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Inclusion of Rice Bran in Diets for Post-weaning Piglets: Effect on the Productive Behavior and Carcass Traits

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Abstract

This study assessed the effect of bran rice inclusion in the diet on the productive behavior and carcass characteristics of Pampa Rocha piglets. Sixteen animals were used from weaning up to 42 days and 77 days of age, which were housed in boxes in a deep bed system of wheat straw. A randomized complete block design with two treatments and four replications was used. Treatments consisted of diets with different lipid content (T0 = 0 % rice bran; T15 = 15 % rice bran). Productive behavior was evaluated through analysis of variance and comparison of means for daily food consumption (DC), daily weight gain (DG) and conversion efficiency (CE). Weight and backfat thickness were the evaluated carcass traits, and they were analyzed through a comparison of means per treatment. The DG and CE showed differences during week 5, although they showed no differences in the experimental period average. For DC, no differences were recorded during the weeks or the average of the experimental period. Carcass traits did not differ statistically between treatments. Based on the results, rice bran could be considered as an alternative in the preparation of ration for piglets.

Keywords: nutrition, Pampa Rocha

Inclusión de afrechillo de arroz en dietas para lechones en posdestete: efecto sobre el comportamiento productivo y características de carcasa

Resumen

Se evaluó el efecto de la inclusión de afrechillo de arroz en la dieta sobre el comportamiento productivo y características de carcasa en lechones de la raza Pampa Rocha. Se utilizaron 16 animales desde el destete a los 42 días y hasta los 77 días de edad, los cuales se alojaron en boxes en un sistema de cama profunda de paja de trigo. Se empleó un diseño experimental de bloques completos al azar con dos tratamientos y cuatro repeticiones. Los tratamientos consistieron en dietas con diferente contenido lipídico (T0 = 0 % de afrechillo de arroz; T15 = 15 % de afrechillo de arroz). Para evaluar el comportamiento productivo se realizó un análisis de varianza y una comparación de medias para las variables consumo diario de ración (CD), ganancia de peso diaria (GD) y eficiencia de conversión (EC). Las características de carcasa evaluadas fueron peso y espesor de grasa dorsal, y se analizaron a través de una comparación de medias por tratamiento. Para GD y EC, se observaron diferencias durante la semana 5, no presentándose diferencias en el promedio del período experimental. Para el CD no se registraron diferencias a través de las semanas y en el promedio del período experimental. Las características de carcasa no difirieron estadísticamente entre tratamientos. En función de los resultados se concluye que el afrechillo de arroz podría considerarse como alternativa en la elaboración de raciones para lechones.

Palabras clave: nutrición, Pampa Rocha

Introduction

Swine production in Uruguay is characterized by the presence of small and medium producers, who must compete in a reduced internal market, supplied largely by imported products and by agribusiness mediated by large intensive production companies. As a survival strategy, there is a permanent search for alternatives that reduce production costs, represented mainly by animal feeding[1]. Thus, any change in food costs will directly affect profitability, determining the search for cost reduction in the offered diet, without affecting productive parameters[2].

Rice bran is an alternative food due to its low cost and nutritional characteristics. It can replace part of the grains and protein by-products. The latter generally has a high unit cost, and it is characterized by high energy concentrations, adequate amounts of protein and high contents of unsaturated fatty acids[3]. The characteristics of rice bran lipids can affect the palatability and nutritional meat value, and can negatively affect fat quality for industrialization purposes. However, its inclusion in the diet may be interesting when intended for fresh consumption cuts[4].

In addition to food characteristics, animal breed is another factor to consider for its impact on productive behavior, carcass characteristics and meat quality. Pampa Rocha is the only local breed in our country. Studies related to the productive characterization of carcass, meat and fat, of this resource, have allowed concluding that it presents similar productivity levels to those observed in traditional breeds. Although they have a fattening tendency, it can be modified by installation management, crosses or concentrate offer[5][6]. Currently, its low population number is disturbing, mainly due to the introduction of hybrid lines that have displaced existing breeds in the country. Both purebred and crossbred are used mainly by small producers because of its hardiness, since these animals adapt to the infrastructure conditions of the producers, unlike the commercial hybrid lines which have greater requirements.

Based on this background, the objective of this study was to evaluate the effect of adding rice bran in the diet on the productive behavior and carcass characteristics of piglets of Pampa Rocha breed.

Material and Methods

The experiment was carried out in the Swine Production Unit at the South Regional Center (Experimental Station of the College of Agronomy-Universidad de la República), located in Progreso (Canelones, Uruguay), between July and November 2014. Procedures were carried out according to protocol No. Exp. 111130-000834-13, approved by the Honorary Commission of Animal Experimentation (CHEA by its Spanish acronym, Udelar).

Sixteen Pampa Rocha pigs (whole males and females) were used from weaning (42 days) and up to 77 days of age. The average weight at the beginning of the experiment was 14.85 ± 1.93 kg. A randomized complete block design was used with two treatments and four repetitions. Animals of each repetition belonged to the same litter and treatments were assigned randomly within each block.

Isoproteic and isoenergetic diets with different lipid content were used as treatments: T0 treatment consisted of a diet with 0 % rice bran (control) and the T15 treatment with 15 % rice bran (higher lipid content). Bran percentage used in T15 corresponds to the maximum tolerated by the category[7]. Table 1 details the percent composition of diets and Table 2 the chemical composition of the rice bran used.

Table 1. Percentage ingredients composition and nutritional levels of the diets used (kg).

Ingredients	T0	T15
Corn	68	55
Soybean flour	28,5	26,5
Rice bran	0	15
Phosphate	1,72	1,72
Carbonate	0,8	0,8
Vitamin core	0,5	0,5
Salt	0,5	0,5
Total	100	100
Nutritional levels (fresh basis)		
Crude Protein (%)	0,2	0,19
Metabolisable energy (kcal/kg)	3,25	3,27
Ether extract (%)	0,034	0,048

Table 2. Chemical composition of the rice bran used (data on fresh basis)

Dry matter (%)	88,9
Crude Protein (%)	13,1
Ashes (%)	10,8
Crude fibre (%)	8,3
Ether extract (%)	14,8
Digestible energy (kcal/kg)*	3200

The energy content of both diets was 3,300 kcal Digestible Energy per kg and 18 % crude protein (National Research Council Requirements Tables[8]).

Feeding was carried out once a day (8:00 AM), basing the daily food supply on animals live weight and considering a 75 % restriction with respect to the theoretical maximum intake during the four first days.

The experiment was carried out in a 50 cm deep bed system of wheat straw, each repetition housed in boxes with a 0.52 m^2/ animal surface, with group feeders and pacifier-type troughs for free access to drinking water. To evaluate productive behavior, daily ration consumption (kg/day), daily weight gain (kg/day) and conversion efficiency were determined weekly and in the experimental period average.

Carcass characteristics were studied on males (six animals per treatment), which were slaughtered at the end of the experiment, evaluating carcass weight and backfat thickness. Backfat thickness was measured with a millimeter ruler and values obtained at the first rib, last rib and last vertebra were averaged.

For statistical analysis of daily ration intake, daily weight gain and conversion efficiency, an analysis of variance was performed using a mixed model with repeated measures over time. Repeated measures were assessed at each piglet level and/or experimental unit using a heterogeneous autoregressive structure over time. Means comparison was made using the least significant difference test (LSD) with a 95 % confidence level.

For statistical analysis of carcass weight and backfat thickness, a mean adjustment was conducted by treatment and its comparison through Student's t-test, with a 95 % significance level. All statistical analysis were implemented using the statistical software Infostat.

Results and Discussion

Regarding productive behavior variables, differences were observed between treatments within week 5 (treatment-date interaction) for both weight gain and conversion efficiency, with greater gain and better conversion efficiency in T0 treatment. No differences were observed in the experimental period average, for any of the variables. In the case of the intake variable, there were no significant differences over the weeks or during the experimental period. These results are detailed in Table 3.

There are previous studies in our country regarding the addition of brown rice bran in commercial hybrid diets during the finishing period (60-110 kg live weight) and its effect on productive behavior, and carcass, meat and fat characteristics[4][9]. By adding 25 % of this food, Bauza and others[4] found a decrease in growth rate, observing no differences in conversion efficiency with respect to diets with different compositions. However, there are no studies that assess the adding of brown rice bran in post-weaning piglets diets or in the Pampa Rocha breed.

On the other hand, the results obtained in the present study did not differ from the expected growth parameters reported by the available requirements tables[10]. Daily weight gain results were higher than those recorded by Barlocco and others[11] and Carballo[12] in Pampa Rocha piglets and their crosses with commercial breeds, in post-weaning stage and in field breeding conditions, which can

Table 3. Adjusted means and standard deviation for weight gain (kg/day), ration intake (kg/day) and conversion for treatments T0 and T15, weekly and as average of the experimental period.

		Week				
	Treatment	2	3	4	5	Average
Gain	T0	0.522 (0.03) a	0,535 (0,05) a	0,495 (0,05) a	0,748 (0,02) a	0,577 (0,01) a
	T15	0.585 (0.03) a	0,439 (0,05) a	0,514 (0,05) a	0,673 (0,02) b	0,553 (0,01) a
Intake	T0	1.020 (0.08) a	1,037 (0,12) a	1,257 (0,15) a	1,420 (0,02) a	1,183 (0,08) a
	T15	1.062 (0.08) a	1,105 (0,12) a	1,360 (0,15) a	1,547 (0,02) a	1,268 (0,08) a
Conversion	T0	1,952 (0,24) a	1,9687 (0,32) a	2,680 (0,47) a	1,894 (0,08) b	2,124 (0,14) a
	T15	1,896 (0,24) a	2,561 (0,32) a	2,682 (0,47) a	2,306 (0,08) a	2,360 (0,14) a

Different letters indicate significant differences, with 95 % confidence.

The values in parentheses correspond to the standard deviation.

explain the differences due to animals higher energy requirements in those conditions. Compared to the two mentioned studies, our intake data and conversion efficiency were similar. Furthermore, Maciel and others[13] analyzed the productive behavior of post-weaning piglets in outdoor and deep bed production systems and reported similar values of daily gain in field reared piglets (0.550 kg/day), and higher in deep bed reared piglets (0,645 kg/day). Conversion efficiency data recorded in our study was similar to those of the aforementioned authors.

Regarding carcass characteristics, there were no differences between treatments for the variables evaluated (Table 4).

Table 4. Adjusted means and standard deviation of carcass characteristics evaluated for treatments T0 and T15.

	T0	T15
Carcass weight (kg)	23,4 (2,3) a	24,2 (2,3) a
Backfat thickness (mm)	1,47 (0,3) a	1,44 (0,3) a

Different letters indicate significant differences, with 95 % confidence.

The values in parentheses correspond to the standard deviation.

Capra and others[9] evaluated diets with different lipid content, one of them including 25 % rice bran, in commercial hybrids in the finishing stage (60-110 kg), and also found no differences in carcass characteristics.

Considering the higher lipid content of diet containing rice bran, an effect on backfat thickness could have been expected since Pampa Rocha is characterized by its hardiness, which determines an early deposition of adipose tissue[5]. The absence of differences for this variable could be due to the fact that the trial duration was not sufficient for differences to be observed.

Conclusion

Since the addition of rice bran in the diet did not influence the productive behavior or carcass characteristics of Pampa Rocha piglets, it is concluded that this food could be considered as an alternative in ration preparations for this category, mainly when considering production costs reduction and accordingly, financial results.

Author's contribution

All the authors contributed equally to the content.

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