

Reproductive parameters of the Italian local chicken breed *Mericanel della Brianza*

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The global use of highly productive breeds has been coupled to a loss of genetic diversity in most species of farm animals. A considerable portion of avian genetic stocks has disappeared in the last decades and the relevance to establish policies toward conservation and sustainable use of animal genetic resources is widely recognised. Our aim was to study the reproductive characteristics of a local Italian breed, *Mericanel della Brianza*, historically present in the rural areas in Lombardia (North of Italy). The birds were owned by a poultry fancier and were primarily selected for phenotype. Performance of male and female breeders has been recorded during the reproductive season from March to May in 2005. *Mericanel della Brianza* is a breed of small size, the standard body weight is 750 and 650g for adult males and females respectively. Males (n.5) have been individually housed in small pens and trained to semen collection. Ejaculates have been collected weekly and the following parameters recorded: volume (ml), concentration (10^9 /ml), motility (%) and viability (%). Females (n.4) were kept in a pen with one male and egg production was recorded daily. Eggs were set every 2 weeks and incubation parameters were recorded (fertile eggs at candling, dead embryos and live chickens at hatching). A sample of few eggs has been considered to measure egg components and composition. The egg, albumen, yolk and shell weights were recorded; the lipid and cholesterol egg contents and the fatty acid composition of total egg lipid were measured. Semen production was rather poor, the mean values for both volume (0.19 ml) and concentration (1.42×10^9 /ml) of the ejaculates were lower compared to the standard values measured in selected strains; in contrast, the mean values for sperm motility (49%) and viability (73%) were good. Mean egg weight was 38.6g; yolk, albumen and shell represented the 36, 47 and 16% of the total egg weight. The mean lipid content of the edible egg was 15.5% of the total egg weight; the mean cholesterol content was 525mg/100g edible egg. The characteristic fatty acid composition of the chicken egg was identified; the mean values for the saturates/polyunsaturates and the n-6/n-3 ratio were 1.73 and 10.4 respectively. A large variability was found in the incubation parameters; the mean fertility and hatchability rates were 63.8 and 45.8% respectively.

Keywords: egg; semen; fertility; chicken; Italian breed.

Introduction

The global use of highly productive breeds has been coupled to a loss of genetic diversity in most species of farm animals. A considerable portion of avian genetic stocks has disappeared in the last decades and the poultry breeding industry is concerned about the loss of the reservoir of genetic variability. The standard breeds are the source of all the existing commercial flocks. The relevance to establish policies toward conservation and sustainable use of animal genetic resources is widely recognised by many Countries (Fulton, 2006; Woelders et al., 2006).

Our aim was to study the reproductive characteristics of a local Italian breed, *Mericanel della Brianza*, historically present in the rural areas in Lombardia (North of Italy). *Mericanel della Brianza* is a bantam breed, 8 varieties are recognized (gold is the most common), with single red comb, red

earlobes and yellow shanks and toes with no feathering. The body weight ranges from 700 to 800 g and from 600 to 700 g in males and females respectively. The breed standard was published by the Italian Federation of Poultry Breed Associations (F.I.A.V., 1996).

Materials and methods

The birds were owned by a poultry fancier, and were primarily selected for phenotype and kept for exhibition purposes. Performance of male and female breeders has been recorded during the reproductive season from March to May in 2005. Males (n.5) have been individually housed in small pens and trained to semen collection. Ejaculates have been collected weekly and the following parameters recorded: volume (ml), concentration (10^9 /ml) (spectrophotometry), motility (%) and forward progressive motility (score 1-4) (subjective evaluation), and viability (%) (nigrosin-eosin staining). Females (n.4) were kept in a pen with one male and egg production was recorded daily. Eggs were set every 2 weeks; the number of fertile eggs was recorded at candling and the number of dead embryos and live chickens at hatching. A sample of few eggs has been considered to measure egg components and composition. The egg, albumen, yolk and shell weights were recorded. Total egg lipid has been extracted in a suitable excess of chloroform:methanol (2:1) and weighted. The fatty acid composition of total egg lipid was determined by gas chromatography on capillary column after trans-methylation by refluxing. Cholesterol egg content was determined by colorimetric kit (R-Biopharm, I) after saponification.

Results and discussion

All the males have been successfully trained to semen collection in few weeks, and then ejaculates have been routinely collected for 6 weeks. The production of semen was not constant within male, and the 37% of the collections (10 out of 27) failed to produce an ejaculate. Major characteristics of semen production and quality are reported in table 1. Semen production was rather poor; the mean values for both volume (0.19 ml) and concentration (1.42×10^9 /ml) of the ejaculates were lower compared to the standard values measured in chicken strains (Etches, 1996). In contrast, the mean values for sperm motility (49%) and viability (73%) were good.

Table 1: Descriptive statistics on semen parameters measured in the *Mericanel della Brianza* male breeders during the reproductive season (n. 17 total ejaculates analyzed).

Semen parameters	Mean	SE	Max	Min	CV	Range
Volume (μ l)	188	10	250	150	22.1	100
Concentration (10^9 /ml)	1.42	0.18	2.91	0.44	52.1	2.47
Motility %	49.4	4.53	75	30	37.8	45
FPM* (score 1-4)	2.20	0.218	3.5	1.0	40.9	2.5
Viability (%)	73.2	2.55	88.5	52.7	14.4	35.8

*FPM=forward progressive motility

A sample of 6 eggs has been considered to measure egg composition (table 2) and quality (table 3). Mean egg weight was 38.6g; yolk, albumen and shell represented the 36, 47 and 16% of the total egg weight.

The mean lipid content of the edible egg was 15.5%; the mean cholesterol content was 525 mg/100g edible egg. The characteristic fatty acid composition of the chicken egg was identified; the mean values for the saturate/polyunsaturate and the n-6/n-3 ratio was 1.73 and 10.4 respectively.

Table 2: Descriptive statistics on egg components produced by the *Mericanel della Brianza* female breeders during the first reproductive season (n. 6 eggs analyzed).

	Mean	SE	Max	Min	CV	Range
<i>Weight (g)</i>						
Egg	38.6	1.20	45.6	34.4	9.48	11.2
Albumen	18.0	0.81	22.6	15.3	13.5	7.32
Yolk	13.8	0.52	16.5	12.1	11.3	4.41
Shell	6.18	0.30	7.58	4.57	14.6	3.01
Edible egg	31.9	1.26	38.5	27.4	11.8	11.0
<i>Proportion on total egg weight (%)</i>						
Albumen	47.3	0.85	50.0	43.3	5.39	6.56
Yolk	36.4	0.68	40.0	34.1	5.67	5.91
Shell	16.3	0.98	21.7	11.1	17.9	10.6
Edible egg	83.6	0.98	89.0	78.3	3.50	10.6

Table 3: Descriptive statistics on lipid composition of eggs produced by the *Mericanel della Brianza* female breeders during the first reproductive season (n. 6 eggs analyzed).

	Mean	SE	Max	Min	CV	Range
<i>Lipid contents</i>						
Total lipid (g/100g e.e.*)	15.5	1.25	21.5	13	19.8	8.49
Cholesterol (mg/100g e.e.*)	525	21.2	585	450	9.90	135
<i>Fatty acids (% on total fatty acids**)</i>						
C16:0	26.4	0.52	28.3	25.1	4.81	3.19
C16:1n-7	1.98	0.27	3.22	1.41	33.3	1.81
C18:0	10.8	0.33	12.3	9.81	7.59	2.45
C18:1n-9	34.2	0.51	35.6	32.1	3.69	3.42
C18:1n-7	1.74	0.10	2.10	1.38	14.3	0.72
C18:2n-6	15.9	0.74	18.3	13.9	11.4	4.38
C20:4n-6	2.71	0.06	2.93	2.50	5.75	0.43
C22:6n-3	1.48	0.07	1.72	1.26	12.1	0.46
S/P [^]	1.73	0.07	1.94	1.51	9.95	0.43
n-6/n-3	10.4	0.39	21.5	13.0	19.8	8.49

* e.e. =edible egg; ** only fatty acids > 1% are reported; ^ S/P=saturate/polyunsaturate.

Eggs have been set after two weeks of storage on four different times during the reproductive season. A total of 85 eggs were set. A large variability was found in the incubation performance: the hatchability rate decreased from the 63.6% (on total egg set) to the 23% during the reproductive period, and a similar consistent decrease was observed in fertility rates (Figure 1).

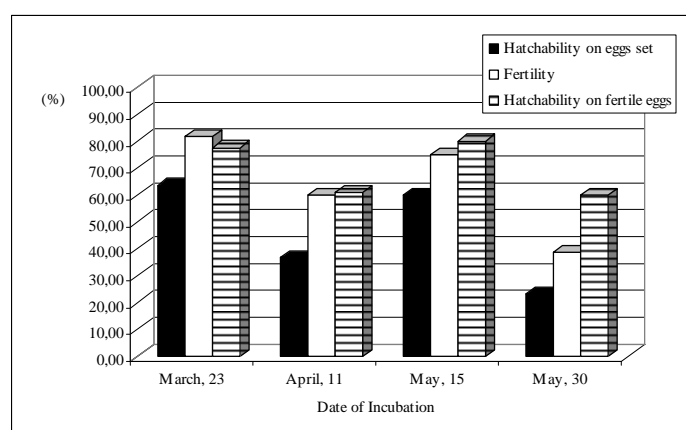


Figure 1: Hatchability and fertility values recorded during the reproductive Season from March to May in 2005.

The proportion of dead embryos on the total egg set did not show a large variation during the reproductive season, and the values ranged from the 15% (May) to the 23% (April). The proportion of

dead embryos on fertile eggs showed a higher range of variation, from the 20 to the 40%, however no specific trend was observed from March to May (Figure 2).

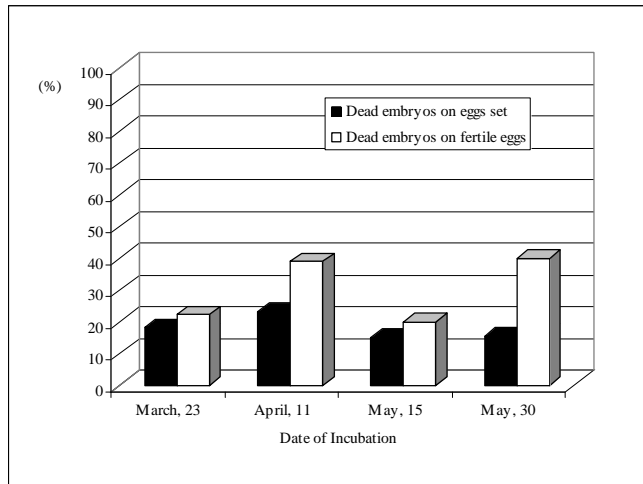


Figure 2: Proportion of dead embryos recorded during the reproductive Season from March to May in 2005.

The reproductive performance of the local Italian breed *Mericanel della Brianza* has been measured in a small population kept for exhibition purposes. Reproductive parameters related to male and female performances showed large variations. The results are of interest to support conservation programmes of the breed and its potential use in sustainable farming systems.

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