

Evaluation of productive and economic parameters of pigs in the final stage, with three feeding programs

Evaluación de parámetros productivos y económicos de cerdos en la etapa de finalización, con tres programas de alimentación

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Abstract

The objective was to evaluate the productive and economic parameters of pigs in the final stage with three commercial feeding programs. 240 pigs with homogeneous characteristics were used, assigning 40 females and 40 males completely random to the treatments. The animals were fed with 3 diets in flour containing different level of protein: T0 (16 %), T1 (16.42 %) and T2 (17.51). For the analysis of the information, a completely randomized design was used, the means were contrasted with the Tukey test. There were no significant differences ($P > 0.05$) for the evaluated variables, with the highest consumption of dry matter (CDM) recorded in the T1 (2,065), followed by T2 (2,063) and T0 (1,931 kg.). The daily weight gain (DWG) was for T2 of 0.863 grs., T1 with (0.858) and for T0 of 0.826 grs. With a food conversion (FC) for the proposal T0 of 2,562, T1 (2,671) and T2 3,027 kg. The pigs fed with T1 recorded a cost of 16,869 / Kg. of live weight, followed by T2 with \$ 14,556 and obtaining more profitability with T0 when obtaining a cost of \$ 13,248. The productive behavior between treatments was similar, but the best profitability is obtained with the T0.

Pigs, Fattening, Behavior, Profitability

Resumen

Objetivos El objetivo fue evaluar los parámetros productivos y económicos de cerdos en etapa de finalización bajo tres programas de alimentación comercial. Se utilizaron 240 cerdos con características homogéneas, asignando 40 hembras y 40 machos completamente al azar a los tratamientos. Los animales fueron alimentados con 3 dietas en harina conteniendo diferente nivel de proteína: T0 (16 %), T1 (16.42 %) y T2 (17.51). Para el análisis de la información, se utilizó un diseño completamente al azar, las medias se compararon con la prueba de Tukey. No existieron diferencias significativas ($P > 0.05$) En las variables evaluadas, registrándose mayor consumo de materia seca (CMS) en el T1 (2.065), seguido de T2 (2.063) y T0 (1.931 kg.). La mayor Ganancia diaria de peso (GDP) fue para T2 de 0.863 grs., T1 con (0.858) y para T0 de 0.826 grs. Con una conversión alimenticia (CA) para la propuesta T0 de 2.562, T1 (2.671) y T2 3.027 kg. Los cerdos alimentados con T1 registraron un costo de 16.869/kg. de PV, seguido de T2 con \$ 14.556 y siendo más rentable con T0 al obtenerse un costo de \$13.248. En conclusión, el comportamiento productivo entre tratamientos fue similar, pero la mejor rentabilidad se obtuvo con el T0.

Cerdos, Engorda, Comportamiento, Rentabilidad

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Introduction

In volume, pork represents a fifth of the total meat production in Mexico. In recent years, the industry has registered an average annual growth of 2.1%. However, demand has shown a faster growth, causing a significant increase in imports, representing around 45% of apparent consumption. The United States is the main exporter to Mexico; Most of the imported products are fresh, chilled or frozen meats (OECD, 2019).

The evaluation of the cost of production and the indicators of the different production parameters are very important in pig farming. The parameters of pig production have generally improved in the last five years. This improvement did not directly imply a reduction in production costs due to high food prices (Rocadembosch, Amado, Bernaus, Font, & Fraile, 2016).

For the pig industry, food accounts for about 70% of production costs. In recent years, food costs have increased by more than 226.6% since 2008. However, the demand for pork products is increasing, despite rising prices (Banson, Nketsia-Tabiri, Anno, & Kofi Dagbui, 2014). The increase in feeding costs in recent years has generated challenging conditions for pig producers (Saddoris Clemons, Schneider, Feoli, Cook, & Newton, 2011).

Conventional pig diets contain substantial amounts of cereal grains (for example, corn and wheat) and protein supplements such as soy flour to provide pigs with the energy and nutrients they need. However, trends in the demand and supply of these conventional foods require pig producers worldwide to seek low-cost alternatives (TWoyengo, Beltranena, & Zijlstra, 2014).

The protein / energy ratio is important for the production yield and utilization of the food resources available to animals. In pig production, a low protein / energy ratio in the diet can be useful to reduce feeding costs and minimize the adverse effects of ammonia release in the environment (Yingying, et al., 2015).

To maximize profit opportunities, producers must develop feeding strategies that result in better yields on food and / or margin on food costs (Saddoris Clemons, Schneider, Feoli, Cook, & Newton, 2011).

Food conversion represents the highest economic value in scenarios with high food prices (Rocadembosch, Amado, Bernaus, Font, & Fraile, 2016). In the rations of traditional foods they present by stages deficits or excesses of nutrients according to the requirements of the animals; this causes more expensive productive activity and nutritional imbalances and shows that these portions are more expensive than food with the inclusion of unconventional raw materials (Estévez Alfayate, 2016).

In the feeding management of pigs in the final stage, food must be provided that meets the nutritional requirements depending on the level of production that is desired to be achieved, and the genetic potential of the animals, as well as reducing their cost when used in a manner efficient. Based on these elements, the present work aimed to evaluate the productive variables of pigs in the final stage, fed with three different diets in protein to determine the biological and economic optimum.

Methodology to be developed

Location. The project was carried out with pig producers in La Piedad Michoacán. It is located between the coordinates 20 ° 21 'north latitude and between 102 ° 02' west longitude. Its territory extends to about 284.11 square kilometers and is at an average height of 1,680 meters above sea level.

Installations

6 pens of 40 m² each were used with two feeders per pen and three drinking fountains with a firm floor and 1.5 m ponds, roofs of sheets and ventilation on both sides. The flow and availability of water in the pens was monitored every day, under the gram flow technique (in a bottle to determine how much water flows in a minute) expected parameter 2.5 L / min. With lighting-saving bulbs for the entire house.

Treatments

The farm was considered as an independent experiment due to its particular conditions, three treatments were evaluated:

T0: Food in presentation of flour with 16% protein for pigs in the final stage.

T1: Food in presentation of flour with 16.42% protein for pigs in the final stage.

T2: Food in flour presentation with 17.51 protein for pigs in the final stage.

Animals

240 animals were used being 120 females and 120 castrated males, with homogeneous characteristics [age, live weight (PV), genetics, sanitary condition, etc.], of which they were randomly assigned and with the same number of males and females to the treatments.

Weighing and stamping of animals

The animals were identified at the beginning of the experiment, listing from 1 to 80 for each treatment. Weighing was carried out at the beginning and at the end of the experiment by introducing the animals into a mobile electronic scale type drawer, where the corresponding reading was carried out.

Feeding

Ad libitum food was provided twice a day, (9:00 am and 3:00 pm), always at the same time. The food was offered with the support of a table based on food consumption by stage (see Table 1).

Stage	Starting age	Age of Term	Fattening days	Initial weight	Final weight	Daily consumption
Finisher	147	182	35	93.1	120	2.84

Table 1 Feed proposal for pigs in completion stage

Table 2 shows the nutritional composition of each food used in each of the treatments.

NUTRIMENT	T0	T1	T2
PC%	16	16.42	17.51
METABOLIZABLE ENERGY (kcal)	3320	3300	NE
GREASE (%)	3.5	3.09	4.13
FIBER%)	4	3.96	1.97
ASHES (%)	7	NE	3.8
P TOTAL (%)	0.45	0.66	0.409
Total Ca (%)	0.53	NE	0.477

Table 2 Nutritional composition of the diets of each of the treatments

Duration of fattening

The experimental period was 35 days in order to reach 120 kg of PV per animal.

Variables to measure

Daily food consumption (CDA)

The amount of food offered for each of the treatments was weighed before filling the feeders, and the rejection was weighed the next day.

$$CDA = \text{Food offered} - \text{food rejected}$$

Daily Weight Gain (GDP)

The daily weight gain was calculated considering the final weight (Pvf) minus the initial weight (Pvi) divided between the days of fattening.

$$GDP = (Pvf - Pvi) / \text{fattening days}$$

Food conversion

It was estimated by dividing the daily food consumption by the daily weight gain.

$$CA = \text{Daily food consumption} / GDP$$

Cost per kg of PV produced (\$ / Kg of PV)

The cost per kilogram of live weight produced was calculated by multiplying the food conversion by the price of each food.

Statistic analysis

A completely randomized design was carried out, being the experimental unit of 80 animals.

$$Y_{ij} = \mu + T_i + \epsilon_{ij}$$

The data were analyzed by means of an analysis of variance and comparison of means with Tukey test ($\alpha \leq 0.05$) using the statistical software SAS version 9.0.

Results

The analysis of the evaluated variables, in the three protein levels proposed, showed that there were no significant differences ($P > 0.05$), in any of the variables evaluated in pigs in the period of completion.

Cost per kg of PV produced (\$ / kg of PV)

The productive and economic results expressed by the pigs in the final stage using three levels of protein in the diet (T0, T1, and T2), are shown in Table 3.

Treatment	Initial Weight (kg)	Final Weight (kg)	Consumption kg / pig / stage	CDA (kg)	GDP (kg)	CA	kg cattle / pig / stage	Food cost \$ / pig / stage	Cost \$ / kg PV earned
T0	84.537	113.463	5339.500	1.931	0.826	2.562	28.927	383.227	13.248
T1	78.815	108.830	5782.800	2.065	0.858	2.671	30.015	506.325	16.869
T2	82.091	112.305	5777.200	2.063	0.863	3.027	30.214	439.789	14.556

Table 3. productive and economic indicators of pig behavior in the final stage with three feeding proposals

When performing the analysis of the productive behavior (Table 3), it was observed that the pigs that consumed T2 feed (30,214kg), recorded more kilograms gained. No differences were observed in the animals of T1 and T0 (30,015 vs 28,927 kg), however, the lowest recorded gain was obtained from the animals of T0 (Table 3). When analyzing the cost generated by pig in completion, the animals of the T0 recorded the lowest cost: 383,227 pesos. While, the animals of T2 generated an investment cost of \$ 439,789, on the other hand, pigs of T1 had the highest cost generated by investment with \$ 506,325 pesos per animal.

When analyzing the cost per kilogram of live weight gained, pigs fed T1 treatment recorded a cost of 16,869 / kg of PV, followed by T2 with \$ 14,556 and pigs fed with T0 treatment being more profitable when obtaining a cost of \$ 13,248 / kg of PV.

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Conclusions

The completion stage is the most expensive period for food conversion, therefore, economic and efficient diets that impact profitability should be formulated. There were no differences in the productive response of pigs fed the three levels of protein. However, the best conversion and profitability are obtained by feeding pigs in completion with 16% crude protein.

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