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MEAT QUALITY OF ITALIAN STRAINS OF MUSCOVY, COMMON AND MUSCOVYxCOMMON DUCKS BRED UNDER TWO DIFFERENT TECHNOLOGIES.

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Abstract

The Authors evaluated the performances of some ducks bred in Italy. The meat quality was studied in relationship to two different breeding techniques (whole inside a poultry house; first period in poultry house then second period, from 29 days to slaughtering age, in pens at open air).
478 Muscovy ducks (MD)(178 males and 300 females), 478 Common ducks (CD)(178 males and 300 females) and 240 mule ducks (mulards) were used for the trial. A sample of each species, bred under the two systems, was slaughtered (11 weeks MD–males, 9 weeks MD–females, 8 weeks both sexes of CD and 10 weeks mulards).
Results showed that the system which imposed the open air period did not determine a reduction of growth speed, on the contrary males and mulards improved their growth. No statistical differences were observed between slaughtering traits in relationship to the systems of breeding. Mulards showed carcass traits more similar to MD–males (ready to cook carcass incidence was 63%, 65% and 58%, in mulards, MD–males and in both sexes of CD, respectively). Breast muscles rate was higher in mulards than MD–males, MD–females and both sexes of CD (23% vs 20%, 17% and 17–18%). Abdominal fat incidence decreased with age and at traditional slaughtering ages was very low: mulards 0.8%, MD–females 2.7%, MD–males 1.5%, CD 1.3–2.2%. Dry matter of breast muscle was higher in mulards than in MD and CD. Shear force was lower in mulards than in all other species.

Résumé

On a étudié les caractéristiques de croissance et la qualité de la viande de différents types de canards obtenus en Italie selon deux techniques d'élevage différentes. Cette expérimentation a porté sur 478 canards de barbarie (groupe MD, comprenant 178 mâles et 300 femelles), 478 canards communs (groupe CD, 178 mâles et 300 femelles) et 240 canards mulards non sexés. Tous les canetons ont été élevés jusqu'à l'âge de 28 jours en poussinière. Les animaux ont été ensuite séparés en deux groupes : un lot est resté dans le même bâtiment, l'autre a été transféré dans des parquets de plein air. Un échantillon de chaque espèce a été abattu aux âges suivants : 8 semaines pour les canards communs (groupe CD), 9 semaines pour le groupe MD–femelles, 10 semaines pour les canards mulards, et 11 semaines pour le groupe MD–mâles.

Les résultats ont montré que l'élevage en plein air à partir de 29 jours ne réduisait pas la croissance des animaux (en particulier pour les mâles et les mulards). On n'a pas observé de

différences statistiques entre systèmes d'élevage pour le rendement à l'abattage. Les mulards avaient un rendement carcasse plus proche des barbarie-mâles que des canards communs : rendement P.A.C. de 63 % pour les mulards, 65 % pour le groupe MD-mâles et 58 % pour le groupe CD. La proportion des filets sans peau était plus élevée chez les mulards (23%) que pour les groupes MD-mâles (20 %), MD-femelles (17 %) et CD (17 à 18 %). On a observé une diminution du pourcentage de gras abdominal quand l'âge augmente et à l'âge habituel d'abattage, ce pourcentage est faible : 0,8 % pour les mulards, 1,5 % pour les mâles MD, 2,7 % pour les femelles MD et 1,3 à 2,2 % pour le groupe CD. La matière sèche du filet sans peau était plus abondante chez les mulards que chez les autres canards. La tendreté du filet (mesuré avec l'appareil de Warner-Bratzler) était plus grande chez les mulards.

Introduction

Duck provide meat in several countries of the world, for this purpose not only one specie of duck is used. Two different species are the most widespread for meat production: Muscovy duck (MD) – mainly in France and Italy – and Common duck (CD) – mainly in North Europe and in South East-Asia. The most popular duck for meat production is the CD (particularly the Peckin types) but in some countries, where the high content of fat in the carcass is not a desirable characteristic, the preferred duck is the Muscovy duck (e.g. in France and Italy).
In these last years a great improvement of duck performances have been achieved through specific genetic programs carried out in some European countries. On the contrary in Italy the local ducks were not submitted to specific genetic programs to improve their performances, since the market of duck meat is quite limited. The popular prejudice which considers duck meat very fat, dark and with a particular taste limited duck production to small farms which did not select for growth speed.
The purpose of present study was to evaluate the performance and the characteristics of meat quality of the local strains of Muscovy, common and hybrid ducks bred under two different breeding techniques.

Experimental procedures

The experiment was carried out during two years: 478 Muscovy ducks (178 males and 300 females) and 478 Common ducks (178 males and 300 females) were used in the first trial and 240 mulards were used in the second trial. All the ducks belonged to local strains, not selected for growth speed. Both trials were carried out during the favourable seasons (Spring through early Summer). The ducklings of each experiment, randomly chosen, were bred in six different pens, inside a window-less poultry house from one to 28 days old (day-light: 23L:1D). In the first trial the density was 6 males/m² and 10 females/m² ; in the second trial the density was 10 mule-ducks/m². At the age of 29 days the birds were divided into two groups: one half (intensive ducks) continued to be bred inside the poultry house (day-light: 10L:14D) while the other half (open air ducks) was transferred to open air pens. The density in each pen was 3 males/m² or 5 females/m² or 5 mule ducks/m². All ducks fed ad libitum two commercial diets (starter and finisher) (Paci et al., 1992). Individual live weights and feed consumption per pen were recorded weekly. A sample of each duck, bred under the two systems, was

slaughtered at the traditional ages: 11 weeks for MD–males and 9 weeks for MD–females, 8 weeks for CD and 10 weeks for mulards. The ducks were electrically stunned (200 V per 5") then bled and dry–plucked. The ducks were immediately dissected and the following traits were weighted: dry–plucked and bled carcass, neck with head, legs, giblets, gizzard, liver, ready to cook carcass, abdominal fat, skin with subcutaneous fat and breast muscles. The left breast muscle was cold–boned to test shear force by Warner–Bratzler equipment. Chemical composition of breast muscle was determined according to the A.O.A.C. methods of analysis: crude protein (CP) and ether extract on deep freezed samples, dry matter (DM) on fresh cooled samples. Data were analysed by variance analysis to test the effect of system of breeding within the different category of duck and sex.

Results and discussion

Live weights of growing birds (estimated means and variation coefficients) starting from the week after the assignment to poultry house or open air groups are shown in table 1.
The live weights confirmed the typical differences between the waterfowl species. Within the same specie, the CD showed an early growth and slight differences in size between sexes. The MD confirmed a slower growth than CD at the youngest ages and marked differences in body weight between sexes from the 5th week, even if the sexes can be distinguished by weight just from the 3rd week of age (Paci et al., 1992a; Paci et al., 1992b).
In Mulards sexual dimorphism was very limited and their live weights were always heavier than live weight of MD–female and CD–female, independently of breeding system. Starting from 9 weeks of age Mulards exceeded also in live weight the CD–male (2300 g vs. 2150 g, respectively).
In comparison with data obtained out of Italy on the same species, the performance of the MD did not overtake the performances of the strains selected in France (Sauveur et al., 1990), West Germany (Torges, 1986), Hungary (BogrΘnΘ et al., 1992), and Israel (Meltzer, 1988) but were quite similar to the strains bred in East Germany (Pingel, 1988–1989; Pingel, 1990; Pingel et al., 1992).
The CD showed live weights lower than those referred in North Europe (Powell, 1988; Pingel, 1990; Ricard et al., 1985) and other Countries (Abdelsamie and Farrel, 1985; Tai, 1985). Consequently our Mulards did not reach the body weight of hybrids obtained in the other Countries from heavier parents. It is important to point out that the ducks used in our trial became from commercial flocks normally used for meat and eggs production in Italy.
The different breeding systems showed a significant effect on the performances of the birds ($P<.05$). All ducks, except for MD–females, showed a better growth in the open air breeding. The MD–males improved their growth starting from 6 weeks (two weeks after their transfer to open air) and CD–males from 7 weeks. CD–females and mule ducks showed the improvement of performances already from the first week of breeding at open air. Since different results have been obtained in broilers by Ricard (1988) and Scholtyssek et al. (1985), our results may be explained by the best climatic condition induced in the open air pens, in comparison with the poultry house, by the period of the year in which the experiments were carried out (Spring – Summer).
Feed consumption was stimulated by open air breeding and feed conversion efficiency did not show significant differences between the breeding systems (1–77 d.:open–air–MD–males = 3.5 and intensive–MD–males = 3.2; 1–63 d.: open–air–MD–females = 3.2 and

intensive-MD-females = 3.1; 1-56 d.: open-air-CD-males = 3.8 and intensive-CD-males = 4.3; 1-56 d.: open-air-CD-females = 3.7 and intensive-CD-females = 4.0; 1-70 d.: open-air-mule-ducks = 4.0 and intensive-mule-ducks = 3.7).

In table 2 the slaughtering traits at the traditional ages are reported in relationship to the different breeding systems; the obvious differences between species have been omitted.

The MD and CD showed favorable slaughtering traits, being considered to the very limited selection for meat production they were submitted. Within MD the ready cook carcass rate, the breast muscles and the skin with subcutaneous fat were 65.1%, 20.5% and 17.1% in males and 61.6%, 17.2% and 19.9% in females. Within CD the ready cook carcass rate, the breast muscles and the skin with subcutaneous fat were 58.2%, 18.1% and 19.8% in males and 58.6%, 17.5% and 23.9% in females. A superior carcass traits resulted in the mule ducks for a higher proportion of "filets" (23.7%) and lower percentage of abdominal fat (0.8%) than their parents.

Comparing our slaughtering traits with data reported out of Italy, the carcass rates of MD-males were similar to the rates observed in France and East Germany MD (62.6% - Sauveur and de Carville, 1990; 65.2% - Pingel, 1990), while inferior to the rates (67.2%) reported by Torges (1986). The breast muscles rate was similar to the rate of French MD (21.8% - Sauveur and de Carville, 1990), but differed from the rate observed in German MD (16.0% - Pingel, 1992; 30.3% - Torges H.G., 1986).

The CD produced good carcass conformations even if they showed carcass rates lower than those reported out of Italy (60.6% - Sauveur and de Carville, 1990; 64.1% - Pingel, 1990). The percentage of "filets" and of skin with subcutaneous fat were 17.8% and 21.8%, respectively.

The carcass rates of hybrids obtained by crossing Italian strains (62.8%) resulted slightly higher than those reported in France (60.9% - Sauveur and de Carville, 1990) and lower (68.0%) than those described by Pingel (1992). The Italian hybrids resulted in higher breast proportions (23.7%) than those produced out of Italy (20.9% - Sauveur and de Carville, 1990; 15.8% - Pingel, 1990).

The different breeding systems did not influence significantly the slaughtering traits of ducks even if open air bred birds seemed to be slightly more omogeneous and gave heavier ready to cook carcasses. The good performances of the hybrids appeared in a good growth and meat proportion, more evident in mule ducks bred at open air than in the intensively bred ducks (breast muscles: intensive breeding, 23.2%; open air breeding, 24.2%).

Some chemical and physical characteristics of the breast muscles in relationship to the different breeding systems are reported in table 3.

In all the ducks, at the traditional slaughtering ages, dry matter and protein content of breast muscles showed a similar degree of maturity. In particular the dry matter and the protein content were higher in CD (DM=24.9%, CP=20.6%) and mule duck (DM=25.5%, CP=21.1%) than in MD (DM=23.4%, CP=19.9%). The quick growth rate of CD and mule ducks may explain the observed values.

Within species, fat content in breast muscles was lower in MD-females than MD-males (1.5% vs 2.4%) and higher in CD-females than in CD-males (2.8% vs 2.4%). Mule ducks showed a lower fat content of breast muscles than their parents (2.1%). The shear values were lowest in the mule ducks (1.5 Kg/cm2) probably on account of the superior development of the muscle fibres.

No statistical differences were observed between chemical composition of breast muscles in relationship to the systems of breeding.

The characteristics of meat observed in the local strains seem to give the opportunity to produce carcasses more accepted by the Italian consumer.

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Table 1- Live weights at different ages in relationship to the different breeding systems.

Age	Breeding system		Muscovy ducks		Common ducks		Mule ducks
			male	female	male	female	
5 weeks	intensive	x g	1560[a]	1183	1466[a]	1246[b]	1293[b]
		v.c.	8.3	11.6	10.5	8.9	11.8
	open air	x g	1513[b]	1081	1398[b]	1319[a]	1464[a]
		v.c.	10.7	9.2	6.8	8.9	10.8
6 weeks	intensive	x g	2003[b]	1410	1753[a]	1491[b]	1663[b]
		v.c.	6.9	11.6	7.1	9.0	11.2
	open air	x g	2040[a]	1405	1713[b]	1665[a]	1754[a]
		v.c.	5.9	9.2	7.6	9.0	10.8
7 weeks	intensive	x g	2390[b]	1736[a]	1855[b]	1562[b]	1868[b]
		v.c.	8.2	11.7	11.1	9.4	11.9
	open air	x g	2511[a]	1690[b]	1961[a]	1839[a]	1968[a]
		v.c.	8.1	10.7	7.5	9.4	10.9
8 weeks	intensive	x g	2806[b]	1954	1994[b]	1775[b]	1980[b]
		v.c.	11.0	10.3	10.7	9.8	11.4
	open air	x g	2923[a]	1933	2139[a]	1970[a]	2153[a]
		v.c.	8.2	9.8	7.3	9.7	10.6
9 weeks	intensive	x g	3160[b]	2135[a]	2058[b]	1741[b]	2161[b]
		v.c.	6.5	10.6	11.2	11.8	12.1
	open air	x g	3280[a]	2089[b]	2247[a]	2046[a]	2440[a]
		v.c.	8.2	10.0	6.9	10.2	9.2
10 weeks	intensive	x g	3445	2212[a]	2156[b]	1835[b]	2397[b]
		v.c.	6.3	10.0	8.9	13.0	10.4
	open air	x g	3484	2153[b]	2300[a]	2065[a]	2598[a]
		v.c.	8.3	9.9	7.5	10.1	9.0
11 weeks	intensive	x g	3604[b]	2280[a]	2256	1799[b]	2452[b]
		v.c.	4.2	11.6	8.8	9.8	8.28
	open air	x g	3669[a]	2189[b]	2243	2033[a]	2679[a]
		v.c.	4.4	9.5	5.2	10.0	8.9
13 weeks	intensive	x g	3780	2348	2335	1881[b]	2488*[b]
		v.c.	5.5	10.4	7.0	10.3	7.7
	open air	x g	3816	2294	2281	2076[a]	2767*[a]
		v.c.	7.3	10.5	6.9	11.2	5.9

*live weights measured at 12 weeks.

Note: intensive and open air breeding are significantly different ($P<.05$) when means bear different letter.

Table 2 - Slaughtering traits in relationship to the different breeding systems (breast muscles, skin with subcutaneous fat and abdominal fat in percentage on ready-cook-carcass).

	Breeding system		Muscovy ducks		Common ducks		Mule ducks
			male 11 weeks	female 9 weeks	male 8 weeks	female 8 weeks	10 weeks
Live weight	intensive	x g	3601	2114	1858	1768	2450
		v.c.	5.7	7.8	6.6	6.7	6.8
	open air	x g	3603	2042	2142	2030	2554
		v.c.	3.1	6.4	7.3	5.4	7.7
Ready-cook-carcass	intensive	%	64.9	61.0	58.2	58.4	62.3
		v.c.	3.3	3.1	4.2	3.4	6.4
	open air	%	65.2	62.2	58.1	58.7	63.3
		v.c.	1.5	0.6	2.0	1.8	8.3
Breast muscles	intensive	%	20.7	18.1	18.5	16.8	23.2
		v.c.	6.1	9.9	8.5	8.8	4.5
	open air	%	20.3	16.4	17.7	18.1	24.2
		v.c.	4.8	10.0	5.0	3.1	5.0
Skin with subc. fat	intensive	%	17.3	21.2	19.6	22.9	18.0
		v.c.	7.5	5.6	6.6	8.4	4.9
	open air	%	16.9	18.6	19.9	24.9	19.6
		v.c.	5.8	7.5	8.2	6.8	4.5
Abdominal fat	intensive	%	1.4	2.5	1.3	1.3	0.6
		v.c.	10.0	10.0	13.4	13.1	10.3
	open air	%	1.6	2.8	1.4	2.2	0.9
		v.c.	8.1	11.8	13.0	12.7	12.1

Table 3 - Chemical and physical characteristics of the breast muscles in relationship to the different breeding systems (value a.f.b.).

	Breeding system		Muscovy ducks		Common ducks		Mule ducks
			male 11 weeks	female 9 weeks	male 8 weeks	female 8 weeks	10 weeks
Dry matter	intensive	%	23.5	23.7	23.4	26.0	25.0
	open air	%	23.1	23.1	25.7	24.4	26.0
Crude protein	intensive	%	20.2	19.6	20.8	20.5	21.1
	open air	%	19.8	19.9	21.5	19.6	21.1
Ether extract	intensive	%	2.5	1.6	2.1	2.6	2.2
	open air	%	2.3	1.3	2.6	2.9	2.0
Shear force	intensive	Kg/cm²	2.6	2.3	1.7	2.0	1.5
	open air	Kg/cm²	2.3	2.0	1.7	1.5	1.5

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