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**EFFETTO DELLA TECNICA DI ALLEVAMENTO
SULLE PERFORMANCES E SULLA QUALITÀ
DELLA CARNE NEL MULARD**

**EFFECT OF BREEDING SYSTEM ON PERFORMANCES
AND MEAT QUALITY OF ITALIAN MULARD**

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RIASSUNTO

Scopo della ricerca è stato quello di valutare l'effetto di diversi sistemi di allevamento sulle performances produttive dell'ibrido intergenerico ottenuto da ceppi locali di anatra muschiata ed anatra comune (mulard).

120 soggetti sono stati allevati in clausura dalla nascita fino all'età di macellazione, altrettanti sono stati trasferiti in recinti all'aperto dal 29° giorno di vita fino all'epoca di macellazione.

I risultati indicano un miglior accrescimento nei soggetti allevati all'aperto sin dalla settimana seguente il trasferimento. Non sono emerse differenze significative tra le rese di macellazione dei due gruppi, sebbene sia stata rilevata una tendenza a rese migliori nel campione appartenente ai soggetti allevati all'aperto. Quanto da noi osservato sembra indicare la possibilità di impiego del mulard nell'allevamento all'aperto in condizioni climatiche favorevoli.

Parole chiave: anatra, allevamento, qualità della carne

ABSTRACT

The aim of the study was to investigate the effect of the intensive and semi-intensive breeding on the performances and meat quality of Italian mulards, the hybrid ducks obtained by crossing local strains of Muscovy drakes with local strains of Common ducks.

240 mulards were used for the trial carried out during the favourable seasons (spring through early summer). Ducklings, randomly chosen, were located in six different pens inside a windowless poultry house from one to 28 days old. At 29 days old, the mulards were assigned to two groups: one half continued to be bred inside the poultry house and the other half was transferred to open air pens, six pens inside the poultry house and six

(1) Borsista C.N.R.

pens at open air were used in total. Individual live weights and feed consumption per pen were recorded weekly. A sample of mulards (12 birds for each group) was slaughtered starting from 7 till 11 weeks of age. Slaughtering traits and chemical composition of breast muscles were recorded.

Results showed that during the first week at open air the ducks grew significantly quicker than the intensive ducks. After the first week at open air the growth speed of open air ducks reduced but it became again higher at the 8th and at the 9th week of age. At every age ducks bred at open air showed higher weights than the other group of ducks. Slaughtering traits did not show significant differences between the birds bred under the two technologies, although a tendency to best traits was observed in the open air ducks. No difference between the chemical composition of the breast muscle were observed in relationship to the different breeding systems.

Our results confirmed the possibility of using mulards in semi-intensive systems of breeding with good results. The favourable environmental conditions and good hygiene, which satisfy the requirement of duck welfare, improved the potential of heterosis resulting in a better growth rate and a trend to better meat proportion in the mulard bred at open air.

Key words: duck, breeding system, meat quality

INTRODUCTION

In Italy the poultry industry is founded on the intensive breeding but a new tendency is rising: the semi-intensive system, which consists in the open air breeding during the last period of growth.

It is well known that the breeding system is one of the *ante-mortem* factors which affects meat quality. In France the semi-intensive breeding, is the principal condition to obtain the registered trademark "Label Rouge" (1).

Consumers are greatly interested in quality and animal welfare. Buildings and equipment must maintain good conditions of hygiene, avoid behavioural disorders and traumatic injuries so to obtain the best carcass characteristics (10).

Duck breeding is widely used in several countries to produce meat. Two different species of duck are commonly used for meat production: Muscovy duck - mainly in France and Italy - and Common duck - mainly North Europe and South East-Asia (2, 4, 11).

In Italy the consume of duck meat is not widespread for three main reasons: the expensive price, the particular taste of the meat and the common opinion that the carcasses have an high fat content, even if Muscovy duck are less fat than Common ducks.

Our previous experiments, carried out with Muscovy and Common ducks during favourable seasons, showed positive results in relationship to the semi-intensive system of breeding (5, 6, 7, 8). The aim of the present study was to investigate the effect of the breeding systems on the growing performances, the carcass traits and the meat quality of the mulards, the mule ducks obtained by crossing Muscovy drakes with Common ducks.

MATERIALS AND METHODS

240 mulards (local Muscovy drake x local Common duck) were used for the trial, carried out during the favourable seasons (spring through early summer). Ducklings, randomly chosen, were bred in six different pens inside a windowless poultry house from one to 28 days old (day light: 23L:1D). The mulards were bred at the density of 10 birds/m². At 29 days old the ducks were divided into two groups: one half ("intensive ducks") continued to be bred inside the poultry house (day light: 10L:14D) and the other half ("open air ducks") were transferred to open air pens; six pens inside the poultry house and six pens at open air were used starting from this age. The density in every pen was 5 mulards/m².

Ducks fed *ad libitum* two commercial diets (3). Crumble feed was given from one to 42 days old (M.E.=12.01 MJ/Kg, crude protein=18.05%, crude fibre=4.27%) and pellet feed from 43 days old to slaughtering age (M.E.=12.50 MJ/Kg, crude protein=16.43%, crude fibre=3.99%).

Individual live weights and feed consumption per pen were recorded weekly.

A sample of mulards (12 birds from each group) was slaughtered weekly starting from 7 till 11 weeks of age. The live weights (LW) of ducks were measured immediately before slaughtering. Then the ducks were electrically stunned (200 V for 5"), bled and dry plucked. The mulards were immediately dissected and the following traits were weighed: dry plucked and bled carcass, neck with head, legs, giblets, gizzard, liver, ready to cook carcass (RCC), abdominal fat (FAT), skin with subcutaneous fat (SKIN) and breast muscles (BM). The left breast muscle was cold boned and used to test shear force (SHEAR) by Warner-Bratzler equipment.

Chemical composition of breast muscles was determined according to

the A.O.A.C. methods of analysis: crude protein (PROT) and ether extract (EE) on deep-freeze samples, dry matter (DM) and ashes (ASH) on fresh samples.

Data were analysed according to the following models:

$$\text{Live Weight}_{ijk} = \mu + \text{BS}_i + \text{PEN}_j + e_{ijk}$$

$$\text{Feed Conversion Efficiency}_{ij} = \mu + \text{BS}_i + e_{ij}$$

$$\text{Slaughtering trait}_{ijk} = \mu + \text{COV}_{x_{ijk}} + \text{BS}_i + \text{PEN}_j + e_{ijk}$$

$$\text{Breast Muscles characteristic}_{ijk} = \mu + \text{BS}_i + \text{PEN}_j + e_{ijk}$$

where:

μ = overall mean; BS = breeding system; PEN = pen; COV = LW for RCC and RCC for SKIN, FAT or BM; e = residual error.

RESULTS AND DISCUSSION

Daily growth rate (estimated means and variation coefficients) of birds bred under the two different breeding systems are shown in table 1.

During the first week at open air the ducks showed a better growth than the "intensive duck": the daily weight gain was 49.6 g/d vs. 42.9 g/d, $P < 0.05$. After the first week at open air the growth rate of semi-intensive ducks decreased but it became again higher at the 8th and the 9th week of age (27.4 g/d and 42.9 g/d, for 7-8 and 8-9 weeks of age in "open air duck", vs. 16.5 g/d and 22.5 g/d, for 7-8 and 8-9 weeks of age in "intensive duck" $P < 0.05$). After the 10th week of age the daily growth became very small and feed efficiency becomes very high in both groups.

Figure 1 shows the trend of growth in the "intensive and open air animals". Ducks bred at open air always showed higher live weights than the other group of ducks.

Feed intake was stimulated by open air breeding but feed conversion was only slightly worsened with no significant differences (1-70d.: open air duck 4.0 and intensive duck 3.7).

Slaughtering traits, Table 2, did not show significant differences

Table n.1 - Average daily growth (Estimated means) of mulards bred intensively (starter and finisher periods in poultry house) or at open air (starting 29 d.).

	Breeding system					
	INTENSIVE					
	mulards	avg.	V.C.	mulards	avg.	V.C.
	n.	g	%	n.	g	%
DAILY GROWTH						
0- 7 d.	240	11.5	10.7			
8-14 d.	240	33.4	11.8			
15-21 d.	240	48.0	12.0			
22-28 d.	240	50.7	9.0			
	INTENSIVE			OPEN AIR		
	mulards	avg	V.C.	mulards	avg	V.C.
	n.	g	%	n.	g	%
29-35 d.	120	42.9 ^b	11.3	120	49.6 ^a	11.3
36-42 d.	120	53.5 ^a	10.7	120	41.2 ^b	11.4
43-49 d.	108	35.1	11.7	108	35.1	11.2
50-56 d.	96	16.5 ^b	11.1	96	27.4 ^a	11.2
57-63 d.	84	22.5 ^b	11.8	84	42.9 ^a	9.6
64-70 d.	72	32.5 ^a	11.8	72	21.9 ^b	9.5
71-77 d.	60	7.1	7.9	60	8.7	9.3

Note: means within a row with different superscripts are significantly different ($P < 0.05$).

between the birds bred under the two breeding technologies, although a tendency to better traits was observed in the "open air ducks".

Ready to cook carcass increased progressively till the 11th week of age ("intensive ducks" 63.3% and "open air ducks" 64.1%) but already reached good values at the 10th week of age ("intensive ducks" 62.3% and "open air ducks" 63.3%).

Breast muscles were characterised by late growth as observed in Muscovy ducks and showed considerable growth only starting from the 8th week of age. The average rate of breast muscles on RCC was 23.5% at the 10th week of age.

The skin with subcutaneous fat and the abdominal fat showed a typical trend with age: the highest values were observed between 7-8 weeks and the lowest values between 10-11 weeks. The limited proportion of the

Live weights of mulards

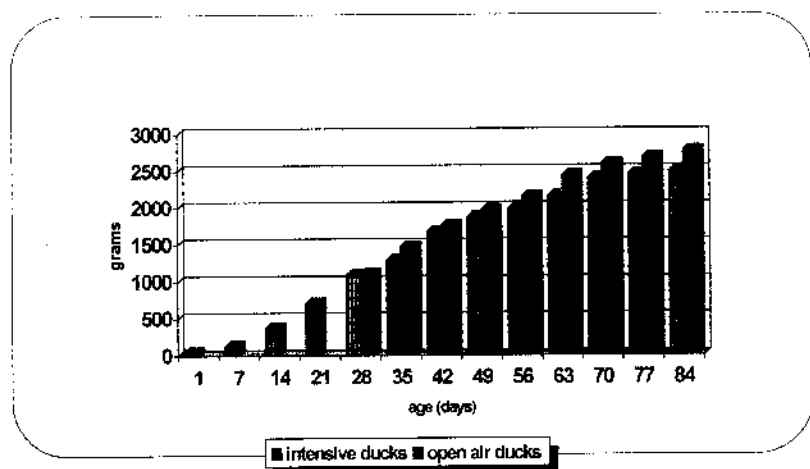


Figure 1

skin with subcutaneous fat and the abdominal fat in the Italian mulard must be pointed. The skin proportion of Italian mulards, at the 9th week of age, was 19.2-19.9% while the average skin proportion of the Mulard produced in Germany was 23.6-26.0 (9).

No differences in the chemical composition and physical characteristic of the breast meat (Table 3) were observed between the two breeding systems. On account of the reduced volume of the breast muscles till 8 weeks of age it was not possible to test shear force; in fact the sample of meat used for this test had to be 11 mm diameter (with no connective tissue).

CONCLUSION

Our results confirm the possibility of using the mulard in the semi-intensive system of breeding with good results. The favourable environmental conditions and the good hygiene, which characterise generally open-air breeding, seem to improve the potential of the heterosis resulting in a better growth rate and meat proportion in the mulards bred at open air.

Table 2 - Slaughtering traits of mulards at different ages (estimated means, expressed as percentages on LW or RCC).

parameter	age (weeks)	Breeding system	
		INTENSIVE	OPEN AIR
LIVE (g)	7	1900	2000
WEIGHT	8	2080	2273
	9	2260	2480
	10	2450	2554
	11	2573	2730
	READY (%)	7	56.9
COOK CARCASS	8	57.3	57.5
	9	59.7	61.0
	10	62.3	63.3
	11	63.3	64.1
	BREAST (%)	7	9.9
MUSCLES	8	10.9	11.2
	9	15.1	16.3
	10	23.2	24.2
	11	24.1	24.5
	FAT (%)	7	1.6
8		1.7	1.9
9		1.6	1.8
10		0.6	0.9
11		0.9	0.5
SKIN (%)	7	22.0	23.2
	8	21.7	22.4
	9	19.9	19.2
	10	18.0	19.6
	11	17.3	16.2

The mulard, obtained by crossing Italian strains of Muscovy drakes with Common ducks, is characterised by lighter weight of the carcass compared with the male parent and by limited incidence of the skin with subcutaneous fat and of the abdominal fat on the carcass in respect to the female parents.

This product could meet the new requirements and wishes of the consumers since does not determine increases of the productive costs for the limited construction and equipment that the open air breeding systems need.

Table 3 - Some chemical and physical characteristics of the breast muscles of mulard.

parameter		age (weeks)	Breeding system	
			INTENSIVE	OPEN AIR
DRY MATTER	%	7	22.7	22.6
	a.f.b.	8	23.5	23.0
		9	23.9	24.1
		10	25.0	26.0
		11	26.3	25.8
CRUDE PROTEIN	%	7	17.5	17.3
	a.f.b.	8	18.8	18.3
		9	20.3	19.8
		10	21.1	21.1
		11	21.5	21.0
ETHER EXTRACT	%	7	2.8	3.2
	a.f.b.	8	2.6	2.7
		9	1.9	2.3
		10	2.2	2.0
		11	2.4	2.0
ASH	%	7	4.7	4.6
	a.f.b.	8	4.4	4.6
		9	4.4	4.7
		10	4.7	4.4
		11	4.5	4.5
SHEAR FORCE	(Kg/cm ²)	7	-	-
		8	-	-
		9	3.2	3.3
		10	1.5	1.5
		11	1.8	1.5

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