DOES RACTOPAMINE INTERACT WITH IMMUNOLOGICAL CASTRATION ON PORK LEAN AND FAT QUANTITIES?

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Abstract – The experiment was carried out involving pigs from two different commercial farms representing distinct genetic crosses: Topigs (Tempo sires x Topigs 40 dams) from farm A (n=203) and Agroceres PIC (AGPIC 337 sires x CB 22 dams) from farm B (n=110) as a factorial arrangement of 2 x 2 x 3 with the main effects of farm (Farm A vs. Farm B), RAC level (0 vs. 7.5 mg/kg) and sex condition (female, FE vs. physical castrates, PC vs. immunocastrated, IC). The effect of adding RAC in the diet was significant (P<0.01) for LM. There were no (P>0.05) differences for LM in Farm A between pigs fed control vs. RAC. However, in Farm B IC (28.14 kg RAC vs. 25.96 kg control; P<0.01) and FE (26.92 kg RAC vs. 23.96kg control; P<0.01) fed RAC were leaner than the control, and PC control vs. RAC did not differ (P>0.05). Feeding RAC at the 7.5mg/kg increases pork lean quantity, especially for IC. The interactions between the two main factors may vary for different farms due to several causes, among them is the genetic background involved.

Key words – immunological castration, pork lean yield, ractopamine.

I. INTRODUCTION

To meet consumer's needs for a balanced and healthy diet, new technologies are required in the food chain to offer leaner cuts. Also, there is distinct pressure from national and international society for conscious production of animals reasonably free from stress. Then, the challenge to the scientific community is to produce high lean yields, while attending and not interfering in animal welfare.

As far as boar taint control is concerned immunological castration is an excellent alternative when compared to physical castration. It consists of a vaccine containing a modified form of GnRH in a low reactogenic adjuvant system [1; 2].

Regarding to the improvement in growth performance and in carcass characteristics of finishing pigs [3; 4] ractopamine has shown its potential as a repartitioning agent [5].

Considering the rapid increase of immunological castration and ractopamine utilization in Brazil, and the lack of information about any interaction effect of the two technologies, this study was planned to evaluate the inclusion of 7.5 mg/kg of RAC in diets of immunocastrated boars, physical castrates boars and females, on pork lean and fat yields.

II. MATERIALS AND METHODS

Three hundred and thirteen crossbred pigs from two different commercial farms representing distinct genetic crosses: Topigs (Tempo sires x Topigs 40 dams) from farm A (n=203) and Agroceres PIC (AGPIC 337 sires x CB 22 dams) from farm B (n=110) were used in this experiment. They were grouped in females (FE), physical castrates (PC) and immunological castrated boars (IC), fed or not with RAC (7.5 mg/kg, Ractosuin, Ourofino Agrobusiness) during the final 21d before harvest. RAC was incorporated in the conventional diet based on corn and soybean formulated with 16% protein and 0.91% lysine. The boars designated to immunological castration received two doses of vaccine 8 and 4 weeks before slaughter, as recommended (Vivax, Pfizer Animal Health).

At the end of finishing period, pigs from Farm A and B were transported to a commercial abattoir for slaughtering procedure. Humane slaughter was conduct in accordance with the Sanitary and Industrial Inspection Regulation for Products of Animal Origin [6].

The carcass selection was based on hot carcass weight and fat and muscle depth measured by HGP (Hennessy Grading Probe), to ensure the homogeneity of the groups. Ten pigs of each combination RAC dietary and sex from each farm were selected summing up 120 pigs. After chilling, carcasses were transport to the Meat Technology Center (CTC) of the Institute of Food technology, (ITAL, Campinas-SP), and were dissected according to the European Union (EU) reference method [7], and lean meat and fat quantities and yields were recorded. The average of sum from the 11 primal cuts was defined as lean meat weight (LM), and the sum of intramuscular and subcutaneous fat from the same cuts was defined as fat weight (FW).

The experiment was carried out as a factorial arrangement of 2 x 2 x 3 with the main effects of farm (Farm A vs. Farm B), RAC level (0 vs. 7.5 mg/kg) and sex condition (FE vs. PC vs. IC), as well as the double and triple interactions. Least squares means were computed for main and interaction effects and were separated statistically using Tukey test ($P<0.05$) for the variables that showed difference in ANOVA F-test.

III. RESULTS AND DISCUSSION

Results from LM and FW quantities regarding sex and RAC for the two farms are presented in Table 1.

The effect of adding RAC in the diet was significant ($P<0.01$) for LM. There were no ($P>0.05$) differences for LM in Farm A between pigs fed control vs. RAC. Nevertheless, in Farm B IC (28.14 kg RAC vs. 25.96 kg control; $P<0.01$) and FE (26.92 kg RAC vs. 23.96 kg control; $P<0.01$) fed RAC were leaner than the control, and PC control vs. RAC did not differ ($P>0.05$).

According to [8] supplementation of 5 ppm of RAC is enough to promote improvements in gain of lean meat plus 3% increase in the percentage of lean meat [9], as observed in this study with the addition of 7.5ppm, although not seem for the PC.

Pigs fed control vs. RAC diet presented no ($P>0.05$) differences in both farms for FW. Even RAC being a potent stimulator of adipose tissue fat mobilization, often it does not decrease fat deposition in pigs, as observed in this study, which corroborated with [10], who reported the increasing on carcass lean tissue weights (23.3 kg and 24.3 kg), without alter fat tissue weights (5.08 kg and 4.95 kg) of entire males and immunological castrated pigs. This can be explained by a combination of rapid down regulation of adipocyte β-adrenergic receptors [11]; [12], lack of effect on lipogenesis [13], and a relative insensitivity of porcine adipocytes to β-agonists [14].

The effect of sex was significant for LM ($P<0.05$) and for FW ($P<0.01$) and the influence of farm was significant ($P<0.01$) only for the LM. The two way interaction farm vs. sex best explains what occur in the main effects.

Out of all interactions tested, only the two way interaction farm vs. sex for LM ($P<0.01$) and FW ($P<0.05$) traits were significant. There were no ($P>0.05$) differences for FW between farms A and B for pigs fed control diet, but pigs fed RAC there were ($P<0.01$) differences only for PC, animals from Farm A (9.82 kg) were fatter than from Farm B (8.56 kg).

For LM, there were ($P<0.01$) differences only for IC fed control diet, where pigs from Farm B (25.96 kg) were leaner than those from Farm A (23.05 kg).

The same pattern occur for pigs fed with RAC, pigs from Farm B were leaner than from Farm A for FE (26.92 kg and 23.89 kg) and IC (28.14 kg and 24.14 kg). Similar results were obtained by [15], these authors compared IC, PC and FE fed or not with 10ppm RAC and results indicated IC and FE fed with RAC had higher percentage of lean meat. Rikard-Bell et al. (2009) [3], also reported results compatible to the present study for fat weight in FE (6.29 kg) and IC (5.98 kg). However, they found a reduction in half carcass fat mass by dietary RAC, which is different than we found.

The differences between the two farms could be explained by different attributes of each genetic line, where Farm B is focused towards the improvement

of carcass traits and Farm A is oriented to maternal ability. Although, other differences between farms should be taken into account, once animals were slaughter under different facilities and were handle by distinct people.

Table 1. Effects of sex, RAC and the two farms-genetics on lean meat and fat weight.

Variable	Sex[1]	Farm A[2]		Farm B		SEM[3]	Significance[4]			
		0 RAC (mg/kg)	7.5 RAC (mg/kg)	0 RAC (mg/kg)	7.5 RAC (mg/kg)		F	S	R	F x S
LM (kg)	PC	24.10	24.52	24.32^{B}	25.35^{B}					
	IC	23.05^{g}	24.14^{g}	$25.96^{b;A;f}$	$28.14^{a;A;f}$	0.58	**	*	**	**
	FE	22.52	23.89^{g}	$23.96^{b;B}$	$26.92^{a;AB;f}$					
FW (kg)	PC	9.82^{A}	$9.82^{A;f}$	8.93	8.56^{g}					
	IC	8.09^{B}	8.02^{B}	8.57	7.44	0.42	ns	**	ns	*
	FE	8.00^{B}	7.60^{B}	7.98	8.54^{a}					

$^{A, B, C}$ Within sex row, from each farm, means with different capital letters differ (P<0.05).
$^{a, b, c}$ Within ractopamine columns, from each farm, means with different lowercase letters differ (P<0.05).
$^{f, g, h}$ Comparing different farm columns with the same treatment, means with different letters differ (P<0.05).
[1] PC (Physical castrates males), IC (Immunocastrated males), FE (Females).
[2] Farm A (commercial genetic line Topigs), Farm B (commercial genetic line Agroceres PIC).
[3] Standard error of the mean
[4] Statistical significance by ANOVA, where **, P<0.01; *, P<0.05; ns, non-significant. Interactions FxR, SxR and FxSxR were non-significant.

IV. CONCLUSIONS

According to the results of the present study it could be concluded that feeding ractopamine at 7.5mg/kg increases pork lean quantity, especially for immunocastrated males. The interactions between the two main factors may vary for different farms due to mainly genetic background involved.

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