

Comparison of Carcass Characteristics between KMnO_4 and AgNO_3 as Chemical Castration in Finisher Pigs

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Abstract

A total of 24 Large White Yorkshire (LWY) of male pigs of 2-3 months age were allocated into three different groups viz. T1, T2, and control consisting of 8 pigs per group for the experiment. T1 group was chemically castrated using KMnO_4 , T2 group was chemically castrated using AgNO_3

and the control group was surgically castrated. The experiment was conducted to evaluate and compare the effect of the different chemicals used for castration on certain carcass characteristics and for controlling the boar taint. Chemicals were injected at a total dose of 2 ml intra testicular. The final result shows that the chemical castration group performed better on Carcass weight ($p>0.01$), Butt ($p<0.01$), BFT ($p<0.01$) and Dressing percentage ($p<0.01$) when compared to the surgically castrated group. The sensory evaluation of the meats and fats also show that there is no significant difference between the chemically castrated group and surgically castrated group. Thus, it may be concluded chemical castration may also be effective in controlling the boar taint.

Keywords: Large White Yorkshire (LWY); Castration; KMnO_4 ; Boar taint

Materials and Methods

A total of 24 Large White Yorkshire (LWY) of male pigs of 2-3 months age were selected for this experiment. All the pigs were fed as per the NRC 1998 standard of feeding regimen for growing/finisher pigs and the experiment was conducted from winter to monsoon (November to June), 2018 to 2019. The pigs were allocated into three different groups viz. T1, T2, and control consisting of 8 pigs per group.

The tested animals were managed following the Committee for the Purpose of Control and Supervision of Experiments on Animals (CPCSEA) and the experiment was approved by the Institutional Animal Ethics Committee (IAEC) at the College of Veterinary Sciences and Animal Husbandry, Mizoram, India.

The first group or control (C) was surgically castrated under local anesthesia, with all the necessary post-operative treatment. Pigs in the second group or treatment one (T1), were subjected to chemical castration using 5% silver nitrate solution which was injected @ a dose of 2 ml intra-testicular/testes. Pigs in the third group or treatment two (T2) were subjected to chemical castration using 0.25% (250 mg potassium permanganate in 17 ml glacial acetic acid and 83 ml sterile distilled water). These solutions were injected @ a dose of 2 ml intra-testicular/testes.

For T1 and T2, the prepared solution was injected using 24-gauge needle syringes. The needle was inserted into the testes from the caudal end of the testes to the caput of the testes. The solution was injected into the testes while withdrawing the syringe from the testes, so that maximum solution was injected into the whole of the testes. For comparison and statistical analysis, the surgically castrated group (C) was taken as control and was compared with the two groups of T1 and T2 respectively.

At the end of the experiment i.e. after 6 months three pigs from each group were slaughtered to study the Carcass Weight (kg), Butt (kg), Backfat thickness (cm), Dressing Percentage (%), and sensory evaluation.

Results and Discussion

The mean \pm SE of pre-slaughter weight (kg), carcass weight (kg), butt (kg), backfat thickness (cm), and dressing percentage

Introduction

Castration in the pig is performed to decrease the boar taint upon cooking of pork in males which is an unpleasant odor. The intensity of boar taint is directly proportional to the age of the animal at slaughter in uncastrated male pigs by Rydhmer et al., [1].

Besides, the soiling of certain body parts with pig excrement at the head and abdomen were found to have a significant effect on the level of the androstenone and skatole leading to boar taint in the meat by Thomsen et al., [2].

One method of inhibiting sexual development and boar taint is immunization against Gonadotropin-Releasing Factor (GnRF) by Bonneau et al., or by chemical methods [3]. Therefore, this study aimed to understand certain carcass characteristics of pigs under the non-surgical mode of castrations using KMnO_4 and AgNO_3 .

(%) of LWY male pigs at 8 months of age are presented in **Table 1**

The mean \pm SE of the sensory attributes of meat in LWY male pigs at slaughter age of 8 months are presented in **Table 2**.

The mean live weight (kg) of pigs under T1, T2, and C groups at the end of the experiment were 102.67 ± 0.67 , 97.00 ± 1.50 & 98.00 ± 1.04 kg respectively. Statistical analysis revealed that the live weight of T1 at the end of the experimental study (i.e. at 180 days) was significantly higher ($P < 0.01$) than T2 and C groups. The higher pre-slaughter weight may be due to better FCE in T1 when compared to T2 and C groups.

The carcass weight of pigs under the T1, T2, and C groups were 74.67 ± 0.60 , 70.33 ± 1.09 & 69.17 ± 0.73 kg respectively after evisceration and exsanguination. The highly significant difference in the carcass weight of T1 may be due to the fact that animals in this group showed a highly significant weight of butt than the T2 and C. Moreover, during the experimental studies, it was found that the T1 group was having a better performance in terms of the weight of the different cut parts i.e. ham, loin, picnic, and jowl when compared to the T2 and C group but the difference was found to be non-significant as shown in **Figure 1- 6**. Similar work had also been reported by Gispert et al., Serrano et al., Zamaratskaia et al., and Oliver et al., of higher carcass weight under immune-castration [4-7].

The mean dressing percentage (%) of pigs under T1, T2, and C groups were 70.58 ± 0.10 , 72.73 ± 0.16 , and 72.51 ± 0.01 % respectively which was calculated out after recording the carcass weight and live weight. Statistical analysis shows a significantly lower dressing percentage in the C group ($P < 0.01$) compared to T1 and T2 groups.

The higher dressing percentage observed in chemical castration maybe because there was higher lean meat and lesser BFT in these groups as show in **Figure 7-9**. This maybe due to the increase in the testosterone hormones which promotes protein metabolism which in turn led to an increase in muscle mass and decreases the fat percent, which follows the finding by Schanbacher, Pond and Bonneau et al., [8,9].

The BFT recorded in the study was comparable to the findings of Serrano et al., Latorre et al., Fahim and Bonneau et al., reporting that the BFT were lower than those of animals under surgical castration [5,9-11]. The present study reveals that the measurements of BFT in chemically castrated animals (T1 and T2) were significantly lower when compared to the surgically castrated group (C). The higher BFT in the C group may be due to higher feed intake as the requirement of energy in surgically castrated pigs was more for decomposition of fats which subsequently and gradually deposited in the body by Balaji et al., [12]. The lower BFT in the chemically castrated animals may be due to the increase in the amount of meat, subsequently reducing the amount of fat percentage.

From the present study statistical analysis revealed that there was no significant difference in the sensory attributes of the meat among the treatment groups. Similar findings were also reported by Caldara et al., Zamaratskaia et al., Dunshea et al., Meloen et al., Fahim and Koger in which the animals were either

castrated by immune-castration or by chemical castration [6,11,13-18].

Charact eristics	Treatment group				
	C	T1	T2	f value	p Value
Live Weight (kg)	98.00 \pm 1.04b	102.67 \pm 0.67a	97.00 \pm 1.50b	7.43*	0.02
Carcass Weight(k g)	69.17 \pm 0.73a	74.67 \pm 0.60b	70.33 \pm 1.09a	12.09**	0.01
Head(kg)	7.60 \pm 0.10	7.10 \pm 0.56	6.27 \pm 0.37	2.97 NS	0.13
Fore shank(kg)	2.47 \pm 0.03	2.67 \pm 0.17	2.50 \pm 0.01	1.19 NS	0.37
Hind Shank(kg)	3.17 \pm 0.56	2.60 \pm 0.10	3.60 \pm 0.85	2.11 NS	0.2
Pluck(kg)	13.83 \pm 1.36	14.67 \pm 1.74	12.83 \pm 0.44	0.50 NS	0.63
Ham(kg)	16.87 \pm 0.33	17.83 \pm 0.17	16.67 \pm 0.58	1.14 NS	0.31
Loin(kg)	16.89 \pm 0.17	17.17 \pm 0.44	16.50 \pm 0.50	0.94NS	0.44
Picnic(kg)	17.17 \pm 0.27	18.17 \pm 0.33	16.33 \pm 0.60	0.04NS	0.96
Butt(kg)	18.36 \pm 0.33b	20.17 \pm 0.17a	19.00 \pm 0.60b	51.80**	0.001
Jowl(kg)	3.56 \pm 0.17	4.00 \pm 0.29	3.33 \pm 0.44	1.46 NS	0.31
BFT(cm)	4.13 \pm 0.09b	2.57 \pm 0.19a	2.90 \pm 0.10a	39.13**	0.001
Dressing (%)	70.58 \pm 0.10a	72.73 \pm 0.16b	72.51 \pm 0.01b	30.33**	0.001

(* Significant ($P \leq 0.05$), (** Significant ($P \leq 0.01$) and NS Non-significant
Note: Means bearing at least one common superscript in each row do not differ significantly.

Table 1: Mean Characteristics of meat between the different treatments.

Characteris tics	Treatment group			
	C	T1	T2	f value
Appearance	4.8 \pm 0.64	4.8 \pm 0.70	4.83 \pm 0.70	0.840 NS
Flavour	4.85 \pm 0.95	4.8 \pm 0.99	4.81 \pm 0.95	0.962 NS
Texture	4.2 \pm 0.76	4.5 \pm 0.70	4.25 \pm 0.51	0.136 NS
Juiciness	3.6 \pm 0.73	3.7 \pm 0.57	3.67 \pm 0.57	0.854 NS
Presence of Taint	5.95 \pm 1.15	5.58 \pm 1.04	6.25 \pm 0.64	0.157 NS
Overall Acceptability	5.7 \pm 1.00	5.6 \pm 1.63	5.95 \pm 0.69	0.641NS

(* Significant ($P \leq 0.05$), (** Significant ($P \leq 0.01$) and NS Non-significant
Note: Means bearing at least one common superscript in each row do not differ significantly.

Table 2: Mean sensory evaluation of meat between the different treatments.



Figure 1: Different primal cuts parts of pork.



Figure 2: Pork butt consists of parts of the neck, shoulder blade, and upper arm of the pig.



Figure 3: The lower part is called the picnic and includes the rest of the leg down to the hock.



Figure 4: Pork loin is a cut of meat from a pig, created from the tissue along the dorsal side of the rib cage.



Figure 5: Ham is a specific cut of the pork meat from the pig's thighs.



Figure 6: Pork jowl is a cut of pork from a pig's cheek.



Figure 7: The figure shows the head part of pig.



Figure 8: Fore shank is the front forearm of the pig.



Figure 9: Hind shank is a part of a pig.

Conclusion

It may also be pointed out that the pigs castrated with chemicals were found to have lower Dressing percentage and Back Fat Thickness and higher Carcass weight and Pre-Slaughter Weight when compared to the surgically castrated pigs. From the present research work, it was also found that the taint odor in the meat of the pork between the chemical castration and surgical castration yield no significant difference. Concluding that the chemical castration may also be effective in controlling the boar taint.

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