.93 kg (p<0.05), and in terms of average daily gain, the advantage was observed relative to control animals group by 114.3 g (p<0.001), as well as 2 experimental groups, a similar trend was observed in the following age periods. According to the researchers, this advantage of the experimental groups over the control group in terms of live weight and average daily gains is due to the presence of the following active components in the complex feed additive: silicon dioxide; aluminum oxide; magnesium carbonate; titanium dioxide; selenium; clinopleolite; dry brewer's yeast, milk thistle. The obtained practical results are consistent with the results of research, which indicates the objectivity and scientific reliability of the conducted experiments.

It is worth noting that stress during the weaning of piglets from sows is often accompanied by intestinal, microbial and immunological changes that cause diarrhoea and other diseases and, as a result, negatively affects the realization of the productive characteristics of fattening pigs (Fairbrother *et al.*, 2005). M. Peng *et al.* (2019) in their experiments on piglets after weaning proved that dietary supplements with *Eucommia leaf extract ulmoides* improve the growth indicators of piglets (the average daily gain of experimental animals increased by 65 g (p<0.05) compared to control counterparts), feed conversion (by 0.06 kg (p<0.05)) and the morphology of the small intestine (an increase in the depth of microvilli crypts by 1.25 times) with a simultaneous decrease (by 2.8 times) in the frequency of diarrhoea. Eucomia oleracea is a traditional Chinese medicinal herb, and therefore has a composition rich in biologically active compounds and exhibits anti-inflammatory, antioxidant, antiviral and hepatoprotective functions. In the same case, under the influence of technological stress, a liquid feed additive containing propionic acid prevented the development of gastrointestinal disorders in piglets, and therefore diarrhoea was not observed in the experimental groups.

In the course of the experiment, it was observed that pigs that used a feed additive, which includes an extract of Escholzia californica, showed less toxic oral manipulations in relation to each other, the consequences of oxidative stress were easier due to the presence of a number of useful phytogenic additive compounds. Similar results were obtained by M. Han *et al.* (2016), using grape seed proanthocyanidins at a dose of 250 mg/kg in the feed of pigs, which contributed to a 1.8-fold reduction in their aggressive behaviour, an increase in average daily growth from 467 g to 499 g, eased the course of diarrhoea from 34 to 23 cases due to reduction of intestinal permeability and improvement of its morphology, respectively, and also increased the average assimilation of feed of experimental pigs from 862 g to 893 g per day. As noted by G. Chen *et al.* (2015; 2020), due to the high therapeutic and nutritional effects of alkaloids and flavonoids of the extract of leaves of paper mulberry (*Broussonetia papyrifera*) in the amount of 150-300 g/t in thirty piglets during the 42 days of the experiment, the live weight increased by 12.8%, their average daily gains increased by 9.8%, the frequency of diarrhoea decreased by 62.9%, and the feed conversion ratio increased by 1.09 times, which indicates the mental and physical resilience of animals.

The analysis of the productivity of young pigs in the following age periods makes it possible to state that it is at this time (14-22 weeks of fattening) that the positive effect of the liquid feed additive (II and III research groups), which was used at the stages of weaning and transfer to fattening, is more effectively manifested, therefore, in periods of significant technological stress. Thus, at the age of 14 weeks, young pigs that received a stress corrector during periods of technological stress in accordance with the scheme of the experiment (Table 2) with prolonged exposure, of the III group probably exceeded in terms of live weight and average daily growth of peers of the control group and analogues of the II experimental group groups that received a stress corrector for schemes: three days before and three days after changing the technology of fattening and growing. We note that the animals of the III experimental group exceeded the analogues from the I and II groups by 3.43 kg and 82.5 g in terms of live weight and average daily gains (p<0.001); 1.97 kg and 63.5 g (p<0.001), respectively.

At the age of 17 weeks, a similar trend was observed, the animals that received a liquid feed additive during periods of technological stress (II and III experimental groups) probably outperformed the control (I group) in terms of live weight and average daily gains. In the final phase of fattening (22-26 weeks), which is equivalent to the age of reaching a live weight of 100 and 120 kg, it is possible to note somewhat equalized indicators of average daily gains in the section of groups, which is confirmed by the fact that during these age periods the animals were almost not subjected to technological stress, had already stably formed groups according to behavioural characteristics (stable hierarchical relations were established) and therefore the indicators of growth energy were equalized. But, taking into account the significant advantage of the experimental groups in terms of average daily growth rates over the control group in the early periods (significant technological stress), in the age period of 22-26 weeks there is a probable advantage of young animals of the II and III groups over the analogues of the I group in terms of live weight – 3.1 kg ($p<0.001$) and 5.33 kg ($p<0.001$) and 3.7 kg ($p<0.001$) and 5.43 kg ($p<0.001$), respectively.

Based on the comparison of indicators of live weight and average daily gains in the control and experimental groups, it can be stated that longer exposure to the use of the stress corrector is more effective, because the animals of the III experimental group in all age periods had higher indicators than both the control pigs and the analogues of the II research group. The expediency of using a liquid feed additive during the period of fattening of young pigs in order to overcome the negative consequences of technological stress in the conditions of industrial technology due to the increase of productive characteristics in all age periods has also been proven.

The obtained results of the study are consistent with a number of experiments conducted in order to overcome the effects of technological stress. Thus, a group of researchers from Wuhan (People's Republic of China) conducted an experiment on 170 fattening pigs with a random distribution of animals into two groups, where the first group – the control group – received the basic diet, and the pigs of the second group (experimental) received the same basic diet with the addition of quercetin in a dose of 25 mg per 1 kg of feed. After the experiment, the scientists recorded that the second group of experimental pigs had natural flavonoids quercetin increased feed conversion by 1.95 times, average daily gains increased by 20 g, pigs better overcame the effects of technological stress in fattening conditions (Zou *et al*., 2016). In the conditions of the cooperative innovation centre of sustainable pig farming in China, researchers together with scientists of the nutrition laboratory of the Faculty of Veterinary Medicine of Aristotle University (Greece) randomly divided 180 domestic pigs into two groups: the animals of the first control group consumed the basic diet, and the peers of the second experimental group together with the basic diet consumed essential oil of oregano with carvacrol and thymol in a dose of 25 mg per 1 kg of feed. Based on the research results, the scientists noted that the pigs of the second research group reduced the level of aggressive behaviour and quickly overcame the effects of technological stress, in particular transport stress, and the pig population increased by average daily gains from 16.2 to 20.6 g (Zhang *et al*., 2015).

As a result of the study of the fattening qualities of the young pigs of the experimental groups, depending on the use during significant technological stress of liquid feed additive (Table 3), it was established that the animals that had the opportunity to receive the stress corrector were more precocious.

Table 3. *Performance responses of fattening pigs, (n=30),* $\overline{X} \pm S_{\overline{X}}$

Group	Age a live weight, days	Average daily gain, g	Feed conversion, kg
live weight 100 kg			
I – control	161.0±0.57	876.7±5.99	2.91
II – experimental	157.4±0.47	905.7±6.19	2.82
III – experimental	154.9±0.53	928.6±6.20	2.80
+/- II to I	-3.6^{***}	$+29.0^{***}$	-0.09
+/- III to I	-6.1^{***}	$+51.9^{***}$	-0.11

Table 3. Continued

Group	Age a live weight, days	Average daily gain, g	Feed conversion, kg
+/- III to II	-2.5[s]	+22.9[b]	-0.02
live weight 120 kg			
I – control	188.5±0.55	842.2±4.58	3.32
II – experimental	183.5±0.39	869.1±4.24	3.22
III – experimental	181.2±0.30	880.3±3.13	3.18
+/- II to I	-5.0***	+26.9***	-0.10
+/- III to I	-7.3***	+38.1***	-0.14
+/- III to II	-2.3[s]	+11.2[a]	-0.04

Notes: * – p<0.05; ** – p<0.01; *** – p<0.001 (in comparison with animals of the control group – Group I); a – p<0.05; b – p<0.01; s – p<0.001 (comparing animals of experimental group III with analogues of experimental group II)
Source: author's calculations

Thus, the young pigs of the III experimental group reached a live weight of 100 and 120 kg 6.1 and 7.3 days earlier, compared to animals of the control group, and 2.5 and 2.3 days earlier, compared to the analogues of the II experimental group, (p<0.001). The value of indicators of average daily growth closely correlates with precociousness. So, the more animals reach their final live weight, the higher their growth. Values of average daily gains in pigs of the II and III experimental groups were probably higher (p<0.001) than the control, by 29.0 g and 51.9 g, respectively; 26.9 and 38.1 g at weight conditions of 100 and 120 kg.

With regard to the conversion of feed for the II experimental group, the indicator reached 2.82 kg, and for the III experimental group – 2.80 kg, which is lower than the similar indicator of the animals of the I control group by 0.09 and 0.11 kg, where the feed conversion is 2, 91 kg when fattening up to a live weight of 100 kg. A similar trend is observed in the next weight category – 120 kg. Similar results were obtained by researchers in Germany and France on 120 heads of crossbred piglets of breed combinations, where the maternal basis was animals (German Landrace × Big White), and the paternal basis was Pietren, which received low-protein diets with different contents of crystalline essential amino acids, such as leucine and histidine. During the six weeks of the experiment, experimental pigs significantly (p<0.001) reduced feed consumption per unit of gain, and their average daily gains increased to 8.7% (Wessels *et al.*, 2016). In addition, in this experiment, the optimal amount of amino acid introduction was determined to optimize the ratio of growth to feed, which is a distinguishing feature of our experiment (liquid feed additive was added to water and the time of its drinking was taken into account). In turn, studies of L. Wang *et al.* (2023) established that drinking organic acids together with water to pigs with the help of a medicator through a water system contributes to excellent digestibility of feed in the diet, ensures a high degree of conversion of consumed feed, reduces the colonization of pathogenic microorganisms, increases appetite in animals, stimulates growth parameters and increases motor activity pigs, as they are used as an energy source.

In the section of experimental groups (II and III), there is an advantage of the animals of the III experimental group in terms of fattening qualities, which received the stress corrector for a longer period during periods of technological stress (7 days before and 7 days after) over the animals of the II experimental group, which received the specified supplement with a shorter duration (3 days before and 3 days after) in weight conditions of 100 and 120 kg, which is consistent with the results of experiment

L. Wang *et al.* (2023). Scientists from a number of laboratories and institutes in the Hunan province of the People's Republic of China have developed various nutritional strategies for pigs to combat stress and replace antibiotics, including phytogenic feed additives, plant extracts, organic acids, functional amino acids, low-content of protein, prebiotics, probiotics, vitamins, minerals, etc. Scientists have established that the addition of plant extracts to the main diet of pigs, which have been used for a long time in traditional medicine for the purpose of therapeutic and preventive functions, positively affects the increase of stress resistance of animals, the growth of live weight from 3.2-4.6%, average daily gains from 10.2 g to 12.4 g, reducing the age of reaching live weight to slaughter conditions from 1.6 to 2.4 days.

It is worth noting that as a result of the research, the experimental young of the III research group reached a live weight of 100 and 120 kg earlier than the analogues of the II research group by 2.5 days ($p<0.001$) and 2.3 days ($p<0.001$), respectively. Average daily gains of animals of the III group were higher by 22.9 g ($p<0.01$) when fattening up to a live weight of 100 kg and 11.2 g ($p<0.05$) when fattening up to 120 kg compared to analogues from the II experimental group. Thus, increasing the stress resistance of pigs to overcome technological stress by adding appropriate functional components of plant origin, optimizing their quantity and duration of use, is currently a useful practice to increase the alternative of key signal searches in pig farming.

Conclusions

On the basis of the obtained research results, it was established that the liquid feed additive, as an additional component of the diet, prevents, to a certain extent, the manifestation of technological stress during the critical periods of fattening of young pigs, and due to the innovative composition, it stimulates their internal body reserves and has a calming effect without reducing productive qualities, in contrast to traditional technology. It was found that the II and III experimental groups, which received a liquid feed supplement along with water in the critical periods of fattening according to the research scheme, had a significantly: increase in live body weight by 0.14-3.1 kg and 0.23-5, 43 kg; average daily gains – 17.1-49.2 g and 3.6-57.2 g. Pigs of the III experimental group reached a live weight of 100 kg 6.1 days earlier and a slaughter weight of 120 kg 7.3 days earlier than peers of the control group. Relative to the analogues of the II research group, the probable advantage was recorded again in the animals of the III group, since they exceeded the age of reaching a live weight of 100 kg by 2.5 days, and 120 kg by 2.3 days, the difference is statistically significant ($p<0.001$). Indicators of average daily gains in pigs of both II and III experimental groups were significantly higher ($p<0.001$) compared to control analogues, by 29.0 g and 51.9 g, respectively; 26.9 and 38.1 g at weight conditions of 100 kg and 120 kg. Pigs of the III experimental group had the lowest level of feed conversion when they reached the slaughter weight of both 100 kg and 120 kg, which is 0.11 kg and 0.14 kg, respectively, lower than the animals of the I control group. It was established that the animals of the III experimental group, which received the stress corrector for a longer period during the periods of technological stress (7 days before and 7 days after), had an advantage in terms of productive parameters over the animals of the II experimental group, which consumed the specified supplement with a shorter duration (3 days before and 3 days after) during the entire research period.

Prospects for further experiments are to study the effectiveness of using a liquid feed additive on other technological groups of pigs.

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Conflict of Interest

None.

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Підвищення продуктивності молодняку свиней в контексті подолання технологічного стресу

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Анотація. Виробничі дії є обов’язковими елементами технологічного циклу і викликають різні види стресу тварин. Використання кормових добавок на основі рослинних екстрактів у рідкій композиції для свиней є важливою стратегією для випрацювання їх стресостійкості та підвищення продуктивності. Мета експерименту – дослідити оптимальну тривалість випоювання рідкої кормової добавки у різні періоди технологічного стресу на параметри продуктивності свиней. В умовах ферми, помісних свиней чисельністю 90 голів рандомно розділили на три групи згідно з загальноприйнятими зоотехнічними методами. Тварини І групи (контрольна) відгодовувалися за базовою технологією; тварини II дослідної групи – БТ + введення рідкої кормової добавки за три доби до технологічної дії і три доби після, а свині III дослідної групи – БТ + введення рідкої кормової добавки за сім діб до і сім діб після. Свині III дослідної групи у віці 11-26 тижнів вірогідно перевищували за живою масою на 1,70-5,43 кг, за середньодобовими приростами у період з 14-22 тижня – на 20,0-82,5 г своїх аналогів. За показником скороспілості свині III групи на 6,1 добу раніше досягали живої маси 100 кг і на 7,3 доби –120 кг. Значення середньодобових приростів у свиней III групи були вірогідно вищими на 51,9 г – за живої маси 100 кг і 38,1 г – 120 кг. Свині III групи мали найнижчий рівень конверсії корму – 0,11 кг при вазі 100 кг і 0,14 кг – 120 кг. Встановлено, що для підвищення продуктивності свиней варто їх випоювати РКД 7 діб до і 7 діб після періоду технологічного стресу впродовж всього періоду вирощування. Практичне значення експерименту полягає у виявленні оптимальної тривалості застосування рідкої кормової добавки задля підвищення стресостійкості і продуктивності свиней

Ключові слова: відгодівля; вагова кондиція; рідка кормова добавка; стрес-коректор; технологія