MEZINÁRODNÍ TESTOVÁNÍ DRŮBEŽE
státní podnik, ÚSTRAŠICE

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XIX. International performance test of commercial layers - alternative system

The final report

(2020 – 2021)

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1 The list of participants

Sample	Genotype	Hatchery flock	State	Breeding organization
1	xxxxx	xxxxx	xxxxx	xxxxx
2	xxxxx	xxxxx	xxxxx	xxxxx
3	xxxxx	xxxxx	xxxxx	xxxxx
4	xxxxx	xxxxx	xxxxx	xxxxx
5	xxxxx	xxxxx	xxxxx	xxxxx
6	xxxxx	xxxxx	xxxxx	xxxxx
7	xxxxx	xxxxx	xxxxx	xxxxx
8	xxxxx	xxxxx	xxxxx	xxxxx

2 The basic data of performance test

2.1 Progeny testing

The progeny testing of commercial layers hybrids consists of:
- incubation and hatch of hatching eggs delivered from a regular PS flock
- pullets rearing: 18 weeks long rearing period (126 days)
- hen production: 56 weeks long laying period (127 – 518 days of age)

2.2 Location of the test

Mezinárodní testování drůbeže, s.p. Ústrašice – Testační stanice nosných slepic (Test Station of Layers)

2.3 Material

Each sample consisted of 1080 hatching eggs delivered to the test station. There were 8 genotypes compared in the test. The list of genotypes and their origin is shown in „The list of participants".

2.4 Important dates

setting in the hatchery:	27 April 2020
beginning of rearing – day 1:	19 May 2020
end of rearing:	22 September 2020
beginning of laying, start of the period 1:	23 September 2020
end of laying, end of the period 14:	19 October 2021

3 Incubation and hatching

3.1 Sorting and weighing of hatching eggs

The hatching eggs were sorted immediately after delivery to the test station. The average egg weight of each sample was found.

3.2 Storage of hatching eggs

After sorting and weighing, the hatching eggs were disinfected and stored in temperature of 16 – 18 °C.

3.3 Setting in the hatchery

Hatching eggs of all samples were set for a single stage incubation at once. Correspondent data monitoring was made during incubation.

4 Rearing of pullets

4.1 Samples and their location

The rearing of pullets took 126 days. Day old chicks were sexed. The males were destroyed. After culling of non standard birds, 200 pullets of each sample were randomly chosen for the test. They were divided in 2 groups of 100 birds. Day old pullets are marked (wing banded). Beak trimming is carry out by hot blade in the hatchery. This treatment is done on all of pullets.

4.2 Housing system

Pullets were kept in windowless house with full control of the environment, on deep litter. Manually filled tube feeders and automatic nipple drinkers were used. The perches are placed during 4-5 weeks of age. Perch surface per bird is 5 cm. The first accessible level is at 20 cm height.

4.3 Conditions of the environment

Temperature

Age	Below the heater °C	In the house °C
Day 1 - 3	36	27
Day 4 - 7	33	27
Day 8 - 14	30	24
Day 15 - 21	27	24
Day 22 - 28	24	22
Day 29 - 35	-	20
From week 6	-	18 - 20

Stocking density

Age	Birds/m^2
Day 1 - 112	9
From day 112	7

Ventilation

Transversal automatically controlled ventilation (fans and air inlets on the opposite side of the house) was used. Ventilation provided minimum ventilation rate of 3 m^3/hour/kg live weight in winter, with possible increase in summer, depending on temperature and air humidity. Relative humidity was kept between 50 – 70 %.

4.4 Lighting programme

Pullets were kept in windowless house. All the birds were submitted to the following lighting programme.

Age	Hours of light	From - to	Luminous intensity (lx)
Day 1 - 3	23	$1^{00} – 24^{00}$	40
Day 4 - 7	20	$2^{00} – 22^{00}$	30
Day 8 - 14	18	$3^{00} – 21^{00}$	20
Day 15 - 21	16	$4^{00} – 20^{00}$	10
Day 22 - 28	14	$5^{00} – 19^{00}$	10
Day 29 - 35	12	$6^{00} – 18^{00}$	5-10
Week 6 - 16	10	$6^{00} – 16^{00}$	5-10
Week 17	12	$6^{00} – 18^{00}$	10-15
Week 18	13	$5^{00} – 18^{00}$	5-10

4.5 Feeding and watering

Pullets were fed to reach their BW standards during the rearing. The complete feed was daily given into the tube feeders. The feed K1 was distributed several times a day. The feeds K2, KZK and N0 were distributed twice a day – 50% in the morning and 50% in the afternoon. All the distributed feed should be daily eaten. Water was supplied by automatic nipple drinkers.

Feed was supplied by xxxxx

Diet formulas

	K1 IT N	K2 IT N	KZK IT N	NO
Age	Week 1 - 4	Week 5 - 10	Week 11 - 16	Week 17 - 18
Feed form	crumbled	crushed	crushed	crushed
Components – content in %:				
Wheat	51.00	52.78	58.49	51.26
Maize	15.00	16.00	10.00	15.00
Extr. soybean groats	23.85	19.30	9.00	16.35
Extr. rapeseed groats	1.50	2.00	3.00	3.00
Extr. sunflower groats	1.50	2.00	2.90	2.50
Wheat bran	-	2.50	12.20	2.30
Fish meal	1.50	0.70	-	-
Soybean oil	1.56	0.92	0.88	0.30
Animal fat	-	-	-	1.82
Lysine-HCl	0.29	0.22	0.20	0.13
L-threonine	0.07	0.03	-	-
DL-methionine	0.23	0.17	0.08	0.15
Sodium sulfate	0.15	0.13	0.12	0.17
Salt	0.26	0.27	0.27	0.24
Limestone	1.97	1.95	2.15	3.53
Limestone-roughly ground	-	-	-	2.00
MCP – monocalciumphosphate	0.85	0.75	0.42	0.80
Vitamin and mineral supplement	0.27	0.28	0.29	0.45
Nutrient content (calculated values):				
CP (g/kg)	203.10	186.00	155.90	169.10
Fat (g/kg)	36.00	29.60	28.30	40.00
Linoleic acid (g/kg)	16.00	13.00	12.50	11.00
Crude fiber (g/kg)	29.80	32.80	42.00	33.10
ME (MJ/kg)	12.30	12.10	11.80	11.90
Lysine (g/kg)	11.41	9.75	7.28	8.26
Methionine (g/kg)	5.15	4.39	3.21	3.96
Met. + Cys. (g/kg)	8.67	7.77	6.31	7.13
Threonine (g/kg)	7.90	6.82	5.23	5.91
Tryptophan (g/kg)	2.42	2.21	1.88	2.02
Ca (g/kg)	12.00	11.50	11.50	24.50
P (g/kg)	6.20	6.00	5.90	5.90
P digest. (g/kg)	4.80	4.50	3.80	4.40
Vitamin A (IU/kg)	10000.00	10000.00	10000.00	10000.00
Vitamin D3 (IU/kg)	3000.00	3000.00	3000.00	3000.00

4.6 Veterinary precautions

House was cleaned, washed and disinfected with xxxxx before the pullets` placement. Disinfection of shoes with xxxxx solution at house entry was used. Rodent control was provided regularly.

Vaccination programme

Age	Disease
Day 1	Marek`s disease + infectious bronchitis
Day 3	Salmonellosis
Day 7	Coccidiosis
Day 10	E.coli
Day 13	Infectious bronchitis
Day 17	Newcastle disease
	Gumboro disease
Week 3	Salmonellosis
Week 4	Gumboro disease
Week 6	Infectious bronchitis
	Newcastle disease
Week 9	Infectious bronchitis
Week 10	Avian pneumovirus
Week 11	Avian encephalomyelitis
Week 12	Infectious bronchitis
Week 13	Salmonellosis
Week 14	E.coli
Week 16	Infectious bronchitis
	Newcastle disease
	Egg-drop syndrome

4.7 Transfer to the laying house

Pullets were moved to the laying house at the age of 16 weeks (112 days). 160 birds per sample (2 replications of 80 birds) were selected according to their live weight. All samples were kept in coincident environment conditions.

5 Production period

5.1 Samples and their placement

160 birds of each sample were divided in 2 replications of 80 birds. All samples were kept in coincident environment conditions.

5.2 Housing system

Hens were kept in windowless house with full control of the environment. They were kept in floor system, combination of slatted floor and deep litter. The total floor space of the pen was 11.5 m^2 – 2/3 slatted floor and 1/3 deep litter (shaving). Droppings were removed by the conveyor belt twice a week.

Tube feeders and automatic nipple drinkers were located on the slatted floor (5 cm of tube feeder per 1 layer. 8 layers per 1 nipple). Feed was manually distributed into the feeders. Perches were located above the slatted floor, 15 cm of perch per 1 layer.

There were 2 group nests with size of 120 x 60 cm in each pen (their floor space is not calculated in the total floor space of the pen). The floor of the nests was sloping and it was formed by the artificial grass. The nests were automatically closed before the end of the light period. Eggs were collected manually, each sample separately.

5.3 Conditions of the environment

Temperature was kept between 18 – 20 °C. Relative humidity was 60 – 70 %. Temperature was regulated by transversal automatically controlled ventilation (fans and air inlets on the opposite side of the house), in cold weather a gas heater was used. Ventilation provided minimum ventilation rate of 3 m^3/hour/kg live weight in winter and 5 m^3/hour/kg live weight in summer.

5.4 Lighting program

Hens were kept in windowless house. All the birds were submitted to the following lighting program:

Age	Hours of light
Week 19	14
Week 20	15
Week 21	15.5
Week 22 – end of the test	16

Luminous intensity: 15 – 20 lx.

5.5 Feeding

Hens were fed with three types of feed: from 19th week of age N 1 start, from 23th week of age N 1 and from 47th week of age N 2. All complete feeds were in mash form and fed ad libitum.

Feed was supplied by xxxxx

Diet formulas

Ingredients		**N1 start** (19^{th}-22^{th} week)	**N1** (23^{th}-46^{th} week)	**N2** (47^{th}-78^{th} week)
Wheat		35.03	45.82	45.46
Extr. soybean groats		16.20	11.60	10.95
Maize		20.60	15.00	15.00
Limestone		4.62	4.68	5.10
Soybean oil		1.46	1.92	1.00
Extr. rape meal		5.00	5.00	5.00
Extr. sunflower meal		7.10	7.30	7.50
MCP - monocalciumphosphate		0.55	0.47	0.33
Lysine-HCI		0.12	0.21	0.22
Salt		0.24	0.24	0.24
DL-methionine		0.16	0.14	0.14
Sodium sulfate		0.19	0.17	0.17
L-threonine		-	-	0.03
Animal fat		3.48	2.20	3.41
Limestone-roughly ground		4.80	4.80	5.00
Premix		0.45	0.45	0.45
Nutrient content (calculated values):				
Crude protein	g/kg	173.9	161.0	158.6
Fat	g/kg	68.0	58.8	61.6
Linoleic acid	g/kg	18.6	19.3	15.5
Crude fiber	g/kg	40.0	40.0	40.1
ME	MJ/kg	11.45	11.40	11.40
Lysine	g/kg	8.58	7.93	7.81
Methionine	g/kg	4.27	3.91	3.87
Meth. +cysteine	g/kg	7.49	6.99	6.91
Threonine	g/kg	6.30	5.67	5.86
Tryptophan	g/kg	2.06	1.90	1.86
Ca	g/kg	37.0	37.0	39.0
P	g/kg	5.4	5.1	4.8
P (digestible)	g/kg	3.9	3.7	3.4
Vitamin A	U.I./kg	10000	10000	10000
Vitamin D3	U.I./kg	3000	3000	3000

6 Evaluated parameters

6.1 Incubation and hatching

- weight of hatching eggs
- fertility in %
- hatchability of set eggs in %
- hatchability of fertile eggs in %

6.2 Feed consumption

- per 1 reared pullet
- per 1 hen in production period
- per 1 egg
- per 1 kg of eqq mass
- per 1 feeding day

6.3 Live body weight

- at the age of 1 day – group weighing
- at the age of 14 days (2 week), 28 days (4 week), 42 days (6 week), 56 days (8 week), 70 days (10 week), 84 days (12 week), 98 days (14 week) – individual weighing (40 birds per sample)
- at the age of 112 days (16 weeks) – individual weighing all birds
- at the age of 126 days (18 weeks), 140 days (20 weeks), 154 days (22 weeks), 168 days (24 weeks), 182 days (26 weeks), 210 days (30 weeks) – individual weighing (40 birds per pen)
- at the age of 518 days (74 weeks) – individual weighing all birds

6.4 Health and mortality

- mortality during rearing
- mortality of hens and it's causes

6.5 Egg production

Egg production was recorded daily. Eggs were collected manually at the same time every day. Eggs of different samples were collected separately. Production was evaluated in 14 four week periods, from 127 to 518 days of age.

Results of the egg production:

- per 1 hen housed
- per 1 hen present
- per 1 hen housed for each period

6.6 Sexual maturity

- age of the layers at 10 %. 30 %. 50 % and peak of lay

6.7 Egg weight

- average egg weight for each period
- average egg weight for the whole production
- classification of eggs

6.8 Production of egg mass

- per 1 hen housed
- per 1 hen present

6.9 Second quality eggs

Second quality eggs were sorted out as:

- cracked eggs
- broken eggs
- double-yolk eggs
- shell-less eggs

6.10 Egg quality

- egg weight
- yolk weight
- shell strength
- index of egg shape
- shell thickness
- Haugh´s units
- yolk colour
- egg shell colour
- presence of blood spots on the yolk

7 Results

Tab. No. 1	Results of incubation and hatching
Tab. No. 2	Results of rearing
Tab. No. 3	Mortality in rearing
Tab. No. 4	Results of the egg production
Tab. No. 5	Feed consumtion
Tab. No. 6	Live weight of laying hens
Tab. No. 7	Mortality and it's causes
Tab. No. 8	Second quality eggs
Tab. No. 9	Weight classes of eggs
Tab. No. 10a	Egg quality – Period 6
Tab. No. 10b	Egg quality – Period 9
Tab. No. 10c	Egg quality – Period 12
Tab. No. 11	Intensity of lay
Tab. No. 12	Average egg weight
Tab. No. 13	Floor eggs
Graph No. 1	Intensity of lay

Results of incubation and hatching **Tab. No. 1**

Sample	Cross	Weight of hatching eggs	Fertility	Hatchability	
				Set eggs	Fertile eggs
		g	%	%	%
1	xxxxx	56.54	95.65	89.16	93.22
2	xxxxx	60.93	93.06	81.11	87.16
3	xxxxx	62.08	94.72	87.68	92.57
4	xxxxx	56.29	95.19	87.03	91.43
5	xxxxx	57.72	95.83	91.75	95.74
6	xxxxx	58.35	94.81	81.57	86.03
7	xxxxx	61.15	93.70	85.27	91.00
8	xxxxx	60.21	87.13	75.83	87.03

Results of rearing **Tab. No. 2**

Sample	Cross	Live weight										Feed consumption per 1 pullet at the age of 126 days
		Day 1	Week 2	Week 4	Week 6	Week 8	Week 10	Week 12	Week 14	Week 16	Week 18	
		g	g	g	g	g	g	g	g	g	g	kg/bird
1	xxxxx	34.7	126.9	257.9	447.0	644.5	893.0	1103.0	1220.5	1318.0	1 600.0	7.45
2	xxxxx	36.6	132.8	283.1	467.0	667.0	898.0	1096.0	1199.0	1300.0	1 553.0	7.48
3	xxxxx	37.5	128.6	278.6	467.0	689.5	927.0	1125.0	1224.5	1302.0	1 586.0	7.48
4	xxxxx	34.3	129.9	247.1	468.5	682.5	913.5	1092.5	1203.5	1300.0	1 572.5	7.36
5	xxxxx	34.1	119.4	239.0	437.0	627.0	849.0	1069.5	1200.0	1285.5	1 519.5	7.45
6	xxxxx	34.6	122.4	249.3	462.0	659.0	887.5	1102.0	1192.5	1272.5	1 494.0	7.58
7	xxxxx	35.8	127.6	243.4	467.0	649.0	879.0	1080.0	1199.5	1297.0	1 569.5	7.42
8	xxxxx	36.3	134.1	254.3	473.0	659.0	901.5	1110.5	1228.5	1302.5	1 588.5	7.42

Mortality in rearing **Tab. No. 3**

Sample	Cross	Number of pullets			
		Initial flock	Final flock	Mortality	
		birds	birds	birds	%
1	xxxxx	200	199	1	0.50
2	xxxxx	200	200	0	0.00
3	xxxxx	200	198	2	1.00
4	xxxxx	200	200	0	0.00
5	xxxxx	200	200	0	0.00
6	xxxxx	200	196	4	2.00
7	xxxxx	200	199	1	0.50
8	xxxxx	200	200	0	0.00

Results of the egg production **Tab. No. 4**

Sample	Cross	Age at production					Egg production per				Egg weight	Egg mass per	
		10%	30%	50%	Max.		hen - housed		hen - day			hen - housed	hen - day
					day	%	number	%	number	%	g	kg	kg
1	xxxxx	137	140	141	166	100.00	338.92	86.46	351.27	89.61	60.08	20.36	21.10
2	xxxxx	139	141	145	167	99.38	343.32	87.58	346.02	88.27	60.60	20.80	20.97
3	xxxxx	139	140	141	166	100.00	342.31	87.32	350.99	89.54	60.37	20.66	21.19
4	xxxxx	139	140	141	166	100.00	349.41	89.13	352.82	90.00	60.43	21.12	21.32
5	xxxxx	139	141	143	167	100.00	339.86	86.70	343.16	87.54	59.64	20.27	20.47
6	xxxxx	137	138	142	167	100.00	340.68	86.91	354.19	90.35	59.69	20.33	21.14
7	xxxxx	139	141	143	150	99.38	329.59	84.08	341.74	87.18	64.13	21.14	21.91
8	xxxxx	138	140	142	167	100.00	342.46	87.36	344.52	87.89	60.47	20.71	20.83

Feed consumption **Tab. No. 5**

Sample	Cross	Feed consumption			
		per 1 hen	per 1 egg	per 1 kg of egg mass	per 1 feeding day
		kg	g	kg	g
1	xxxxx	53.76	153.05	2.55	137.15
2	xxxxx	52.26	151.03	2.49	133.31
3	xxxxx	54.31	154.73	2.56	138.54
4	xxxxx	52.09	147.64	2.44	132.88
5	xxxxx	51.63	150.44	2.52	131.70
6	xxxxx	53.36	150.67	2.52	136.13
7	xxxxx	54.02	158.07	2.47	137.80
8	xxxxx	52.41	152.13	2.52	133.70

Live weight of laying hens **Tab. No. 6**

Sample	Cross	Live weight (g)					
		week 20	week 22	week 24	week 26	week 30	final live weight
1	xxxxx	1740.0	1748.5	1803.0	1847.5	1907.0	1956.7
2	xxxxx	1752.5	1736.0	1801.0	1850.5	1895.0	1987.9
3	xxxxx	1746.0	1700.0	1795.5	1833.5	1901.5	1981.6
4	xxxxx	1745.5	1725.0	1815.0	1857.5	1957.0	2082.6
5	xxxxx	1730.0	1692.0	1758.0	1805.0	1895.5	1994.2
6	xxxxx	1710.5	1657.5	1734.0	1825.0	1847.0	1980.6
7	xxxxx	1741.0	1723.0	1792.0	1861.5	1874.5	1950.6
8	xxxxx	1769.0	1787.0	1812.0	1914.5	1942.5	2083.7

Mortality and it's causes **Tab. No. 7**

Sample	Cross	Number of hens				Causes														
		Start of lay	End of lay	Mortality		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
		birds	birds	birds	%															
1	xxxxx	160	149	11	6.88						1			7		3				
2	xxxxx	160	157	3	1.88		1							1		1				
3	xxxxx	160	151	9	5.63									5	1	3				
4	xxxxx	160	156	4	2.50									2		2				
5	xxxxx	160	156	4	2.50									2		2				
6	xxxxx	160	144	16	10.00						1			11		4				
7	xxxxx	160	151	9	5.63						1			4		2	2			
8	xxxxx	160	157	3	1.88									3						

Diagnostic:

1 - Viral diseases
2 - Bacterial diseases
3 - Fungal diseases
4 - Parasitary diseases
5 - Tumors
6 - Injuries
7 - Digestive tract diseases
8 - Respiratory tract diseases
9 - Reproduction tract diseases
10 - Locomotion apparatus diseases
11 - Metabolic derangement
12 - Cannibalism
13 - Diverticulus inflammation
14 - Culling and other causes
15 - Sampling (excluded of calculation)

Second quality eggs **Tab. No. 8**

Sample	Cross	Eggs laid	Cracked eggs		Broken eggs		Double-yolk eggs		Shell-less eggs		Nonstandard together	
		number	number	%	number	%	number	%	number	%	number	%
1	xxxxx	54227	3026	5.58	1199	2.21	0	0.00	0	0.00	4225	7.79
2	xxxxx	54931	3689	6.72	1426	2.60	0	0.00	0	0.00	5115	9.31
3	xxxxx	54770	3420	6.24	1318	2.41	0	0.00	0	0.00	4738	8.65
4	xxxxx	55905	2793	5.00	1020	1.82	0	0.00	0	0.00	3813	6.82
5	xxxxx	54378	2537	4.67	898	1.65	0	0.00	1	0.00	3436	6.32
6	xxxxx	54508	2644	4.85	866	1.59	0	0.00	0	0.00	3510	6.44
7	xxxxx	52734	3097	5.87	1129	2.14	0	0.00	0	0.00	4226	8.01
8	xxxxx	54794	3039	5.55	1061	1.94	0	0.00	0	0.00	4100	7.48

Weight classes of eggs **Tab. No. 9**

Sample	Cross	Egg weight	XL	L	M	S
			(= > 73 g)	(63 - 73 g)	(53 - 63 g)	(= < 53 g)
		g	%	%	%	%
1	xxxxx	60.08	1.40	33.96	60.31	4.33
2	xxxxx	60.60	1.36	34.59	60.53	3.53
3	xxxxx	60.37	1.28	36.13	59.27	3.32
4	xxxxx	60.43	0.98	36.41	59.58	3.02
5	xxxxx	59.64	0.40	32.01	63.35	4.24
6	xxxxx	59.69	1.44	29.24	65.44	3.87
7	xxxxx	64.13	8.09	55.53	35.30	1.09
8	xxxxx	60.47	1.34	34.76	60.74	3.16

Egg quality - Period 6 **Tab. No. 10a**

Sample	Cross	Egg weight	Yolk weight	Shell strength	Index of egg shape	Shell thickness	Haugh's units	Yolk colour				Egg shell colour			Blood spot
								L	a	b	Roche	L	a	b	
		g	g	N		mm									sum
1	xxxxx	62.37	16.82	45.47	1.27	0.40	88.53	-4.03	3.30	10.37	11.50	56.53	18.47	28.07	0
2	xxxxx	62.03	16.42	42.34	1.29	0.38	93.80	-4.13	3.27	10.17	11.43	58.17	16.80	28.27	0
3	xxxxx	62.23	16.10	42.27	1.28	0.38	88.17	-5.90	3.67	8.87	12.40	58.10	18.60	28.20	0
4	xxxxx	61.16	16.12	44.46	1.29	0.39	89.13	-4.20	3.07	10.27	11.50	58.60	18.03	28.50	1
5	xxxxx	60.47	15.89	47.32	1.29	0.41	87.70	-4.40	3.13	10.07	11.50	51.03	19.03	27.03	0
6	xxxxx	59.67	16.07	44.55	1.30	0.39	85.63	-3.63	3.00	10.63	11.23	54.83	19.53	28.40	1
7	xxxxx	67.00	17.17	42.38	1.28	0.39	89.07	-2.77	2.73	11.37	10.60	55.90	18.30	28.73	0
8	xxxxx	61.43	16.87	40.59	1.27	0.38	90.60	-3.60	3.03	10.63	11.20	59.40	17.97	28.73	0

Interpretative notes:

L - colour of egg (0=black, 100=white)

a - red colouring and it's fullness

b - yellow colouring and it's fullness

Egg quality - Period 9 **Tab. No. 10b**

Sample	Cross	Egg weight	Yolk weight	Shell strength	Index of egg shape	Shell thickness	Haugh's units	Yolk colour				Egg shell colour			Blood spot
								L	a	b	Roche	L	a	b	
		g	g	N		mm									sum
1	xxxxx	62.02	17.72	45.46	1.30	0.36	85.67	-2.80	3.07	11.40	10.97	58.63	20.03	29.63	1
2	xxxxx	62.21	17.07	38.10	1.31	0.36	91.63	-3.63	2.90	10.70	11.07	62.07	17.20	29.07	1
3	xxxxx	63.45	17.53	38.30	1.29	0.37	88.70	-5.07	3.50	9.50	12.03	59.83	18.93	27.17	2
4	xxxxx	63.31	17.60	42.33	1.33	0.36	85.57	-3.23	3.20	11.00	11.23	59.33	20.07	30.03	2
5	xxxxx	62.42	17.26	47.06	1.32	0.36	87.37	-4.30	3.23	10.13	11.63	57.47	20.07	29.43	2
6	xxxxx	60.94	17.19	44.07	1.31	0.38	81.87	-2.07	2.90	12.07	10.67	58.17	19.87	29.83	3
7	xxxxx	67.88	17.91	50.41	1.30	0.37	85.03	-2.63	2.73	11.53	10.60	61.07	18.37	29.93	2
8	xxxxx	62.73	18.02	38.18	1.30	0.37	87.83	-3.10	3.13	11.30	11.00	61.13	18.60	29.07	2

Interpretative notes:

L - colour of egg (0=black, 100=white)

a - red colouring and it's fullness

b - yellow colouring and it's fullness

Egg quality - Period 12 **Tab. No. 10c**

Sample	Cross	Egg weight	Yolk weight	Shell strength	Index of egg shape	Shell thickness	Haugh's units	Yolk colour				Egg shell colour			Blood spot
								L	a	b	Roche	L	a	b	
		g	g	N		mm									sum
1	xxxxx	64.26	18.80	42.74	1.33	0.36	75.80	-3.67	2.93	10.67	11.03	57.43	18.93	29.03	0
2	xxxxx	62.88	17.95	36.40	1.35	0.35	78.70	-1.77	2.80	11.17	10.23	59.67	17.13	28.03	0
3	xxxxx	64.65	18.36	38.07	1.31	0.36	78.77	-2.60	3.03	10.97	11.10	53.57	17.07	26.00	0
4	xxxxx	64.02	18.28	41.78	1.35	0.35	75.23	-2.90	3.03	11.47	10.90	58.60	17.47	28.37	0
5	xxxxx	61.87	17.64	41.25	1.33	0.34	78.73	-3.53	3.00	10.67	11.07	53.77	18.97	27.13	0
6	xxxxx	61.14	16.80	37.10	1.35	0.34	73.93	-1.07	2.90	11.57	10.77	56.20	18.60	28.20	0
7	xxxxx	68.00	18.36	43.24	1.31	0.33	78.43	-3.20	3.03	10.97	10.87	59.70	18.60	28.93	1
8	xxxxx	63.83	18.35	41.78	1.32	0.35	78.20	-3.13	3.27	11.27	11.23	59.47	19.20	28.13	0

Interpretative notes:

L - colour of egg (0=black, 100=white)

a - red colouring and it's fullness

b - yellow colouring and it's fullness

Intensity of lay in week (%) **Tab. No. 11**

in four week periods

Sample	Cross	Period													
		1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	xxxxx	62.10	96.63	95.98	95.29	93.42	92.39	89.00	87.79	85.92	84.11	83.21	82.77	81.56	80.27
2	xxxxx	56.90	93.86	93.93	94.93	95.22	92.92	90.49	90.04	89.17	88.46	87.88	86.27	85.87	80.18
3	xxxxx	61.81	94.40	95.09	95.47	94.20	91.65	89.46	89.71	88.64	87.81	86.63	84.40	83.73	79.55
4	xxxxx	61.94	95.85	96.07	96.79	95.42	94.29	91.14	91.92	90.00	89.22	88.21	87.05	86.65	83.33
5	xxxxx	57.19	96.52	94.35	94.82	93.62	92.19	88.33	88.71	87.05	86.74	85.92	84.22	82.90	81.25
6	xxxxx	63.04	96.58	96.43	97.37	94.96	93.10	90.07	87.77	87.68	84.42	83.37	82.12	81.16	78.64
7	xxxxx	59.87	95.25	95.09	94.89	90.65	87.63	82.08	84.53	85.07	84.08	83.13	81.18	77.79	75.87
8	xxxxx	61.45	96.81	95.87	96.72	95.09	94.06	90.47	90.22	88.46	88.08	86.18	83.73	80.33	75.60

Average egg weight **Tab. No. 12**

in four week periods (g)

Sample	Cross	Period													
		1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	xxxxx	50.90	56.17	56.97	59.71	59.92	60.97	61.55	61.76	61.60	61.01	61.44	62.27	62.59	62.94
2	xxxxx	51.76	56.75	58.83	60.53	60.99	61.55	61.86	61.51	61.49	61.29	62.29	61.42	62.13	63.31
3	xxxxx	50.56	56.67	57.96	59.51	60.56	62.05	62.44	62.40	61.84	61.19	60.92	61.07	62.76	63.07
4	xxxxx	51.28	57.02	58.77	60.15	60.27	61.07	61.56	61.84	61.89	61.57	61.33	61.90	62.65	62.52
5	xxxxx	49.25	55.65	57.05	58.83	59.04	60.37	60.90	61.09	61.56	61.05	61.16	61.92	62.41	62.24
6	xxxxx	50.26	55.96	57.88	59.60	59.90	60.81	60.85	60.75	60.60	60.46	61.93	61.23	61.93	61.87
7	xxxxx	53.20	59.32	61.17	63.86	63.47	65.63	65.73	65.86	66.22	65.80	65.94	66.32	67.03	66.70
8	xxxxx	51.56	56.89	58.62	60.85	61.12	61.32	61.51	61.38	61.71	60.78	62.61	61.44	62.46	62.46

Floor eggs **Tab. No. 13**

in four week periods (%)

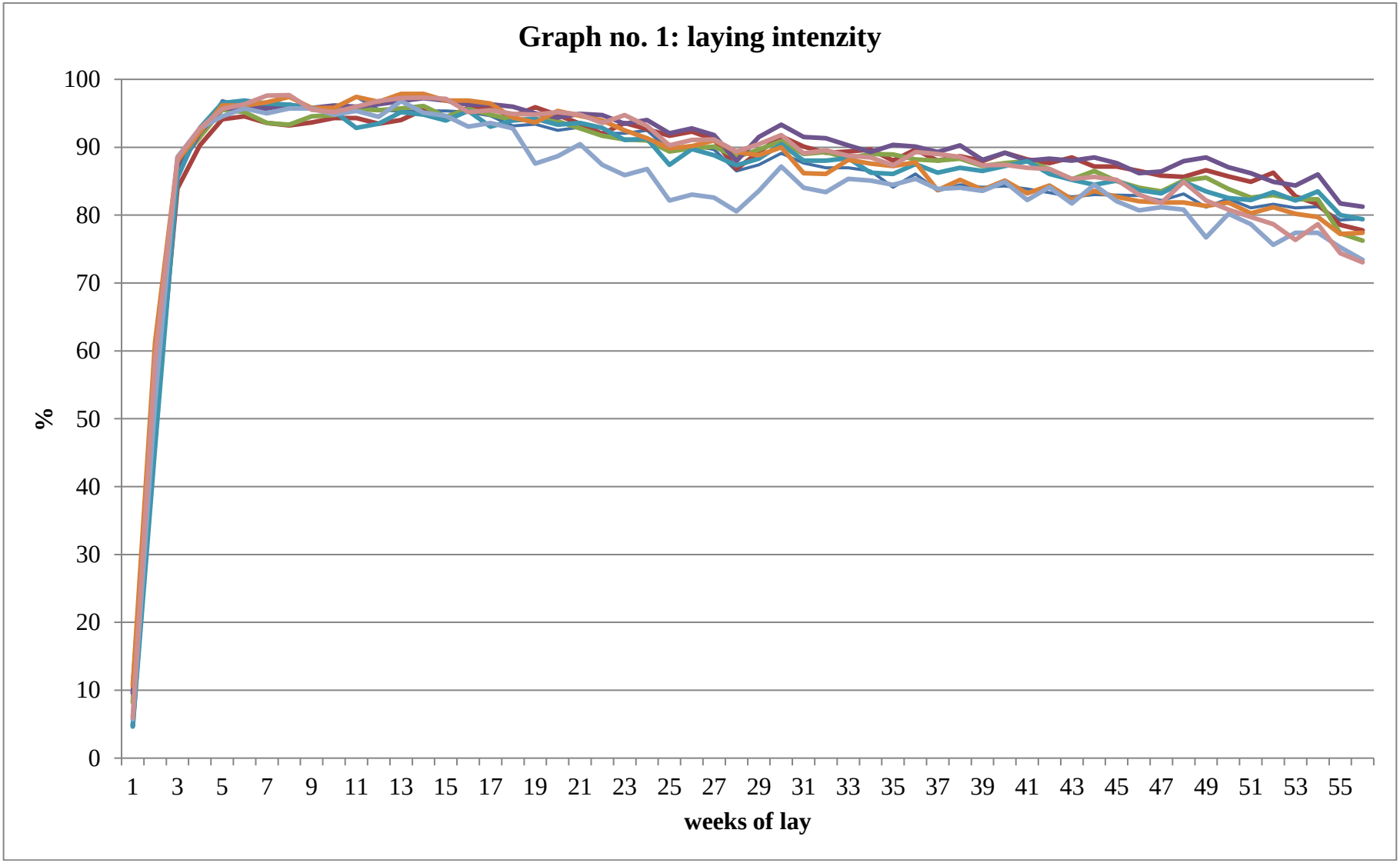
Sample	Cross	Period														Periods 1-14
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	
1	xxxxx	1.07	0.32	0.49	0.42	0.36	0.07	0.13	0.07	0.08	0.08	0.11	0.03	0.16	0.17	0.25
3	xxxxx	2.82	1.37	1.00	1.61	0.77	1.13	0.57	0.69	0.73	0.46	0.28	0.26	0.48	0.59	0.91
4	xxxxx	1.70	0.37	0.19	0.25	0.28	0.09	0.15	0.10	0.17	0.23	0.81	0.49	0.49	0.97	0.45
5	xxxxx	1.91	0.60	0.38	0.28	0.10	0.39	0.03	0.05	0.03	0.10	0.59	0.52	0.51	0.24	0.41
6	xxxxx	0.72	0.39	0.12	0.16	0.12	0.17	0.10	0.02	0.18	0.03	0.08	0.22	0.38	0.17	0.20
7	xxxxx	1.81	1.68	1.40	1.36	1.05	0.45	0.11	0.16	0.08	0.30	0.05	0.03	0.15	0.30	0.64
8	xxxxx	1.76	1.14	0.56	0.09	0.14	0.24	0.15	0.35	0.05	1.12	1.99	1.10	1.13	1.19	0.79

Results excluded of publication:

sample no. 2

sample no. 8 - box 8 (all periods)

Bird unrest observed before the end of 8th period, with symptoms of canibalism in the house. We decreased light intensity to lower limit (15 lx) on the start of 9th period, which could have affected the nesting behavior.


Graph no. 1: laying intenzity
100
90
80
70
60
50
40
30
20
10
0
%
1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31 33 35 37 39 41 43 45 47 49 51 53 55
weeks of lay