



MEZINÁRODNÍ TESTOVÁNÍ DRŮBEŽE ÚSTRAŠICE

státní podnik

390 02 Tábor 2

Česká republika

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[REDACTED] (No. 1220)

[REDACTED]

[REDACTED] (VT č. 1220)

**International Poultry Testing Station Ústrašice
Mezinárodní testování drůbeže Ústrašice**

**Czech Republic
Česká republika**

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Zpracovatel studie:

Ing. Jan Tyl

Associate Investigator:
Spoluzpracovatel studie:

**Ing. Hana Horná
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Study monitor:
Dohlížitel:

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Study sponsor :
Dohlížitel:

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**March 2021
Březen 2021**

Aim of the Project

To evaluate the effects of different application methods (via feed or/and water) [REDACTED] and its combination on growth performance, intestinal integrity and health status in broilers fed low protein diets.

Study location

The study was carried out on the test facility Mezinárodní testování drůbeže, s.p., (next MTD, s.p. only), Ústřašice, Czech Republic. Feed samples were sended for the contents of nutrients [REDACTED]

Trial period

Beginning of the trial:	19 January 2021
End of the trial:	23 February 2021
Finishing of the final report:	March 2021

Study responsibility

Ing. Jan Tyl was the independent Study Director, responsible that the trial is conducted according to the protocol. Ing. Hana Horná was responsible for daily animal care at the test facility. Full details of study's responsibility are provided below.

Persons involved in the trial

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Material and methods

Birds

In total there were 7800 day old chicks (males) of [REDACTED]. Day-old chicks were randomly distributed into 6 dietary treatments with 10 replicates per treatment and 130 chicken per replicate.

Origin 1-day old chicks:

breeder company – [REDACTED]

[REDACTED]

age of the breeding flock - 36 weeks

Experimental treatments:

Tr. No.	Tr.	Description	No. of	No. of chick
1	T1	[REDACTED]	10	1300
2	T2	[REDACTED]	10	1300
3	T3	[REDACTED]	10	1300
4	T4	[REDACTED]	10	1300
5	T5	[REDACTED]	10	1300
6	T6	[REDACTED]	10	1300

Housing system

Chickens were kept in the windowless chicken house with full climatic control, on deep litter. The heating program was conducted according to the [REDACTED]. Drinking water was supplied ad libitum by nipple drinkers. Each pen was equipped with manually filled tube feeders. Bedding material was wood shaving.

Light was provided as follows during the experimental period:

<u>Lighting programme:</u>	Day 1 - 7	23 hours of light + 1 hour of darkness
	Day 8 - 32	18 hours of light + 6 hours of darkness
	Day 33 - 35	23 hours of light + 1 hour of darkness
<u>Stocking density:</u>	16 broilers per square meter	

The conduct of the trial was conformed to the national welfare legislation.

Veterinary precautions

The chicken house was disinfected with [REDACTED] before the chick placement.

On days 1 and 12 the chicken were vaccinated with [REDACTED] (the spray in the eyes). On the first days old chickens was applied the water solution of permanganate.

Feeds and Diets

Chickens were fed ad libitum according to three phase feeding programme. The test phases were 0-10 days of age for the starter BR1, 11-24 days of age for the grower BR2 and 25-35 days of age for the finisher BR3.

Feed was produced by International Poultry Testing Station Ústřašice. The composition of diets is shown in following tables.

Composition of the feed

Ingredients (%)	Control diets		
	Starter	Grower	Finisher
Corn	37.00	44.80	50.40
Soyabean meal	34.40	27.10	22.00
Wheat	20.00	20.00	20.00
Soyabean oil	3.65	3.67	3.12
Limestone	1.69	1.41	1.36
Monocalciumphosphate	1.15	1.01	0.94
Salt	0.30	0.30	0.30
Sodium bicarbonate	0.11	0.12	0.12
██████████	0.50	-	-
██████████	-	0.50	-
██████████	-	-	0.50
██████████	1.20	1.10	1.26
Nutritional composition (%)			
crude protein	22.00	19.30	17.60
ME (MJ/kg)	12.65	13.00	13.10
Ca	1.05	0.90	0.85
P available	0.50	0.45	0.42
Na	0.16	0.16	0.16
Cl	0.23	0.23	0.23
Lys	1.27	1.09	1.00
Met	0.63	0.55	0.51
M+C	0.92	0.81	0.76
Threonin	0.80	0.70	0.65
Thryptophan	0.24	0.20	0.18
Val	1.00	0.87	0.80
Ile	0.86	0.75	0.71
Arg	1.30	1.13	1.05

Parameters recorded and methods applied

Live weight

Live weight was measured on day 1 and on day 10 (all the birds in each pen were weighed altogether). On day 24 of age birds were weighed individually, without fasting. On day 35 birds were weighed individually, after 12 hours of fasting.

Feed consumption

Feed consumption was determined per pen for the feed – starter, grower and finisher.

Weight gain

Weight gain per phase and average daily weight gains were calculated for the periods 1 – 10 days, 11 – 24 days, 25 – 35 days and for the overall experiment (1 – 35 days).

Feed conversion ratio

Feed conversion ratio was calculated as feed consumption per 1 kg of live weight and per 1 kg of weight gain for the periods 1 – 10 days, 11 – 24 days, 25 – 35 days and for the overall experiment (1 – 35 days). The calculation was included weight of deaths.

Mortality

All pens were checked three times a day to see if there were any dead or ill birds. Dead chickens were registered by date, weight and reason of mortality on the day of death. Mortality was recorded for the periods 1 – 10 days, 11 – 24 days, 25 – 35 days and 1 – 35 days.

Foot pad lesions

One third of the animals were recorded at the end of the feeding trial according the scale.

Statistical analyses

Performance results of Live weight (on days 1, 10, 24 and 35) and Feed conversion ratio were statistically evaluated using the ANOVA single-factor model (Duncan test) or nonparametric method (Kruskal-Wallis test).

Results

Tab. No.	1 Hatchability
	2 Performance results:
	2a Body weight
	2b Weight gain
	2c Feed conversion per 1 kg of live weight
	2d Feed conversion per 1 kg of weight gain
	2e Feed consumption
	3 Mortality
	4 Foot pad lesions
	5 Statistical analysis of body weight at the age of 35 days (average body weight, standard deviation, coefficient of variation)
	6 -7 Statistical analyses of performance results
	8 Performance results per pen:
	8a Body weight
	8b Weight gain
	8c Feed conversion per 1 kg of live weight
	8d Feed conversion per 1 kg of weight gain
	8e Feed consumption
	8f Foot pad lesions

Results of incubation and hatching

Tab. No. 1

Treatment	Tr. No.	Fertility	Hatchability		Birds housed	Average weight	
			Set eggs	Fertile eggs		Hatching eggs	Day old chicks
		%	%	%		g	g
T1	1	93.89	88.89	94.67	1300	65.00	39.62
T2	2				1300		39.65
T3	3				1300		39.62
T4	4				1300		39.62
T5	5				1300		39.58
T6	6				1300		39.62

Body weight per phases

Tab. No. 2a

Treatment	Tr. No.	Day 1		Day 10		Day 24		Day 35	
		Birds	Average body weight	Birds	Average body weight	Birds	Average body weight	Birds	Average body weight
			g		g		g		g
T1	1	1300	39.62	1300	271.08	1273	1290.80	1262	2347.11
T2	2	1300	39.65	1300	274.54	1268	1303.06	1257	2400.64
T3	3	1300	39.62	1300	266.04	1270	1296.94	1266	2373.33
T4	4	1300	39.62	1300	277.31	1268	1298.49	1261	2365.30
T5	5	1300	39.58	1300	270.85	1270	1297.69	1259	2368.24
T6	6	1300	39.62	1300	263.81	1276	1289.44	1269	2363.49

Weight gain per phases

Tab. No. 2b

Treatment	Tr. No.	Day 1 - 10		Day 11 - 24		Day 25 - 35		Day 1 – 35	
		Weight gain per phase	Daily weight gain	Weight gain per phase	Daily weight gain	Weight gain per phase	Daily weight gain	Weight gain per phase	Daily weight gain
		g	g	g	g	g	g	g	g
T1	1	231.46	23.15	1019.72	72.84	1056.31	96.03	2307.49	65.93
T2	2	234.88	23.49	1028.52	73.47	1097.58	99.78	2360.99	67.46
T3	3	226.42	22.64	1030.90	73.64	1076.40	97.85	2333.72	66.68
T4	4	237.69	23.77	1021.19	72.94	1066.80	96.98	2325.68	66.45
T5	5	231.27	23.13	1026.85	73.35	1070.54	97.32	2328.66	66.53
T6	6	224.19	22.42	1025.63	73.26	1074.06	97.64	2323.88	66.40

Feed conversion per 1 kg of live weight**Tab. No. 2c**

Treatment	Tr. No.	Feed conversion ratio		
		Day 10	Day 24	Day 35
		g/kg live weight	g/kg live weight	g/kg live weight
T1	1	1017.03	1238.39	1479.31
T2	2	998.88	1235.61	1444.46
T3	3	1007.95	1234.08	1466.67
T4	4	999.72	1248.42	1481.32
T5	5	1006.82	1249.72	1447.75
T6	6	1040.09	1250.55	1467.63

Feed conversion per 1 kg of weight gain

Tab. No. 2d

Treatment	Tr. No.	Feed conversion ratio			
		Day 1-10	Day 11-24	Day 25-35	Day 1-35
		g/kg weight gain	g/kg weight gain	g/kg weight gain	g/kg weight gain
T1	1	1191.09	1024.67	1781.60	1505.06
T2	2	1167.51	1024.83	1699.56	1469.11
T3	3	1184.30	1027.20	1753.59	1491.88
T4	4	1166.34	1034.57	1772.32	1506.93
T5	5	1179.11	1039.39	1694.30	1472.71
T6	6	1223.88	1038.04	1734.03	1492.90

Feed consumption per phases**Tab. No. 2e**

Treatment	Tr. No.	Feed consumption			
		Starter (d 1-10)	Grower (d 11-24)	Finisher (d 25-35)	Total (d 1-35)
		kg	kg	kg	kg
T1	1	358.40	1716.30	2378.90	4453.60
T2	2	356.50	1731.20	2351.00	4438.70
T3	3	348.60	1728.75	2392.95	4470.30
T4	4	360.40	1741.30	2388.00	4489.70
T5	5	354.50	1749.70	2291.50	4395.70
T6	6	356.70	1740.20	2369.30	4466.20

Mortality

Tab. No. 3

Treat.	Tr. No.	Mortality in the period									Mortality according causes														
		Day 1 - 10		Day 11 - 24		Day 25 - 35		Day 1 - 35			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
		birds	g	birds	g	birds	g	birds	g	%															
T1	1	0	0	7	3905	11	16403	18	20308	1.38										16			2	20	
T2	2	0	0	12	9125	11	17968	23	27093	1.77	1									20			2	20	
T3	3	0	0	10	7842	4	7074	14	14916	1.08										13			1	20	
T4	4	0	0	12	8973	7	11240	19	20213	1.46										18			1	20	
T5	5	0	0	10	7303	11	18938	21	26241	1.62	2									19				20	
T6	6	0	0	4	3246	7	12407	11	15653	0.85										10			1	20	

Causes:

- 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 - Sudden death syndrome
- 12 - Cannibalism
- 13 - Diverticulus inflammation
- 14 - Culling and other causes
- 15 - Sampling (excluded of calculation)

Foot pad lesions

Tab. No. 4

Treatment	Tr. No.	Evaluation	
		right foot	left foot
T1	1	1.60	1.53
T2	2	1.64	1.58
T3	3	1.55	1.50
T4	4	1.65	1.61
T5	5	1.61	1.54
T6	6	1.54	1.47

Statistical analysis - Body weight at 35 days of age

Tab. No. 5

Treatment	Tr. No.	Cocks			
		No. of birds	Average body weight	Standard deviation	Coefficient of variation
			g/birds	g/birds	%
T1	1	1262	2347.11	294.11	12.53
T2	2	1257	2400.64	294.00	12.25
T3	3	1266	2373.33	276.07	11.63
T4	4	1261	2365.30	275.72	11.66
T5	5	1259	2368.24	290.58	12.27
T6	6	1269	2363.49	269.33	11.40

Statistical analyses of performance results

Performance results were statistically evaluated using the ANOVA single-factor model (Duncan test) or nonparametric method (Kruskal-Wallis test).

The following symbols are used for levels of significance:

$p \leq 0,001$ * * * - differences are very high significant

$p \leq 0,01$ * * - differences are high significant

$p \leq 0,05$ * - differences are significant

$p > 0,05$ o - differences are not significant

Body weight - day 1

Tab. No. 6a

Treatment	Treat. No.	No. of box	Average (g)	Standard deviation	Duncan test					
					T1	T2	T3	T4	T5	T6
T1	1	10	39.62	0.31		o	o	o	o	o
T2	2	10	39.65	0.34	0.790406		o	o	o	o
T3	3	10	39.62	0.31	1.000000	0.818006		o	o	o
T4	4	10	39.62	0.31	1.000000	0.811663	1.000000		o	o
T5	5	10	39.58	0.34	0.818006	0.647379	0.790406	0.803803		o
T6	6	10	39.62	0.31	1.000000	0.803803	1.000000	1.000000	0.811663	

Body weight - day 10

Tab. No. 6b

Treatment	Treat. No.	No. of box	Average (g)	Standard deviation	Duncan test					
					T1	T2	T3	T4	T5	T6
T1	1	10	271.08	8.38		o	o	o	o	o
T2	2	10	274.54	12.09	0.466903		o	o	o	*
T3	3	10	266.04	9.24	0.320774	0.105691		*	o	o
T4	4	10	277.31	9.93	0.219532	0.560206	0.035578		o	*
T5	5	10	270.85	11.10	0.961318	0.466899	0.313350	0.219520		o
T6	6	10	263.81	12.07	0.166908	0.045512	0.638712	0.013018	0.165511	

Body weight - day 24

Tab. No. 6c

Treatment	Treat. No.	No. of birds	Average (g)	Standard deviation	Kruskal-Wallis test					
					T1	T2	T3	T4	T5	T6
T1	1	1273	1290.80	172.39		o	o	o	o	o
T2	2	1268	1303.06	166.35	1.000000		o	o	o	o
T3	3	1270	1296.94	168.10	1.000000	1.000000		o	o	o
T4	4	1268	1298.49	160.25	1.000000	1.000000	1.000000		o	o
T5	5	1270	1297.69	175.87	1.000000	1.000000	1.000000	1.000000		o
T6	6	1276	1289.44	174.14	1.000000	1.000000	1.000000	1.000000	1.000000	

Body weight - day 35

Tab. No. 6d

Treatment	Treat. No.	No. of birds	Average (g)	Standard deviation	Kruskal - Wallis test					
					T1	T2	T3	T4	T5	T6
T1	1	1262	2347.11	294.11		* *	o	o	o	o
T2	2	1257	2400.64	294.00	0.001391		o	*	o	o
T3	3	1266	2373.33	276.07	1.000000	0.425141		o	o	o
T4	4	1261	2365.30	275.72	1.000000	0.012661	1.000000		o	o
T5	5	1259	2368.24	290.58	1.000000	0.129075	1.000000	1.000000		o
T6	6	1269	2363.49	269.33	1.000000	0.064317	1.000000	1.000000	1.000000	

FCR - day 10

Tab. No. 7a

Treatment	Treat. No.	No. of box	Average (g)	Standard deviation	Duncan test					
					T1	T2	T3	T4	T5	T6
T1	1	10	1017.42	28.62		o	o	o	o	o
T2	2	10	999.16	21.51	0.374321		o	o	o	*
T3	3	10	1009.44	55.51	0.658861	0.608447		o	o	o
T4	4	10	1000.57	36.49	0.400514	0.937965	0.645738		o	*
T5	5	10	1007.87	46.65	0.620821	0.651940	0.930647	0.686100		o
T6	6	10	1041.42	42.45	0.186959	0.041610	0.097601	0.045224	0.092930	

FCR - day 24

Tab. No. 7b

Treatment	Treat. No.	No. of box	Average (g)	Standard deviation	Duncan test					
					T1	T2	T3	T4	T5	T6
T1	1	10	1239.42	44.32		o	o	o	o	o
T2	2	10	1235.58	15.89	0.776579		o	o	o	o
T3	3	10	1233.88	31.56	0.701861	0.900210		o	o	o
T4	4	10	1248.71	26.78	0.493097	0.363872	0.323259		o	o
T5	5	10	1250.37	25.58	0.448989	0.324521	0.283871	0.902477		o
T6	6	10	1250.55	29.22	0.458873	0.330800	0.287285	0.899317	0.989526	

FCR - day 35

Tab. No. 7c

Treatment	Treat. No.	No. of box	Average (g)	Standard deviation	Duncan test					
					T1	T2	T3	T4	T5	T6
T1	1	10	1480.09	28.52		*	o	o	*	o
T2	2	10	1444.62	14.82	0.020388		o	*	o	o
T3	3	10	1467.30	31.46	0.377377	0.117776		o	o	o
T4	4	10	1482.21	35.84	0.875616	0.015499	0.321432		*	o
T5	5	10	1448.47	39.59	0.034785	0.776544	0.168563	0.027457		o
T6	6	10	1467.86	24.15	0.368852	0.121456	0.966707	0.322126	0.180860	

Performance results per replicate

Body weight per phases

Tab. No. 8a (page 1)

Treatment	Tr. No.	Pen	Day 1		Day 10		Day 24		Day 35	
			Birds	Average body weight	Birds	Average body weight	Birds	Average body weight	Birds	Average body weight
				g		g		g		g
T1	1	1	130	40.00	130	273.08	128	1298.91	128	2451.02
		7	130	39.62	130	276.54	128	1322.58	128	2428.13
		13	130	40.00	130	272.69	128	1331.09	125	2373.92
		19	130	39.23	130	274.62	128	1313.52	127	2395.20
		25	130	39.23	130	273.46	127	1274.25	126	2422.06
		36	130	39.62	130	279.23	128	1358.05	127	2420.63
		42	130	40.00	130	273.08	125	1221.36	122	2306.72
		48	130	39.62	130	275.38	127	1234.49	127	2216.06
		54	130	39.23	130	251.15	126	1218.02	125	2179.92
		60	130	39.62	130	261.54	128	1332.42	127	2272.76
T2	2	2	130	40.00	130	284.62	127	1295.35	124	2409.68
		8	130	39.62	130	275.38	127	1309.13	124	2431.37
		14	130	40.00	130	262.69	127	1284.09	127	2379.06
		20	130	39.23	130	273.46	128	1299.45	127	2429.53
		26	130	39.23	130	275.77	126	1287.38	125	2463.28
		35	130	39.62	130	285.38	127	1327.24	127	2387.24
		41	130	40.00	130	291.54	126	1305.79	124	2453.06
		47	130	39.62	130	275.00	128	1350.78	127	2415.04
		53	130	39.23	130	248.85	126	1275.32	126	2262.38
		59	130	40.00	130	272.69	126	1295.32	126	2377.70
T3	3	3	130	40.00	130	273.46	126	1286.75	126	2422.54
		9	130	39.62	130	256.15	128	1343.52	128	2483.59
		15	130	40.00	130	271.15	126	1304.21	125	2447.68
		21	130	39.23	130	255.38	127	1272.28	127	2286.06
		27	130	39.23	130	253.46	127	1267.80	126	2412.62
		34	130	39.62	130	276.92	126	1320.95	125	2407.28
		40	130	40.00	130	277.69	127	1232.36	126	2297.30
		46	130	39.62	130	266.92	128	1309.30	128	2363.67
		52	130	39.23	130	270.00	128	1339.77	128	2316.02
		58	130	39.62	130	259.23	127	1291.81	127	2298.03

Body weight per phases

Tab. No. 8a (page 2)

Treatment	Tr. No.	Pen	Day 1		Day 10		Day 24		Day 35	
			Birds	Average body weight	Birds	Average body weight	Birds	Average body weight	Birds	Average body weight
				g		g		g		g
T4	4	4	130	40.00	130	276.92	127	1251.89	127	2380.24
		10	130	39.62	130	272.69	126	1343.57	125	2473.84
		16	130	40.00	130	296.15	125	1359.52	124	2469.03
		22	130	39.23	130	276.92	128	1304.61	128	2307.19
		28	130	39.23	130	284.23	127	1270.24	125	2434.08
		33	130	39.62	130	268.85	127	1207.95	127	2111.97
		39	130	40.00	130	272.31	127	1289.69	126	2411.27
		45	130	39.62	130	286.15	127	1315.51	126	2392.78
		51	130	39.23	130	278.46	127	1345.91	126	2411.19
		57	130	39.62	130	260.38	127	1297.32	127	2268.03
T5	5	5	130	40.00	130	263.46	125	1278.08	124	2370.89
		11	130	39.62	130	285.38	128	1308.59	128	2368.75
		17	130	40.00	130	269.23	127	1297.95	125	2300.24
		23	130	39.23	130	273.08	128	1297.27	128	2358.59
		29	130	39.23	130	272.31	128	1272.34	126	2435.56
		32	130	39.62	130	275.38	128	1254.22	127	2333.62
		38	130	40.00	130	276.54	127	1422.91	124	2517.82
		44	130	39.62	130	284.23	126	1312.46	125	2343.12
		50	130	39.23	130	248.85	126	1218.65	126	2365.00
		56	130	39.23	130	260.00	127	1314.09	126	2290.87
T6	6	6	130	40.00	130	278.46	128	1303.75	127	2375.91
		12	130	39.62	130	274.23	128	1306.95	128	2356.33
		18	130	40.00	130	250.38	128	1240.16	126	2323.33
		24	130	39.23	130	273.46	127	1269.13	126	2462.54
		30	130	39.23	130	248.08	127	1258.03	126	2333.97
		31	130	39.62	130	278.85	128	1323.44	127	2396.61
		37	130	40.00	130	267.69	128	1333.44	128	2344.30
		43	130	39.62	130	257.69	127	1272.99	127	2384.33
		49	130	39.23	130	257.69	128	1302.58	128	2342.34
		55	130	39.62	130	251.54	127	1283.31	126	2315.48

Weight gain per phases (WG) and daily weight gain

Tab. No. 8b (page 1)

Treatment	Tr. No.	Box	Day 1 - 10		Day 11 - 24		Day 25 - 35		Day 1 - 35	
			WG	DWG	WG	DWG	WG	DWG	WG	DWG
			g	g	g	g	g	g	g	g
T1	1	1	233.08	23.31	1025.83	73.27	1152.11	104.74	2411.02	68.89
		7	236.92	23.69	1046.04	74.72	1105.55	100.50	2388.51	68.24
		13	232.69	23.27	1058.40	75.60	1042.83	94.80	2333.92	66.68
		19	235.38	23.54	1038.90	74.21	1081.68	98.33	2355.97	67.31
		25	234.23	23.42	1000.79	71.49	1147.81	104.35	2382.83	68.08
		36	239.62	23.96	1078.82	77.06	1062.58	96.60	2381.01	68.03
		42	233.08	23.31	948.28	67.73	1085.36	98.67	2266.72	64.76
		48	235.77	23.58	959.10	68.51	981.57	89.23	2176.45	62.18
		54	211.92	21.19	966.86	69.06	961.90	87.45	2140.69	61.16
		60	221.92	22.19	1070.88	76.49	940.33	85.48	2233.14	63.80
T2	2	2	244.62	24.46	1010.74	72.20	1114.32	101.30	2369.68	67.71
		8	235.77	23.58	1033.75	73.84	1122.24	102.02	2391.76	68.34
		14	222.69	22.27	1021.40	72.96	1094.96	99.54	2339.06	66.83
		20	234.23	23.42	1025.99	73.29	1130.07	102.73	2390.30	68.29
		26	236.54	23.65	1011.61	72.26	1175.90	106.90	2424.05	69.26
		35	245.77	24.58	1041.86	74.42	1060.00	96.36	2347.63	67.08
		41	251.54	25.15	1014.26	72.45	1147.27	104.30	2413.06	68.94
		47	235.38	23.54	1075.78	76.84	1064.26	96.75	2375.42	67.87
		53	209.62	20.96	1026.47	73.32	987.06	89.73	2223.15	63.52
		59	232.69	23.27	1022.63	73.04	1082.38	98.40	2337.70	66.79
T3	3	3	233.46	23.35	1013.28	72.38	1135.79	103.25	2382.54	68.07
		9	216.54	21.65	1087.36	77.67	1140.08	103.64	2443.98	69.83
		15	231.15	23.12	1033.05	73.79	1143.47	103.95	2407.68	68.79
		21	216.15	21.62	1016.90	72.64	1013.78	92.16	2246.83	64.20
		27	214.23	21.42	1014.33	72.45	1144.82	104.07	2373.39	67.81
		34	237.31	23.73	1044.03	74.57	1086.33	98.76	2367.66	67.65
		40	237.69	23.77	954.67	68.19	1064.94	96.81	2257.30	64.49
		46	227.31	22.73	1042.37	74.46	1054.38	95.85	2324.06	66.40
		52	230.77	23.08	1069.77	76.41	976.25	88.75	2276.78	65.05
		58	219.62	21.96	1032.58	73.76	1006.22	91.47	2258.42	64.53

Weight gain per phases (WG) and daily weight gain

Tab. No. 8b (page 2)

Treatment	Tr. No.	Box	Day 1 - 10		Day 11 - 24		Day 25 - 35		Day 1 - 35	
			WG	DWG	WG	DWG	WG	DWG	WG	DWG
			g	g	g	g	g	g	g	g
T4	4	4	236.92	23.69	974.97	69.64	1128.35	102.58	2340.24	66.86
		10	233.08	23.31	1070.88	76.49	1130.27	102.75	2434.22	69.55
		16	256.15	25.62	1063.37	75.95	1109.51	100.86	2429.03	69.40
		22	237.69	23.77	1027.69	73.41	1002.58	91.14	2267.96	64.80
		28	245.00	24.50	986.01	70.43	1163.84	105.80	2394.85	68.42
		33	229.23	22.92	939.11	67.08	904.02	82.18	2072.35	59.21
		39	232.31	23.23	1017.38	72.67	1121.58	101.96	2371.27	67.75
		45	246.54	24.65	1029.36	73.53	1077.27	97.93	2353.16	67.23
		51	239.23	23.92	1067.44	76.25	1065.28	96.84	2371.96	67.77
		57	220.77	22.08	1036.94	74.07	970.71	88.25	2228.42	63.67
T5	5	5	223.46	22.35	1014.62	72.47	1092.81	99.35	2330.89	66.60
		11	245.77	24.58	1023.21	73.09	1060.16	96.38	2329.13	66.55
		17	229.23	22.92	1028.72	73.48	1002.29	91.12	2260.24	64.58
		23	233.85	23.38	1024.19	73.16	1061.33	96.48	2319.36	66.27
		29	233.08	23.31	1000.04	71.43	1163.21	105.75	2396.32	68.47
		32	235.77	23.58	978.83	69.92	1079.40	98.13	2294.01	65.54
		38	236.54	23.65	1146.37	81.88	1094.91	99.54	2477.82	70.79
		44	244.62	24.46	1028.23	73.44	1030.66	93.70	2303.50	65.81
		50	209.62	20.96	969.80	69.27	1146.35	104.21	2325.77	66.45
		56	220.77	22.08	1054.09	75.29	976.78	88.80	2251.64	64.33
T6	6	6	238.46	23.85	1025.29	73.23	1072.16	97.47	2335.91	66.74
		12	234.62	23.46	1032.72	73.77	1049.38	95.40	2316.71	66.19
		18	210.38	21.04	989.77	70.70	1083.18	98.47	2283.33	65.24
		24	234.23	23.42	995.67	71.12	1193.41	108.49	2423.31	69.24
		30	208.85	20.88	1009.95	72.14	1075.94	97.81	2294.74	65.56
		31	239.23	23.92	1044.59	74.61	1073.18	97.56	2357.00	67.34
		37	227.69	22.77	1065.75	76.12	1010.86	91.90	2304.30	65.84
		43	218.08	21.81	1015.30	72.52	1111.34	101.03	2344.72	66.99
		49	218.46	21.85	1044.89	74.63	1039.77	94.52	2303.11	65.80
		55	211.92	21.19	1031.77	73.70	1032.17	93.83	2275.86	65.02

Feed conversion ratio (Feed consum. per 1 kg of live weight)

Tab. No. 8c (page 1)

Treatment	Tr. No.	Box	Feed conversion ratio		
			Day 10	Day 24	Day 35
			g/kg live weight	g/kg live weight	g/kg live weight
T1	1	1	983.10	1273.83	1467.23
		7	1059.81	1268.73	1477.39
		13	1004.23	1244.74	1505.38
		19	1025.21	1221.01	1463.14
		25	1009.85	1276.20	1448.02
		36	991.74	1137.78	1439.01
		42	988.73	1271.55	1483.79
		48	1008.38	1251.62	1473.74
		54	1041.35	1255.58	1522.85
		60	1061.76	1193.17	1520.34
T2	2	2	1008.11	1235.46	1441.73
		8	1033.52	1259.84	1461.94
		14	1010.25	1226.28	1450.03
		20	1004.22	1223.42	1435.36
		26	1006.97	1234.11	1417.21
		35	991.91	1235.94	1448.08
		41	981.53	1267.45	1450.73
		47	979.02	1224.12	1445.90
		53	1017.00	1219.18	1466.76
59	959.10	1229.99	1428.43		
T3	3	3	964.84	1273.74	1455.62
		9	1087.09	1229.49	1446.34
		15	973.05	1241.93	1428.65
		21	1075.30	1276.29	1509.43
		27	1028.83	1219.39	1418.66
		34	977.78	1250.81	1455.33
		40	903.05	1173.46	1479.22
		46	1017.29	1250.59	1485.01
		52	1025.64	1217.51	1509.44
		58	1041.54	1205.59	1485.26

Feed conversion per 1 kg of live weight

Tab. No. 8c (page 2)

Treatment	Tr. No.	Box	Feed conversion ratio		
			Day 10	Day 24	Day 35
			g/kg live weight	g/kg live weight	g/kg live weight
T4	4	4	991.67	1262.73	1469.07
		10	1026.80	1244.38	1479.29
		16	948.05	1266.07	1484.53
		22	963.89	1239.03	1518.41
		28	1001.35	1256.33	1429.74
		33	992.85	1282.40	1544.12
		39	1064.97	1231.88	1430.05
		45	981.18	1280.80	1504.27
		51	986.19	1229.18	1492.91
		57	1048.74	1194.33	1469.71
T5	5	5	1036.50	1262.94	1471.16
		11	973.05	1244.65	1488.03
		17	1031.43	1231.20	1460.74
		23	952.11	1264.59	1466.13
		29	1042.37	1259.27	1389.88
		32	1011.17	1274.59	1439.59
		38	995.83	1205.81	1383.90
		44	933.69	1281.22	1466.86
		50	1010.82	1265.23	1418.47
		56	1091.72	1214.25	1499.92
T6	6	6	1008.29	1289.77	1484.82
		12	978.96	1257.94	1502.43
		18	1041.47	1232.60	1457.58
		24	990.15	1278.04	1423.07
		30	1085.27	1251.52	1471.22
		31	1020.69	1270.55	1470.97
		37	1068.97	1234.57	1468.64
		43	1080.60	1259.73	1451.43
		49	1035.82	1185.39	1448.92
		55	1103.98	1245.42	1499.54

Feed conversion per 1 kg of weight gain

Tab. No. 8d (page 1)

Treatment	Tr. No.	Box	Feed conversion ratio			
			Day 1-10	Day 11-24	Day 25-35	Day 1-35
			g/kg weight gain	g/kg weight gain	g/kg weight gain	g/kg weight gain
T1	1	1	1151.82	1067.18	1688.48	1491.76
		7	1237.01	1047.72	1731.33	1502.04
		13	1176.86	1039.61	1850.48	1531.55
		19	1196.08	1007.40	1764.61	1487.72
		25	1178.98	1059.50	1643.83	1472.18
		36	1155.70	934.19	1832.75	1463.17
		42	1158.42	1047.63	1731.12	1510.79
		48	1177.81	1026.49	1759.18	1500.88
		54	1234.12	1040.08	1876.37	1551.44
		60	1251.30	985.08	1995.62	1547.58
T2	2	2	1172.96	1013.49	1691.01	1466.59
		8	1207.18	1042.44	1709.22	1486.72
		14	1191.71	1019.31	1717.96	1475.13
		20	1172.41	1012.74	1684.60	1459.12
		26	1173.98	1016.68	1623.53	1440.68
		35	1151.80	1022.62	1719.66	1472.79
		41	1137.61	1048.39	1667.68	1475.25
		47	1143.79	1025.24	1731.47	1470.14
		53	1207.34	1020.61	1796.25	1493.02
		59	1123.97	1026.31	1671.07	1453.37
T3	3	3	1130.15	1067.30	1666.55	1480.53
		9	1285.97	1022.77	1706.30	1469.93
		15	1141.43	1039.20	1647.58	1452.78
		21	1270.46	1060.67	1808.93	1536.06
		27	1217.24	1013.11	1644.77	1442.48
		34	1141.00	1045.58	1713.58	1480.16
		40	1055.02	969.38	1841.78	1505.84
		46	1194.59	1043.83	1781.27	1510.47
		52	1200.00	1011.16	1916.61	1535.61
		58	1229.42	996.92	1853.04	1511.57

Feed conversion per 1 kg of weight gain

Tab. No. 8d (page 2)

Treatment	Tr. No.	Box	Feed conversion ratio			
			Day 1-10	Day 11-24	Day 25-35	Day 1-35
			g/kg weight gain	g/kg weight gain	g/kg weight gain	g/kg weight gain
T4	4	4	1159.09	1042.95	1702.72	1494.50
		10	1201.32	1034.70	1768.37	1503.93
		16	1096.10	1057.11	1760.72	1509.65
		22	1122.98	1034.91	1888.10	1544.84
		28	1161.70	1032.97	1625.77	1453.51
		33	1164.43	1060.69	1900.53	1574.01
		39	1248.34	1007.08	1664.20	1454.50
		45	1138.85	1067.28	1784.35	1529.94
		51	1147.91	1025.20	1836.26	1517.96
		57	1236.93	983.91	1846.20	1496.11
T5	5	5	1222.03	1048.23	1722.74	1496.94
		11	1129.89	1033.03	1793.66	1513.49
		17	1211.41	1017.73	1769.07	1486.98
		23	1111.84	1064.61	1716.60	1491.09
		29	1217.82	1037.05	1537.27	1412.91
		32	1181.08	1052.99	1635.10	1464.66
		38	1164.23	1011.29	1623.58	1406.72
		44	1084.91	1077.85	1710.29	1492.59
		50	1200.00	1057.65	1585.43	1442.86
		56	1285.71	998.20	1894.82	1526.39
T6	6	6	1177.42	1074.94	1727.19	1510.46
		12	1144.26	1053.01	1812.09	1528.28
		18	1239.49	1023.04	1718.85	1483.22
		24	1155.99	1065.16	1582.12	1446.43
		30	1289.13	1037.63	1736.77	1496.77
		31	1189.71	1055.82	1723.82	1495.94
		37	1256.76	1020.17	1782.21	1494.30
		43	1276.90	1041.33	1676.35	1476.22
		49	1221.83	980.84	1784.51	1473.76
		55	1310.34	1028.32	1823.40	1526.05

Feed consumption per phases

Tab. No. 8e (page 1)

Treatment	Tr. No.	Box	Feed consumption			
			Starter (D 1-10)	Grower (D 11-24)	Finisher (D 25-35)	Total (D 1-35)
			kg	kg	kg	kg
T1	1	1	34.90	180.00	249.00	463.90
		7	38.10	180.40	245.00	463.50
		13	35.60	180.20	242.30	458.10
		19	36.60	172.40	242.60	451.60
		25	35.90	175.30	238.70	449.90
		36	36.00	165.00	247.70	448.70
		42	35.10	164.00	232.60	431.70
		48	36.10	164.40	219.30	419.80
		54	34.00	163.90	223.60	421.50
		60	36.10	170.70	238.10	444.90
T2	2	2	37.30	170.10	234.90	442.30
		8	37.00	177.20	237.50	451.70
		14	34.50	169.70	238.90	443.10
		20	35.70	171.40	242.50	449.60
		26	36.10	168.60	239.00	443.70
		35	36.80	176.20	231.50	444.50
		41	37.20	177.80	239.00	454.00
		47	35.00	180.20	236.40	451.60
		53	32.90	168.90	223.40	425.20
		59	34.00	171.10	227.90	433.00
T3	3	3	34.30	177.10	238.50	449.90
		9	36.20	178.90	249.00	464.10
		15	34.30	175.60	237.50	447.40
		21	35.70	175.40	232.90	444.00
		27	33.90	166.30	238.00	438.20
		34	35.20	179.10	232.50	446.80
		40	32.60	154.65	247.85	435.10
		46	35.30	178.00	240.40	453.70
		52	36.00	176.20	239.50	451.70
		58	35.10	167.50	236.80	439.40

Feed consumption per phases

Tab. No. 8e (page 2)

Treatment	Tr. No.	Box	Feed consumption			
			Starter (D 1-10)	Grower (D 11-24)	Finisher (D 25-35)	Total (D 1-35)
			kg	kg	kg	kg
T4	4	4	35.70	169.20	244.00	448.90
		10	36.40	179.40	249.20	465.00
		16	36.50	184.40	243.00	463.90
		22	34.70	175.70	242.30	452.70
		28	37.00	170.90	238.00	445.90
		33	34.70	165.80	218.20	418.70
		39	37.70	168.70	236.00	442.40
		45	36.50	182.20	243.10	461.80
		51	35.70	179.20	246.60	461.50
		57	35.50	165.80	227.60	428.90
T5	5	5	35.50	173.10	235.50	444.10
		11	36.10	176.00	243.40	455.50
		17	36.10	171.90	222.50	430.50
		23	33.80	179.70	233.20	446.70
		29	36.90	172.00	226.00	434.90
		32	36.20	171.80	225.20	433.20
		38	35.80	185.90	221.80	443.50
		44	34.50	182.60	221.00	438.10
		50	32.70	166.40	229.00	428.10
		56	36.90	170.30	233.90	441.10
T6	6	6	36.50	182.40	235.90	454.80
		12	34.90	179.10	243.40	457.40
		18	33.90	165.30	239.20	438.40
		24	35.20	175.90	238.30	449.40
		30	35.00	169.60	234.90	439.50
		31	37.00	181.70	235.20	453.90
		37	37.20	176.80	230.60	444.60
		43	36.20	172.40	236.60	445.20
		49	34.70	166.20	237.50	438.40
		55	36.10	170.80	237.70	444.60

Foot pad lesions

Tab. No. 8f (page 1)

Treatment	Tr. No.	Box	Evaluation	
			right foot	left foot
T1	1	1	1.43	1.43
		7	1.53	1.53
		13	1.53	1.48
		19	1.73	1.70
		25	2.05	2.03
		36	1.40	1.45
		42	1.38	1.20
		48	1.68	1.40
		54	1.70	1.53
		60	1.55	1.53
T2	2	2	1.73	1.65
		8	1.68	1.58
		14	1.75	1.60
		20	1.43	1.40
		26	1.85	1.75
		35	1.53	1.30
		41	1.60	1.83
		47	1.40	1.35
		53	1.83	1.68
59	1.63	1.63		
T3	3	3	1.63	1.63
		9	1.95	1.85
		15	1.83	1.73
		21	1.60	1.68
		27	1.13	1.20
		34	1.50	1.48
		40	1.65	1.43
		46	1.23	1.20
		52	1.48	1.33
58	1.50	1.45		

Foot pad lesions

Tab. No. 8f (page 2)

Treatment	Tr. No.	Box	Evaluation	
			right foot	left foot
T4	4	4	1.55	1.65
		10	1.98	1.83
		16	1.63	1.48
		22	1.95	2.05
		28	1.88	1.88
		33	1.18	1.15
		39	1.58	1.58
		45	1.65	1.65
		51	1.58	1.38
		57	1.55	1.43
T5	5	5	1.50	1.58
		11	1.55	1.43
		17	1.48	1.50
		23	1.65	1.65
		29	1.95	1.93
		32	1.65	1.60
		38	1.40	1.43
		44	1.68	1.50
		50	1.68	1.38
		56	1.53	1.38
T6	6	6	1.48	1.50
		12	1.55	1.43
		18	1.58	1.60
		24	1.60	1.55
		30	1.83	1.83
		31	1.68	1.48
		37	1.25	1.38
		43	1.50	1.25
		49	1.53	1.35
		55	1.43	1.35