25th Congress

ASPA2023

Animal Production Science:
innovations and sustainability
for future generations

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Phenotypic characterization of semen production and quality in Italian chicken and turkey breeds

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BACKGROUND

Native Italian chicken and turkey breeds are an important resources of avian biodiversity










22 chicken breeds







8 turkey breeds

BACKGROUND

Loss of biodiversity

populations

native breeds

Extensive breeding

Intensive breeding

According to **FAO risk categories**, the majority of chicken and turkey breeds were categorized as at risk, and only 5 chicken breeds had population sizes that were categorized as not at risk (Castillo et al., 2021).

BACKGROUND

Conservation of biodiversity in Italian poultry breeds
TuBAvI (2017-2020)

Conservation of biodiversity in Italian poultry breeds: deepening and monitoring
TuBAvI-2 (2021-2024)

- ✓ are dedicated to the safeguard, conservation and valorisation of the Italian poultry genetic resources
- ✓ supplying new data and tools for the implementation of a nationwide conservation program

TUTELA BIODIVERSITÀ AVICOLA ITALIANA

FONDO EUROPEO AGRICOLO PER LO SVILUPPO RURALE: *l'Europa investe nelle zone rurali*

Action 1 – Phenotypical characterisation of Italian autochthonous breeds and species

- ➢ Oviposition rate
- ➢ Growing performance
- ➢ Eggs quality
- ➢ Reproductive performance
- ➢ Morphological characterisation
- ➢ Resistance to diseases
- ➢ Environmental stress resilience
- ➢ Innate immunity
- ➢ Low-input system adaptation
- ➢ Semen production





OBJECTIVE

The purpose of this work was to assess the fresh semen quality of different Italian chicken and turkey breeds

MATERIALS AND METHODS

Animals

38 COCKERELS

13 TURKEYS

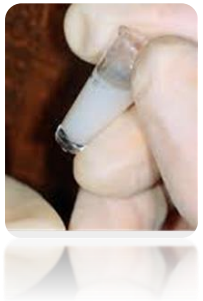
MATERIALS AND METHODS

Quantitative sperm traits

SEMEN COLLECTION

- abdominal massage
- training period 3 – 6 weeks

VOLUME

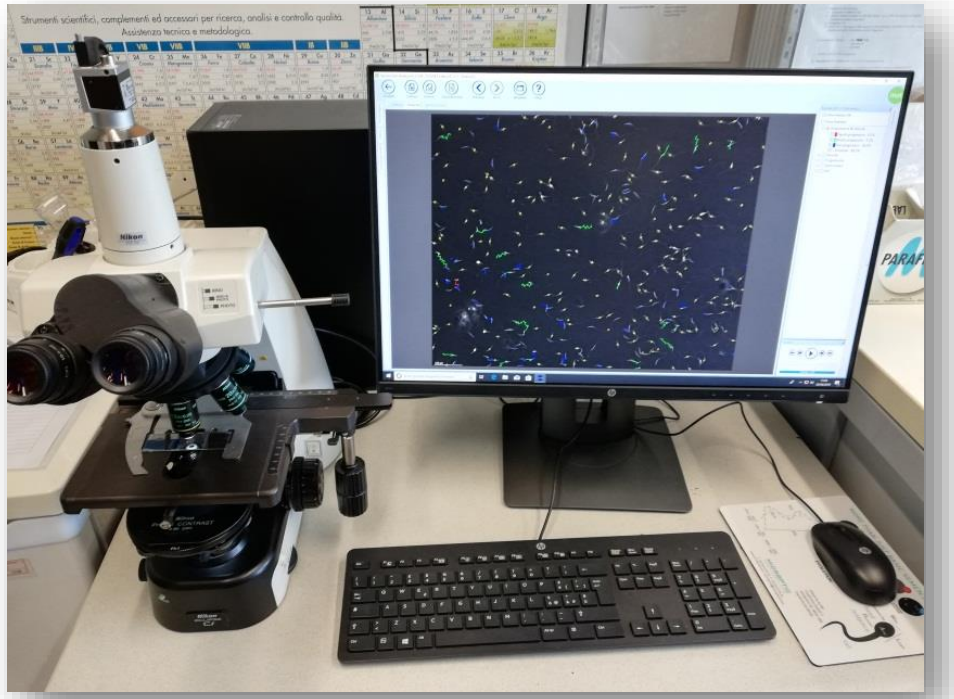


SPERM CONCENTRATION

1. Dilution 1:200 (NaCl)
2. Optical density 530 nm
3. N° sperm × 10^9/mL

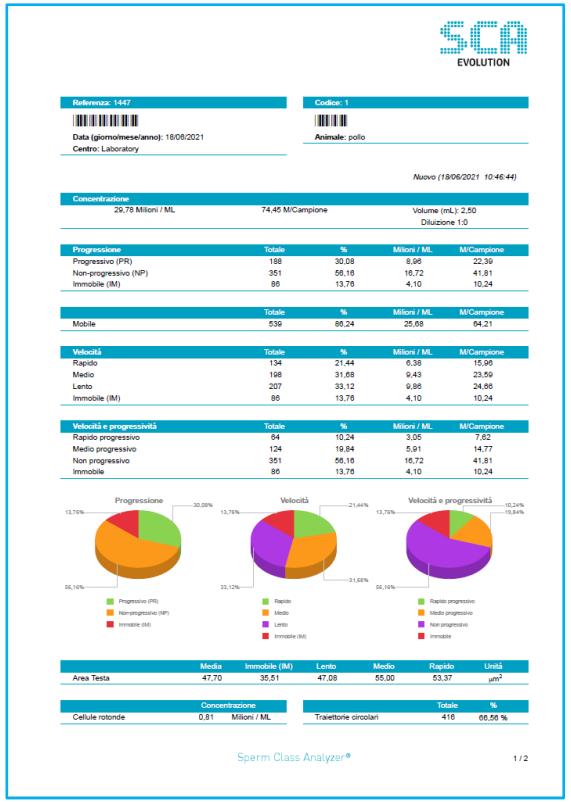
MATERIALS AND METHODS

Sperm motility



1. Dilution
   100×10^6 spz/mL
2. Incubation
3. 3 µL
   Leja chamber

- Total Motility (%)
- Progressive Motility (%)
- VCL (µm/s)
- VSL (µm/s)
- VAP (µm/s)
- LIN (%)
- STR (%)



SCA EVOLUTION

Referenza: 1447
Data (giorno/mese/anno): 18/06/2021
Centro: Laboratory

Codice: 1
Animale: pollo

Nuovo (18/06/2021 10:46:44)

Concentrazione			
29,78 Milioni / ML	74,45 M/Campione	Volume (mL): 2,50	Diluizione 1:0

Progressione	Totale	%	Milioni / ML	M/Campione
Progressivo (PR)	188	30,08	8,96	22,39
Non-progressivo (NP)	351	56,16	16,72	41,81
Immobile (IM)	86	13,76	4,10	10,24

	Totale	%	Milioni / ML	M/Campione
Mobile	539	86,24	25,68	64,21

Velocità	Totale	%	Milioni / ML	M/Campione
Rapido	134	21,44	6,38	15,96
Medio	198	31,68	9,43	23,59
Lento	207	33,12	9,86	24,66
Immobile (IM)	86	13,76	4,10	10,24

Velocità e progressività	Totale	%	Milioni / ML	M/Campione
Rapido progressivo	64	10,24	3,05	7,62
Medio progressivo	124	19,84	5,91	14,77
Non progressivo	351	56,16	16,72	41,81
Immobile	86	13,76	4,10	10,24

	Media	Immobile (IM)	Lento	Medio	Rapido	Unità
Area Testa	47,70	35,51	47,08	55,00	53,37	µm²

	Concentrazione	
Cellule rotonde	0,81	Milioni / ML

	Totale	%
Traiettorie circolari	416	66,56 %

Sperm Class Analyzer®

1 / 2

CASA-system
software Sperm Class Analyzer-SCA
Nikon mod. Ci-L

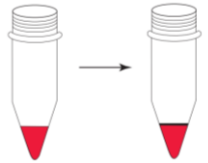
MATERIALS AND METHODS

Sperm membrane integrity

MUSE®
Cell Analyzer

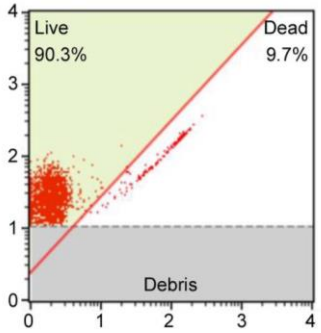
1. **Dilution**
   1×10^5 - 1×10^7 (semen: PBS)

2. **Dilution**
   20 µL semen + 780 µL **Muse Count and Viability Reagent®** (1:40)



3. **Incubation**
   5 min/room temperature

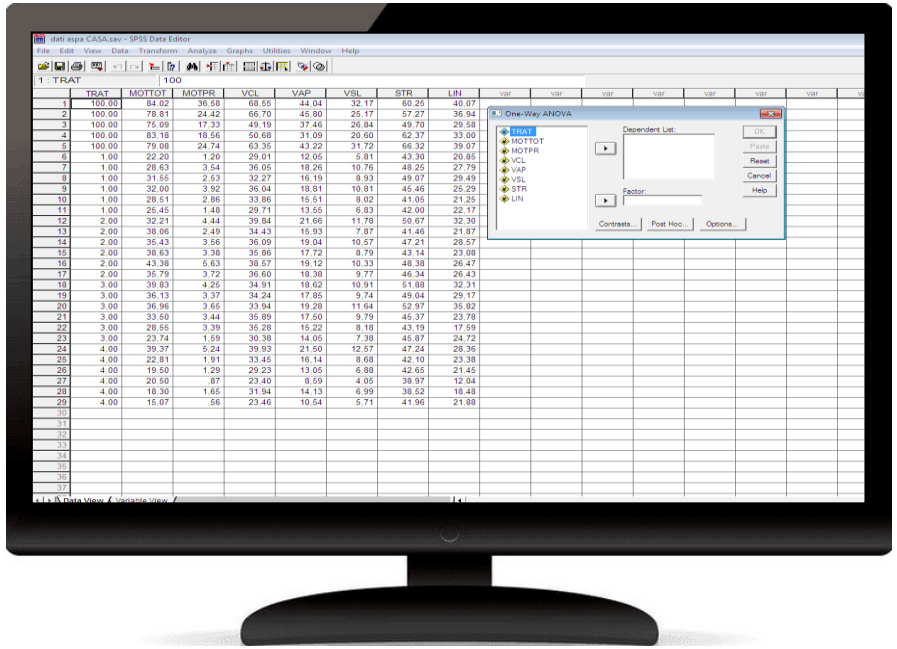
4. **Analysis**
   Setting/read

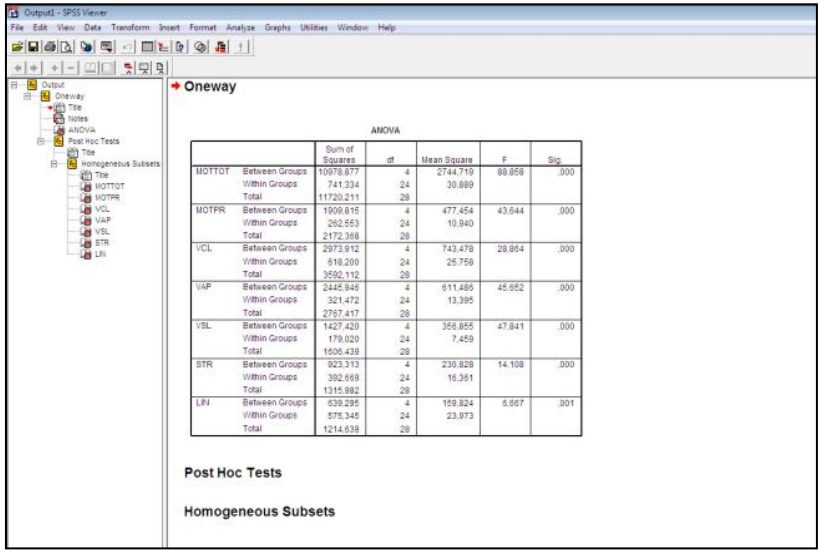


MATERIALS AND METHODS

Statistical analysis

- Sperm quality parameters were analyzed by **ANOVA**
- **SHEFFE'S** comparison test
- Significance was set at **P < 0.05**





RESULTS




	Sperm quality traits									
BREED	**Volume (µL)**	**Conc (× 10^9/mL)**	**TM (%)**	**PM (%)**	**VCL (µm/sec)**	**VAP (µm/sec)**	**VSL (µm/sec)**	**LIN (%)**	**STR (%)**	**SMI (%)**
Bionda piemontese	402 ± 25^{a} ↑	2.9 ± 0.2^{a}	87.7 ± 1.9^{a}	24.6 ± 1.2^{a}	74.5 ± 3.6^{a}	46.6 ± 2.1^{a}	29.1 ± 1.2^{a}	40.3 ± 0.9^{a}	63.4 ± 0.8^{a}	89.2 ± 1.6^{b}
Mericanel della Brianza	113 ± 9^{b}	2.3 ± 0.2^{b}	91.1 ± 3.2^{a}	27.2 ± 3.2^{a}	72.6 ± 9.3^{a}	47.7 ± 5.6^{a}	30.6 ± 3.5^{a}	42.7 ± 3.0^{a}	64.3 ± 2.7^{a}	96.2 ± 0.9^{a} ↑
Robusta maculata	146 ± 15^{b}	1.6 ± 0.1^{b}	86.4 ± 1.8^{a}	31.3 ± 1.3^{a}	75.7 ± 4.2^{a}	49.9 ± 2.4^{a}	33.5 ± 1.5^{a}	46.8 ± 1.4^{a}	68.7 ± 1.2^{a}	95.0 ± 0.6^{ab}
Siciliana	153 ± 6^{b}	3.4 ± 0.1^{a} ↑	91.2 ± 0.5^{a}	26.7 ± 0.9^{a}	66.8 ± 1.0^{a}	44.2 ± 1.0^{a}	31.3 ± 0.7^{a}	43.4 ± 0.9^{a}	62.3 ± 0.7^{a}	91.7 ± 0.5^{b}

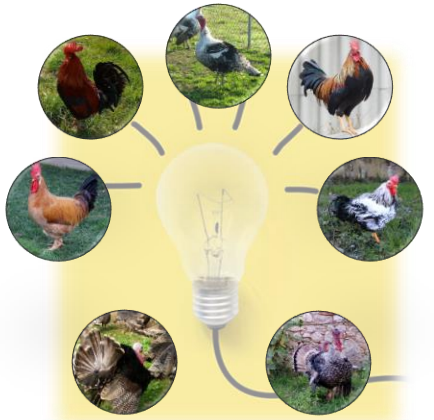
RESULTS



	Sperm quality traits									
BREED	**Volume (µL)**	**Conc (× 10^9/mL)**	**TM (%)**	**PM (%)**	**VCL (µm/sec)**	**VAP (µm/sec)**	**VSL (µm/sec)**	**LIN (%)**	**STR (%)**	**SMI (%)**
Romagnolo	200 ± 28^a	5.9 ± 0.4^a	79.1 ± 2.1^a	24.2 ± 2.5^a	64.0 ± 3.0^a	35.0 ± 2.6^a	22.4 ± 2.1^a	27.6 ± 1.7^a	48.4 ± 1.6^a	92.9 ± 0.9^a
Bronzato comune	157 ± 18^a	5.5 ± 0.4^a	79.9 ± 3.2^a	25.6 ± 2.6^a	64.8 ± 3.1^a	35.8 ± 1.6^a	22.7 ± 1.1^a	29.5 ± 1.3^a	50.2 ± 1.4^a	93.7 ± 1.1^a
Ermellinato di Rovigo	128 ± 10^a	6.1 ± 0.3^a	73.8 ± 0.8^a	17.0 ± 1.2^a	63.0 ± 1.8^a	29.2 ± 2.9^a	16.7 ± 3.2^a	22.2 ± 4.4^a	41.6 ± 4.9^a	88.7 ± 0.8^b

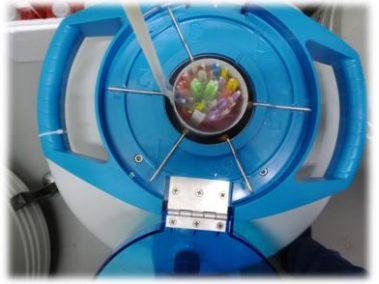
CONCLUSION

For the first time, the results provided a phenotypic characterization of semen production in Italian avian breeds



These knowledge are useful in predicting the fertilizing ability of each donor

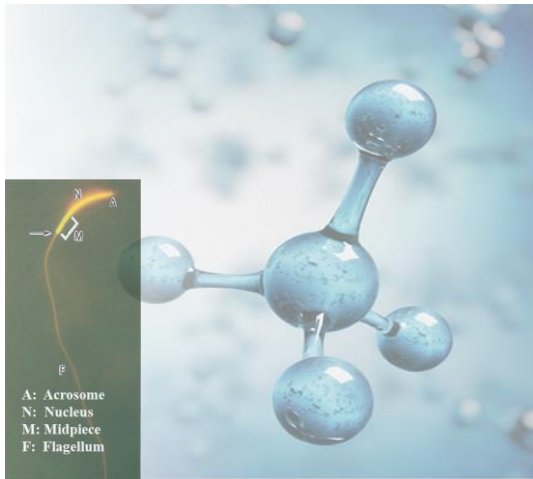
The quality of fresh semen is an important prerequisite for the implementation of a successful freezing protocol



FUTURE PERSPECTIVES

The semen production and quality in other autochthonous chicken and turkey breeds

Further studies are planned to evaluate the main structural components of the sperm membrane, such as the lipid composition and protein profile, to obtain a more comprehensive overview



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THANK YOU FOR YOUR ATTENTION