ECONOMICAL EVALUATION OF RACTOPAMINE INCLUSION IN DIETS OF FINISHING GILTS

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ABSTRACT

The use of adrenergic agonists such as ractopamine leads to lean carcasses due to an increase in muscle deposition. The effects of ractopamine on performance and carcass traits in pigs may be varied depending on the level of agonist and amino acids, especially lysine, on diet, sex and age of the animals at the beginning of the additive supply. These factors, as well as the feed cost and the adoption or not the carcass classification influence the economic viability of the use of ractopamine. The economic analysis, therefore, is necessary to evaluate the feasibility of ractopamine inclusion in diets of finishing gilts. This study aimed to evaluate the addition of ractopamine at 0, 5, 10 and 15 mg/kg of diets for gilts slaughtered with 110 kg, on feed cost, gross and net incomes, considering or not the carcass rewarding. A total of 468 gilts were used and fed for 28 days. There was an increase in feed cost and linear decrease in net income without carcass rewarding with raising level of additive. For net income with carcass rewarding, there was a linear effect with higher income for the level of 15 mg/kg. Considering the carcass classification, the inclusion of ractopamine at the level of 15 mg/kg promotes higher income.

Keywords: β-adrenergic agonist, cost, economic evaluation.

AVALIAÇÃO ECONÔMICA DA INCLUSÃO DE RACTOPAMINA EM DIETAS PARA FÊMEAS SUÍNAS EM FASE DE TERMINAÇÃO

RESUMO

A utilização de agonistas β adrenérgicos, tais como a ractopamina, leva a melhorias na carcaça devido ao aumento na deposição muscular. Os efeitos da ractopamina no desempenho e nas características de carcaça em suínos podem ser variáveis, dependendo do nível do agonista e de aminoácidos, especialmente de lisina, na dieta, sexo e idade dos animais no início do fornecimento do aditivo. Esses fatores, bem como o custo da alimentação e a adoção ou não da tipificação das carcaças influenciam a viabilidade econômica do uso da ractopamina. A análise econômica, portanto, é necessária para avaliar a viabilidade de inclusão de ractopamina em dietas para leitoas em terminação. Objetivou-se avaliar a adição de ractopamina em 0, 5, 10 e 15 mg/kg de ração para suínos fêmeas abatidas com 110 kg, quanto aos custos com alimentação, receitas bruta e líquidas, considerando ou não a bonificação de carcaças. Foram utilizadas 468 fêmeas suínas, alimentadas durante 28 dias.

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Observou-se aumento nos custos com alimentação e redução linear na receita líquida sem bonificação, com a elevação do nível do aditivo. Para a receita líquida com bonificação, verificou-se efeito linear com maior receita para o nível de 15 mg/kg. Considerando a bonificação de carcaças, a inclusão de ractopamina ao nível de 15 mg/kg promove maior receita.

Palavras-chave: β-agonista adrenérgico, custo, avaliação econômica.

EVALUACIÓN ECONÓMICA DE INCLUSIÓN DE RACTOPAMINA EN DIETAS PARA HEMBRAS PORCINAS EN FASE DE ENGORDA

RESUMEN

El uso de agonistas beta-adrenérgicos como la ractopamina, conduce a mejoras en la res muerta debido al aumento en la deposición muscular. Los efectos de la ractopamina en el rendimiento y características de la res muerta en cerdos se pueden variar dependiendo del nivel de agonista y los aminoácidos, especialmente lisina, en la dieta, en el sexo y la edad de los animales al comienzo del suministro del aditivo. Estos factores, así como el costo de la alimentación y la adopción o no de la clasificación de las res muertas influyen en la viabilidad económica del uso de la ractopamina. La análisis económica, por lo tanto es necesario para evaluar la viabilidad de inclusión de ractopamina en dietas para cerdas en engorda. El objetivo fue evaluar la adición de ractopamina en 0, 5, 10 y 15 mg/kg de dieta para las cerdas sacrificadas con 110 kg, considerando los costos de la alimentación, ingresos brutos y netos, teniendo en cuenta o no la bonificación de las canales. Se utilizó un total de 468 cerdas alimentadas durante 28 días. Hubo un aumento en los costos de la alimentación y disminución lineal en el ingreso neto sin bonificación, con el aumento del nivel de aditivo. Para el ingreso neto con bonificación, hubo un efecto lineal con mayores ingresos en el nivel de 15 mg/kg. Teniendo en cuenta la bonificación de las res muerta, la inclusión de la ractopamina en 15 mg/kg promueve mayores ingresos.

Palabras clave: β - agonista adrenérgico, costo, evaluación económica.

In the past, the main strategy of pig producers to improve income per animal was obtained by promoting higher feed intake, aiming at higher slaughter weight in the shortest time. However, with the implementation of carcass classification by pork industry, the best rewarding nowadays is based on payment per carcasses that presents higher lean meat yield.

Therefore, the use of ß-adrenergic agonists such as ractopamine leads to lean carcasses due to an increase in muscle deposition. Several studies prove the effectiveness of ractopamine in enhancing carcass characteristics of pigs (1), as well as performance parameters (2), although less evident.

The effects of ractopamine on performance and carcass traits in pigs can be variable, depending on the levels of the agonist in diet, besides the lysine and other amino acids in the diet, sex and age of the animals at the additive inclusion. Thus, the feasibility of ractopamine inclusion can also be varied by the above mentioned, but also by feed cost and carcass rewarding in a classification system. In that context, economic evaluation is necessary to estimate the feasibility of ractopamine inclusion in finishing pig diets.

According to the above, the objective was to evaluate the feed cost and gross and net incomes of finishing gilts fed increasing levels of ractopamine, considering or not the rewarding in a carcass classification system.

To evaluate the economical feasibility of ractopamine inclusion in diets for finishing gilts, data of performance and carcass characteristics of 468 animals from 84.77±7.20kg to 110.59±7.70kg of weight were used. The pigs were distributed in a randomized block design with 4 treatments, 9 replicates and 13 animals per experimental unit. The blocks were formed by using the initial weight of the animals in each pen. The treatments consisted of increasing levels of ractopamine in diets (0, 5, 10 and 15 mg/kg) in replacement to kaolin. The diets were formulated to meet minimal nutritional and energy requirements, as indicated by Rostagno et al. (3), considering an energy concentration of 3,230 kcal EM/kg of diet, 16.20% of crude protein and 1.10% of digestible lysine for gilts with a high potential for lean deposition. A digestible lysine content of 1.10% was established due to the higher demand of this amino acid when ractopamine is added to diets (4), and the proportions of other amino acids were maintained based on ideal protein concept (3).

The cost of each experimental diet was determined based on the following ingredients prices on August of 2015, as follow: R$0.63/kg of corn, R$1.63R$/kg of soybean meal, R$2.88/kg of dicalcium phosphate, R$0.22/kg of limestone, R$0.20/kg of salt, R$8.53/kg of L-lysine.HCl, R$14.21/kg of DL-methionine, R$14.07/kg of L-threonine, R$17.02/kg of L-tryptophan, R$9.66/kg of vitamin and mineral supplement, R$0.10/kg of kaolin and R$17.00/kg of ractopamine.

Feeding cost was calculated by the feed intake of the animals at each pen, during the experimental period and the cost of each experimental diet. The values of lean meat percentage (%LM) and carcass weight (CW) were used to obtain the carcass rewarding index (CRI), considering it as a correction factor of carcass value, as mentioned by Fávero et al. (5).

The value received per pig, in Brazilian Real (R$), was determined on two situations, considering or not the carcass rewarding, as follows:

Final pig value without rewarding = price per kg of pig x pig weight

Final pig value with rewarding = [CRI x (price per kg of pig/ 0.7236)] x CW

The initial value of pig (R$ per pig at 85kg) was determined considering the pig weight in the beginning of experimental period and the price per kg of pig. The initial and final values of animals and feeding cost had been used to calculate the gross and net incomes, considering or not the carcass rewarding, in Brazilian Real (R$), as following:

Gross income = Final pig value – Initial pig value at 85kg

Net income = Gross income – feeding cost

The data obtained after error distribution checking (Cramer Von-Mises test at 5%, according to Everitt (6), were submitted to statistical analysis, using the PROC GLM from the SAS software (1998), performing multiple linear regressions up to the third degree.

No differences were found among treatments on gross income with or without bonification (Table 1).

However, the ractopamine levels in diets promoted linear increase on feeding cost ($Y = 61.2053 + 0,5117X$, $R^2 = 0.8053$), carcass rewarding index ($Y = 1.1099 + 0.0005\ X$, $R^2 = 0.8912$), and consequently a reduction on net income without carcass rewarding ($Y = 101.0236 – 0.9152X$, $R^2 = 0.7895$). For the net income taking into account the carcass rewarding, a linear trend was found ($Y = 101.5505 + 4.0326X$, $R^2 = 0.9033$), and the highest value was found with the ractopamine level of 15 mg/kg in diet. In a technical-economical simulation of ractopamine inclusion in finishing pig diet, Brumatti and Kiefer (7) reported maximum profit at the levels 10 and 12 mg of ractopamine/kg, considering a revenue system per body weight and per carcass reward, respectively. Cantarelli et al. (8) also observed a greater net income with carcass rewarding, although ractopamine inclusion in finishing barrow diets promoted an enhancing on feeding cost.

Table 1. Feed cost, feeding cost, carcass rewarding index, gross and net incomes with or without carcass rewarding of gilts fed increasing levels of ractopamine from 85 to 110 kg.

Parameters	Ractopamine levels, mg/kg				CV[5] %	Effect	P- value
	0	5	10	15			
Feed cost (R$/kg of diet)	0.967	0.975	0.983	0.991	-	-	-
Feeding cost (R$/animal)	61.76	62.07	62.91	63.18	9.18	Linear	<0.0011
Carcass rewarding index	1.114	1.115	1.120	1.121	7.24	Linear	0.0030
GI[1], R$	161.52	160.92	162.87	159.52	20.33	-	0.7358
GICR[2], R$	166.39	171.98	178.82	179.25	14.56	-	0.9787
NI[3], R$	99.76	98.85	99.96	96,34	15.43	Linear	<0.0001
NICR[4], R$	104.63	109.91	115.91	114.07	13.11	Linear	<0.0001

[1]Gross income without carcass rewarding; [2]Gross income considering carcass rewarding; [3]Net income without carcass rewarding; [4]Net income considering carcass rewarding; [5]Coefficient of variation.

Regarding the high price of ractopamine, the reduction in feed intake and the improvement in feed conversion when the additive was included (data not shown) were not enough to justify the inclusion of this agonist. In the same way, a study to assess the economic efficiency of ractopamine in diet up to the level of 10 mg/kg, Bridi et al. (9) reported an increase in the average cost of diet per kilogram of weight gain, resulting also in reduction on economic efficiency, indicating that the use of this adrenergic agonist cannot be justified only by the performance of animals. Reese and Bitney (10) stated previously that the viability of ractopamine usage in pig diets should not be based only on the best feed efficiency or higher daily gain, requiring a consistent carcass classification system, which reward economically the production of leaner carcasses.

Schinckel et al. (11) also reported that the economic viability of ractopamine addiction in pig diets is related to several factors, the most important one is lean meat content in relation to carcass fat. Although the criteria adopted in carcass classification may vary, measurements of fat and loin depths, ranging on the location and number of measures taken, including or not the carcass weight as a predictor (12) are generally used. Thus, the variation in carcass classification could outline the ractopamine concentration in the diets of finishing pigs.

Reese and Bitney (10) evaluated the addition of increasing levels of ractopamine in finishing pig diets on the income obtained per pig slaughtered, reported that the addition of 9 mg/kg has promoted greater reduction in backfat thickness, although the addiction of 4.5 mg/kg was more economically feasible when the carcass classification was based on measurements over the loin. In the present work, concerning the parameters used for carcass classification, the highest net income was achieved by the level of 15 mg/kg of ractopamine, demonstrating the importance of combination among lower feed intake, lower feed cost, and mainly the best carcass classification index.

We concluded that the addition of ractopamine in gilt diets slaughtered at 110 kg, may be feasible when a carcass classification system is adopted and in this situation, the highest ractopamine level of 15 mg/kg promoted higher net income.

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