



MEZINÁRODNÍ TESTOVÁNÍ DRŮBEŽE
státní podnik, ÚSTRAŠICE

390 02 Tábor 2

Tel.: 381 200 320

Corporate test LT 2021

XXXXXX

XXXXXX

alternative system

**The final report
(2021 – 2022)**

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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			
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: 18 weeks long growing period (126 days)
- hen keeping: 28 weeks long laying period (127 – 322 days of age)

2.2 Location of the test

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

2.3 Material

There were compared 4 treatments in the trial. Each treatment consisted of 2160 hatching eggs delivered to the test station.

2.4 Test term

setting in the hatchery:	30 August 2021
beginning of rearing – day 1:	22 September 2021
end of rearing:	25 January 2022
beginning of laying, beginning of the period 1:	26 January 2022
end of laying, end of the period 7:	9 August 2022

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 126 days. Day old chicks were sexed. Cocks were destroyed. 400 pullets of each treatment were randomly chosen after retirement of inconvenient birds. They were divided in groups by 100 birds.

4.2 Housing system

Pullets were kept in windowless house with full climatic control, 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 - 112	9 birds/m ²
From day 112	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 m³/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)
Day 1 - 3	23	1 ⁰⁰ – 24 ⁰⁰	40
Day 4 - 7	20	3 ⁰⁰ – 23 ⁰⁰	30
Day 8 - 14	18	4 ⁰⁰ – 22 ⁰⁰	20
Day 15 - 21	16	5 ⁰⁰ – 21 ⁰⁰	10
Day 22 - 28	14	6 ⁰⁰ – 20 ⁰⁰	10
Day 29 - 35	12	7 ⁰⁰ – 19 ⁰⁰	5 - 10
Week 6 - 16	10	7 ⁰⁰ – 17 ⁰⁰	5 - 10
Week 17	12	7 ⁰⁰ – 19 ⁰⁰	10 - 15
Week 18	13	6 ⁰⁰ – 19 ⁰⁰	10 - 15

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 IT N	K2 IT N	KZK IT N	N0 IT N
Age		Week 1 - 4	Week 5 - 10	Week 11 - 16	Week 17-18
Feed form		crumbled	mash	mash	mash
Ingredients – content in %:					
Wheat		51.00	52.78	58.49	51.12
Extr. soybean groats		23.85	19.30	9.00	16.55
Maize		15.00	16.00	10.00	15.00
Soybean oil		1.56	0.92	0.88	0.76
Fish meal		1.50	0.70	-	-
Extr. rape meal		1.50	2.00	3.00	2.50
Extr. sunflower meal		1.50	2.00	2.90	2.50
MCP – monocalciumphosphate		0.85	0.75	0.42	0.80
Limestone		1.97	1.95	2.15	3.80
Calcium carbonate		-	-	-	1.73
L-lysine		0.29	0.22	0.20	0.13
Methionine		0.23	0.17	0.08	0.18
L-threonine		0.07	0.03	-	-
Salt		0.26	0.27	0.27	0.28
Sodium sulfate		0.15	0.13	0.12	-
Sodium bicarbonate		-	-	-	0.14
Animal fat		-	-	-	1.36
Wheat bran		-	2.50	12.20	2.70
Vitamin and mineral supplement		0.27	0.28	0.29	0.45
Nutrient content (calculated values):					
Crude protein	g/kg	203.10	186.00	155.90	168.94
Fat	g/kg	36.00	29.60	28.30	39.97
Linoleic acid	g/kg	16.00	13.00	12.50	13.00
Crude fiber	g/kg	29.80	32.80	42.00	32.97
ME enzyme	MJ/kg	12.30	12.10	11.80	11.91
Lysine dig.	g/kg	10.15	8.60	6.28	7.20
Methionine dig.	g/kg	4.76	4.04	2.89	3.87
Met. + Cys. Dig.	g/kg	7.74	6.89	5.48	6.52
Threonine dig.	g/kg	6.80	5.81	4.34	4.97
Tryptophan dig.	g/kg	2.11	1.92	1.59	1.74
Ca phytase	g/kg	12.00	11.50	11.50	24.49
P avail.	g/kg	4.80	4.50	3.80	4.41
Vitamin A	U.I./kg	10000.00	10000.00	10000.00	10000.00
Vitamin D3	U.I./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 16 weeks (112 days). There were selected 320 birds of treatment.

5 Production period

5.1 Treatments

320 pullets of each treatment were divided in 4 replicates by 80 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 m² – 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 m³/hour/kg live weight in winter and 5 m³/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 19	14	5 ⁰⁰ – 19 ⁰⁰	15 - 20
Week 20	15	4 ⁰⁰ – 19 ⁰⁰	15 - 20
Week 21	15.5	3 ³⁰ – 19 ⁰⁰	15 - 20
Week 22 – 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 IT N start (19 th -30 th week)	N1 IT N (31 th -46 th week)
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
MCP – monocalciumphosphate		0.55	0.47
Limestone		6.60	6.60
Limestone – roughly ground		2.82	2.88
L-lysine		0.12	0.20
Methionine		0.18	0.15
Salt		0.28	0.28
Sodium bicarbonate		0.17	0.14
Animal fat		2.35	1.25
Vitamin and mineral supplement		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 enzyme	MJ/kg	11.75	11.75
Lysine dig.	g/kg	7.43	6.89
Methionine dig.	g/kg	4.08	3.68
Met. + Cys. Dig.	g/kg	6.73	6.21
Threonine dig.	g/kg	5.27	4.76
Tryptophan dig.	g/kg	1.76	1.61
Ca phytase	g/kg	38.50	38.50
P avail.	g/kg	3.91	3.70
Vitamin A	g/kg	10000.00	10000.00
Vitamin D3	U.I./kg	3000.00	3000.00

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 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 pen)
- at the age of 112 days (16 weeks) – individual weighing
- 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 days 322 (46 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 7 four week periods, from 127 to 322 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
Tab. No. 3	Mortality during the rearing
Tab. No. 4	Live weight at 20, 22, 24, 26, 30 and 46 weeks of age
Tab. No. 5	Results of the egg yield
Tab. No. 6	Feed consumption
Tab. No. 7	Mortality and it's causes
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Tab. No. 9	Weight classes of eggs
Tab. No. 10a	Egg quality – Period 3
Tab. No. 10b	Egg quality – Period 5
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Tab. No. 11	Laying intensity
Tab. No. 12	Average egg weight
Tab. No. 13	Eggs on the bedding

Graph No. 1	Laying intensity
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Results of hatching**Tab. No. 1**

Sample		Weight of hatching eggs	Fertility	Hatchability	
				Set eggs	Fertilized eggs
		g	%	%	%
1	T1	57.83	89.50	78.30	87.50
2	T2	58.81	91.00	84.50	92.90
3	T3	60.06	89.60	76.30	85.10
4	T4	57.75	92.30	82.80	89.70

Results of the rearing

Tab. No. 2

Sample		Live weight (in weeks)										Feed consumption per 1 pullet at the age of 126 days
		1 day old	2 nd week	4 th week	6 th week	8 th week	10 th week	12 th week	14 th week	16 th week	18 th week	
		g										
1	T1	35.3	125.3	285.5	483.0	677.0	921.5	1120.3	1262.8	1413.3	1615.3	7.72
2	T2	36.2	131.3	284.8	478.3	690.3	953.3	1135.8	1254.5	1411.0	1637.5	7.79
3	T3	36.1	132.1	279.0	487.5	691.5	939.3	1114.5	1266.8	1410.3	1632.3	7.74
4	T4	35.5	128.1	281.6	483.3	694.3	933.3	1110.8	1272.0	1392.8	1625.8	7.79

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

Sample		Number of pullets			
		Initial flock	Final flock	Mortality	
		birds	birds	birds	%
1	T1	400	399	1	0.25
2	T2	400	393	7	1.75
3	T3	400	398	2	0.50
4	T4	400	392	8	2.00

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

Sample		Live weight (g)					
		20 weeks	22 weeks	24 weeks	26 weeks	30 weeks	final live weight
1	T1	1870.5	1869.8	1884.5	1956.5	1961.8	1980.4
2	T2	1859.0	1862.3	1888.0	1953.3	1988.3	1900.2
3	T3	1854.5	1859.5	1899.8	1950.0	1960.0	1969.6
4	T4	1850.3	1849.3	1884.0	1905.8	1900.6	1899.6

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			g	hen - housed
					day	%	number	%	number	%	kg		kg
1	T1	140	144	147	212	97.81	166.09	84.74	166.55	84.98	60.39	10.03	10.06
2	T2	137	141	144	178	99.06	164.32	83.84	168.94	86.19	60.57	9.95	10.23
3	T3	137	142	144	209	99.06	166.27	84.83	168.39	85.92	60.46	10.05	10.18
4	T4	138	141	143	165	97.19	166.96	85.18	169.94	86.70	59.13	9.87	10.05

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	25.84	155.12	2.57	131.81
2	T2	25.93	153.49	2.53	132.30
3	T3	25.69	152.58	2.52	131.09
4	T4	25.81	151.87	2.57	131.68

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	314	6	1.88									5		1				
2	T2	320	285	35	10.94		1							25		9				
3	T3	320	300	20	6.25									15		2	3			
4	T4	320	301	19	5.94		1				1			11		6				

- Diagnostic:
- | | | |
|-------------------------|------------------------------------|---|
| 1 – Viral diseases | 6 – Injuries | 11 – Metabolic derangement |
| 2 – Bacterial diseases | 7 – Digestive tract diseases | 12 – Cannibalism |
| 3 – Fungal diseases | 8 – Respiratory tract diseases | 13 – Diverticulus inflammation |
| 4 – Parasitary diseases | 9 – Reproduction tract diseases | 14 – Culling and othercauses |
| 5 – Tumors | 10 – Locomotion apparatus diseases | 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	53149	3182	5.99	760	1.43	1	0.00	0	0.00	3943	7.42
2	T2	52583	3032	5.77	777	1.48	0	0.00	1	0.00	3810	7.25
3	T3	53205	2972	5.59	730	1.37	0	0.00	1	0.00	3703	6.96
4	T4	53426	2807	5.25	682	1.28	0	0.00	0	0.00	3489	6.53

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	60.39	1.21	36.14	60.96	1.69
2	T2	60.57	2.02	38.75	57.39	1.83
3	T3	60.46	0.98	38.91	58.33	1.78
4	T4	59.13	0.61	30.20	65.98	3.21

Egg quality - 3th egg period

Tab. No. 10a

Sample		Egg weight g	Yolk weight g	Egg shell strength N	Index of egg shape	Egg shell thickness mm	Haugh's units	Yolk colour				Egg shell colour			Blood spot
								L	a	b	Roche	L	a	b	
1	T1	60.93	16.01	46.67	1.26	0.35	88.00	-2.20	3.00	11.97	10.70	52.30	18.53	28.10	0
2	T2	61.54	16.16	46.77	1.28	0.34	79.20	-2.03	2.90	12.00	10.63	52.10	18.40	27.50	0
3	T3	61.60	16.13	49.50	1.27	0.36	74.80	-1.93	3.33	11.93	10.83	48.37	20.10	28.10	0
4	T4	61.97	17.07	46.10	1.28	0.36	79.47	-1.43	2.87	11.20	10.73	40.63	18.17	25.07	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 - 5th egg period

Tab. No. 10b

Sample		Egg weight g	Yolk weight g	Egg shell strength N	Index of egg shape	Egg shell thickness mm	Haugh's units	Yolk colour				Egg shell colour			Blood spot
								L	a	b	Roche	L	a	b	
1	T1	61.70	15.77	48.08	1.28	0.37	98.03	-4.97	3.47	9.60	11.83	59.70	18.40	29.00	1
2	T2	62.79	16.42	48.37	1.27	0.36	89.20	-4.67	3.70	9.90	11.93	59.37	18.90	29.00	3
3	T3	61.99	16.32	50.60	1.29	0.37	82.83	-4.30	3.67	10.10	11.97	58.97	19.40	29.27	3
4	T4	59.81	15.75	52.01	1.28	0.38	88.97	-4.13	3.63	10.33	11.63	58.07	19.97	30.37	4

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. 10c

Sample		Egg weight g	Yolk weight g	Egg shell strength N	Index of egg shape	Egg shell thickness mm	Haugh's units	Yolk colour				Egg shell colour			Blood spot
								L	a	b	Roche	L	a	b	
1	T1	61.64	17.25	42.09	1.31	0.33	83.60	-2.43	2.17	11.47	9.93	56.03	18.27	27.73	1
2	T2	60.84	17.27	44.49	1.31	0.35	85.07	-2.43	2.27	11.70	9.83	56.37	18.33	26.73	1
3	T3	62.34	17.16	41.28	1.30	0.33	82.27	-2.47	2.17	11.67	9.67	56.73	19.03	28.17	0
4	T4	62.84	17.24	44.14	1.30	0.34	84.87	-2.80	2.17	11.30	9.93	53.90	20.30	28.07	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

Laying intensity

in four weeks long periods (%)

Tab. No. 11

Sample		Period						
		1	2	3	4	5	6	7
1	T1	49.13	94.24	94.63	94.61	90.85	85.26	84.46
2	T2	57.56	96.10	95.73	92.88	89.21	79.17	76.22
3	T3	56.85	94.80	95.23	94.00	90.17	82.28	80.48
4	T4	58.64	94.59	94.74	93.25	88.85	82.88	83.33

Average egg weight
in four weeks long periods (g)

Tab. No. 12

Sample		Period						
		1	2	3	4	5	6	7
1	T1	52.99	59.75	61.18	61.65	60.21	61.52	62.18
2	T2	52.45	59.75	61.44	62.14	61.00	61.82	62.92
3	T3	52.32	59.42	61.12	61.96	61.12	61.83	62.73
4	T4	51.50	57.55	59.84	60.47	59.51	60.91	61.84

Eggs on the bedding
in four weeks long periods (%)

Tab. No. 13

Sample		Box no.	Period						
			1	2	3	4	5	6	7
1	T1	1	0.26	0.00	0.09	0.14	0.83	0.73	2.44
		5	0.45	0.05	0.14	0.14	0.64	0.42	0.68
		9	1.59	0.14	0.19	0.42	2.06	1.13	0.52
		13	2.37	1.27	1.45	1.32	1.90	2.07	0.66
2	T2	2	1.46	0.09	1.26	0.52	0.15	0.00	0.07
		6	1.67	0.52	0.00	0.10	1.16	0.80	0.64
		10	2.55	0.14	0.28	0.19	0.05	0.00	0.05
		14	1.17	0.47	0.75	0.52	0.05	0.28	0.17
3	T3	3	0.80	0.05	0.28	0.10	0.10	0.06	0.00
		7	3.36	1.18	1.58	1.35	1.47	1.15	0.47
		11	1.72	0.05	0.33	0.28	0.25	1.02	0.55
		15	1.46	0.19	0.34	0.19	0.05	0.00	0.00
4	T4	4	0.58	0.56	0.38	0.40	0.16	0.06	0.34
		8	0.89	0.32	0.32	0.19	0.00	0.21	0.26
		12	1.07	0.05	0.19	0.34	0.10	0.06	0.11
		16	2.65	0.14	0.19	0.09	0.20	0.00	0.05

