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Removal of Penile Spicules of Covies (*Cavia porcellus*) and its Effect on Weight Gain and Aggressiveness

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ABSTRACT

This research took place on Irquis Farm, University of Cuenca, Victoria del Portete parish, Cuenca canton, province of Anzuay, Ecuador. The effects of penile spicule extirpation on weight gain and aggressiveness, and damage caused to the carcass at the beginning of growing/fattening were studied. The study consisted of three treatments: whole animals without castration, used as controls (T1); animals with extirpation of the glans´s spicules (T2); and chemically castrated animals, using 0.5 ml of 2% alcohol with iodine, directly injected in each testicle (T3). A total of 90 animals were included, following a randomized block design with six treatments and five replicas. The diet consisted of forage mixture of 33-35% dry matter, and a commercial feed supplement administered *ad libitum*. A covariance analysis (ANACOVA) was made using the initial weight as co-variable. The final weight was significantly influenced by the treatment; the Tukey´s test resulted in higher final weight in T2, followed by T1. Their behavior was significantly different from T3 ($P < 0.05$). In relation to aggressiveness expressed in carcass damage, no significant differences were observed, according to Chi-square test ($P > 0.05$).

Key words: *covy, penile spicules, aggressiveness*

INTRODUCTION

Covy production is an important rural economic item. Today it is one of the most promising animal raising activities in the Andean countries, thanks to the growing local and foreign demands (Chauca, 2007). The population of the Ecuadoran Sierra where covy production is highest, breeds these animals either in household facilities, especially used for home sustenance, with none or little excess production for the market; or market-oriented with higher supplies and surplus (Guacho, 2009), like most Andean countries.

One of the challenges of covy production is growing optimum carcass at the right age to meet the demands of the domestic and foreign markets. Due to the aggressive and dominant character of male covies, they must be castrated to facilitate handling (Hernández and Fernández, 2002; Cruz, 2008; Vega, Pujada and Astocuri, 2012). Aggressiveness is a problem in mid-sized and small farms, where the raising space is not always adequate. Overpopulation leads to aggressive behavior, which may result in fights that harm carcass due to wounds and ecchymotic spots, stress, and decreased weight gain rate (Apráez *et al.*, 2011).

Covy castration is a zootechnical practice established to ensure handling of aggressive animals, and further improvements in weight gain. Simple common techniques, like open testicle and chemical castration can be used, though they can cause mortality by malpractice, and also affect the weight gain rate due to stress and pain (Cruz, 2008). A traditional, but not well known, unpublished technique used by farmers is manual removal of the spicules from the animal´s glans.

Anatomically, hystricomorphic male rodents bear two keratinized spicules on the penis, known as styloid process or keratinaceous styles (Márquez *et al.*, 2008; Stan, 2015), which are protuberances that stick out during erection. They have a thick corneous stratus of keratin on layers of epithelial cells. Their role has not been clearly defined, though it is thought to be linked to vaginal stimulation, to induce spontaneous ovulation in the female (Sachs *et al.*, 2005; Stan, 2015; Atalar *et al.*, 2006), and is related to secondary sexual traits in other species with the same function as in hystricomorphic rodents (Adebayo *et al.*, 2011). They are held in a retractable sac on the ventral side of the glans, also associated to the structure of the penis of greater cane rats (*Thryonomys swinderianus*), known as *intromittent sac* or *sacculus urethralis* (Hooper, 1961; Márquez *et al.*, 2008; Adebayo *et al.*, 2011; Stan, 2015) covered in the interior with a transient epithelium of epithelial cells, and a coat of keratin.

The aim of this research was to evaluate the effect of penile spicule extirpation from covies on

weight and aggressiveness in their growth stage, based on carcass damage until 90 days of age.

MATERIALS AND METHODS

Location

This research took place in a special area on Irquis Farm, owned by the University of Cuenca, parish of Victoria del Portete, Cuenca canton, province of Azuay, 2 663 m above sea level, with temperate-cold climate, average temperature of 8 °C, relative humidity of 80 %, and rainfall values of 800 - 2 000 mm.

Procedure

The study lasted 60 days. A total of 90 male covies type 1 (35 days of age) were used after a 10-day collective raising period for adaptation and weight standardization. The initial average live weight at the beginning of the study was 658.3 ± 8.54 g at the start of growth and/or fattening. The animals were placed in cages following the elevated cage method; each cage was labeled. Every biosafety measure was considered, including both infrastructure and automatic water troughs.

The study consisted of three treatments: whole animals without castration, used as controls (T1); animals with extirpation of the glans's spicules (T2); and chemically castrated animals, using 0.5 ml of 2% alcohol with iodine, directly injected in each testicle (T3). The technique applied by traditional breeders was used: withdrawal through hand pressure to stick out the penis completely until the glans was observed. Then the intromittent sac was reversed and the penile spicules were exposed. Other procedures to protect the animal according to bioethics standards were added, and the protocol continued as follows:

1. Glans asepsis using povidone
2. Topic application of anesthetics based on roxicain.
3. Removal of spicules by hand pressure.
4. Aid to retract the penis into the prepuce.

The protocol suggested guaranteed animal well-being without violating the national and international regulations. The animals were fed with Rye grass (*Lolium multiflorum*), white clover (*Trifolium repens*), 19.18 % crude protein content, crude fiber 31.02 %, and digestible energy 2 806.08 kcal kg^{-1}. Diet complementation was made with excess commercial feedstuff containing crude protein (19.77 %), crude fiber (8.89 %), and digestible energy (2 771.55 kcal kg^{-1}). The amount of forage supplied followed the recommendations of Caycedo *et al.* (2011) who established age periods: youngsters of 100 g of up to 30 days of age (200 g); 30-60 days (350 g); and 60-100 days (400-500 g), using green forage daily, or similar, and 33-35% of live weight equivalence of green matter. Excess feeding with the commercial feedstuff was administered ad *libitum* throughout the period, in chain feeders.

Data collection

The live weights were measured in grams at the beginning, by periods, and at the end, using a digital balance (one gram accurate). Aggressiveness was determined indirectly through direct observation of the upper back carcass of slaughtered animals, and classified according to the area affected using the criterion in Figure 1.

- Low aggressiveness (LA): isolated wounds covering less than a fourth of the upper back.
- Mid aggressiveness (MA): continual wounded areas covering at least half of the upper back.
- High aggressiveness (HA): continual wounds covering at least three fourths of the upper back.

Experimental design

A randomized six-block design with three treatments and five replicas was made. SPSS 22.0, for Windows, was used for data processing and statistical analysis. Covariance analysis (ANACOVA) was made using the initial weight as variable to verify the effect of the different treatments on the weight. The multiple range significance test (Tukey´s) was used for mean comparisons. The square-Chi test (X^2) was made to determine the relation between variables aggressiveness and treatments. .

RESULTS AND DISCUSSION

Weight

Significant differences ($P < 0.05$) were found among the treatments, with marked values from the third period on (measurements of observation units every two days) (Fig. 2).

Besides, since the second period, significant ranges ($P < 0.05$) were determined with the Tukey´s test; treatment T2 had the highest average weight 719.7 g ± 15.58 ($P < 0.05$), with differences compared to the others. Considering the

third evaluation period, treatments T1 and T2 showed the highest average weights, both sharing one value, but statistically different ($P < 0.05$) from the results achieved in treatment T3. This trend was evidenced until the end of observations in the twentieth period, with a slight change in the twelfth period.

Considering the final live weight (Table 1), treatment T2 reached the highest value (1 529.8 g ± 28.02), followed by T1 (1 499.7 g ± 38.27), with no significant differences among them, except for T3 (1 367.9 g ± 33.26), which had significant differences ($P < 0.05$). This tendency was also observed during correction of initial weight; hence, the highest weight of T2 owed to the influence of the treatment.

Although there is no previous evidence of relationship between spicule extirpation and productive issues, the results observed for weight using the procedure suggested are comparable or higher than the findings of other studies that linked weight to castration methods. Accordingly, Apráez *et al.* (2011) achieved 1 283.21 g in whole animals, and 1 295.77 g in castrated animals, during 16 weeks; the best performance was observed in the castrated animals. Similar reports were made by Vega *et al.* (2012), using similar animals and raising periods, with chemical castration (iodine tincture at 2%), via intratesticular. As a result, the final weights were higher in the castrated animals (837.9 g) than in the whole animals (738.4 g). However, the above mentioned weights were below the weights observed in this study.

Aggressiveness

The aggressiveness observed to damage the carcass had no significant differences among the treatments, similar to the reports of Quijandría and Shiva (2009), but they differed from Vega *et al.* (2012), who found a lower number in castrated animals, using a different assessing method based on quantification of post-feeding fights during the last 10 days of fattening.

CONCLUSIONS

The extirpation of penile spicules had a positive effect on weight gain and final weight, similar to the whole animals and better than the chemically castrated animals. The treatments did not reveal significant differences in terms of aggressiveness.

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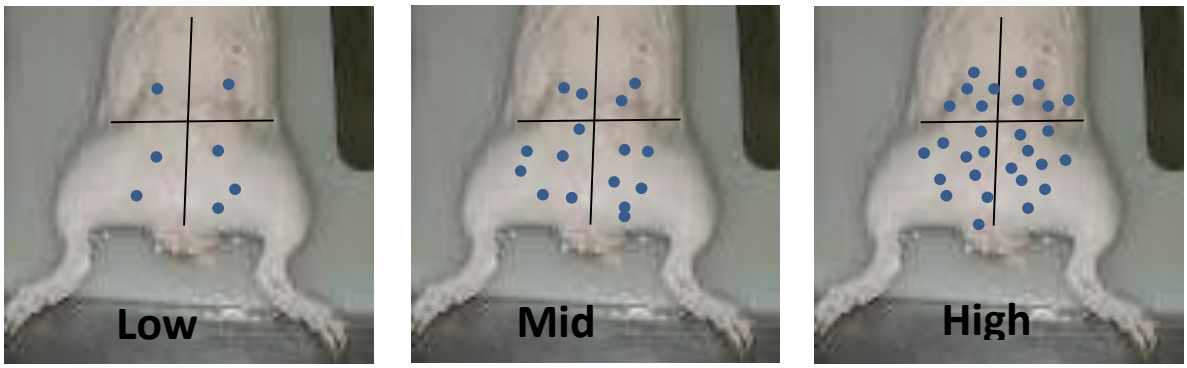

Fig. 1. Aggressiveness levels

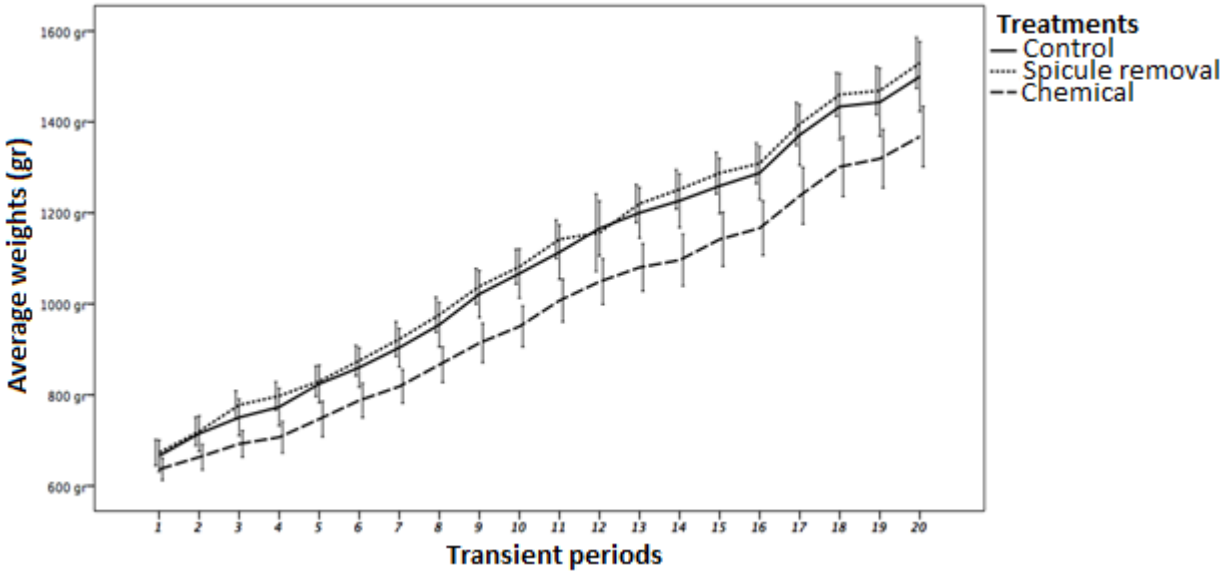

Fig. 2. Growth curve per treatment for 20 transient periods

Table1. Initial weight, final weight, and total weight gain per treatment

	Total		Treatments					
			T1		T2		T3	
	Mean	SE±	Mean	SE±	Mean	SE±	Mean	SE±
Initial weight	658.33	8.54	665.67	17.25	673.00	14.26	636.33	12.04
Final weight	1468.54	20.47	1499.70[b]	38.27	1529.79[b]	28.02	1367.85[a]	33.26
Weight gain	809.76	18.10	836.37[b]	33.89	860.48[b]	24.54	725.54[a]	30.45

*Unequal letters (a, b) in the same row indicate significant differences ($P < 0.05$), according to the Tukey´s test.

Table 2. Treatment-aggressiveness contingency chart

		Aggressiveness/Categories*			Total
		AA	AM	AB	
T1	Cases	3	8	10	21
	%	14.3	38.1	47.6	100
T2	Cases	2	7	14	23
	%	8.7	30.4	60.9	100
T3	Cases	3	7	10	20
	%	15	35	50	100
	Total cases	8	22	34	64
	%	12.5	34.4	53.1	100.0

*HA: high aggressiveness, MA: mid aggressiveness, LA: low aggressiveness
Square-Chi test: $P > 0.05$ (NS)