



# MEZINÁRODNÍ TESTOVÁNÍ DRŮBEŽE ÚSTRAŠICE

státní podnik

390 02 Tábor 2

Česká republika

## BROILER FEEDING TEST No. 5/2024

**Effect of feed additives to performance of broilers**

XXXXX

**3 April 2024 – 8 May 2024**

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**June 2024**

## Basic tests information

### The basic dates

Beginning of the test: 13 March 2024 (setting in the incubator)  
3 April 2024 (transfer to the chicken house)  
End of the test: 8 May 2024

## Material and methods

### Material

In total there were 2240 day old chicks of xxxxx. Day old chicks were randomly distributed into 4 dietary treatments.

### Experimental treatments

No.	Treat.	Description	Number pen	Sex	Birds per pen	Total number of birds
1	T1	xxxxx	8	4♂+4♀	70	560
2	T2	xxxxx	8	4♂+4♀	70	560
3	T3	xxxxx	8	4♂+4♀	70	560
4	T4	xxxxx	8	4♂+4♀	70	560

Origin of hatching eggs: Mezinárodní testování drůbeže s.p., Ústrašice, age of the breeding flock was 52 weeks.

### Housing system

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

### Lighting programme

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

### Stocking density

16,3 broilers per square meter.

## Feed

Feed was produced in Mezinárodní testování drůbeže s.p., Ústrašice.

Day 1 – 14 Starter (BR1)

Day 15 – 28 Grower (BR2)

Day 29 – 35 Finisher (BR3)

## Diet formulas

Components (%)	Starter BR1		Grower BR2		Finisher BR3	
	T1,T2,T3	T4	T1,T2,T3	T4	T1,T2,T3	T4
Soybean meal	38.70	39.00	34.50	34.50	30.20	30.20
Wheat	33.00	30.00	37.39	36.89	39.20	38.87
Maize	20.80	21.69	20.50	20.50	22.00	22.00
Soybean oil	3.20	3.20	4.10	4.10	5.07	5.00
Limestone	1.38	1.19	1.00	1.00	0.90	0.90
MCP	1.00	1.00	1.00	1.00	1.10	1.00
Salt	0.30	0.30	0.29	0.29	0.29	0.29
Na <sub>2</sub> CO <sub>3</sub>	0.12	0.12	0.15	0.15	0.15	0.15
L-lysine HCl	0.30	0.30	0.28	0.28	0.26	0.26
L-threonine	0.15	0.15	0.15	0.15	0.20	0.20
DL-methionine	0.06	0.06	0.14	0.14	0.13	0.13
Premix AMVBR1 Plus	1.00	3.00	-	-	-	-
Premix AMVBR2 Plus	-	-	0.50	1.00	-	-
Premix AMVBR3 Plus	-	-	-	-	0.50	1.00
<b>Nutrient content</b>						
Crude protein (g/kg)	218.99	218.50	205.67	205.21	190.66	190.35
ME (MJ/kg)	12.03	11.78	12.47	12.40	12.82	12.75
Lysine (g/kg)	14.29	14.30	13.13	13.11	11.91	11.90
Methionine (g/kg)	5.97	5.95	6.20	6.20	5.61	5.60
Met.+Cys. (g/kg)	9.80	9.74	9.85	9.83	9.03	9.02
Ca (g/kg)	9.50	9.50	7.61	7.81	7.03	7.26
P dig. (g/kg)	3.10	3.07	3.11	3.10	3.27	3.08
Na (g/kg)	2.14	2.14	2.12	2.12	2.06	2.06

## Veterinary precautions

The chicken house was disinfected by xxxxx before the chick placement. On days 1 chickens were vaccinated with xxxxx.

## **Parameters recorded**

### **Live weight**

Live weight was measured on days 1 (all the birds in each pen were weighed altogether), 14 and 28 (all the birds were weighed individually, without fasting). On day 35 birds were weighed individually, after 12 hours of fasting.

### **Weight gain**

Weight gain per phase and average daily weight gains were calculated for the periods 1 – 14 days, 15 – 28 days, 29 – 35 days and for the overall experiment (1 – 35 days).

### **Feed conversion ratio**

Feed consumption and feed conversion ratio to gain ratio were calculated for the periods 1 – 14 days, 15 – 28 days, 29 – 35 days and for the overall experiment (1 – 35 days). The calculation was included weight of deaths.

### **Feed consumption**

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

### **Mortality**

All pens were checked twice a day to see if there were any dead or ill birds. Dead chickens were registered by date and reason of mortality on the day of death. Mortality was recorded for the periods 1 – 14 days, 15 – 28 days, 29 – 35 days and 1 – 35 days.

### **Carcass analysis**

The carcass analysis was done in 5 birds per each pen on day 35. Breast muscles was weighed without skin and thigh muscles with skin.

### **Foot pad lesions**

At the end of the trial the animals were recorded according the scale.

### **Statistical analyses**

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

## **Results**

Tab. No.	<b>1 Hatchability</b>
	<b>2 Performance results:</b>
	<b>2a Body weight</b>
	<b>2b Weight gain</b>
	<b>2c Feed conversion ratio per 1 kg of live weight</b>
	<b>2d Feed consumption per 1 kg of weight gain</b>
	<b>2e Feed consumption</b>
	<b>3 Mortality</b>
	<b>4 Carcass analysis</b>
	<b>5 Foot pad lesions</b>
	<b>6 Statistical analysis of body weight at the age of 35 days</b>
	(average body weight, standard deviation, coefficient of variation)
	<b>7 - 10 Statistical analyses of performance results</b>
	<b>11 Performance results per pen:</b>
	<b>11a Body weight</b>
	<b>11b Weight gain</b>
	<b>11c Feed conversion ratio per 1 kg of live weight</b>
	<b>11d Feed consumption per 1 kg of weight gain</b>
	<b>11e Feed consumption</b>
	<b>11f Foot pad lesions</b>

**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	94.40	85.70	90.78	560	68.00	47.73
T2	2				560		47.81
T3	3				560		47.46
T4	4				560		47.36

**Body weight per phases**

**Tab. No. 2a**

Treatment	Tr. No.	Day 1		Day 14		Day 28		Day 35	
		Birds	Average body weight	Birds	Average body weight	Birds	Average body weight	Birds	Average body weight
			g		g		g		g
T1	1	560	47.73	557	494.24	551	1485.49	550	2171.46
T2	2	560	47.81	558	523.07	554	1549.87	553	2231.73
T3	3	560	47.46	555	518.32	549	1524.88	546	2204.91
T4	4	560	47.36	559	480.39	549	1473.20	548	2198.87

**Weight gain per phases**

**Tab. No. 2b**

<b>Treatment</b>	<b>Tr. No.</b>	<b>Day 1 - 14</b>		<b>Day 15 - 28</b>		<b>Day 29 - 35</b>		<b>Day 1 - 35</b>	
		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	446.51	31.89	991.25	70.80	685.97	98.00	2123.73	60.68
T2	2	475.26	33.95	1026.80	73.34	681.86	97.41	2183.92	62.40
T3	3	470.86	33.63	1006.56	71.90	680.03	97.15	2157.45	61.64
T4	4	433.03	30.93	992.81	70.91	725.67	103.67	2151.51	61.47



**Feed conversion ratio (Feed consumption per 1 kg of live weight)**

**Tab. No. 2c**

<b>Treatment</b>	<b>Tr. No.</b>	<b>Feed conversion ratio</b>		
		<b>Day 14</b>	<b>Day 28</b>	<b>Day 35</b>
		<b>g/kg LW</b>	<b>g/kg LW</b>	<b>g/kg LW</b>
T1	1	1013.06	1332.07	1561.60
T2	2	965.60	1329.77	1547.47
T3	3	948.60	1346.99	1555.71
T4	4	1027.84	1385.01	1566.35

**Feed consumption per 1 kg of weight gain (WG)****Tab. No. 2d**

<b>Treatment</b>	<b>Tr. No.</b>	<b>Feed consumption per 1 kg of weight gain</b>			
		<b>1-14 days</b>	<b>15-28 days</b>	<b>29-35 days</b>	<b>1-35 days</b>
		<b>g/kg WG</b>	<b>g/kg WG</b>	<b>g/kg WG</b>	<b>g/kg WG</b>
T1	1	1121.52	1493.33	2062.26	1597.16
T2	2	1062.79	1517.23	2044.54	1581.65
T3	3	1044.58	1555.38	2028.10	1590.53
T4	4	1140.40	1560.93	1937.86	1601.40

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

<b>Treatment</b>	<b>Tr. No.</b>	<b>Feed consumption</b>			
		<b>Starter (1-14 days)</b>	<b>Grower (15-28 days)</b>	<b>Finisher (29-35 days)</b>	<b>Total</b>
		kg	kg	kg	kg
T1	1	280.00	816.54	778.29	1874.83
T2	2	282.70	862.95	771.44	1917.09
T3	3	274.37	860.03	754.70	1889.10
T4	4	276.20	851.58	770.25	1898.03



Results of carcass analysis

Tab. No. 4

Treatment	Tr. No.	Sex	Weight				Ratio of abd. fat to live weight	Breast muscles without skin			Thigh muscles with skin			Total muscles			Carcass	
			Total	Body	Gibl.	Abd. fat		Weight	Percentage		Weight	Percentage		Weight	Percentage		Value	Yield
									Total weight	Body carcass		Total weight	Body carcass		Total weight	Body carcass		
			g	g	g	g		g	%	%	%	g	%	%	g	%	%	%
T1	1	♂	2366	1646	141	19	0.79	579	24.46	35.16	484	20.45	29.41	1063	44.91	64.57	69.56	75.51
		♀	2116	1447	128	20	0.95	504	23.80	34.80	426	20.15	29.46	930	43.95	64.26	68.39	74.43
		♂	<b>2241</b>	<b>1546</b>	<b>134</b>	<b>19</b>	<b>0.86</b>	<b>541</b>	<b>24.15</b>	<b>34.99</b>	<b>455</b>	<b>20.31</b>	<b>29.43</b>	<b>996</b>	<b>64.43</b>	<b>44.46</b>	<b>69.01</b>	<b>75.00</b>
T2	2	♂	2410	1683	145	21	0.88	596	24.74	35.43	495	20.56	29.44	1092	45.30	64.86	69.84	75.86
		♀	2185	1512	131	22	1.00	530	24.27	35.06	438	20.04	28.95	968	44.31	64.00	69.23	75.21
		♂	<b>2297</b>	<b>1598</b>	<b>138</b>	<b>22</b>	<b>0.94</b>	<b>563</b>	<b>24.52</b>	<b>35.25</b>	<b>467</b>	<b>20.31</b>	<b>29.21</b>	<b>1030</b>	<b>64.46</b>	<b>44.83</b>	<b>69.55</b>	<b>75.55</b>
T3	3	♂	2393	1669	140	20	0.83	580	24.22	34.73	493	20.59	29.51	1072	44.81	64.24	69.75	75.60
		♀	2163	1471	135	20	0.94	508	23.49	34.54	428	19.81	29.13	936	43.30	63.67	68.01	74.25
		♂	<b>2278</b>	<b>1570</b>	<b>137</b>	<b>20</b>	<b>0.88</b>	<b>544</b>	<b>23.87</b>	<b>34.64</b>	<b>461</b>	<b>20.22</b>	<b>29.33</b>	<b>1004</b>	<b>63.97</b>	<b>44.09</b>	<b>68.92</b>	<b>74.96</b>
T4	4	♂	2431	1692	143	15	0.60	595	24.48	35.16	499	20.51	29.46	1094	44.99	64.62	69.62	75.51
		♀	2157	1489	133	18	0.85	516	23.93	34.67	436	20.21	29.28	952	44.14	63.95	69.02	75.20
		♂	<b>2294</b>	<b>1591</b>	<b>138</b>	<b>16</b>	<b>0.72</b>	<b>556</b>	<b>24.22</b>	<b>34.93</b>	<b>467</b>	<b>20.37</b>	<b>29.37</b>	<b>1023</b>	<b>64.31</b>	<b>44.59</b>	<b>69.34</b>	<b>75.36</b>

**Foot pad lesions****Tab. No. 5**

<b>Treatment</b>	<b>Tr. No.</b>	<b>Evaluation</b>	
		<b>right foot</b>	<b>left foot</b>
T1	1	3.29	3.28
T2	2	3.26	3.23
T3	3	2.89	2.93
T4	4	3.01	3.04

**Statistical analysis - Body weight at 35 days of age**

**Tab. No. 6**

Treatment	Tr. No.	Cocks				Hens			
		Number of birds	Average body weight	Standard deviation	Coefficient of variation	Number of birds	Average body weight	Standard deviation	Coefficient of variation
			g/birds	g/birds	%		g/birds	g/birds	%
T1	1	273	2280.95	250.69	10.99	277	2063.54	211.20	10.23
T2	2	274	2334.36	228.18	9.77	279	2130.93	202.29	9.49
T3	3	278	2295.95	261.44	11.39	268	2110.48	237.46	11.25
T4	4	269	2310.83	221.07	9.57	279	2090.93	220.77	10.56

### Statistical analyses of performance results

Performance results were statistically evaluated using the ANOVA single-factor model (Scheffe test, 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. 7a**

Treatment	Treat. No.	No. of box	Average (g)	Standard deviation	Duncan test			
					T1	T2	T3	T4
T1	1	8	47.73	0.53		o	o	o
T2	2	8	47.81	0.68	0.812411		o	o
T3	3	8	47.46	0.84	0.422053	0.328766		o
T4	4	8	47.36	0.62	0.309092	0.231950	0.778628	



**Body weight - day 1 - ♂**

Treatment	Treat. No.	No. of box	Average (g)	Standard deviation	Duncan test			
					T1	T2	T3	T4
T1	1	4	47.93	0.34		o	o	o
T2	2	4	48.23	0.60	0.432605		o	o
T3	3	4	48.07	0.55	0.692013	0.662260		o
T4	4	4	47.82	0.49	0.773904	0.307993	0.518427	

**Body weight - day 1 - ♀**

Treatment	Treat. No.	No. of box	Average (g)	Standard deviation	Duncan test			
					T1	T2	T3	T4
T1	1	4	47.54	0.65		o	o	o
T2	2	4	47.39	0.50	0.708209		o	o
T3	3	4	46.84	0.58	0.106922	0.180401		o
T4	4	4	46.90	0.30	0.126646	0.205571	0.879717	

**Body weight - day 14**

**Tab. No. 7b**

Treatment	Treat. No.	No. of birds	Average (g)	Standard deviation	Kruskal-Wallis test			
					T1	T2	T3	T4
T1	1	557	494.24	66.18		***	***	***
T2	2	558	523.07	50.22	0.000000		o	***
T3	3	555	518.32	48.42	0.000000	0.917265		***
T4	4	559	480.39	51.03	0.000000	0.000000	0.000000	

**Body weight - day 14 - ♂**

Treatment	Treat. No.	No. of birds	Average (g)	Standard deviation	Kruskal-Wallis test			
					T1	T2	T3	T4
T1	1	277	496.52	78.78		***	***	**
T2	2	278	540.23	49.79	0.000000		*	***
T3	3	278	529.47	47.00	0.000021	0.040617		***
T4	4	279	492.62	50.92	0.008150	0.000000	0.000000	

**Body weight - day 14 - ♀**

Treatment	Treat. No.	No. of birds	Average (g)	Standard deviation	Scheffe test			
					T1	T2	T3	T4
T1	1	280	491.99	50.77		**	**	***
T2	2	280	506.03	44.59	0.007291		o	***
T3	3	277	507.13	47.31	0.003034	0.994711		***
T4	4	280	468.20	48.24	0.000000	0.000000	0.000000	

**Body weight - day 28**

**Tab. No. 7c**

Treatment	Treat. No.	No. of birds	Average (g)	Standard deviation	Kruskal-Wallis test			
					T1	T2	T3	T4
T1	1	551	1485.49	176.05		***	**	o
T2	2	554	1549.87	160.23	0.000000		*	***
T3	3	549	1524.88	177.69	0.002335	0.025729		***
T4	4	549	1473.20	159.71	1.000000	0.000000	0.000018	

**Body weight - day 28 - ♂**

Treatment	Treat. No.	No. of birds	Average (g)	Standard deviation	Kruskal-Wallis test			
					T1	T2	T3	T4
T1	1	274	1536.09	180.68		***	**	o
T2	2	275	1613.66	155.92	0.000001		o	***
T3	3	278	1587.72	158.92	0.009327	0.284658		***
T4	4	270	1531.58	153.61	1.000000	0.000000	0.000081	

**Body weight - day 28 - ♀**

Treatment	Treat. No.	No. of birds	Average (g)	Standard deviation	Kruskal-Wallis test			
					T1	T2	T3	T4
T1	1	277	1435.44	156.25		***	o	o
T2	2	279	1486.99	138.25	0.000057		**	***
T3	3	271	1460.43	173.02	1.000000	0.007112		o
T4	4	279	1416.70	144.69	1.000000	0.000000	0.143616	

**Body weight - day 35**

**Tab. No. 7d**

Treatment	Treat. No.	No. of birds	Average (g)	Standard deviation	Scheffe test			
					T1	T2	T3	T4
T1	1	550	2171.46	255.73		**	o	o
T2	2	553	2231.73	238.17	0.001287		o	o
T3	3	546	2204.91	266.41	0.184799	0.374760		o
T4	4	548	2198.87	246.62	0.354787	0.196919	0.984162	

**Body weight - day 35 - ♂**

Treatment	Treat. No.	No. of birds	Average (g)	Standard deviation	Scheffe test			
					T1	T2	T3	T4
T1	1	273	2280.95	250.69		o	o	o
T2	2	274	2334.36	228.18	0.082236		o	o
T3	3	278	2295.95	261.44	0.911587	0.320623		o
T4	4	269	2310.83	221.07	0.556023	0.730513	0.914259	

**Body weight - day 35 - ♀**

Treatment	Treat. No.	No. of birds	Average (g)	Standard deviation	Scheffe test			
					T1	T2	T3	T4
T1	1	277	2063.54	211.20		**	o	o
T2	2	279	2130.93	202.29	0.004239		o	o
T3	3	268	2110.48	237.46	0.098219	0.752772		o
T4	4	279	2090.93	220.77	0.533947	0.196534	0.777484	

Average weight gain (day 1-14)

Tab. No. 8a

Treatment	Treat. No.	No. of box	Average (g)	Standard deviation	Duncan test			
					T1	T2	T3	T4
T1	1	8	31.89	1.49		*	*	o
T2	2	8	33.95	1.63	0.012943		o	***
T3	3	8	33.63	1.20	0.027022	0.664849		**
T4	4	8	30.93	1.59	0.207082	0.000667	0.001616	

Average weight gain (day 1-14) - ♂

Treatment	Treat. No.	No. of box	Average (g)	Standard deviation	Duncan test			
					T1	T2	T3	T4
T1	1	4	32.03	1.01		**	**	o
T2	2	4	35.14	1.05	0.001787		o	**
T3	3	4	34.39	0.74	0.008468	0.329474		**
T4	4	4	31.76	1.33	0.725931	0.001155	0.005594	

Average weight gain (day 1-14) - ♀

Treatment	Treat. No.	No. of box	Average (g)	Standard deviation	Duncan test			
					T1	T2	T3	T4
T1	1	4	31.75	2.03		o	o	o
T2	2	4	32.76	1.14	0.357067		o	*
T3	3	4	32.87	1.12	0.333467	0.921098		*
T4	4	4	30.09	1.51	0.143997	0.032861	0.031003	

## Average weight gain (day 15-28)

Tab. No. 8b

Treatment	Treat. No.	No. of box	Average (g)	Standard deviation	Duncan test			
					T1	T2	T3	T4
T1	1	8	70.85	4.73		o	o	o
T2	2	8	73.36	4.43	0.354232		o	o
T3	3	8	71.80	5.90	0.715387	0.525767		o
T4	4	8	70.99	4.23	0.954222	0.365380	0.740812	

## Average weight gain (day 15-28) - ♂

Treatment	Treat. No.	No. of box	Average (g)	Standard deviation	Duncan test			
					T1	T2	T3	T4
T1	1	4	74.29	3.71		o	o	o
T2	2	4	76.66	3.89	0.414687		o	o
T3	3	4	75.56	4.34	0.641418	0.688708		o
T4	4	4	74.23	3.07	0.984304	0.415840	0.644469	

## Average weight gain (day 15-28) - ♀

Treatment	Treat. No.	No. of box	Average (g)	Standard deviation	Duncan test			
					T1	T2	T3	T4
T1	1	4	67.41	2.61		o	o	o
T2	2	4	70.06	1.27	0.275316		o	o
T3	3	4	68.04	4.95	0.786152	0.365804		o
T4	4	4	67.74	2.06	0.878807	0.325986	0.893906	

Average weight gain (day 29-35)

Tab. No. 8c

Treatment	Treat. No.	No. of box	Average (g)	Standard deviation	Duncan test			
					T1	T2	T3	T4
T1	1	8	98.15	11.33		o	o	o
T2	2	8	97.51	12.04	0.909012		o	o
T3	3	8	96.96	11.35	0.842915	0.922860		o
T4	4	8	103.83	10.08	0.320783	0.297314	0.273844	

Average weight gain (day 29-35) - ♂

Treatment	Treat. No.	No. of box	Average (g)	Standard deviation	Duncan test			
					T1	T2	T3	T4
T1	1	4	106.50	6.81		o	o	o
T2	2	4	103.00	10.54	0.591993		o	o
T3	3	4	101.23	11.57	0.446091	0.786009		o
T4	4	4	111.36	5.67	0.459484	0.234443	0.165135	

Average weight gain (day 29-35) - ♀

Treatment	Treat. No.	No. of box	Average (g)	Standard deviation	Duncan test			
					T1	T2	T3	T4
T1	1	4	89.81	8.21		o	o	o
T2	2	4	92.01	12.12	0.756422		o	o
T3	3	4	92.68	10.87	0.701237	0.925106		o
T4	4	4	96.29	7.32	0.403478	0.568936	0.612554	

## Average weight gain (day 1-35)

Tab. No. 8d

Treatment	Treat. No.	No. of box	Average (g)	Standard deviation	Duncan test			
					T1	T2	T3	T4
T1	1	8	60.72	3.89		o	o	o
T2	2	8	62.43	3.70	0.438294		o	o
T3	3	8	61.56	4.06	0.692633	0.663661		o
T4	4	8	61.53	4.07	0.684985	0.672470	0.988121	

## Average weight gain (day 1-35) - ♂

Treatment	Treat. No.	No. of box	Average (g)	Standard deviation	Duncan test			
					T1	T2	T3	T4
T1	1	4	63.83	1.48		o	o	o
T2	2	4	65.32	1.95	0.459851		o	o
T3	3	4	64.23	3.68	0.829942	0.576717		o
T4	4	4	64.67	2.60	0.666667	0.726175	0.810655	

## Average weight gain (day 1-35) - ♀

Treatment	Treat. No.	No. of box	Average (g)	Standard deviation	Duncan test			
					T1	T2	T3	T4
T1	1	4	57.62	2.74		o	o	o
T2	2	4	59.53	2.42	0.336233		o	o
T3	3	4	58.90	2.44	0.506095	0.725881		o
T4	4	4	58.39	2.38	0.670785	0.551725	0.780438	



**FCR 14**

**Tab. No. 9a**

Treatment	Treat. No.	No. of box	Average (g/kg live weight)	Standard deviation	Duncan test			
					T1	T2	T3	T4
T1	1	8	1014.75	59.00		o	*	o
T2	2	8	966.23	36.91	0.090823		o	*
T3	3	8	950.18	63.32	0.034494	0.566945		*
T4	4	8	1029.64	58.47	0.595120	0.037674	0.012393	

**FCR 14 - ♂**

Treatment	Treat. No.	No. of box	Average (g/kg live weight)	Standard deviation	Duncan test			
					T1	T2	T3	T4
T1	1	4	1001.59	31.15		o	**	o
T2	2	4	954.48	37.91	0.073645		o	o
T3	3	4	909.93	42.05	0.002822	0.076048		*
T4	4	4	982.47	5.69	0.421062	0.245894	0.010462	

**FCR 14 - ♀**

Treatment	Treat. No.	No. of box	Average (g/kg live weight)	Standard deviation	Duncan test			
					T1	T2	T3	T4
T1	1	4	1027.92	81.79		o	o	o
T2	2	4	977.98	37.05	0.267124		o	*
T3	3	4	990.43	57.15	0.376800	0.765796		o
T4	4	4	1076.82	44.83	0.254335	0.043834	0.066343	

**FCR 28**

**Tab. No. 9b**

Treatment	Treat. No.	No. of box	Average (g/kg live weight)	Standard deviation	Duncan test			
					T1	T2	T3	T4
T1	1	8	1333.47	63.63		o	o	o
T2	2	8	1332.73	76.11	0.985714		o	o
T3	3	8	1354.44	115.94	0.609978	0.619605		o
T4	4	8	1387.10	55.99	0.223069	0.232227	0.428466	

**FCR 28 - ♂**

Treatment	Treat. No.	No. of box	Average (g/kg live weight)	Standard deviation	Duncan test			
					T1	T2	T3	T4
T1	1	4	1289.03	37.79		o	o	o
T2	2	4	1278.42	53.51	0.794351		o	o
T3	3	4	1273.61	76.31	0.719177	0.905885		o
T4	4	4	1354.47	50.46	0.126091	0.093283	0.083457	

**FCR 28 - ♀**

Treatment	Treat. No.	No. of box	Average (g/kg live weight)	Standard deviation	Duncan test			
					T1	T2	T3	T4
T1	1	4	1377.90	52.49		o	o	o
T2	2	4	1387.03	52.82	0.839732		o	o
T3	3	4	1435.26	90.11	0.251472	0.319243		o
T4	4	4	1419.72	43.91	0.385401	0.473411	0.731176	

**FCR 35**

**Tab. No. 9c**

Treatment	Treat. No.	No. of box	Average (g/kg live weight)	Standard deviation	Duncan test			
					T1	T2	T3	T4
T1	1	8	1564.99	80.87		o	o	o
T2	2	8	1551.68	92.93	0.782961		o	o
T3	3	8	1563.42	114.29	0.972515	0.795745		o
T4	4	8	1569.11	63.36	0.927543	0.727562	0.906558	

**FCR 35 - ♂**

Treatment	Treat. No.	No. of box	Average (g/kg live weight)	Standard deviation	Duncan test			
					T1	T2	T3	T4
T1	1	4	1496.80	45.53		o	o	o
T2	2	4	1489.64	42.78	0.852407		o	o
T3	3	4	1480.61	69.19	0.689678	0.814205		o
T4	4	4	1526.64	51.14	0.442875	0.367784	0.278309	

**FCR 35 - ♀**

Treatment	Treat. No.	No. of box	Average (g/kg live weight)	Standard deviation	Duncan test			
					T1	T2	T3	T4
T1	1	4	1633.17	28.09		o	o	o
T2	2	4	1613.71	89.76	0.690498		o	o
T3	3	4	1646.23	86.03	0.789021	0.529119		o
T4	4	4	1611.58	44.08	0.674665	0.965211	0.513213	

FCR per 1 kg of weight gain - 1-14 day

Tab. No. 10a

Treatment	Treat. No.	No. of box	Average (g/kg weight gain)	Standard deviation	Duncan test			
					T1	T2	T3	T4
T1	1	8	1123.74	68.87		o	*	o
T2	2	8	1063.72	43.29	0.071874		o	*
T3	3	8	1046.54	72.06	0.029335	0.596350		**
T4	4	8	1142.77	68.14	0.557745	0.025893	0.009137	

FCR per 1 kg of weight gain - 1-14 day - ♂

Treatment	Treat. No.	No. of box	Average (g/kg weight gain)	Standard deviation	Duncan test			
					T1	T2	T3	T4
T1	1	4	1109.02	35.04		*	**	o
T2	2	4	1048.25	42.79	0.042827		o	o
T3	3	4	1001.05	46.06	0.001956	0.090536		**
T4	4	4	1088.53	8.74	0.439817	0.142249	0.006694	

FCR per 1 kg of weight gain - 1-14 day - ♀

Treatment	Treat. No.	No. of box	Average (g/kg weight gain)	Standard deviation	Duncan test			
					T1	T2	T3	T4
T1	1	4	1138.45	96.24		o	o	o
T2	2	4	1079.20	43.62	0.264364		o	*
T3	3	4	1092.03	66.90	0.354216	0.794524		o
T4	4	4	1197.01	53.96	0.247534	0.041961	0.059489	

**FCR per 1 kg of weight gain - 15-28 day**

**Tab. No. 10b**

Treatment	Treat. No.	No. of box	Average (g/kg weight gain)	Standard deviation	Duncan test			
					T1	T2	T3	T4
T1	1	8	1496.62	107.72		o	o	o
T2	2	8	1521.86	108.03	0.668201		o	o
T3	3	8	1569.14	163.40	0.265861	0.451396		o
T4	4	8	1563.25	65.59	0.289919	0.483275	0.920351	

**FCR per 1 kg of weight gain - 15-28 day - ♂**

Treatment	Treat. No.	No. of box	Average (g/kg weight gain)	Standard deviation	Duncan test			
					T1	T2	T3	T4
T1	1	4	1430.09	68.63		o	o	o
T2	2	4	1444.98	86.65	0.813817		o	o
T3	3	4	1457.94	111.58	0.676222	0.837612		o
T4	4	4	1536.91	76.81	0.134723	0.182132	0.225676	

**FCR per 1 kg of weight gain - 15-28 day - ♀**

Treatment	Treat. No.	No. of box	Average (g/kg weight gain)	Standard deviation	Duncan test			
					T1	T2	T3	T4
T1	1	4	1563.14	102.78		o	o	o
T2	2	4	1598.73	62.93	0.611804		o	o
T3	3	4	1680.34	129.91	0.119516	0.232632		o
T4	4	4	1589.59	47.85	0.690931	0.890471	0.207853	

**FCR per 1 kg of weight gain - 29-35 day**

**Tab. No. 10c**

Treatment	Treat. No.	No. of box	Average (g/kg weight gain)	Standard deviation	Duncan test			
					T1	T2	T3	T4
T1	1	8	2079.90	211.95		o	o	o
T2	2	8	2067.86	233.04	0.912304		o	o
T3	3	8	2056.64	267.05	0.841696	0.918234		o
T4	4	8	1945.88	129.60	0.268360	0.296963	0.314913	

**FCR per 1 kg of weight gain - 29-35 day - ♂**

Treatment	Treat. No.	No. of box	Average (g/kg weight gain)	Standard deviation	Kruskal-Wallis test			
					T1	T2	T3	T4
T1	1	4	1933.38	116.40		o	o	o
T2	2	4	1979.46	173.61	1.000000		o	o
T3	3	4	1958.68	209.78	1.000000	1.000000		o
T4	4	4	1871.43	76.71	1.000000	1.000000	1.000000	

**FCR per 1 kg of weight gain - 29-35 day - ♀**

Treatment	Treat. No.	No. of box	Average (g/kg weight gain)	Standard deviation	Duncan test			
					T1	T2	T3	T4
T1	1	4	2226.43	184.45		o	o	o
T2	2	4	2156.27	275.20	0.683267		o	o
T3	3	4	2154.60	311.14	0.691340	0.992334		o
T4	4	4	2020.33	136.11	0.276746	0.455937	0.439173	

**FCR per 1 kg of weight gain - 1-35 day**

**Tab. No. 10d**

Treatment	Treat. No.	No. of box	Average (g/kg weight gain)	Standard deviation	Duncan test			
					T1	T2	T3	T4
T1	1	8	1600.78	84.37		o	o	o
T2	2	8	1586.12	96.75	0.771033		o	o
T3	3	8	1598.72	119.13	0.965262	0.789972		o
T4	4	8	1604.35	66.20	0.939874	0.726826	0.911316	

**FCR per 1 kg of weight gain - 1-35 day - ♂**

Treatment	Treat. No.	No. of box	Average (g/kg weight gain)	Standard deviation	Duncan test			
					T1	T2	T3	T4
T1	1	4	1529.54	46.78		o	o	o
T2	2	4	1521.61	44.68	0.843237		o	o
T3	3	4	1512.61	72.46	0.688894	0.822409		o
T4	4	4	1559.96	53.40	0.452747	0.370383	0.284460	

**FCR per 1 kg of weight gain - 1-35 day - ♀**

Treatment	Treat. No.	No. of box	Average (g/kg weight gain)	Standard deviation	Duncan test			
					T1	T2	T3	T4
T1	1	4	1672.03	29.75		o	o	o
T2	2	4	1650.64	93.51	0.675333		o	o
T3	3	4	1684.82	89.96	0.801703	0.526475		o
T4	4	4	1648.73	46.03	0.664716	0.970303	0.514374	

**Body weight (BW) per box**

**Tab. No. 11a**

Treatment	Tr. No.	Box No.	Day 1		Day 14		Day 28		Day 35	
			Birds	BW	Birds	BW	Birds	BW	Birds	BW
				g		g		g		g
T1	1	1	70	47.57	68	474.87	67	1538.27	66	2342.91
		2	70	47.86	70	501.01	69	1442.36	69	2050.06
		9	70	47.71	70	502.94	70	1470.51	70	2216.51
		10	70	46.57	70	450.07	70	1343.26	70	1944.76
		17	70	48.14	69	501.72	69	1589.83	69	2277.83
		18	70	47.71	70	516.69	70	1492.54	70	2083.73
		25	70	48.29	70	505.99	68	1546.91	68	2290.32
		26	70	48.00	70	500.17	68	1464.51	68	2178.72
T2	2	3	70	48.21	69	527.13	68	1583.54	68	2243.56
		4	70	47.57	70	487.14	70	1479.10	70	2010.11
		11	70	48.86	70	546.50	70	1586.97	70	2320.83
		12	70	47.14	70	514.51	69	1470.41	69	2157.03
		19	70	48.43	69	558.67	69	1712.80	69	2382.74
		20	70	48.00	70	523.57	70	1518.83	70	2150.69
		27	70	47.43	70	528.70	68	1570.66	67	2390.85
		28	70	46.86	70	498.87	70	1479.40	70	2206.26
T3	3	5	70	47.57	70	520.99	70	1574.83	70	2191.84
		6	70	46.50	69	506.61	67	1545.82	66	2098.08
		13	70	47.86	70	543.99	70	1688.31	70	2475.49
		14	70	46.57	70	514.33	69	1441.41	68	2083.79
		21	70	48.86	70	523.59	70	1549.59	70	2214.67
		22	70	46.57	68	484.94	65	1359.98	64	2023.28
		29	70	48.00	68	529.32	68	1536.68	68	2301.96
		30	70	47.71	70	522.00	70	1490.71	70	2227.83
T4	4	7	70	47.43	69	465.06	68	1456.28	68	2178.91
		8	70	46.86	70	464.96	69	1385.90	69	2013.01
		15	70	47.43	70	503.00	67	1590.90	67	2387.55
		16	70	46.86	70	466.87	70	1415.21	70	2047.56
		23	70	48.43	70	496.01	68	1555.81	68	2341.18
		24	70	46.57	70	444.44	70	1380.51	70	2097.23
		31	70	48.00	70	506.03	67	1524.09	66	2337.58
		32	70	47.29	70	496.53	70	1484.74	70	2204.80



Weight gain (WG) and daily weight gain (DWG) per box

Tab. No. 11b

Treatment	Tr. No.	Box No.	Day 1 - 14		Day 15 - 28		Day 29 - 35		Day 1 - 35	
			WG	DWG	WG	DWG	WG	DWG	WG	DWG
			g	g	g	g	g	g	g	g
T1	1	1	427.30	30.52	1063.40	75.96	804.64	114.95	2295.34	65.58
		2	453.15	32.37	941.35	67.24	607.70	86.81	2002.20	57.21
		9	455.23	32.52	967.57	69.11	746.00	106.57	2168.80	61.97
		10	403.50	28.82	893.19	63.80	601.50	85.93	1898.19	54.23
		17	453.58	32.40	1088.10	77.72	688.00	98.29	2229.69	63.71
		18	468.98	33.50	975.86	69.70	591.19	84.46	2036.02	58.17
		25	457.70	32.69	1040.93	74.35	743.41	106.20	2242.03	64.06
		26	452.17	32.30	964.34	68.88	714.21	102.03	2130.72	60.88
T2	2	3	478.92	34.21	1056.41	75.46	660.01	94.29	2195.35	62.72
		4	439.57	31.40	991.96	70.85	531.01	75.86	1962.54	56.07
		11	497.64	35.55	1040.47	74.32	733.86	104.84	2271.97	64.91
		12	467.37	33.38	955.89	68.28	686.62	98.09	2109.89	60.28
		19	510.24	36.45	1154.13	82.44	669.94	95.71	2334.31	66.69
		20	475.57	33.97	995.26	71.09	631.86	90.27	2102.69	60.08
		27	481.27	34.38	1041.96	74.43	820.19	117.17	2343.42	66.95
		28	452.01	32.29	980.53	70.04	726.86	103.84	2159.40	61.70
T3	3	5	473.42	33.82	1053.84	75.27	617.01	88.14	2144.27	61.26
		6	460.11	32.86	1039.21	74.23	552.25	78.89	2051.58	58.62
		13	496.13	35.44	1144.33	81.74	787.17	112.45	2427.63	69.36
		14	467.76	33.41	927.08	66.22	642.39	91.77	2037.22	58.21
		21	474.73	33.91	1026.00	73.29	665.09	95.01	2165.81	61.88
		22	438.37	31.31	875.04	62.50	663.30	94.76	1976.71	56.48
		29	481.32	34.38	1007.35	71.95	765.28	109.33	2253.96	64.40
		30	474.29	33.88	968.71	69.19	737.11	105.30	2180.12	62.29
T4	4	7	417.63	29.83	991.22	70.80	722.63	103.23	2131.48	60.90
		8	418.10	29.86	920.94	65.78	627.12	89.59	1966.15	56.18
		15	455.57	32.54	1087.90	77.71	796.66	113.81	2340.12	66.86
		16	420.01	30.00	948.34	67.74	632.34	90.33	2000.70	57.16
		23	447.58	31.97	1059.79	75.70	785.37	112.20	2292.75	65.51
		24	397.87	28.42	936.07	66.86	716.71	102.39	2050.66	58.59
		31	458.03	32.72	1018.06	72.72	813.49	116.21	2289.58	65.42
		32	449.24	32.09	988.21	70.59	720.06	102.87	2157.51	61.64

Treatment	Tr. No.	Box No.	Feed conversion ratio		
			Day 14	Day 28	Day 35
			g/kg LW	g/kg LW	g/kg LW
T1	1	1	997.25	1240.27	1443.76
		2	1012.23	1443.74	1652.66
		9	977.11	1299.84	1477.09
		10	1145.85	1354.92	1651.33
		17	1046.64	1284.89	1519.49
		18	995.36	1321.24	1636.15
		25	985.35	1331.13	1546.84
		26	958.24	1391.71	1592.57
T2	2	3	984.73	1294.07	1549.40
		4	1023.46	1462.76	1741.41
		11	988.11	1288.17	1475.46
		12	935.70	1368.52	1600.56
		19	933.14	1202.77	1448.42
		20	987.72	1340.32	1580.23
		27	911.94	1328.69	1485.30
		28	965.04	1376.52	1532.65
T3	3	5	854.15	1222.54	1490.46
		6	1003.50	1386.90	1695.32
		13	921.77	1200.27	1382.99
		14	933.26	1424.19	1652.01
		21	908.57	1306.34	1545.54
		22	1064.37	1565.31	1714.33
		29	955.22	1365.31	1503.44
		30	960.59	1364.64	1523.26
T4	4	7	985.47	1416.94	1600.53
		8	1072.30	1423.04	1609.86
		15	988.36	1319.59	1485.81
		16	1116.86	1414.22	1660.17
		23	980.67	1307.96	1500.81
		24	1102.50	1474.40	1622.55
		31	975.38	1373.38	1519.42
		32	1015.62	1367.24	1553.75

Feed consumption per 1 kg of weight gain (WG) per box

Tab. No. 11d

Treatment	Tr. No.	Box No.	Feed consumption per 1 kg of weight gain			
			1-14 days	15-28 days	29-35 days	1-35 days
			g/kg WG	g/kg WG	g/kg WG	g/kg WG
T1	1	1	1109.01	1352.47	1844.15	1474.89
		2	1119.14	1676.30	2151.63	1692.57
		9	1079.51	1467.59	1826.50	1509.59
		10	1278.10	1460.26	2313.26	1691.84
		17	1158.26	1395.86	2063.32	1552.71
		18	1096.61	1493.78	2431.19	1674.49
		25	1089.31	1504.44	1999.53	1580.96
		26	1059.96	1622.24	2009.64	1629.20
T2	2	3	1084.12	1452.67	2167.29	1584.23
		4	1134.22	1678.50	2517.55	1783.62
		11	1085.12	1445.77	1880.47	1507.19
		12	1030.07	1604.74	2100.18	1636.72
		19	1021.96	1334.84	2078.92	1478.83
		20	1087.41	1525.81	2156.91	1616.30
		27	1001.81	1546.65	1791.16	1516.19
		28	1065.08	1585.88	1850.43	1565.91
T3	3	5	939.98	1404.66	2174.30	1523.53
		6	1104.87	1582.43	2577.99	1735.17
		13	1010.69	1332.66	1774.89	1410.26
		14	1026.17	1699.98	2162.81	1690.07
		21	1002.08	1509.33	2102.84	1580.40
		22	1179.85	1856.57	2033.53	1757.44
		29	1051.45	1585.11	1782.70	1536.26
		30	1057.22	1582.36	1844.06	1556.60
T4	4	7	1098.49	1623.45	1972.97	1637.05
		8	1192.48	1602.87	2024.45	1648.68
		15	1091.25	1479.93	1821.98	1517.03
		16	1241.46	1560.62	2210.60	1699.05
		23	1086.79	1465.02	1887.46	1533.20
		24	1231.55	1650.97	1907.91	1659.40
		31	1077.60	1579.25	1803.32	1552.57
		32	1122.53	1543.91	1938.34	1587.81

Feed consumption per box

Tab. No. 11e

Treatment	Tr. No.	Box No.	Feed consumption			
			Starter (1-14 days)	Grower (15-28 days)	Finisher (29-35 days)	Total
			kg	kg	kg	kg
T1	1	1	32.95	96.80	98.05	227.80
		2	35.50	109.08	90.22	234.80
		9	34.40	99.40	95.38	229.18
		10	36.10	91.30	97.40	224.80
		17	36.60	104.80	97.95	239.35
		18	36.00	102.04	100.61	238.65
		25	34.90	106.32	101.08	242.30
		26	33.55	106.80	97.60	237.95
T2	2	3	36.25	104.30	97.27	237.82
		4	34.90	116.55	93.58	245.03
		11	37.80	105.30	96.60	239.70
		12	33.70	105.90	99.50	239.10
		19	36.40	106.30	96.10	238.80
		20	36.20	106.30	95.40	237.90
		27	33.75	109.45	98.84	242.04
		28	33.70	108.85	94.15	236.70
T3	3	5	31.15	103.62	93.91	228.68
		6	35.60	110.08	94.62	240.30
		13	35.10	106.75	97.80	239.65
		14	33.60	108.95	96.55	239.10
		21	33.30	108.40	97.90	239.60
		22	35.45	106.35	86.00	227.80
		29	35.07	108.58	92.77	236.42
		30	35.10	107.30	95.15	237.55
T4	4	7	31.80	109.45	96.95	238.20
		8	34.90	101.75	87.60	224.25
		15	34.80	107.65	97.25	239.70
		16	36.50	103.60	97.85	237.95
		23	34.05	106.00	100.80	240.85
		24	34.30	108.18	95.72	238.20
		31	34.55	108.15	96.38	239.08
		32	35.30	106.80	97.70	239.80

Foot pad lesions

Tab. No. 11f

Treatment	Tr. No.	Box	Evaluation	
			right foot	left foot
T1	1	1	3.16	3.16
		2	2.96	2.92
		9	3.64	3.64
		10	3.48	3.48
		17	3.40	3.36
		18	3.20	3.24
		25	3.48	3.44
		26	2.96	2.96
T2	2	3	3.68	3.76
		4	3.24	3.24
		11	3.84	3.84
		12	2.60	2.56
		19	3.40	3.32
		20	2.56	2.40
		27	3.52	3.40
		28	3.24	3.28
T3	3	5	3.48	3.52
		6	3.56	3.64
		13	3.40	3.40
		14	2.88	2.92
		21	1.68	1.72
		22	1.72	1.80
		29	3.72	3.68
		30	2.64	2.76
T4	4	7	3.08	3.12
		8	2.28	2.36
		15	3.28	3.32
		16	2.88	2.92
		23	3.60	3.60
		24	2.96	3.00
		31	3.56	3.60
		32	2.44	2.36