INFLUENCE OF DESIGN FEATURES PREMISES FOR FATTENING OF YOUNG PIGS ON THE THERMAL BEHAVIOR OF VARIOUS TECHNOLOGICAL ZONES DURING THE YEAR

M. G. POVOD, O. O. IZHBOLDINA candidates of agricultural science,
Dnipropetrovs'k state agrarian and economic university

A study of the relationship of temperature parameters in different technological areas of premises of various designs for pigs in different periods of the year and their influence on the earliness of animals. It has been established that the greatest temperature fluctuations in various technological areas within premises during the year had been in hoops and the smallest in improved premises.

***Keywords**: pigs, climate, season, temperature, technological area, average daily gain, design features.*

The modern pork production is based on using industrial technologies which assume to create optimal climate in premises for keeping animals and has to promote the most full development of pig genetic potential. The optimization of keeping conditions promote better growth, lowering of illness, reducing of feed expenses on growth and improvement of economical efficiency of pork production.[1,4,5,7].

Under the conditions of inappropriate climate usually the pigs natural illness resistance and immunological reactivity[6,9]. Furthermore the inappropriate climate conditions have great influence on workers health, reduce the premises, machines and equipment period of use.

The pork producers in Ukraine face the necessity to improve the technology in tough economical conditions and prompt to implement alternative technology with using premises of hoops type[10,11,12]. However the animal fattening in

such premises altogether with low investments have considerable disadvantages concerned with climate regulation in winter and summer time.

The aim of our study was to learn the influence of temperature in different technological areas of pig fattening premises with different designing features on their earliness.

Materials and study methodic. The study took place in LLC "Dzerzhynets" in 2012 according the scheme in table 1. There were formed three studying group with 60 young pigs in each.

Group	Season	Keeping conditions	Amount of heads
First controlled	Winter, Spring, Summer, Autumn	Premises with solid concrete floor and natural ventilation	60
Second investigated		Premises with partly slotted and concrete floor with additional ventilation	60
Third		In hoops with deep unchanged bedding	60

The pigs of first control group were kept in traditional (basic) premises with natural ventilation and solid concrete floor with 30 heads per box. The manure were moved off with scraper conveyer (ТСН – 3Б.). The pigs were fed in manual mode from frontal feeders and watered with nipple waters. Box area was 1 square meter per pig.

The fattening pigs of second group were kept in improved premises with 60 pigs per box with partly slotted and concrete floor. Box area was 0.8 square meter per pig. The premises ventilate with vacuum fan and wall valves, the manure was moved off with vacuum system. The pigs were fed with wire-beaded conveyer in auto feeders "Sving".

The 200 pigs of third group were kept in hoops on deep bedding of sand and strew. Box area was 1.5 square meter per pig. Ventilation was natural. The manure was moved off altogether with bedding once after finishing fattening pe-

riod. The animals were fed from round bunker self feeders with complete feed of domestic manufacture which were met scientifically grounded standards.

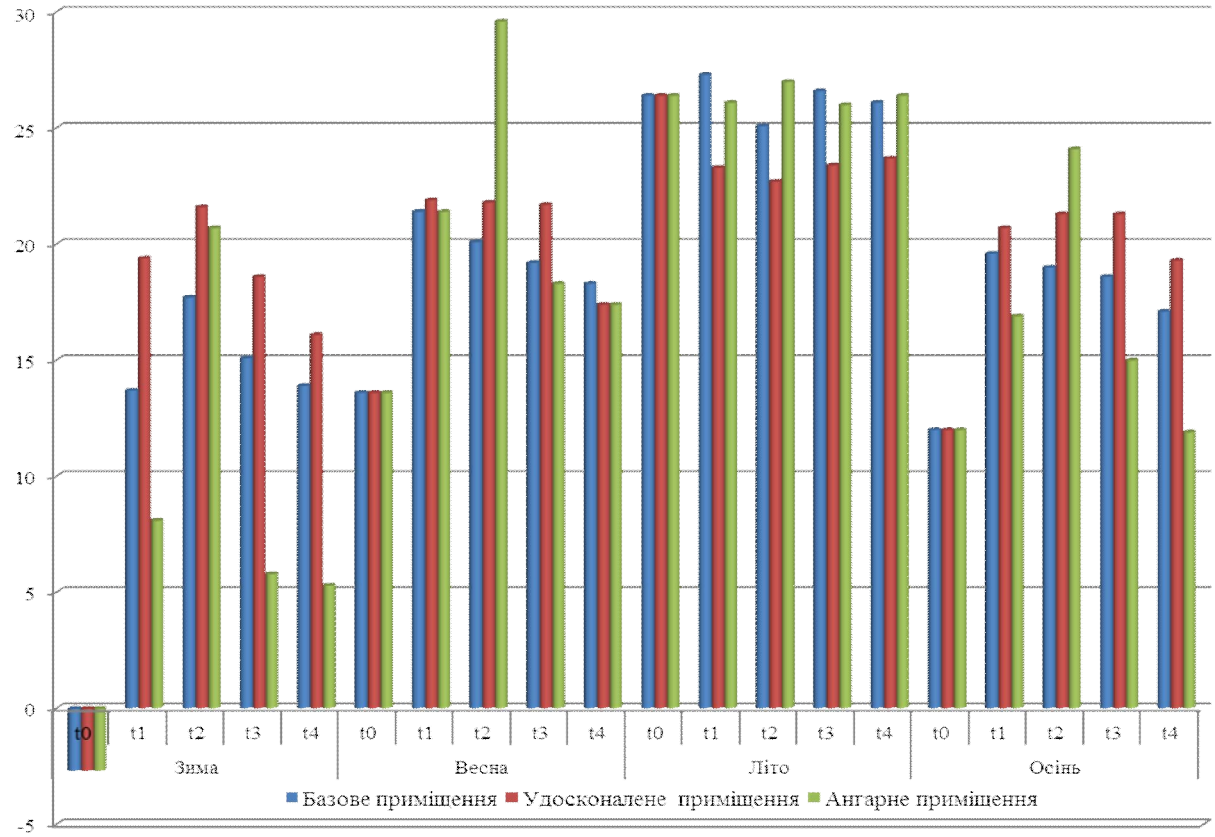
The actual terms of investigation during all seasons were: in winter from 01.12.2011 till 28.02.2012; in spring from 02.03.2012 till 07.06.2012; in summer from 08.06.2012 till 13.09.2012; in autumn from 13.09.2012 till 13.12.2012.

The temperature in premises was measured every two weeks during all seasons over all fattening period on different time (in the morning and in the evening). The measure was got at 60 centimeters high from the floor in the middle of two various part of the premises. The measurement was got in 10 min after thermometer setting. The temperature of the floor or bedding in rest area was measured in 10 min after animals waking up. Food temperature was measured in 6 feeders in extreme parts and in the middle of the premises at 60 centimeters high from the floor.

According to the getting data the strength and the direction of the connection between the outside temperature and the temperature in various technological areas of premises during all seasons.

The biometrical calculation was made by Plokhinskiy method with using MS EXCEL and Statistica 7.0 software.

The research results. The highest temperature fluctuation during year was in hoops, and the lowest in improved premises (pic 1). In traditional (basic) premises the temperature also had considerable fluctuation during year. Floor and bedding temperature in rest area had more fluctuation in basic premises and hoops in comparison with improved premises.



Pic 1. Different technological areas temperature measurement during year.: t0 – outside temperature; t1 – temperature at animal vital activity level, °C; t2 – rest area temperature , °C; t3 – feeding area temperature темп, °C; t4 – food temperature, °C

Note: here and below; Зима- Winter, Весна- Spring, Літо- Summer, Осінь -Autumn ,Базове приміщення -Basic premises , Удосконалене приміщення - improved premises, Ангарне приміщення – hoops.

Air and food temperature had the highest fluctuation in hoops during year.

In basic premises they were lower and in improved premises the lowest. According to the calculation the strong connection between outside temperature and temperature in different area of premises in winter determined the probable tight positive connection between studied figures. In this season the strongest was connection between outside temperature and temperature in keeping and feeding area in hoops.

1. The temperature correlation in different technological areas of premises in winter, n=7

Correlative features	Statistic parameter			
	r	m_r	P	$R_{x/y}$
Basic premises				
$x - y_1$	0,96	0,033	>0,999	0,47
$x - y_2$	0,95	0,041	>0,999	0,38
$x - y_3$	0,89	0,085	>0,999	0,46
$x - y_4$	0,93	0,057	>0,999	0,57
1	2	3	4	5
Improved premises				
$x - y_1$	0,96	0,033	>0,999	0,31
$x - y_2$	0,98	0,016	>0,999	0,29
$x - y_3$	0,97	0,024	>0,999	0,30
$x - y_4$	0,80	0,146	>0,999	0,24
Hoops				
$x - y_1$	0,98	0,016	>0,999	0,57
$x - y_2$	0,89	0,085	>0,999	0,20
$x - y_3$	0,98	0,016	>0,999	0,50
$x - y_4$	0,97	0,024	>0,999	0,46

Note: here and below ; x- outside temperature; y1 – temperature at 60 centimeter high from the floor inside the premises, °C;y2 – rest area floor temperature , °C; y3 – feeding area temperature, °C; y4 – food temperature, °C.

With the calculation of direct regression factor it was determined that with changing outside temperature for 1 °C the temperature in basic premises changed for 0.47°C, -in improved for 0.31°C and in hoops for 0.57 °C. The other was shown during studying the lair temperature. The changing outside temperature for 1°C caused changing of lair temperature in basic premises for 0.38 °C-in improved for 0.29°C and in hoops for - 0.20 °C. This we think was caused by the system of climate control in improved premises and bedding fermentation in hoops.

The temperature changing of feeding area in basic premises and hoops didn't differ considerably though in improved premises they were less connected with outside temperature.

In basic premises in spring food and temperature in feeding and rest area at 60 centimeters high from floor positively collate with outside temperature. In all cases correlation was reliable and vary from r =0.94 till 0.97 (tab 3)

3. The temperature correlation in different technological areas of premises in spring , n=7

Correlative features	Statistic parameter			
	r	m_r	P	$R_{x/y}$
Basic premises				
$x - y_1$	0,97	0,024	>0,999	0,39
$x - y_2$	0,94	0,048	>0,999	0,21
$x - y_3$	0,97	0,024	>0,999	0,43
$x - y_4$	0,97	0,024	>0,999	0,51
Improved premises				
$x - y_1$	0,87	0,097	>0,999	0,08
$x - y_2$	0,72	0,094	>0,95	0,05
$x - y_3$	0,92	0,061	>0,999	0,09
$x - y_4$	0,99	0,008	>0,999	0,59
Hoops				
$x - y_1$	0,97	0,024	>0,999	0,46
$x - y_2$	0,75	0,179	>0,999	0,16
$x - y_3$	0,98	0,016	>0,999	0,59
$x - y_4$	0,99	0,008	>0,999	0,59

In improved premise there were positive highly reliable correlation between outside temperature and food temperature, air temperature in feeding area inside the premises at 60 centimeters high from floor.

The correlation between outside temperature and temperature in rest area was lower (r=0.72) but reliable (P<0.95).

There was determined the positive highly reliable correlation between outside temperature and temperature at 60 centimeters high from floor in hoops and floor temperature in rest, feeding area and food temperature (P>0.999).

So with changing outside temperature for 1 °C in hoops it also changed for 0.46 °C , in basic premises for 0.39°C, and in improved premises for 0.08°C.

The outside temperature had less influence on lair temperature this season. The factor of direct regression between outside temperature and temperature of the lair was in basic premises – 0.21 °C, in improved premises -0.05 °C and in hoops - 0.16 °C.

The diffident situation was this temperature correlation in feeding area. The correlation was much higher in basic premises and hoops and vary from 0.43 °C till 0.59°C. In improved premises the correlation was much lower. In all premises during spring the correlation between outside temperature and food temperature was considerable.

In summer correlation between outside temperature and temperature in premises at 60 centimeter high from the floor , floor temperature in rest and feeding area, food temperature was highly reliable (P>0.999), accept the correlation with lair temperature in hoops, this factor was 0.62 (P>0.95) (tab. 4) .

In summer the lowest was correlation between the outside temperature and temperature in improved premises. With changing outside temperature for 1°C the temperature in different areas of improved premises changed from 0.15 till 0.21 °C. In basic premises this factor was 0.26-0.46°C, and in hoops from 0.09-0.84 °C.

It should note that correlation between outside temperature and temperature of the lair was low. We think it caused by drying of bedding in lair area and its bad heat conduction. The food temperature also close correlate with outside temperature . At the same time the correlation in other two premises was lower.

4. . The temperature correlation in different technological areas of premises in summer , n=7

Correlative features	Statistic parameter			
	r	m_r	P	$R_{x/y}$
Basic premises				
$x - y_1$	0,96	0,033	>0,999	0,46

$x - y_2$	0,96	0,033	>0,999	0,27
$x - y_3$	0,90	0,077	>0,999	0,26
$x - y_4$	0,92	0,061	>0,999	0,37
Improved premises				
$x - y_1$	0,82	0,134	>0,999	0,21
$x - y_2$	0,92	0,061	>0,999	0,19
$x - y_3$	0,77	0,167	>0,999	0,15
$x - y_4$	0,92	0,061	>0,999	0,37
Hoops				
$x - y_1$	0,97	0,024	>0,999	0,70
$x - y_2$	0,62	0,25	>0,95	0,09
$x - y_3$	0,99	0,008	>0,999	0,84
$x - y_4$	0,99	0,008	>0,999	0,82

In Autumn in hoops the positive highly reliable correlation was determined between outside temperature (P>0.999), and temperature inside the premises at 60 centimeters high from the floor (P>0.999), in feeding area (P>0.999) and food temperature (P>0.999) and correlation between outside temperature and floor temperature in rest area was lower (r=0.54) and not reliable (P<0.95) (tab. 5). In basic and improved premises at this season the probable tight correlation was determined between outside temperature and temperature in all studied technological areas.

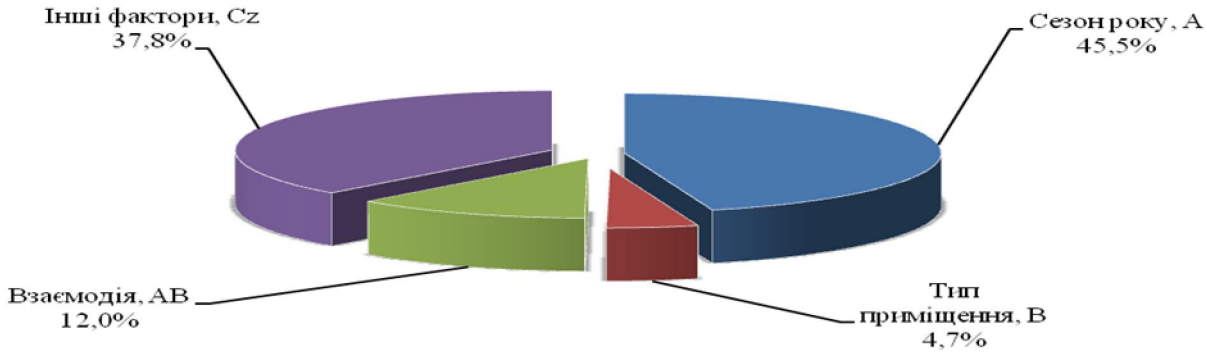
5. The temperature correlation in different technological areas of premises in spring , n=7

Correlative features	Statistic parameter			
	r	m_r	P	$R_{x/y}$
Basic premises				
$x - y_1$	0,80	0,261	>0,95	0,26
$x - y_2$	0,95	0,041	>0,999	0,31
$x - y_3$	0,93	0,057	>0,999	0,30
$x - y_4$	0,97	0,024	>0,999	0,42
Improved premises				
$x - y_1$	0,96	0,032	>0,999	0,12
$x - y_2$	0,67	0,230	>0,95	0,06
$x - y_3$	0,77	0,170	>99	0,10

$x - y_4$	0,89	0,085	>0,999	0,23
Hoops				
$x - y_1$	0,97	±0,024	>0,999	0,54
$x - y_2$	0,54	±0,29	<0,95	0,09
$x - y_3$	0,97	±0,024	>0,999	0,64
$x - y_4$	0,97	±0,024	>0,999	0,66

The most depend on outside temperature in spring like in other season was the temperature in hoops at 60 centimeters high from the floor (R=0.54°C), in feeding area (R=0.64°C) and food temperature (R=0.66°C). With changing outside temperature at this time for 1 °C the bedding temperature at lair area changed only on 0.09 °C. In spring with changing outside temperature for 1 °C in different areas of basic premises it changed for 0.26-0.31 °C, and in improved premises only for 0.06-0.12 °C. The food temperature in basic premises changed for 0.42 °C. and in improved premises for 0.23°C.

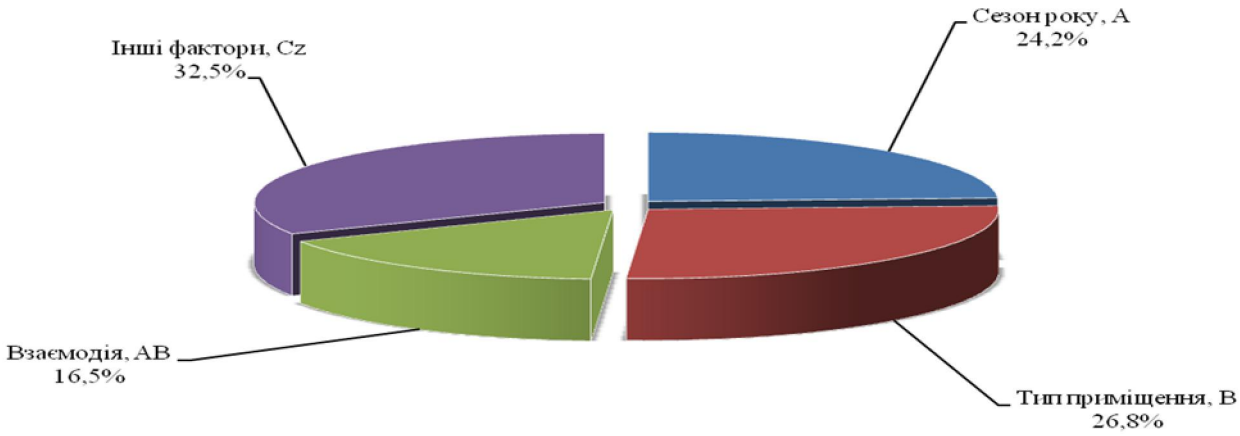
During the variance analysis of influence of season and premises type on inside temperature at 60 centimeters high from the floor (pic. 2) it was determined the highly reliable influence of season -45.5% (P>0.999), type of premises -4.7% (P>0.95) and their interaction -12.0%(p>0.99).



Pic.2 The influence of season A and type of premises B on inside temperature.

The influence of these factors on temperature in lair area shown at pic. 3. It shows that the highest influence on this factor has type of the premises- 26.8%

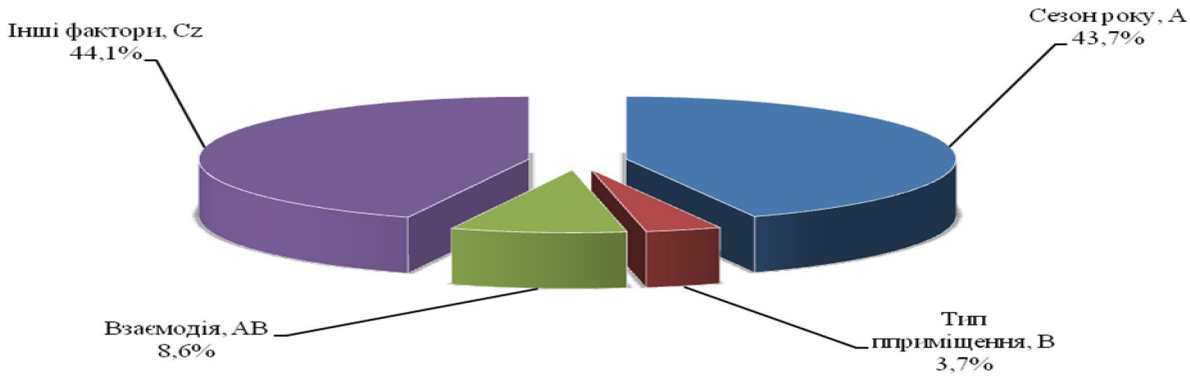
(P>0.999), season -24.2% (P>0.999) and then their interaction -16.5%. others factors -35.2%.



Pic. 3 The influence of season A and type of premises B on lair temperature.

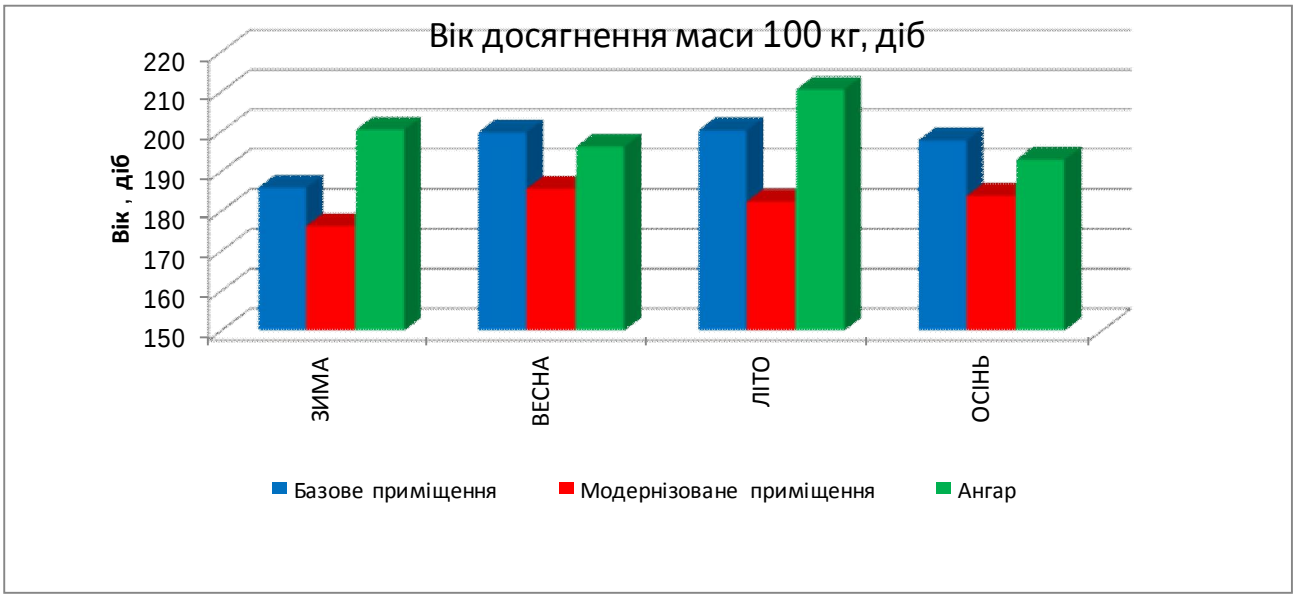
The temperature in feeding area highly reliable (P>0.99) depends on time of the year -40.8% , type of premises- 9.4% and their interaction -12.4% (pic. 4)

The food temperature highly reliable (P>0.99) depends on time of the year -43.7% , and the interaction of time of the year and type of the premises -8.6% (P>0.95) The type of premises has unreliable influence on food temperature. (pic.5)



The temperature with other microclimate factors had influence on productive quality of young animals which were fattening in different type of

premises. The pig earliness factors in different type of premises during year are shown in pic. 6. Pigs kept in improved premises gain 100 kg the fastest during all time of the year. In extreme seasons (in winter and summer) the worst earliness had pigs kept in hoops, at the same time they had better factors of earliness during spring and autumn than animals in basic premises.



Pic. 6. Pig earliness factors in different type of premises during year.

The pigs which were kept in basic premises during all seasons grown slower than in improved premises but faster than pigs kept in hoops in summer and winter.

Resume

1. The correlation between outside temperature during year was the highest in hoops, lower in basic premises and the lowest in improved premises.
2. The correlation between outside temperature and temperature of food was highest in hoops, lower in basic premises and the lowest in improved premises.
3. The lair temperature has weak correlation with air temperature in premises and food temperature.

4. The season influence on temperature changing in rest area, feeding area and temperature of food were accordingly 45.5%, 40.8% and 43.7 %. At the same time the seasons influence on lair temperature only on 24.2%.

5. The design features of premises have influence on temperature in rest area for 4.7%, lair temperature -26.8% and food temperature – 3.7%. The factor interaction of season and type of premises has influence on temperature of rest area for 12.0%, lair temperature -16.5% and food temperature – 8.6% and temperature in feeding area- 12.4%.

6. During all seasons pigs kept in improved premises have the highest earliness. During winter and summer pigs kept in hoops have the worst earliness and at the same time in spring and autumn they had better earliness factors than pigs kept in basic premises.

REFERENCE LIST

1. Бугаєвський В.М., Вплив середовища та технології утримання на продуктивність свиней / В. М. Бугаєвський О. М. Остапенко, М. І. Данильчук // Наукові праці МДГУ–2010 – №119, Т. 132 – С. 59–61.

2. Високос М.П., Чорний М.В., Захаренко М.О. Практикум для лабораторно-практичних занять з гігієни тварин. – Харків: Еспада, 2003. – 216 с.

3. Данилів Б. В. Розвиток свинарства на індустріальній основі / Б. В. Данилів // Економіка АПК.–2008. – № 10. – С. 16–25.

4. Зайцев А. М. Микроклимат животноводческих комплексов / А.М. Зайцев, В.И. Жильцов, А.В. Шавров. – М.: Агропромиздат, 1986. – 192 с.

5. Козир В.С. Вплив мікроклімату на ефективність вирощування свиней/ В.С. Козир // Тваринництво України. – 2006. – № 5. – С. 9 – 10.

6. Кузнецов А. Ф. Микроклимат помещений и естественная резистентность организма откармливаемых свиней в зависимости от сезона года / А. Ф. Кузнецов // Гигиена промышленного животноводства.–

Новочеркасск: Советская Россия.– 1978.– С. 140-141.

7. Лана Вивант. Влияние температуры на производительность и здоровье свиней / Вивант Лана // Тваринництво сьогодні. – 2014. - № 1. – С. 20–23.

8. Плохинський Н. А. Руководство по биометрии для зоотехников / Н. А. Плохинський – М. : Колос, 1969. – 256 с.

9. Ткачук О. Д. Вплив мікроклімату на основні показники резистентності свиней / О. Д. Ткачук // Вісник Полтавської ДАА. – 2010. – № 2. – С. 136–140.

10. Чертков Д., // Маловитратна технологія –основа високорентабельного свинарства / Д. Чертков, І. Колот, В. Гламазда // Тваринництво України.– 2003. – № 7. – С. 10–11.

11 Höges. J. (1989): Erfahrungen mit Scharrel- schweinen. Deutsche Geflügelwirtschaft und Schweineproduktion 31. 977.

12. Lammers P., M. Honeyman, J. Mabry, J. Harmon. Sow and litter performance for individual crate and group hoop barn gestation housing systems: Progress report III.2006. In: Iowa State University Animal Industry report

ВПЛИВ КОНСТРУКТИВНИХ ОСОБЛИВОСТЕЙ ПРИМІЩЕНЬ ДЛЯ ВІДГОДІВЛІ МОЛОДНЯКУ СВИНЕЙ НА ТЕМПЕРАТУРНИЙ РЕЖИМ РІЗНИХ ТЕХНОЛОГІЧНИХ ЗОН В ПРОДОВЖ РОКУ

М. Г. Повод, О. О. Іжболдіна,

Проведено дослідження зв’язку параметрів температури в різних технологічних зонах приміщень різної конструкції для відгодівлі свиней в різні періоди року та вплив їх на скороспілість свиней. Встановлено, що найбільші коливання температури повітря в різних технологічних зонах приміщення протягом року були в ангарі, а найменші в удосконаленому приміщенні.

Ключові слова: *свині, мікроклімат, пора року, температура, технологічна зона, середньодобовий приріст, конструктивні особливості.*

ВЛИЯНИЕ КОНСТРУКТИВНЫХ ОСОБЕННОСТЕЙ ПОМЕЩЕНИЙ ДЛЯ ОТКОРМА МОЛОДНЯКА СВИНЕЙ НА ТЕМПЕРАТУРНЫЙ РЕЖИМ РАЗЛИЧНЫХ ТЕХНОЛОГИЧЕСКИХ ЗОН В ТЕЧЕНИЕ ГОДА

М. Г. Повод, о. О. Ижболдина

Проведено исследование связи параметров температуры в различных технологических зонах помещений различной конструкции для откорма свиней в разные периоды года и влияние их на скороспелость животных. Установлено, что наибольшие колебания температуры воздуха в различных технологических зонах помещения в течение года были в ангаре, а найменьшие в усовершенствованном помещении.

Ключевые слова: *свиньи, микроклимат, время года, температура, технологическая зона, среднесуточный прирост, конструктивные особенности.*