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EFFECT OF SORGHUM ON CARCASS AND MEAT QUALITY OF MUSCOVY AND COMMON DUCKS *(Cairina moschata L. and Anas platyrhynchos L.)*

EFFETTO DELL'INTRODUZIONE DELLA FARINA DI SORGO NEL MANGIME SULLE RESE DI MACELLAZIONE E SULLA QUALITÀ DELLA CARNE DI ANATRE MUSCHIATE *(Cairina moschata L)* E COMUNI *(Anas platyrhynchos L.)*

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SUMMARY

Two experiments were carried out during one year to evaluate the carcass and meat quality parameters in Italian strains of Muscovy and Common ducks fed *ad libitum* with diets containing sorghum. In the 1st trial, three experimental diets were formulated using corn, corn with high tannin sorghum and high tannin sorghum, as cereal base. In the 2nd trial, three experimental diets were formulated using corn, low tannin sorghum, and low tannin sorghum with high tannin sorghum as cereal base; the diets containing sorghum were supplemented with synthetic aminoacids during starter and finisher periods. The results showed that sorghum based diets may not affect the fresh meat quality characteristic but seem to modify the quality parameters of meat submitted to physical treatments (deep freezed then thawed).

Key words: sorghum, feed, duck, slaughtering, meat

RIASSUNTO

In due diversi esperimenti é stato studiato sulle rese di macellazione e sulla qualità della carne di anatra muschiata e comune l'effetto dell'impiego del sorgo in diete per accrescimento e finissaggio.

Nel corso delle prove le diete sono state fornite *ad libitum* ad ambedue le specie di anatra. Nella prima prova sono state testate tre differenti diete, un controllo, nel quale il

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cereale base era rappresentato dal mais e due trattati, nei quali una varietà di sorgo ad elevato contenuto di tannini (**hts** - bird resistant) sostituiva al 50% (trattamento 1) o completamente (trattamento 2) il mais. Nella seconda prova, oltre al controllo a base di mais, sono state impiegate due diete, nella prima il cereale base era una varietà bianca di sorgo (**lts** - a basso contenuto di tannino) e nella seconda il cereale base era una miscela di sorgo rosso (**hts**) e sorgo bianco (**lts**).

I risultati hanno mostrato che l'introduzione del sorgo nelle diete per anatre non determina variazioni significative delle rese di macellazione e dei parametri di stima della qualità della carne fresca ma sembra modificare i parametri qualitativi della carne sottoposta a trattamenti di congelamento.

Parole chiave: sorgo, alimentazione, anatra, macellazione, carne.

INTRODUCTION

In our previous experiments we observed the effect of sorghum on growing performances and slaughtering traits of some Italian strains of ducks, characterised by high rusticity and by reduced fat content of carcasses (Paci et al., 1992, 1993). The ducks, fed with low tannin sorghum or with high tannin sorghum supplemented with synthetic aminoacids, showed comparable growth rates and feed efficiencies to the ducks fed with the corn based diets. The results showed the possibility to use sorghum in diets for ducks when synthetic aminoacids are used to reduce the anti-nutritional effects related to the tannin content of sorghum (Paci et al., 1995).

The purpose of the present study was to study the effect of sorghum on the slaughtering traits and some quality parameters of Muscovy and Common duck meat.

MATERIAL AND METHODS

Two experiments were carried out during one year: 136 Muscovy ducks males (MD) and 212 Common ducks females (CD) were used in the 1st trial, and 132 MD males and 225 CD females were used in the 2nd trial. The ducks, outside finished (Paci et al., 1995), were fed *ad libitum* with 3 diets containing corn, high tannin sorghum (HTS) (.81% tannin a.f.b), and low tannin sorghum (LTS) (.12% a.f.b tannin) as cereal base. No animal components were used in the diets.

In the 1st trial, 3 diets were formulated. Cereals base in the starter-

grower period were corn 69%, corn 37% with high tannin sorghum 34%, and high tannin sorghum 74% (ME and CP of CORN, CORN+HTS, and HTS were: 12.52MJ/Kg and 17.9%, 12.23MJ/Kg and 18.4%, 12.05MJ/Kg and 18.2%, respectively). Cereal base in the finisher period were corn 75%, corn 41% with high tannin sorghum 36%, and high tannin sorghum 78% (ME and CP of CORN, CORN+HTS, and HTS were: 12.81MJ/Kg and 15.6%, 12.77MJ/Kg and 15.5%, 12.57MJ/Kg and 16.0%, respectively).

In the 2nd trial, 3 experimental diets were formulated. Cereals base in the starter-grower period were corn 70%, low tannin sorghum 69%, and low tannin sorghum 36% with high tannin sorghum 36% (ME and CP of CORN1, LTS, and LTS+HTS were: 12.30MJ/Kg and 18.0%, 12.21MJ/Kg and 18.0%, 11.94MJ/Kg and 18.3%, respectively). Cereals base in the finisher period were corn 76%, low tannin sorghum 75%, low tannin sorghum 38% with high tannin sorghum 38% (ME and CP of CORN1, LTS, and LTS+HTS were: 12.51MJ/Kg and 15.7%, 12.63MJ/Kg and 15.9%, 12.35 MJ/Kg 16.1%, respectively). In the 2nd trial the sorghum based diets were supplemented with amino acids (content was related to tannin content of the diets).

In both trials 15 ducks from each group were slaughtered at 11 weeks (MD) and 8 weeks (CD). The ducks, electrically stunned (200 V - 5"), bled, dry-plucked, were reduced to carcasses. After 24 h chilling (4°C ± .5°C) the following traits were weighed: ready to cook carcass (RCC), legs, skin with subcutaneous fat, and breast muscles (BM). BM of 5 ducks per group were used to determine water holding capacity (WHC) according the Grau and Hamm' method (Grau and Hamm, 1957). Left legs of 10 ducks per group were frozen (-30°C), and thawed (24 h at 4°C ± .5°C) to determine the thawing loss (TL). Muscle to bone ratio (M/B ratio) was measured in 6 right legs per group by hand separation after bag boiling for 2.5 hours (water temperature 80°C). In the 2nd experiment the TL was measured also in the BM of 10 ducks per group. Data of both trials were analysed by variance analysis to test the effect of diets and duck species (Wilkinson, 1988).

RESULTS AND DISCUSSION

The ducks, particularly MD, fed HTS gave lower live weights, lower

food intakes, worse feed efficiencies, and lower slaughtering traits (higher incidence of the skin with subcutaneous fat on the RCC) than ducks fed CORN or CORN+HTS, probably due to the high tannin content of diets. In the 2nd trial the productive performances of ducks (MD and CD) fed with LTS or LTS+HTS did not show any lack of growth, probably on account of the amino acids additions (Paci et al., 1995).

Slaughtering traits and meat quality parameters of MD and CD are tabulated in table 1 and 2, respectively. In the 1st trial, MD fed CORN or CORN+HTS showed heavier RCC ($p<.05$) and better BM yields ($p<.01$) than MD fed HTS. In the 2nd trial, MD fed CORN1 or LTS+HTS showed higher RCC weights ($p<.05$) than MD fed LTS. A worsening of BM incidence resulted in MD fed LTS+HTS ($p<.05$), probably due to the amino acid supply, sufficient for growth but not enough to sustain the BM development. The higher skin rates and the greater incidence of waste and of the low value components of RCC may explain the observed reduction of BM in MD fed LTS+HTS (Paci et al., 1995). No statistical difference was observed in the leg yields, and in the meat and bones weights of the leg. The highest value of M/B ratio was observed in HTS. In the 2nd trial, MD fed LTS+HTS resulted in lower weights of the leg bones (not significant), and higher weights of the leg muscles ($P<.05$) with consequent better M/B ratio ($p<.05$) than MD fed CORN1 and LTS. In the 1st and in the 2nd trial MD fed sorghum-based diets showed the highest TL of the leg, ($P<.05$ and $P<.01$, respectively). The BM thawing losses showed contrary not significant trends. Only in the 1st trial the BM water holding capacity was lower in sorghum based diets ($p<.05$).

In the 1st trial, CD fed HTS (table 2) showed lower BM proportion than CD fed CORN and CORN+HTS ($P<.01$). In the 2nd trial CD fed LTS+HTS showed lower leg proportions ($p<.05$). No change was observed in M/B ratio. In the 2nd trial CD fed sorghum-based diets showed the highest leg thawing losses ($P<.05$). No change was observed in BM water holding capacity.

The results showed that sorghum based diets may not affect the fresh meat quality characteristic but seem to modify the quality parameters of meat submitted to physical treatments (deep freezed then thawed). Consequently the quality of the carcasses, freezed or deep freezed for conservation, can be worsened when ducks are fed sorghum based diets.

Table 1 - Muscovy duck: slaughtering traits and water retaining of meat in 77 days old birds.

		FIRST TRIAL		
		CORN mean ± s.d.	CORN+HTS mean ± s.d.	HTS mean ± s.d.
RCC	g	1977±106.7a	1970±109.5a	1908±135.7b
BM/RCC	%	17.2±1.22 A	17.8±1.83 A	13.5±1.43 B
Leg/RCC	%	10.5±.72	10.8±.67	10.9±.29
" meat	g	175±21.8	175±12.1	178±8.1
" bones	g	38±3.9	37±5.3	35±2.9
M/B ratio		4.7±.80	4.8±.77	5.1±.53
Leg	g	215±17.1	203±14.6	204±15.9
TL/Leg	%	3.1±1.23 b	3.5±1.90 b	7.0±2.39 a
BM	g			
TL/BM	%			
WHC		.42±.024 a	.38±.048 a	.27±.029 b
		SECOND TRIAL		
		CORN1 mean ± s.d.	LTS mean ± s.d.	LTS+HTS mean ± s.d.
RCC	g	2107±112.1a	2076±98.4 b	2112±120.4a
BM/RCC	%	19.5±1.32 a	18.1±1.73ab	17.8±1.47 b
Leg/RCC	%	10.4±.53	10.6±.59	11.0±.79
" meat	g	185±13.5 b	185±8.1 b	189±17.0 a
" bones	g	39±3.0	39±2.4	35±3.9
M/B ratio		4.8±.41 b	4.8±.22 b	5.4±.38 a
Leg	g	222±12.1	220±8.9	224±20.7
TL/Leg	%	1.8±0.53 B	2.4±0.65AB	2.6±0.94 A
BM	g	417±34.5 A	387±47.4 B	381±41.0 B
TL/BM	%	12.2±4.10	9.7±2.61	8.9±3.34
WHC		.49±.021	.46±.019	.47±.020

TL = Thawing loss; WHC = water holding capacity; Values within each trial with different letter in row are significantly different (capital letter $p<.01$, cursive letter $p<.05$).

Table 2 - Common duck: slaughtering traits and water retaining of meat in 56 days old birds.

		FIRST TRIAL		
		CORN mean ± s.d.	CORN+HTS mean ± s.d.	HTS mean ± s.d.
RCC	g	944±46.2	937±47.4	921±62.0
BM/RCC	%	11.2±1.46 A	11.9±2.74 A	7.4±1.34 B
Leg/RCC	%	10.6±.58	10.2±.70	11.3±.11
" meat	g	84±7.8	83±7.5	83±3.0
" bones	g	15±1.2	16±2.5	16±1.3
M/B ratio		5.5±.57	5.2±.61	5.2±.39
Leg	g	104±8.9	99±7.1	91±4.2
TL/Leg	%	2.5±.82	2.3±1.05	3.2±1.24
BM	g			
TL/BM	%			
WHC		.38±.025	.33±.063	.31±.028

		SECOND TRIAL		
		CORN1 mean ± s.d.	LTS mean ± s.d.	LTS+HTS mean ± s.d.
RCC	g	1069±82.5	1092±101.5	1094±104.8
BM/RCC	%	15.5±1.76	15.1±1.07	16.1±1.53
Leg/RCC	%	9.8±.59 a	9.1±.76ab	8.7±.71 b
" meat	g	84±8.3	84±6.7	84±8.3
" bones	g	15±1.8	14±1.0	15±.8
M/B ratio		5.7±.53	5.9±.61	5.7±.63
Leg	g	105±8.6 A	101±9.2AB	96±10.5 B
TL/Leg	%	2.7±1.0 b	4.1±.78 a	3.7±1.98ab
BM	g	172±23.4	168±19.6	178±19.4
TL/BM	%	13.1±2.49	14.3±4.34	17.2±7.30
WHC		.47±.02	.45±.02	.51±.02

TL = Thawing loss; WHC = water holding capacity; Values within each trial with different letter in row are significantly different (capital letter p<.01, cursive letter p<.05).

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