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Productive and reproductive traits of three different Italian poultry species involved in an *in-situ* conservation programme

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ABSTRACT

A study was conducted in three different poultry species: duck (the Germanata Veneta and Mignon breeds), turkey (the Comune Bronzato and Ermellinato di Rovigo breeds) and guinea fowl (the Camosciata breed) to assess productive and reproductive traits of these species that are involved in a conservation and valorisation programme applied to the indigenous Veneto poultry breed. The productive characterisation was carried out during 2005 involving 510 animals while the reproductive traits were studied from 2003 to 2005 on 335 batches. Evaluation of performance traits was based on average daily gain and commercial live weight while reproductive traits were evaluated on percentages of fertility and hatchability. Analysis of variance were performed for production and reproduction traits. Breed, sex and conservation nucleus were significant sources of variation for productive traits while for fertility and hatchability percentages breed and year were the variation sources. Fertility percentages ranged between 38 to 68 respectively for Camosciata and Comune Bronzato breeds. Between 2003 to 2005 the fertility percentages improved for all local Veneto species. The Mignon and Camosciata breed did not show differences between males and females for average daily gain while the Germanata Veneta breed, Comune Bronzato and Ermellinato di Rovigo turkey breeds showed an evident sexual dimorphism.
(Keywords: Poultry, local breed, productive and reproductive traits; conservation programme)

INTRODUCTION

Animal genetic resources are the base for livestock production and development. Genetic diversity enables farmers and breeders to use a wide range of production environments and to develop diverse products to meet the needs of local communities. Moreover, it allows farmers and breeders to respond to the changing environmental conditions and consumer demands. Consequently, the contribution of animal genetic diversity in agriculture, economic development and management resources plays a fundamental role for their conservation. At the same time, being an integral component in many social and cultural traditions, diversity contributes both to the individual and community identity. For all these reasons in many countries the interest and the conservation programmes for safeguarding animal genetic resources are sensitively increasing (FAO 2004). The Co.Va. project (Conservazione e Valorizzazione di Razze Avicole Locali Venete) is an example of a conservation scheme that started in 2000 with funds of Veneto Region of Italy. This programme is the first one that has been carried out in Italy as an *in situ* marker assisted conservation scheme using genetic markers for the conservation of

animal biodiversity (*Cassandro et al*., 2004). AFLP markers were used to perform genetic characterisation (*Targhetta et al*., 2005) and to monitor expected heterozigosity (*De Marchi et al*., 2006). This project has involved three organic farms located in different areas of the region.

The studied local duck breeds are the Germanata Veneta (GV) and Mignon (M); the local turkey breeds are the Comune Bronzato (CB) and Ermellinato di Rovigo (ER); the local guinea fowl breed is the Camosciata (C) and they are dual-purpose breeds for meat and egg production (*De Marchi et al*., 2005). The GV duck was derived from the Real German, its coloration and form are unchanged. This breed is very rustic, and the female can be crossed with the Barberia duck to produce fat liver for pate. The M is a small white duck with yellow legs, beak and skin and it is found in the southern and eastern part of the Veneto region. The CB turkey is a small breed. The breast, neck, shoulders, and rump are black with rainbow reflexes. The ER turkey was derived from a mutation in offspring of crosses of local birds to the American Narraganset breed in 1958 and was then selected for increase performance (*De Marchi et al*., 2005). The C guinea fowl was developed in 1922 (*Veneto Agricoltura*, 2004). The neck and throat skin are blackish, the feathers are white with pearl stains, and the tarsus coloration varies from orange to grey. The demand for products from the Veneto poultry breeds has also increased because of their perceived image as a source of nutritious and healthy natural products from birds that are reared in a clean and natural environment with no industrial residues. In developing systems of breeding, production and marketing for the Veneto avian breeds, emphasis was placed on an organic system of production including housing in an indoor pen with access to a grass paddock.

Aim of this study was the characterisation of productive and reproductive traits of three different poultry species involved in a conservation and valorisation plan applied to the indigenous Veneto poultry breeds.

MATERIAL AND METHOD

The productive characterisation was carried out in 2005. Five hundred and ten animals were branded with wing tags at hatch and reared in an indoor pen with an open grass paddock in the same period (from March to November) in three different conservation nucleus located in mountain (Feltre), hill (Montebelluna) and plain (Ceregnano) areas of the Veneto region of Italy.

In the Feltre conservation nucleus were reared the GV, C, CB and ER breeds, in the Montebelluna the GV, M, C, CB and ER, while in the Ceregnano the C, CB and ER breeds.

In each nucleus birds were fed *ad libitum* on complete feeds of similar chemical composition. All animals were hatched following a reproduction scheme developed in the same time in all conservation nucleus and weighted in the selection period from October to November. The average daily gain (g/d) was calculated as ratio between commercial live weight (g) and age (d).

A total of 24,876 eggs was incubated in 335 batches (from March to May) during 2003, 2004 and 2005 to determine the fertility and hatchability. Candling of then incubate eggs was done at 14 days after incubation. The percentage fertility of the eggs was calculated as follows: $(Te–Ie/Te)\times100$ where Te was the total number of eggs incubated and Ie the total number of infertile eggs; while the percentage hatchability of the eggs was calculated as follows: $(He/Ve)\times100$, where He was the total number of

hatched eggs and Ve the total number of viable eggs (after the first candling) according to *Msoffe et al.* (2004).

Using a GLM procedure (*SAS*, 1999), analysis of variance of commercial live weight and average daily gain was conducted considering the following sources of variation: breed and nucleus combined (BN), sex (S), and the effect of their interactions (BN×S). The least square means solutions of the combined effect were used to estimate sex effect using the contrast statement. Also for the reproductive traits an analysis of variance was performed using the following sources of variation: year and breed combined (YB), nucleus (N), and the effect of their interactions (YB×N). The least square means solutions of the combined effect were used to estimate year effect using the contrast statement.

RESULTS AND DISCUSSION

The GV breed showed an higher average daily gain than M breed (*Table 1*). The commercial live weight (g) of GV breed was 2251±166 and 2545±136 respectively for females and males while the M breed showed a similar commercial live weight (g) ranging between 877±109 to 971±102 respectively for females and males. The GV average daily gain (g/d) showed an important difference between males and females (16.03 vs 19.42, respectively). The CB turkey breed showed a lower commercial live weight respect to the ER breed according to the value reported by *De Marchi et al.* (2005). The turkey breeds showed a consistent difference of average daily gain (g/d) between females and males (19.62 vs 28.82) and (24.22 vs 33.95), respectively for CB and ER breeds (*Table 1*). The C breed showed a low commercial live weight (g) 1406±142 and 1545±128 respectively for females and males, whit modest sexual dimorphism (*Table 1*). The values reported for the C, GV and M breed were similar to those reported by *De Marchi et al.* (2005) and *Veneto Agricoltura* (2004).

Table 1

Average daily gain (g/d) of the indigenous Veneto poultry breed

Breed	Average daily gain (g/d)			
	Female		Male	
	n	Means±SD	n	Means±SD
GV	40	16.03±1.60	27	19.42±2.44
M	30	6.87±1.47	20	7.30±1.04
CB	71	19.62±2.35	48	28.82±4.12
ER	74	24.22±4.07	40	33.95±6.23
C	94	11.06±1.60	66	10.99±1.95

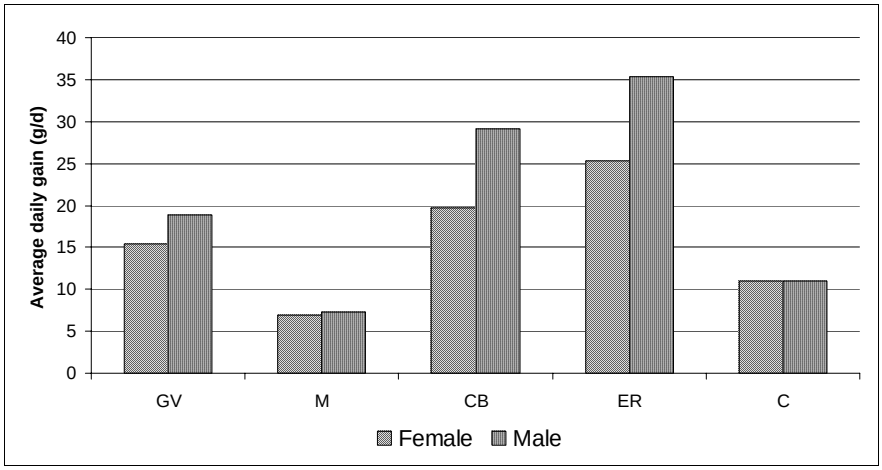
GV: Germanata Veneta, M: Mignon, CB: Comune Bronzato, ER: Ermellinato di Rovigo, C: Camosciata.

Statistical models used for the study of productive traits were adequate, evidencing a high determination coefficient (R^2>0.90) and all effects were highly significant (P<0.001). In the *Figure 1* are shown the least square means of average daily gain. The M and C breed did not show any statistical difference between sex, while that difference was important in the CB and ER turkey breeds. Males of the GV duck breed showed a better average daily gain (g/d) respect to females (18.8 vs 15.4). Average daily gains

(g/d) for the three species were higher in the Castelfranco and Ceregnano nucleus than in Feltre (19.1 and 18.1 vs 14.5 respectively). Regarding C breed, average daily gain was 12.8, 10.6 and 9.4 g/d in Castelfranco, Ceregnano and Feltre nucleus respectively. For the CB and ER turkey breeds daily gains were similar in the Castelfranco (25.0 and 33.4 respectively) and Ceregnano nucleus (26.9 and 33.0 respectively), while was lower in the Feltre one (21.3 and 24.4 respectively).

Figure 1

Least square means of average daily gain (g/d) for the indigenous Veneto poultry breed



Statistical models used for the study of reproductive traits showed a determination coefficient range between 0.33 and 0.59 for hatchability and fertility values respectively. All effects were highly significant (P<0.001) for fertility percentages. Regarding hatchability percentage YB, N and YB x N were significant effects (P<0.001, P=0.002 and P=0.035 respectively).

Table 2

Descriptive statistics of reproductive traits for the indigenous Veneto poultry breed

Breed	Batches	Incubated eggs	Fertility	Hatchability
			Means±SD	Means±SD
GV	70	7689	0.57±0.16	0.63±0.15
M	72	7470	0.53±0.18	0.64±0.17
CB	80	4401	0.68±0.21	0.82±0.13
ER	72	1509	0.38±0.30	0.58±0.31
C	41	3807	0.67±0.25	0.59±0.17

In *Table 2* are shown the descriptive statistics of reproductive traits for the Veneto poultry breeds. The number of batches during 2003, 2004 and 2005 ranged between 41 to 80 respectively for the C and CB breed, while the number of incubated eggs ranged

between 1509 to 7689 for the ER and GV respectively. The values of fertility ranged between 0.38 to 0.68 for the ER and CB, while the hatchability values ranged between 0.58 to 0.82 for the ER and CB respectively. The fertility and hatchability percentages of the C breed were similar to those reported for the local domestic fowl ecotype of Tanzania (*Msoffe et al.*, 2004). The low fertility found in these species was probably caused by confinement stress that prevented the males from expressing their optimal reproductive performances. There is also a possibility, that there were some deficiencies in the commercial feeds given to the animals since no attempt was made to evaluate the nutritional status of the feeds. Another reason might be the fact that eggs had to be stored for up to one week prior to the incubation. Although all the necessary storage precautions were taken, there was still a chance that fertility was lost during storage especially due to diurnal temperature variations. The hatchability percentage obtained in the current experiment was rather low compared to some previous studies. For instance *Wilson* (1979) observed mean hatchability values of 90% in the Sudanese local domestic fowls; *Barua* and *Yoshimura* (1997) reported values of 75% on the local Bangladesh domestic fowls. Similarly *Mwalusanya* (1998) reported hatchability in the free-range local domestic fowls of Tanzania to be over 80%. The fertility percentage of the GV and M breed were lower than those reported for the Muscovy duck breed (Nickolova 2005). The percentage of hatchability of the GV and M breed were lower respect to those reported for Turkish Pekin (78.5%), and the two local populations Boz (70.2%) and Yesilbas (73.0%) (*Isguzar*, 2005).

In the *Figure 2* and *Figure 3* are shown the variation of fertility and hatchability percentages between 2003 and 2005. The fertility percentage of the local species involved in this conservation programme did not show any variations from 2003 to 2005 with the exception of the ER breed that demonstrated a significant increase ($P<0.001$). The hatchability percentage of the GV and M decreased from 2003 to 2004 (62% vs 42%, $P<0.027$) and (59% vs 37%, $P<0.016$). The CB breed did not show any statistical variation of hatchability percentage from 2003 to 2005, while for ER breed there was a statistical difference from 2003 to 2004 ($P<0.001$).

Figure 2

Least square means of fertility percentage from 2003 to 2005 for the indigenous Veneto poultry breed

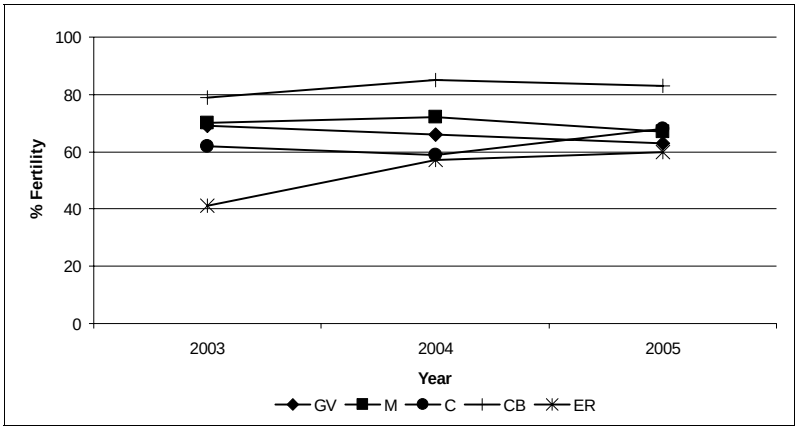
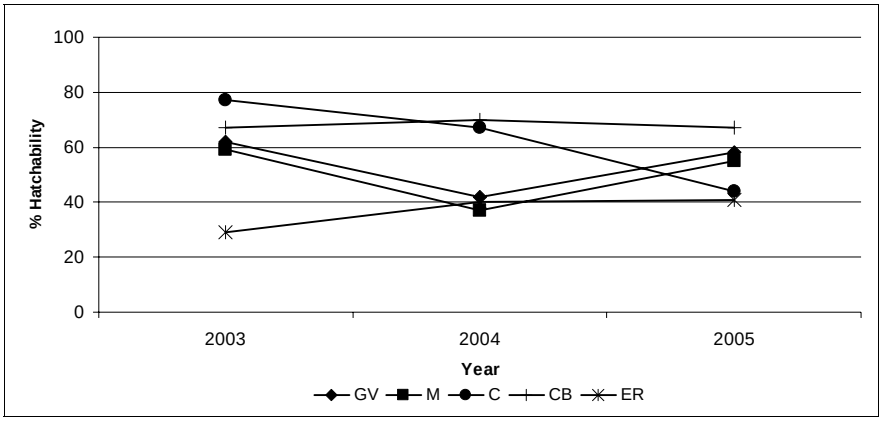


Figure 3

Least square means of hatchability percentage from 2003 to 2005 for the indigenous Veneto poultry breed



CONCLUSIONS

The results of this study confirmed the performance characteristics of the duck, guinea fowl and turkey Veneto poultry species reported in other studies. The breed, sex and conservation nucleus were significant sources of variation for commercial live weight and average daily gain. Regarding reproduction traits all breeds showed medium-low fertility and hatchability percentages. More studies should be conducted to deepen the reasons of the reduced reproductive performances.

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