MEZINÁRODNÍ TESTOVÁNÍ DRŮBEŽE
státní podnik, ÚSTRAŠICE

390 02 Tábor 2 Tel.: 381 200 320

Performance test of laying type of hens

xxxxx

alternative system

The final report HB 2022 (2022 – 2023)

Study Investigator: Ing. Fara Jiří
Ing. Krekulová Markéta

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1 The list of participants

Treatment		Genotype	Hatchery flock	State	Breeding organization
1	T1	xxxxx	xxxxx	xxxxx	xxxxx
2	T2	xxxxx	xxxxx	xxxxx	xxxxx
3	T3	xxxxx			
4	T4	xxxxx			

2 The basic data of performance test

2.1 Performance test

The performance test of final layer's hybrids consists of:
- hatching of delivered eggs
- rearing of pullets: 22 weeks long growing period (154 days)
- hen keeping: 32 weeks long laying period (155 – 378 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

There were compared 4 treatments in the trial. Each treatment consisted of 1080 (the 2nd sample 856) hatching eggs delivered to the test station.

2.4 Test term

setting in the hatchery:	11 July 2022
beginning of rearing – day 1:	3 August 2022
end of rearing:	3 January2023
beginning of laying, beginning of the period 1:	4 January 2023
end of laying, end of the period 8:	15 August 2023

3 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 treatment was taken.

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 treatments were set in the hatchery at a time. Correspondent evidence was made during the hatching period.

4 Rearing of pullets

4.1 Treatments

The rearing of pullets took 154 days. Day old chicks were sexed. Cocks were destroyed. 416 pullets of the 1st sample, 288 pullets of the 2nd sample, 384 pullets of the 3rd sample and 416 pullets of the 4th sample were randomly chosen after retirement of inconvenient birds.

4.2 Housing system

Pullets were kept in windowless house with full climatic control. They were kept in the cage system from 1 to 10 week. Then they moved on deep litter. Manually filled tube feeders and nipple automatic drinkers were used.

4.3 Environment conditions

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	Stocking density
Day 1 – 154	9 birds/m^2
From day 155	7 birds/m^2

Ventilation

Transversal controlled ventilation (fans and air inlets on the opposite side) was used in the house. Automatic ventilation provided minimum ventilation rate 3 m^3/hour/kg live weight in winter, with possibility of increasing in summer, in dependence on temperature and air humidity. Relative humidity was 50 – 70 %.

4.4 Lighting program

Pullets were kept in windowless house. Lighting program was controlled according to time setting:

Lighting program

Age	Hours of light		From - to	Luminous intensity (lx)
	T1	T2, T3, T4		
Day 1 - 3	23	23	1^{00}– 24^{00}	40
Day 4 - 7	20	20	3^{00}– 23^{00}	30
Day 8 - 14	18	18	4^{00}– 22^{00}	20
Day 15 - 21	16	16	5^{00}– 21^{00}	10
Day 22 - 28	14	14	6^{00}– 20^{00}	10
Day 29 - 35	12	12	7^{00}– 19^{00}	5 - 10
Week 6 - 16	10	10	7^{00}– 17^{00}	5 - 10
Week 17	10	10	7^{00}– 17^{00}	10 - 15
Week 18	10	10	7^{00}– 17^{00}	10 - 15
Week 19	11	10	8^{00} – 19^{00}, 7^{00} – 17^{00}	15 - 20
Week 20	12	12	7^{00}– 19^{00}	15 - 20
Week 21	13	13	6^{00}– 19^{00}	15 - 20
Week 22	14	14	5^{00}– 19^{00}	15 - 20

4.5 Feeding and watering

Pullets were fed ad libitum during the rearing. The complete feed mixture was filled daily in tube feeders. Nipple automatic drinkers were used.

Feed was produced in xxxxx

Diet formulas

	K1 starter I	**K2 starter II**	**KZK grower**	**N0 prelay**
xxxxx	Week 1 - 4	Week 5 - 10	Week 11 - 16	Week 17 - 18
xxxxx	Week 1 - 4	Week 5 - 10	Week 11 - 19	Week 20
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 enz. (MJ/kg)	12.30	12.10	11.80	11.50
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 phytase (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 by xxxxx before the pullet placement. Disinfection of shoes by solution of xxxxx before entry was used. Rodent control was provided regularly.

Vaccination program

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 18 weeks (the 1th sample) and of 20 weeks (the 2nd, 3rd and 4th sample). There were selected 320 birds of the 1th treatment and 260 birds of the 2nd, 3rd and 4th treatment.

5 Production period

5.1 Treatments

320 birds of the 1th treatment and 260 birds of the 2nd, 3rd and 4th treatment were divided in 4 replicates by 80 (65) bird. Hens of each treatment were kept in coincident environment conditions.

5.2 Housing system

Hens were kept in windowless house with full climatic control. 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). Belt conveyer for clearance of excrements was used (removed twice a week).

There were tube feeders and nipple automatic drinkers on the slatted floor. 5 cm of tube feeder per 1 layer, 8 layers per 1 nipple. Feed was manually filled in the feeders. Roosts were located above the slatted floor, 15 cm of roost 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). 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 treatment separately.

5.3 Environment conditions

The temperature in the house was kept between 18 – 20 °C. Relative humidity was 60 – 70 %. Temperature was regulated by transversal controlled ventilation (fans and air inlets on the opposite side), in cold weather a gas heater was used. Automatic ventilation provided minimum ventilation rate 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. Lighting program was controlled according to time setting:

Age	Hours of light	From - to	Luminous intensity (lx)
Week 23	15	4^{00} – 19^{00}	15 - 20
Week 24 – end of the test	16	3^{00} – 19^{00}	15 - 20

5.5 Feeding

Layers were fed with two types of feed during the production period - N1 IT N start and N1 IT N. This mash complete feed mixture was fed ad libitum.
Feed was produced in xxxxx

Diet formulas

Ingredients		**N1 start production**	**N1 production**
xxxxx		Week 19 - 24	Week 24 - 54
xxxxx		Week 21 - 24	Week 24 - 54
Wheat		35.08	42.71
Extr. soybean groats		16.20	11.75
Maize		20.60	18.10
Soybean oil		2.50	2.72
Extr. rape meal		5.00	5.00
Extr. sunflower meal		7.10	7.30
Limestone		2.82	2.88
Limestone-roughly ground		6.60	6.60
Animal fat		2.35	1.25
MCP - monocalciumphosphate		0.55	0.47
Salt		0.28	0.28
Sodium bicarbonate		0.17	0.14
DL-methionine		0.18	0.15
L-lysin		0.12	0.20
Premix		0.45	0.45
Nutrient content (calculated values):			
Crude protein	g/kg	174.00	160.98
Fat	g/kg	67.14	58.03
Linoleic acid	g/kg	23.02	22.98
Crude fiber	g/kg	39.99	39.95
ME	MJ/kg	11.45	11.40
Lysine	g/kg	8.58	7.91
Methionine	g/kg	4.43	4.00
Meth. +cysteine	g/kg	7.66	7.08
Threonine	g/kg	6.30	5.69
Tryptophan	g/kg	2.06	1.88
Ca	g/kg	37.00	37.00
P	g/kg	5.38	5.12
P (digestible)	g/kg	3.91	3.70
Vitamin A	U.I./kg	10000	10000
Vitamin D3	U.I./kg	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 egg mass
- per 1 feeding day

6.3 Live body weight

- at the age of 1 day – group weighing
- at the age from 1 to 21 weeks, every week – individual weighing (40 birds per pen)
- at the age of 154 days (22 weeks) – individual weighing
- at the age from 23 to 53 weeks, every week – individual weighing (40 birds per pen)
- at the age of 378 days (54 weeks) – individual weighing

6.4 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 8 four week periods, from 155 to 378 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 units
- yolk colour
- egg shell colour
- presence of blood spots on the yolk

6.11 Eggs on the bedding

- % of eggs laid

7 Results

Tab. No. 1	Results of hatching
Tab. No. 2	Results of the rearing
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Tab. No. 4	Live weight at 23 – 54 weeks of age
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Graph No. 1	Laying intensity

Results of hatching

Tab. No. 1

Sample		Weight of hatching eggs	Fertility	Hatchability	
				Set eggs	Fertilized eggs
		g	%	%	%
1	T1	56.48	93.40	84.35	90.29
2	T2	61.92	79.00	67.76	85.80
3	T3	62.96	87.30	73.80	84.52
4	T4	62.98	90.40	77.78	86.07

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

Sample		**Live weight** (in weeks)											
		1 day old	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	11th
		g											
1	T1	36.32	93	150	221	292	420	547	651	765	886	1001	1035
2	T2	41.70	128	215	335	456	657	857	1037	1175	1309	1581	1538
3	T3	42.50	152	262	413	565	819	1072	1290	1500	1643	1949	1889
4	T4	40.98	124	208	331	454	649	845	1051	1173	1251	1434	1431

Sample		**Live weight** (in weeks)										**Feed consumption per 1 pullet at the age of 154 days**
		12th	13th	14th	15th	16th	17th	18th	19th	20th	21th	22th	
		g											kg/bird
1	T1	1123	1231	1333	1439	1495	1526	1560	1683	1785	1861	1920	10.42
2	T2	1717	1673	1725	1755	1753	1834	1856	1954	2005	2058	2181	11.88
3	T3	1957	1910	1985	2004	1956	2010	2060	2144	2222	2274	2383	11.89
4	T4	1530	1616	1583	1616	1605	1666	1711	1873	1896	2006	2129	11.84

Mortality during the rearing **Tab. No. 3**

Sample		Number of pullets			
		Initial flock	Final flock	Mortality	
		birds	birds	birds	%
1	T1	416	409	7	1.68
2	T2	288	273	15	5.21
3	T3	384	361	23	5.99
4	T4	416	408	8	1.92

Live weight of laying hens **Tab. No. 4**

Sample		Live weight (g)										
		23 weeks	24 weeks	25 weeks	26 weeks	27 weeks	28 weeks	29 weeks	30 weeks	31 weeks	32 weeks	33 weeks
1	T1	1844.0	1889.3	1905.5	1897.0	1899.0	1909.8	1889.0	1929.8	1928.5	1922.0	1943.00
2	T2	2262.0	2321.8	2432.8	2485.5	2609.3	2661.5	2741.5	2752.3	2793.3	2777.0	2844.80
3	T3	2461.8	2581.8	2730.8	2787.8	2882.3	2912.3	2981.0	2974.8	3026.3	3088.8	3109.80
4	T4	2167.8	2234.8	2364.8	2387.5	2467.3	2535.3	2597.8	2589.8	2642.3	2646.8	2712.80

Sample		Live weight (g)										
		34 weeks	35 weeks	36 weeks	37 weeks	38 weeks	39 weeks	40 weeks	41 weeks	42 weeks	43 weeks	44 weeks
1	T1	1942.5	1903.8	1935.3	1939.8	1923.8	1937.0	1915.5	1897.0	1939.5	1930.5	1909.30
2	T2	2872.8	2930.5	2912.3	2984.3	2943.5	2947.8	2866.3	2871.3	2955.5	2969.3	2961.00
3	T3	3195.0	3165.3	3201.3	3251.3	3203.5	3258.0	3246.0	3271.8	3329.0	3294.0	3258.30
4	T4	2758.0	2743.0	2759.8	2831.5	2862.3	2933.5	2863.8	2911.3	2885.3	2936.5	2952.30

Sample		Live weight (g)									
		45 weeks	46 weeks	47 weeks	48 weeks	49 weeks	50 weeks	51 weeks	52 weeks	53 weeks	54 weeks
1	T1	1971.5	1961.3	1928.5	1906.0	1914.3	1961.5	1891.5	1913.5	1892.3	1893.3
2	T2	2966.3	3031.0	3004.8	2940.5	2946.3	3060.3	2982.5	2923.8	2915.5	2958.3
3	T3	3311.5	3405.5	3369.5	3403.0	3599.3	3397.0	3475.3	3498.8	3433.0	3462.8
4	T4	2992.0	2887.0	2960.0	2931.8	2838.0	2958.0	2839.5	2858.5	2903.5	2977.3

Results of the egg yield **Tab. No. 5**

Sample		Age at the yield					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	T1	135	135	135	166	100.00	209.30	93.44	210.76	94.09	65.61	13.73	13.83
2	T2	145	152	158	178	89.23	141.22	63.04	143.56	64.09	60.79	8.58	8.73
3	T3	148	158	167	204	88.08	146.86	65.56	147.00	65.63	64.79	9.52	9.52
4	T4	139	141	145	175	90.77	161.28	72.00	161.99	72.32	63.38	10.22	10.27

Feed consumption **Tab. No. 6**

Sample		Feed consumption			
		per 1 hen	per 1 egg	per 1 kg of egg mass	per 1 feeding day
		kg	g	kg	g
1	T1	31.00	147.08	2.24	138.39
2	T2	31.41	218.81	3.60	140.23
3	T3	33.20	225.83	3.49	148.20
4	T4	33.42	206.32	3.26	149.21

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

Sample		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	T1	320	316	4	1.25						1			2		1				
2	T2	260	254	6	2.31									5	1					
3	T3	260	258	2	0.77									2						
4	T4	260	257	3	1.15									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 othercauses
15 – Sampling (excluded of calculation)

Share of nonstandard eggs **Tab. No. 8**

Sample		Eggs laid	Cracked eggs		Broken eggs		Double-yolked eggs		Membranes		Nonstandard together	
		number	number	%	number	%	number	%	number	%	number	%
1	T1	66976	4467	6.67	1508	2.25	249	0.37	1	0.00	6225	9.29
2	T2	36716	5298	14.43	2319	6.32	72	0.20	0	0.00	7689	20.94
3	T3	38183	6357	16.65	2122	5.56	192	0.50	0	0.00	8671	22.71
4	T4	41932	6575	15.68	2244	5.35	173	0.41	0	0.00	8992	21.44

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

Sample		Average egg weight	XL	L	M	S
			(= > 73 g)	(63 - 73 g)	(53 - 63 g)	(= < 53 g)
		g	%	%	%	%
1	T1	65.61	12.16	72.05	15.61	0.18
2	T2	60.79	1.67	46.82	48.14	3.38
3	T3	64.79	8.04	63.19	27.76	1.00
4	T4	63.38	5.40	61.86	32.00	0.74

Egg quality - 1st egg period **Tab. No. 10a**

Sample		Egg weight	Yolk weight	Egg shell strength	Index of egg shape	Egg shell thickness	Haugh's units	Yolk colour				Egg shell colour			Blood spot
								L	a	b	Roche	L	a	b	
		g	g	N		mm									
1	T1	62.51	15.19	55.42	1.25	0.40	89.95	-2.28	2.83	11.35	10.43	54.48	23.58	29.98	1
2	T2	53.91	14.82	42.47	1.31	0.34	87.88	-2.03	3.38	11.28	10.84	73.83	12.64	22.70	3
3	T3	55.99	15.89	41.95	1.31	0.35	86.73	-2.41	3.11	10.83	11.13	75.58	11.78	22.79	2
4	T4	57.25	14.93	41.95	1.32	0.36	87.34	-1.88	3.09	12.00	10.78	69.27	15.48	28.13	1

Egg quality - 2nd egg period **Tab. No. 10b**

Sample		Egg weight	Yolk weight	Egg shell strength	Index of egg shape	Egg shell thickness	Haugh's units	Yolk colour				Egg shell colour			Blood spot
								L	a	b	Roche	L	a	b	
		g	g	N		mm									
1	T1	65.40	15.77	55.51	1.25	0.40	94.39	-2.73	3.56	11.60	11.16	56.27	21.98	30.64	10
2	T2	58.05	16.29	39.88	1.31	0.33	87.68	-2.18	3.75	12.02	11.19	77.20	10.23	23.15	4
3	T3	60.38	17.03	40.10	1.31	0.34	90.43	-2.21	3.64	12.03	11.13	75.83	10.98	23.66	4
4	T4	61.64	16.49	37.53	1.31	0.35	91.98	-2.50	3.80	11.76	11.37	71.30	13.83	27.55	8

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 - 3rd egg period **Tab. No. 10c**

Sample		Egg weight	Yolk weight	Egg shell strength	Index of egg shape	Egg shell thickness	Haugh's units	Yolk colour				Egg shell colour			Blood spot
								L	a	b	Roche	L	a	b	
		g	g	N		mm									
1	T1	65.98	17.60	54.87	1.25	0.38	85.68	-2.76	3.30	10.74	11.03	56.28	23.57	31.50	0
2	T2	59.48	18.48	40.62	1.31	0.32	78.62	-2.60	3.62	11.07	11.35	77.83	10.93	22.42	1
3	T3	62.72	19.37	39.13	1.31	0.33	80.91	-2.28	3.13	11.08	10.89	77.00	11.30	23.21	4
4	T4	62.61	18.79	36.15	1.32	0.33	82.33	-2.26	3.58	11.59	11.26	73.49	13.95	27.63	3

Egg quality – 4th egg period **Tab. No. 10d**

Sample		Egg weight	Yolk weight	Egg shell strength	Index of egg shape	Egg shell thickness	Haugh's units	Yolk colour				Egg shell colour			Blood spot
								L	a	b	Roche	L	a	b	
		g	g	N		mm									
1	T1	67.15	16.59	52.50	1.26	0.39	90.30	-4.05	3.38	10.37	11.38	56.48	21.65	29.79	11
2	T2	61.49	18.30	38.99	1.32	0.33	79.87	-2.13	2.99	11.91	10.41	77.03	9.83	21.17	5
3	T3	65.44	19.69	37.26	1.33	0.34	83.28	-2.50	2.76	11.63	10.40	77.33	9.67	21.88	4
4	T4	64.57	18.43	36.30	1.32	0.34	84.28	-2.99	3.35	11.22	11.03	71.69	13.28	26.04	9

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 - 5th egg period **Tab. No. 10e**

Sample		Egg weight	Yolk weight	Egg shell strength	Index of egg shape	Egg shell thickness	Haugh's units	Yolk colour				Egg shell colour			Blood spot
								L	a	b	Roche	L	a	b	
		g	g	N		mm									
1	T1	67.39	16.67	50.87	1.27	0.39	91.13	-3.83	3.02	10.50	10.97	57.03	22.08	30.68	7
2	T2	62.52	18.68	38.92	1.34	0.33	78.04	-2.41	2.73	11.61	10.35	78.65	9.51	20.87	2
3	T3	66.21	20.38	37.01	1.33	0.34	83.02	-3.28	2.74	10.88	10.63	77.65	9.84	21.63	6
4	T4	65.56	19.00	35.23	1.32	0.34	82.80	-3.21	3.04	11.03	10.80	73.15	12.83	26.09	5

Egg quality – 6th egg period **Tab. No. 10f**

Sample		Egg weight	Yolk weight	Egg shell strength	Index of egg shape	Egg shell thickness	Haugh's units	Yolk colour				Egg shell colour			Blood spot
								L	a	b	Roche	L	a	b	
		g	g	N		mm									
1	T1	66.45	16.90	49.28	1.28	0.38	88.60	-3.63	2.93	10.63	10.82	58.41	20.43	29.95	6
2	T2	64.12	19.53	36.15	1.34	0.33	76.61	-2.89	2.94	11.31	10.75	78.29	9.19	20.82	4
3	T3	67.14	20.55	35.53	1.33	0.33	79.04	-3.01	2.70	11.15	10.47	77.19	8.83	20.73	3
4	T4	65.39	19.32	33.76	1.34	0.33	77.93	-3.03	2.97	11.19	10.67	75.13	10.61	23.49	6

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 - 7th egg period **Tab. No. 10g**

Sample		Egg weight	Yolk weight	Egg shell strength	Index of egg shape	Egg shell thickness	Haugh's units	Yolk colour				Egg shell colour			Blood spot
								L	a	b	Roche	L	a	b	
		g	g	N		mm									
1	T1	66.43	17.53	50.57	1.27	0.39	75.05	-1.20	2.27	12.68	9.53	58.51	20.72	30.60	9
2	T2	64.41	20.60	37.25	1.34	0.33	64.67	-0.82	2.50	13.01	9.71	78.48	9.42	21.70	2
3	T3	68.21	22.27	37.95	1.33	0.33	67.47	-1.02	2.35	12.83	9.55	79.34	8.93	21.62	0
4	T4	66.70	20.37	34.75	1.35	0.34	65.48	-0.73	2.28	13.08	9.57	74.91	12.04	25.39	4

Egg quality – 8th egg period **Tab. No. 10h**

Sample		Egg weight	Yolk weight	Egg shell strength	Index of egg shape	Egg shell thickness	Haugh's units	Yolk colour				Egg shell colour			Blood spot
								L	a	b	Roche	L	a	b	
		g	g	N		mm									
1	T1	66.05	17.58	48.90	1.27	0.39	79.33	-2.24	2.71	11.83	10.23	58.40	21.18	30.19	5
2	T2	65.37	21.16	34.67	1.33	0.33	71.61	-2.79	3.03	11.41	10.77	77.84	9.52	21.04	3
3	T3	68.98	22.31	36.62	1.34	0.34	72.65	-3.17	2.94	11.06	10.64	77.99	9.16	20.99	1
4	T4	67.06	20.72	33.32	1.35	0.34	69.31	-2.05	2.89	12.01	10.47	74.96	11.68	24.41	3

Interpretative notes: L – colour of egg (0=black, 100=white)
a – red colouring and it's fullness
b – yellow colouring and it's fullness

Laying intensity **Tab. No. 11**

in four weeks long periods (%)

Sample		Period							
		1	2	3	4	5	6	7	8
1	T1	92.20	97.66	96.05	95.04	94.64	91.86	90.25	89.80
2	T2	19.73	72.69	78.53	74.40	70.74	66.09	62.14	60.03
3	T3	13.17	65.04	81.18	79.07	77.20	72.43	69.59	66.81
4	T4	47.21	79.92	81.43	80.23	78.45	72.07	69.73	66.95

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

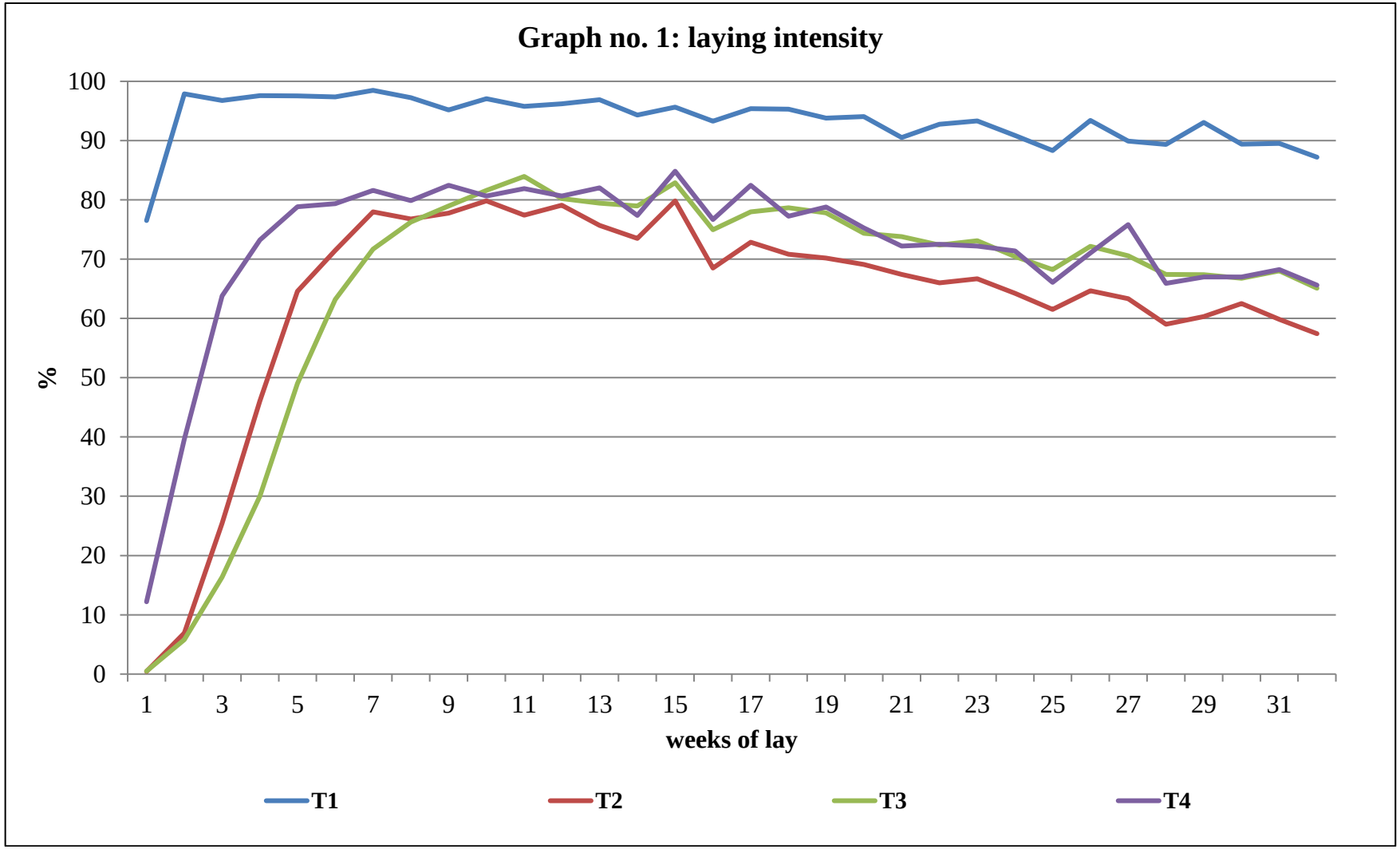
in four weeks long periods (g)

Sample		Period							
		1	2	3	4	5	6	7	8
1	T1	59.50	64.93	66.12	66.88	67.59	67.23	66.32	66.26
2	T2	50.04	55.11	58.97	61.04	62.41	62.89	64.62	65.11
3	T3	51.94	58.50	62.60	64.57	65.96	67.35	68.05	68.89
4	T4	53.22	58.95	62.63	63.96	65.64	66.05	66.61	67.15

Eggs on the bedding **Tab. No. 13**

in four weeks long periods (%)

Sample		Box no.	Period							
			1	2	3	4	5	6	7	8
1	T1	1	0.25	0.23	0.09	0.05	0.00	0.24	0.00	0.05
		5	1.01	1.73	1.41	0.73	0.23	0.05	0.31	0.10
		9	0.93	1.02	0.54	0.95	1.08	0.80	1.16	2.06
		13	0.33	0.81	0.27	0.37	0.56	0.38	0.29	0.19
2	T2	2	1.46	1.17	0.33	0.28	0.64	0.39	1.53	0.16
		6	9.80	7.01	5.01	3.03	2.04	3.89	5.66	3.30
		10	4.75	2.91	1.50	2.43	1.68	1.33	1.77	2.48
		14	9.93	2.14	1.34	1.97	1.75	3.28	3.90	3.87
3	T3	3	2.58	1.32	1.87	1.77	0.36	0.59	0.80	1.11
		7	4.55	2.96	1.12	0.42	0.49	0.30	0.54	0.08
		11	4.79	0.85	0.98	1.94	1.91	1.71	2.34	1.58
		15	2.39	0.42	0.34	0.48	0.07	0.38	1.18	1.16
4	T4	4	4.51	2.38	1.27	3.20	3.31	2.17	5.13	5.54
		8	8.66	6.75	5.56	9.24	8.69	8.35	8.84	8.41
		12	2.31	2.61	3.60	3.88	5.43	5.28	7.15	6.72
		16	4.37	0.90	1.42	2.46	1.86	2.46	4.73	4.90


Graph no. 1: laying intensity
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
weeks of lay
T1
T2
T3
T4