

National Rural Development Program 2014-2020
Measure 10.2 - Biodiversity

Project: TuBAvI-2 (2021-2024)

REPORT ON THE ACTIVITIES PERFORMED DURING THE SECOND YEAR

UniPI

The present report describes the activities performed from May the 1st, 2022 to April 30th, 2023. The activities are described by Action, according to the original program.

Action 1 - Phenotypic characterization of native breeds and species

Task 1.1 - Phenotypic characterization of Livorno, Siciliana, Bianca di Saluzzo, Bionda Piemontese, and Millefiori di Lonigo chicken breeds.

Throughout the designated period, Livorno (L) and Siciliana (S) breed chickens completed their first egg-laying cycle in October 2022 and started the second cycle in January 2023. All birds were raised in open-air enclosures with partial roof coverage, situated on sandy soil, and exposed to natural lighting and temperature conditions at the Poultry Farm of the Department of Veterinary Sciences of the University of Pisa. The daily egg production (Figure 1.1.1), egg weight (Figure 1.1.2), and egg size during the first egg-laying cycle continued to be recorded until the end of September 2022. The evaluation of hens feed consumption as well as FCR-eggs (Table 1.1.1) was conducted until July 2022. In October 2022, family groups were formed for originating the 2023 restocking, according to the mating plan developed by the Animal Molecular Genetics Laboratory at the University of Turin. Nine family groups were established for the L breed (4 for white L, WL, and 5 for black L, BL), and 3 families for the S breed. These groups at the second egg-laying cycle were monitored for daily egg production from January 2023 onwards, and for monthly egg weight and egg size as well as for feed consumption in 14-day intervals (data being processed) from January to June. Reproductive parameters (fertility and embryonic mortality) were assessed through 5 incubations conducted from February to April 2023 (data being processed). Offspring intended for restocking, hatched in April 2023 and are currently being monitored for growth, mortality, and morphometric traits as outlined in the project.

Task 1.2 - Phenotypic characterization of Ancona (A) breed chickens

The monitoring of daily egg production during the first egg-laying cycle continued until the end of September 2022 (Figure 1.2.1). The recording of egg weight was carried out until July (Figure 1.2.2, partial data). In October 2022, three family groups were formed for the 2023 restocking, by following the mating plan developed at the Animal Molecular Genetics Laboratory of the University of Turin. The family groups were monitored from January 2023 for egg production and egg weight during the second egg-laying cycle. Reproductive performance was assessed through six incubations to determine fertility and embryonic mortality levels (data being processed). The restocking nucleus hatched in April 2023, and is being monitored for growth, mortality, and morphometric traits, as planned in the project.

Task 1.3 - Characterization of laying hens' adaptation capacity to seasonal environmental stimuli

In 2022, the physical and chemical characterization of the yolk and albumen of eggs produced during the first egg-laying cycle for L and S breeds continued until July (Tables 1.3.1 and 1.3.2). At the beginning of 2023, the analysis of eggs resumed to characterize the second year of laying (Table 1.3.3).

Action 7 - Evaluation and identification of genetic resistance traits in livestock animals against diseases

Task 7.1 - Evaluation of resilience for growth under environmental stimuli

The growth trial on the Bianca di Saluzzo (BS), Valdarnese (VAL), Mugellese (MUG), and white L (WL) breeds was completed in September 2022, when birds were 180 days old. Birds were reared at the facilities of Pisa University as well as at Florence University. Weights and average gains per breed are presented in Figure 7.1.1.; feed consumption and FCR (Table 7.1.2) and mortality (Table 7.1.3) data are reported for each group within the different breeds.

In February 2023, a new growth trial started and eggs from Ancona (A) breed, coming from Pisa University poultry farm, and eggs from Robusta Lionata (RL), Ermellinata di Rovigo (ER), Pepoi (PP), coming from the Experimental Conservation Center in Ceregnano (Rovigo, Italy), were incubated at the facilities of Pisa and Florence Universities. The incubation results, from Pisa' data, are shown in Table 7.1.4. In March 2023, chicks hatched and were raised in cages within a protected environment until they reached the suitable age for outdoor transfer. Data collection for live weight, feed consumption (data being processed), and mortality (Table 7.1.5, partial data) is currently underway.

Task 7.2 - Evaluation of resistance/resilience to bacterial and parasitic infections/infestations and resilience of intestinal microbiota

Fecal samples were collected from the 2022 and 2023 growing chicks monitored in Task 7.1, as well as from the coeval chicks raised at the Florence University facility, which collaborates in the research. These samples were used for qualitative and quantitative parasitological analyses, including the detection of coccidia (*Eimeria* spp.), nematodes (ascarids, capillaries, *Heterakis* spp.), protozoa (*Giardia* spp. and *Cryptosporidium* spp.), and *Histomonas meleagridis*. The results of the 2022 evaluations are presented in Table 7.2.1, and the partial results of 2023 evaluations are shown in Table 7.2.2.

Regarding the 2022 trial, four cloacal swabs were collected per 120-day-old-bird from Pisa and Florence facilities to detect pathogens such as *Salmonella* spp., *Clostridium perfringens*, *Campylobacter jejuni* (all samples tested negative), and commensal bacteria such as *Enterococcus* spp. (Table 7.2.3), *Lactobacillus* spp., and *Bifidobacterium* spp. The isolated strains were evaluated for antibiotic resistance profiles (Tables 7.2.4 and 7.2.5). The results of the examinations for the presence of pathogens on unhatched eggs in 2023 and on deceased subjects are reported in Table 7.2.6.

Action 8 - Collection of Biological Material and Germplasm

The ongoing collection of genetic material from Livorno breed is being carried out in the region due to the outbreaks of avian influenza that have affected Tuscany, thereby impeding access to the relevant farms.

In 2022, the training of L and S males for semen donation was continued till the end of May when the second sampling was conducted for the purposes of the cryobank. The semen was analyzed and frozen by the PA UniMOL. The semen collection process involved 23 L and 11 S roosters, with a positive response rate of 100% for white L, 38% for black L, and 91% for S.

FIGURES AND TABLES

Figure 1.1.1 – First egg-laying cycle curve of Livorno and Siciliana breeds recorded during the reproductive period from October 2021 to the end of September 2022.

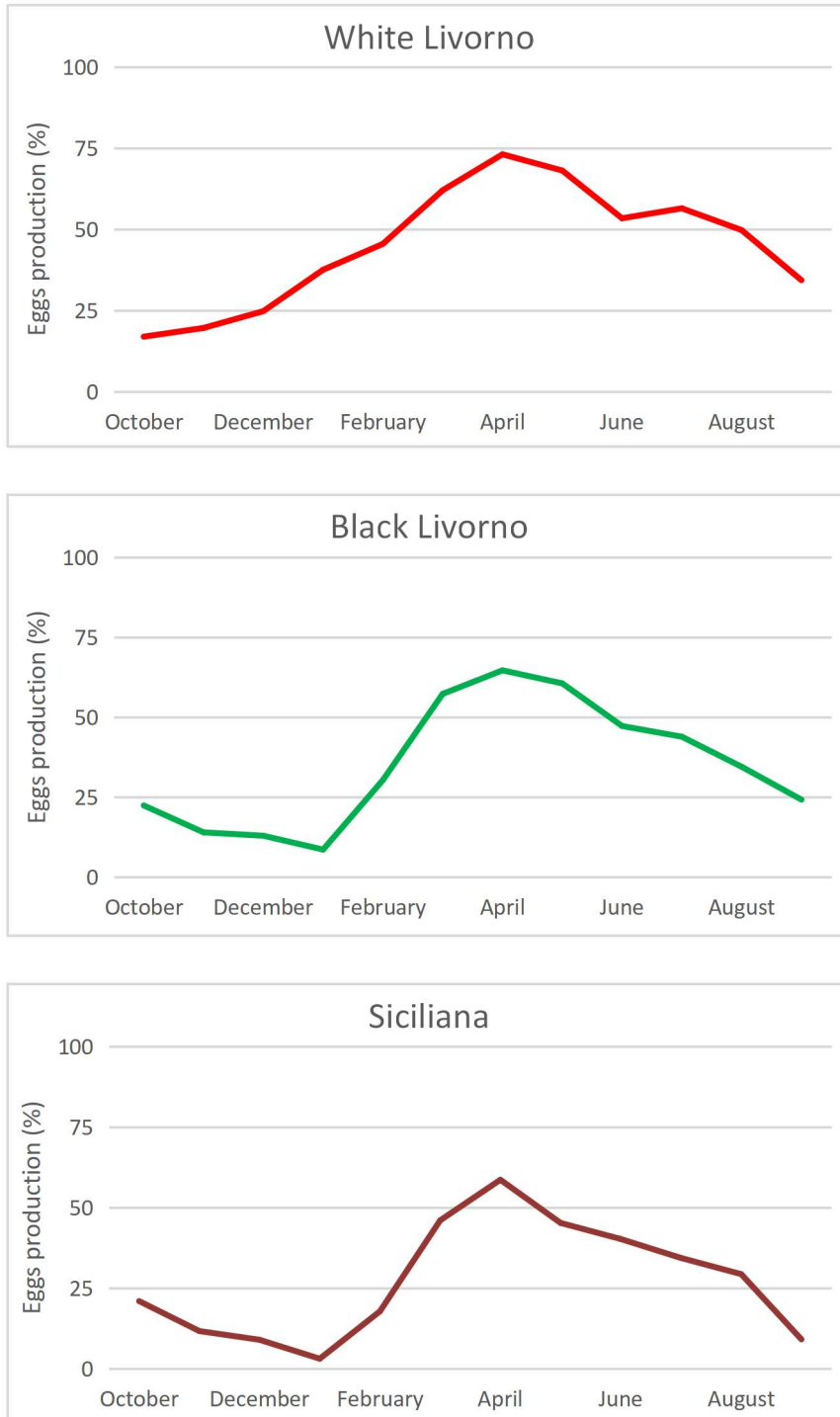


Figure 1.1.2 – Trend of the average egg weight from Livorno and Siciliana breed hens at the first egg-laying cycle (partial data).



Table 1.1.1 – Feed intake and conversion efficiency for eggs (FCR-eggs) of Black Livorno (BL), White Livorno (WL), and Siciliana (S) breed hens at the first egg-laying cycle during the period of May to July (age 56-67 weeks).

	May			June		July			May			June		July		
b r e e d	Average feed intake bird/day (g)						FCR-eggs									
BL				0,162± 0,026	0,143± 0,004	0,137± 0,020	0,127± 0,016	0,130± 0,008				5,94± 0,67	4,55± 0,57	6,18± 3,58	4,61± 0,85	5,82± 3,28
WL	0,128± 0,026	0,109± 0,001	0,092± 0,006	0,099± 0,008	0,097± 0,002	0,085± 0,010	0,091± 0,011	0,088± 0,008	3,56± 0,60	3,49± 0,82	3,69± 0,69	3,54± 0,69	3,45± 0,10	3,43± 0,42	2,80± 0,37	3,01± 0,40
S	0,109± 0,001	0,109± 0,005	0,085± 0,002	0,104± 0,002	0,059± 0,005	0,092± 0,028	0,076± 0,001	0,083± 0,012	4,36± 1,21	5,77± 0,84	4,56± 1,77	6,94± 3,26	3,45± 2,04	6,10± 3,29	4,80± 1,85	6,10± 1,40

Figure 1.2.1 - First egg-laying cycle curve of Ancona breed hens recorded during the reproductive period from October 2021 to the end of September 2022.

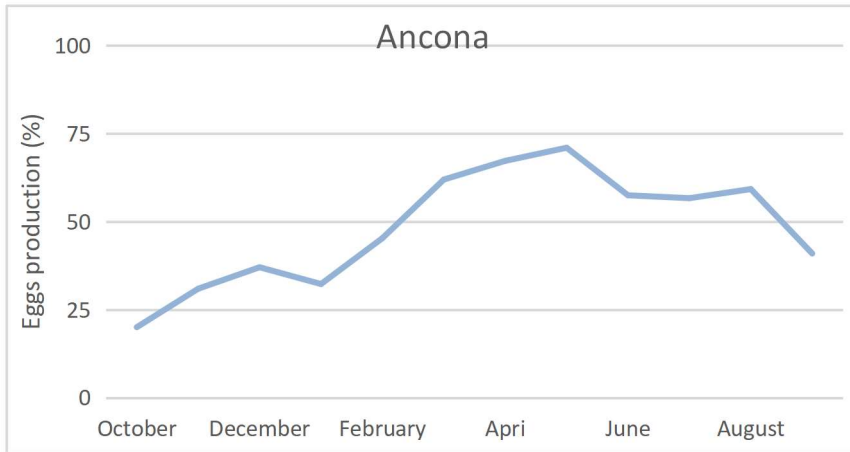


Figure 1.2.2 - Trend of the average egg weight for the two groups of Ancona breed hens in the first egg-laying cycle (partial data).

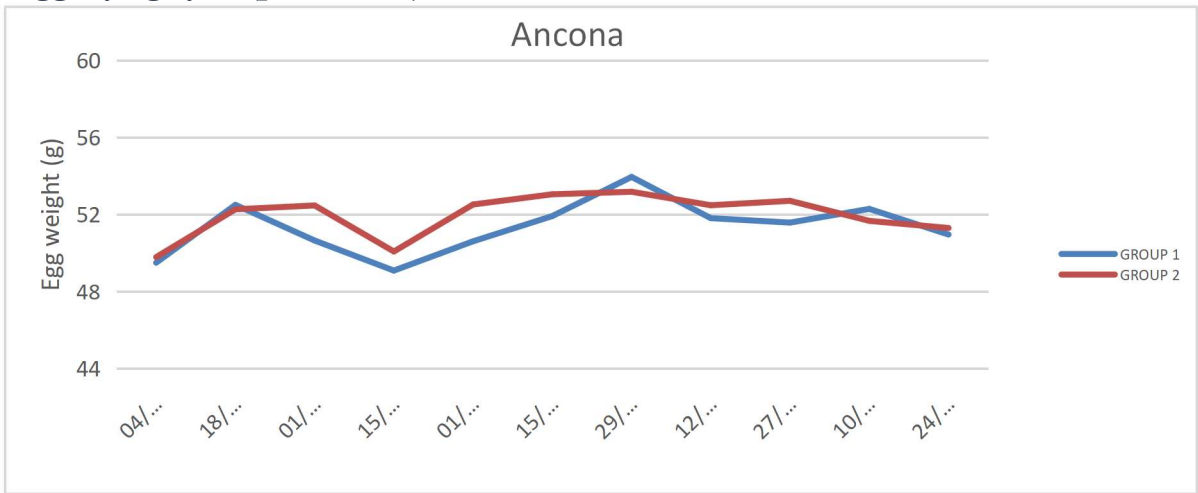


Table 1.3.1 - Physical characterization of eggs from Ancona, Livorno, and Siciliana hens in the first egg-laying cycle.

		Ancona	Livorno	Siciliana	breed	age	breed x age
Egg		49,87 ± 2,83 ^B	56,53 ± 3,29 ^A	46,87 ± 3,31 ^B	0,0001	0,0153	0,0476
Yolk	(g)	16,43 ± 1,08 ^A	15,52 ± 1,18 ^{AB}	14,47 ± 0,98 ^B	0,0011	0,0001	ns
Albumen		28,23 ± 1,89 ^B	35,00 ± 2,45 ^A	27,09 ± 2,48 ^B	0,0001	ns	ns
Shell		5,20 ± 0,41 ^B	6,00 ± 0,54 ^A	5,31 ± 0,87 ^{AB}	0,0001	0,0001	ns
Shell thickness							
Acute pole		0,41 ± 0,03 ^B	0,40 ± 0,04 ^B	0,42 ± 0,05 ^A	0,0001	0,0008	ns
Obtuse pole	(mm)	0,37 ± 0,03 ^B	0,39 ± 0,03 ^B	0,40 ± 0,05 ^A	0,0001	0,0001	0,0007
Equator		0,39 ± 0,02 ^B	0,42 ± 0,03 ^A	0,42 ± 0,05 ^A	0,0001	0,0001	ns
Egg dimensions							
Width		4,10 ± 0,08 ^a	4,13 ± 0,16 ^a	3,88 ± 0,19 ^b	0,0377	ns	ns
Length	(cm)	5,30 ± 0,16 ^B	5,88 ± 0,23 ^A	5,56 ± 0,32 ^B	0,0001	ns	ns
Yolk		33,01 ± 1,33 ^A	27,52 ± 1,71 ^C	30,89 ± 1,90 ^B	0,0001	0,0298	ns
Albumen	(%)	56,57 ± 1,25 ^B	61,85 ± 1,69 ^A	57,92 ± 2,23 ^B	0,0001	ns	ns
Shell		10,42 ± 0,59	10,63 ± 0,84	11,18 ± 1,50	ns	0,0001	0,0380
Yolk color		11 ± 2	10 ± 2	11 ± 2	ns	0,0001	0,0001

Table 1.3.2 - Chemical characterization of egg components from Ancona, Livorno, and Siciliana hens in the first egg-laying cycle.

		Ancona	Livorno	Siciliana	breed	age	breed x age
Yolk							
EE		40,50 ± 1,44 ^B	42,46 ± 1,32 ^A	43,45 ± 1,49 ^A	0,0001	0,0001	0,0021
CP	(%)	9,12 ± 0,78 ^a	8,19 ± 0,72 ^b	8,47 ± 0,65 ^{ab}	0,0196	0,0001	0,0198
DM		54,75 ± 1,54	54,63 ± 1,36	56,18 ± 1,31	ns	0,0001	ns
Sterines	(%)	1,90 ± 0,06 ^B	1,96 ± 0,05 ^A	2,03 ± 0,07 ^A	0,0001	0,0001	0,002
Albumen							
EE		0,70 ± 0,09	0,71 ± 0,09	0,69 ± 0,08	ns	0,0001	ns
CP	(%)	14,00 ± 0,88 ^a	13,62 ± 0,97 ^{ab}	13,16 ± 0,74 ^b	0,0245	0,0001	ns
DM		13,84 ± 1,02 ^A	13,37 ± 1,12 ^{A B}	12,87 ± 0,83 ^B	0,0001	0,0001	0,0802

Table 1.3.3 - Physical and chemical characterization of eggs from Ancona, Livorno, and Siciliana hens in the second egg-laying cycle (partial data).

		Ancona	Livorno	Siciliana	breed	age	breed x age
Egg	(g)	54,23 ± 2,89 ^B	59,57 ± 3,37 ^A	50,26 ± 4,63 ^C	0,0001	0,001	0,0002
Yolk	(g)	18,60 ± 1,01 ^A	17,02 ± 1,19 ^B	15,72 ± 1,06 ^C	0,0001	ns	ns
	(%)	34,33 ± 1,28 ^A	28,63 ± 1,99 ^C	31,47 ± 3,03 ^B	0,0001	0,0001	0,0001
	Colour	12,26 ± 1,40 ^B	12,78 ± 1,48 ^{AB}	13,15 ± 1,55 ^A	0,0001	0,0001	ns
Yolk	EE	42,09 ± 2,30 ^B	42,52 ± 1,87 ^B	43,78 ± 2,39 ^A	0,0001	0,0001	0,0061
	CP	9,12 ± 0,79 ^A	8,62 ± 0,77 ^B	8,48 ± 0,55 ^B	0,0001	0,0016	0,0065
	DM	55,73 ± 2,68 ^{ab}	55,03 ± 2,01 ^b	56,17 ± 3,13 ^a	0,0558	0,0014	ns
	Sterines	1,99 ± 0,14 ^B	1,97 ± 0,10 ^B	2,05 ± 0,15 ^A	0,0013	0,0001	0,0292
Albumen	EE	0,73 ± 0,07 ^B	0,76 ± 0,08 ^A	0,70 ± 0,07 ^C	0,0001	ns	0,0037
	CP	(%) 13,06 ± 0,58 ^A	13,23 ± 0,61 ^A	12,20 ± 0,52 ^B	0,0001	0,0237	ns
	DM	12,77 ± 0,70 ^A	12,96 ± 0,75 ^A	11,77 ± 0,63 ^B	0,0001	0,0398	ns

Figure 7.1.1 - Live body weights and weekly body weight gains at different ages of males and females of Bianca di Saluzzo (BS), White Livorno (LB), Mugellese (MUG), and Valdarnese (VAL) breeds, recorded in the first disease resistance and resilience test: year 2022.



Table 7.1.2 - Feed intake and FCR at different ages for Bianca di Saluzzo (BS), White Livorno (WL), Mugellese (MUG), and Valdarnese (VAL) breeds, recorded in the first disease resistance and resilience test: year 2022.

	WEEKS OF AGE									WEEKS OF AGE								
	1°	2°	4°	6°	8°	13°	17°	21°	25°	1°	2°	4°	6°	8°	13°	17°	21°	25°
Breed	feed intake animal/day (g)									FCR								
WL - group1	7,0	15,9	33,7	52,6	65,4	56,0	71,3	69,7	82,3	1,34	1,87	1,38	2,00	3,80	6,52	37,00	14,75	14,97
WL - group2	7,4	17,5	35,3	60,2	64,2	64,7	56,7	67,2	103,8	1,46	1,79	1,40	2,20	4,30	5,65	14,10	17,85	13,24
BS - group1	6,4	18,0	42,7	79,6	87,0	68,8	92,4	94,2	132,7	1,13	1,77	1,42	2,30	3,70	7,33	17,80	12,52	12,18
BS - group2	7,1	16,6	38,8	71,9	82,8	68,7	94,5	93,0	131,9	1,35	1,77	1,26	2,60	3,60	5,96	8,30	15,16	15,99
VAL - group1	7,3	19,1	44,3	70,1	87,7	69,4	94,4	99,9	159,5	1,68	1,90	1,64	2,20	4,00	6,13	9,40	27,88	21,97
MUG - group1	6,2	12,0	27,0	37,5	43,5	26,6	45,0	52,7	52,6	1,69	1,92	1,82	2,20	4,50	8,30	8,90	27,99	29,08
MUG - group2	6,1	10,3	26,3	35,8	37,7	38,2	35,9	42,2	47,9	1,72	1,77	1,79	2,20	3,90	6,61	8,20	25,81	23,76

Table 7.1.3 - Number of deaths in Bianca di Saluzzo (BS), White Livorno (WL), Mugellese (MUG), and Valdarnese (VAL) breeds, recorded in the first disease resistance and resilience test: year 2022.

n° of animals	Breed	Group	0-15 d	16-30 d	31-60 d	61-90 d	91-120 d	121-180 d
			Deaths by age					
9	MUG	1						
9	MUG	2						
9	BS	1						
10	BS	2						
12	WL	1						
11	WL	2			1			
8	VAL	1					1	1

Table 7.1.4 - Incubation outcome for Robusta Lionata (RL), Pepoi (PP), Ermellinata di Rovigo (ER), and Ancona (A) eggs used for the second disease resistance and resilience test: year 2023.

Breed	egg (n)	fertility (%)	hatched/fertile eggs (%)
RL	50	80,0	52,5
PP	49	73,5	50,0
ER	48	70,8	52,9
A	41	95,1	82,1

Table 7.1.5 - Mortality observed Robusta Lionata (RL), Pepoi (PP), Ermellinata di Rovigo (ER), and Ancona (A) breeds during the second disease resistance and resilience test: year 2023 (partial data).

Breed	GROWTH PERIODS		
	0-14d	15-30d	31-60d
RL	9,5%	15,8%	50,0%
PP	0	9,5%	31,6%
ER	0	0	22,7%
A	0	4,2%	8,7%

Table 7.2.1 - Results of quali-quantitative parasitological analyses obtained in the four examined breeds reared at the two locations (Pisa and Florence) in the first disease resistance and resilience test: year 2022.

Facility	breed	pool	15d		30d		60d		90d		120d	
			Mc Master	flotation	Mc Master	flotation	Mc Master	flotation	Mc Master	flotation	Mc Master	flotation
PISA	WL	1	Neg	Neg	Neg	Neg	Neg	Neg	1000 OPG	<i>Eimeriaspp.</i>	36000 OPG	<i>Eimeriaspp.</i>
	WL	2	Neg	Neg	Neg	Neg	Neg	Neg	264000 OPG	<i>Eimeriaspp.</i>	1650 OPG	<i>Eimeriaspp.</i>
	BS	1	Neg	Neg	Neg	Neg	Neg	Neg	7300 OPG	<i>Eimeriaspp.</i>	2150 OPG	<i>Eimeriaspp.</i>
	BS	2	Neg	Neg	Neg	Neg	450 OPG	<i>Eimeria spp.</i>	84000 OPG	<i>Eimeriaspp.</i>	250 OPG	<i>Eimeriaspp.</i>
	MUG	1	Neg	Neg	Neg	Neg	Neg	Neg	11350 OPG	<i>Eimeriaspp.</i>	1050 OPG	<i>Eimeriaspp.</i>
	MUG	2	Neg	Neg	Neg	Neg	75000 OPG	<i>Eimeriaspp.</i>	35000 OPG	<i>Eimeriaspp.</i>	251 OPG	<i>Eimeriaspp.</i>
	VAL	1	Neg	Neg	Neg	Neg	Neg	Neg	58000 OPG	<i>Eimeriaspp.</i>	200 OPG	<i>Eimeriaspp.</i>

FLORENCE	WL	1	Neg	Neg	Neg	Neg	Neg	Neg	1600 OPG	<i>Eimeriaspp.</i>	100 OPG	<i>Eimeriaspp.</i>
	WL	2	Neg	Neg	Neg	Neg	100 OPG	<i>Eimeriaspp.</i>	350 OPG	<i>Eimeriaspp.</i>	Neg	Neg
	BS	1	Neg	Neg	Neg	Neg	3950 OPG	<i>Eimeriaspp.</i>	200 OPG	<i>Eimeriaspp.</i>	200 OPG	<i>Eimeriaspp.</i>
			Neg	Neg	Neg	Neg	Neg	Neg	Neg	Neg	150 UPG	<i>Ascaridia/Heterakis</i>
	BS	2	Neg	Neg	Neg	Neg	4500 OPG	<i>Eimeriaspp.</i>	50 OPG	<i>Eimeria spp.</i>	Neg	Neg
			Neg	Neg	Neg	Neg	Neg	Neg	Neg	Neg	100 UPG	<i>Ascaridia/Heterakis</i>
	MUG	1	Neg	Neg	Neg	Neg	150 OPG	<i>Eimeriaspp.</i>	Neg	Neg	Neg	Neg
			Neg	Neg	Neg	Neg	Neg	Neg	Neg	Neg	500 UPG	<i>Ascaridia/Heterakis</i>
	MUG	2	Neg	Neg	Neg	Neg	400 OPG	<i>Eimeriaspp.</i>	Neg	Neg	50 OPG	<i>Eimeriaspp.</i>
			Neg	Neg	Neg	Neg	550 UPG	<i>Ascaridia/Heterakis</i>	Neg	Neg	100 UPG	<i>Ascaridia/Heterakis</i>
VAL	1	Neg	Neg	Neg	Neg	300 OPG	<i>Eimeriaspp.</i>	Neg	Neg	100 OPG	<i>Eimeria spp.</i>	
VAL	2	Neg	Neg	Neg	Neg	1100 OPG	<i>Eimeriaspp.</i>	Neg	Neg	Neg	Neg	

Table 7.2.2 - Preliminary results of quali-quantitative parasitological analyses obtained in the four examined breeds reared at the two locations (Pisa and Florence) in the second disease resistance and resilience test: year 2023.

Facility	Breed	pool	15d		30 d	
			McMaster	flotation	McMaster	flotation
PISA	PEPOI	1	Neg	Neg	Neg	Neg
		2	Neg	Neg	Neg	Neg
		3	Neg	Neg	Neg	Neg
		4	Neg	Neg	Neg	Neg
	ROBUSTA LIONATA	1	Neg	Neg	Neg	Neg
		2	Neg	Neg	Neg	Neg
		3	Neg	Neg	Neg	Neg
		4	Neg	Neg	Neg	Neg
	ERMELLINATA DI ROVIGO	1	Neg	Neg	Neg	Neg
		2	Neg	Neg	Neg	Neg
		3	Neg	Neg	Neg	Neg
		4	Neg	Neg	Neg	Neg
	ANCONA	1	Neg	Neg	Neg	Neg
		2	Neg	Neg	Neg	Neg
		3	Neg	Neg	Neg	Neg
		4	Neg	Neg	Neg	Neg
FLORENCE	PEPOI	1	Neg	Neg	Neg	Neg
		2	Neg	Neg	Neg	Neg
		3	Neg	Neg	Neg	Neg
		4	Neg	Neg	Neg	Neg
	ROBUSTA LIONATA	1	Neg	Neg	Neg	Neg
		2	Neg	Neg	Neg	Neg
		3	Neg	Neg	Neg	Neg
		4	Neg	Neg	Neg	Neg
	ERMELLINATA DI ROVIGO	1	Neg	Neg	Neg	Neg
		2	Neg	Neg	Neg	Neg
		3	Neg	Neg	Neg	Neg
		4	Neg	Neg	Neg	Neg
	ANCONA	1	Neg	Neg	2600 OPG	<i>Eimeria spp.</i>
		2	Neg	Neg	5450 OPG	<i>Eimeria spp.</i>
		3	Neg	Neg	26600 OPG	<i>Eimeria spp.</i>
		4	Neg	Neg	9400 OPG	<i>Eimeria spp.</i>

Table 7.2.3 - Number of examined birds and number of positive birds for *Enterococcus spp* in the first disease resistance and resilience test: year 2022

BREED	Birds N.	FACILITY	<i>Enterococcus spp</i>		TOT. <i>Enterococcus spp</i>	
			+	-	+	-
White Livorno	39	Pisa	20	3	32	7
		Florence	12	4		
Bianca di Saluzzo	38	Pisa	9	9	25	13
		Florence	16	4		
Mugellese	35	Pisa	16	3	32	3
		Florence	16	0		
Valdarnese Bianca	12	Pisa	6	1	11	1
		Florence	5	0		
total	124				100	24

Table 7.2.4 - Evaluation of antibiotic resistance profiles (agar diffusion method) for the breeds from Pisa and Florence facilities, in the first disease resistance and resilience test: year 2022.

Facility	Sample	Inhibition zone diameter (mm)					
		CN	TE	AMP	LZD	E	S
Florence	LI FI 003R	19	25	28	30	32	10
	LI FI 004R	22	25	24	38	36	10
	LI FI 015R	23	27	16	36	32	12
	LI FI 043R	26	28	22	34	36	10
	LI FI 046R	27	26	28	44	32	10
	LI FI 048R	26	28	24	40	38	14
	LI FI 050R	25	29	31	42	42	10
	LI FI 056R	23	16	28	40	40	16
	LI FI 059R	21	25	21	42	34	10
	LI FI 060R	19	31	34	35	33	10
	LI FI 067R	19	25	38	35	0	11
	LI FI 076R	21	25	24	32	34	9
	LI FI 084R	21	29	16	44	30	10
	LI FI 100R	17	22	30	33	34	8
Florence	BS FI 001V	13	14	24	38	43	18
	BS FI 003V	13	9	29	35	0	10
	BS FI 004V	13	14	24	30	44	0
	BS FI 010V	13	35	22	32	45	8
	BS FI 011V	13	36	38	38	24	15

BS FI 013V	13	10	26	32	0	7
BS FI 017V	13	23	25	33	36	8
BS FI 019V	13	34	40	38	31	10
BS FI 020V	13	14	36	38	35	14
BS FI 021V	13	7	35	37	0	12
BS FI 026V	13	34	26	38	0	11
BS FI 029V	13	36	30	32	35	11
BS FI 033V	13	31	26	34	33	12
BS FI 036V	13	8	26	38	34	14
BS FI 038V	13	32	26	36	28	11
BS FI 040V	13	30	26	36	0	10
BS FI 042V	13	25	14	34	22	12
BS FI 044V	13	26	30	28	23	19
BS FI 045V	13	25	36	36	32	11
VAL FI 21	17	26	33	34	34	13
VAL FI 32	22	24	26	34	34	0
VAL FI 44	35	42	37	44	52	30
VAL FI 55	25	34	34	38	42	24
MU FI 0X	19	34	34	38	0	10
MU FI 7	22	30	34	34	35	14
MU FI 9	21	30	36	38	32	15
MUG FI 18	18	32	34	32	27	12

	MUG FI 20	19	30	34	34	32	10
	MUG FI 33	20	26	34	36	34	7
	MUG FI 34	21	26	34	34	32	11
	MUG FI 53	13	28	28	30	22	7
	MUG FI 60	21	35	36	38	37	12
	MUG FI 73	18	29	31	31	32	10
	MUG FI 75	18	28	28	32	0	12
	MUG FI 78	19	30	34	36	0	12
Pisa	LB PI 3	22	33	43	37	38	18
	LB PI 16	23	35	44	40	37	14
	LB PI 19	23	36	38	40	36	13
	LB PI 20	23	35	42	36	36	12
	LB PI 22	23	35	40	40	36	11
	LB PI 23	23	35	44	40	36	12
	LB PI 28	20	34	40	38	37	12
	LB PI 32	23	36	39	40	36	12
	LB PI 54	22	38	40	40	37	13
	LB PI 59	21	33	40	35	36	12
	LB PI 61	24	33	44	38	37	12
	LB PI 66	17	30	28	32	32	8
	LB PI 70	22	34	38	37	35	11
	LB PI 72	22	35	43	36	38	13

	LB PI 75	22	35	42	40	35	13
	LB PI 79	22	30	34	32	30	12
	LB PI 83	20	30	30	34	32	11
	LB PI 89	24	36	42	40	40	13
	LB PI 96	21	36	42	40	38	13
	BS PI 2	19	30	40	34	33	9
	BS PI 12	21	33	44	36	36	13
	BS PI 14	20	30	50	34	35	12
	BS PI 15	18	33	34	35	32	10
	BS PI 18	20	28	35	40	30	10
	BS PI 20	21	35	46	38	34	11
	BS PI 36	21	33	35	36	35	12
	BS PI 53	19	35	46	37	34	10
	BS PI 56	18	30	45	33	36	14
	BS PI 76	21	33	50	38	34	11
	BS PI 77	20	34	30	35	30	9
	BS PI 81	20	32	36	35	36	13
	BS PI 88	21	32	35	33	36	13
	BS PI 91	20	33	50	35	36	12
	VAL PI 24	21	7	46	33	35	11
	VAL PI 43	23	30	46	40	0	13
	VAL PI 44	26	30	36	40	27	11

	VAL PI 78	17	28	42	32	30	11
	VAL PI 97	21	7	46	33	35	9
	VAL PI 100	20	32	35	34	29	10
	MUG PI 31	28	39	18	40	45	30
	MUG PI 45	25	10	23	33	45	32
	MUG PI 74	23	16	21	36	43	28
	MUG PI 86	22	14	18	33	41	17
	MUG PI 0-57	28	40	23	41	48	34
	MUG PI 0-73	25	30	21	34	42	28

Table 7.2.5 – Antibiotic resistance tested in the breeds raised at the Pisa and Florence facilities in the first disease resistance and resilience test: year 2022.

Facility	Breed	Antibiotics					
		CN (%)	TE (%)	AMP (%)	LZD (%)	E (%)	S (%)
Florence	Livorno (n=14)	0	0	0	0	7	78
	Bianca di Saluzzo (n=19)	0	37	0	0	26	58
	Valdarnese bianca (n=4)	0	0	0	0	0	25
	Mugellese (n=12)	0	0	0	0	25	50
Pisa	Livorno (n=22)	0	0	0	0	0	18
	Bianca di Saluzzo (n=14)	0	0	0	0	0	50
	Valdarnese bianca (n=6)	0	33	0	0	17	83
	Mugellese (n=6)	0	33	0	0	0	0

Table 7.2.6 - Results of bacteriological examinations performed on unhatched (nh) eggs and deceased subjects in the second resilience and resistance test: year 2023.

Sample	Breed	Location	<i>Salmonella</i> spp.	<i>Campylobacter</i> spp.	<i>Clostridium</i> spp.	<i>E. coli</i>	<i>Enterococcus</i> spp.
nh egg	Ancona	Pisa	-	-	+	+	+
nh egg	Pepoi	Pisa	-	-	-	+	+
nh egg	Ermellinata di Rovigo	Pisa	-	-	-	+	+
nh egg	Robusta Lionata	Pisa	-	-	-	+	+
chick	Robusta Lionata	Pisa	-	-	+	+	+
chick	Robusta Lionata	Pisa	-	-	+	+	+
chick	Robusta Lionata	Pisa	-	-	+	+	+
chick	Robusta Lionata	Pisa	-	-	+	+	+
chick	Robusta Lionata	Pisa	-	-	+	+	+
chick	Ancona	Pisa	-	-	-	+	+
chick	Robusta Lionata	Pisa	-	-	-	+	+
chick	Robusta Lionata	Pisa	-	-	-	+	+
chicken	Robusta Lionata	Pisa	-	-	-	+	+
chicken	Pepoi	Pisa	-	-	-	+	+
chicken	Pepoi	Pisa	-	-	-	+	+
chicken	Ermellinata di Rovigo	Pisa	-	-	-	+	+
chicken	Ermellinata di Rovigo	Pisa	-	-	-	+	+