MEZINÁRODNÍ TESTOVÁNÍ DRŮBEŽE
ÚSTRAŠICE státní podnik

390 02 Tábor 2 Česká republika

BROILER FEEDING TEST No. 13/2020

Effect of feed additives to performance of broilers

[redacted]

3 December 2020 – 7 January 2021

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Basic tests information

The basic dates

Beginning of the test: 10 November 2020 (setting in the incubator)
2 December 2020 (transfer to the chicken house)

End of the test: 7 January 2021

Material and methods

Material

In total there were 1680 day old chicks of [redacted]. Day old chicks were randomly distributed into 4 dietary treatments.

Experimental treatments

Treat. No.	Treat.	Description	No. of pen	Birds per pen	No. of chick
1	T1	[redacted]	6	70	420
2	T2	[redacted]	6	70	420
3	T3	[redacted]	6	70	420
4	T4	[redacted]	6	70	420

Origin of hatching eggs: Mezinárodní testování drůbeže s.p., Ústrašice, age of the breeding flock was 31 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 – 36 23 hours of light + 1 hour of darkness

Stocking density

15,8 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 – 36 Finisher (BR3)

Diet formulas

Components (%)	**Starter BR1**	**Grower BR2**	**Finisher BR3**
Soybean meal	36.98	32.71	26.64
Wheat	30.00	35.00	42.40
Maize	23.77	22.20	21.00
Soybean oil	5.00	6.00	6.00
Limestone	1.49	1.35	1.12
MCP	1.14	1.10	1.20
Salt	0.29	0.30	0.29
Na_2CO_3	0.12	0.15	0.15
L-lysine HCl	0.40	0.39	0.39
L-threonine	0.20	0.20	0.20
DL-methionine	0.10	0.10	0.10
Premix AMVBR1 Plus	0.50	-	-
Premix AMVBR2 Plus	-	0.50	-
Premix AMVBR3 Plus	-	-	0.50
Nutrient content			
Crude protein (g/kg)	230.00	215.00	195.00
ME (MJ/kg)	12.22	12.51	12.61
Lysine (g/kg)	14.01	12.97	11.64
Methionine (g/kg)	6.25	5.68	5.17
Met.+Cys. (g/kg)	9.49	8.81	8.17
Ca (g/kg)	9.60	8.83	7.90
P (g/kg)	4.40	4.24	4.33
Na (g/kg)	1.51	1.63	1.60

Veterinary precautions

The chicken house was disinfected by [redacted] before the chick placement. On days 1 and 13 chickens were vaccinated with [redacted].

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 36 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 – 36 days and for the overall experiment (1 – 36 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 – 36 days and for the overall experiment (1 – 36 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 – 36 days and 1 – 36 days.

Carcass analysis

The carcass analysis was done in 10 birds per each pen (5 ♂ and 5 ♀) on day 36. Breast muscles was weighed without skin and thigh muscles with skin.

Statistical analyses

Performance results of live weight (on days 1, 14, 28, 36) were statistically evaluated using the ANOVA single-factor model (Scheffe test) or nonparametric method (Kruskal-Wallis test).

Results

Tab. No. **1 Hatchability**

2 Performance results:

2a Body weight

2b Weight gain

2c Feed conversion ratio per 1 kg of live weight

2d Feed consumption per 1 kg of weight gain

2e Feed consumption

3 Mortality

4 Carcass analysis

5 Statistical analysis of body weight at the age of 36 days

(average body weight, standard deviation, coefficient of variation)

6 Statistical analyses of performance results

7 Performance results per pen:

7a Body weight

7b Weight gain

7c Feed conversion ratio per 1 kg of live weight

7d Feed consumption per 1 kg of weight gain

7e Feed consumption

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	93.20	85.60	91.70	420	59.40	38.59
T2	2				420		38.74
T3	3				420		38.81
T4	4				420		39.05

Body weight per phases **Tab. No. 2a**

Treatment	Tr. No.	Day 1		Day 14		Day 28		Day 36	
		Birds	Average body weight	Birds	Average body weight	Birds	Average body weight	Birds	Average body weight
			g		g		g		g
T1	1	420	38.59	419	481.67	418	1687.49	418	2315.59
T2	2	420	38.74	420	484.11	418	1729.98	415	2353.14
T3	3	420	38.81	420	488.27	414	1663.28	414	2341.27
T4	4	420	39.05	420	490.77	420	1687.16	418	2367.44

Weight gain per phases **Tab. No. 2b**

Treatment	Tr. No.	Day 1 - 14		Day 15 - 28		Day 29 - 36		Day 1 - 36	
		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	443.08	31.65	1205.82	86.13	628.10	78.51	2277.01	63.25
T2	2	445.37	31.81	1245.87	88.99	623.16	77.90	2314.40	64.29
T3	3	449.46	32.10	1175.01	83.93	678.00	84.75	2302.46	63.96
T4	4	451.72	32.27	1196.40	85.46	680.28	85.04	2328.40	64.68

Feed conversion ratio (Feed consumption per 1 kg of live weight) **Tab. No. 2c**

Treatment	Tr. No.	Feed conversion ratio		
		Day 14	Day 28	Day 36
		g/kg LW	g/kg LW	g/kg LW
T1	1	1068.90	1276.16	1500.69
T2	2	1070.50	1275.71	1513.85
T3	3	1058.41	1318.29	1501.08
T4	4	1059.62	1289.94	1491.34

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

Treatment	Tr. No.	Feed consumption per 1 kg of weight gain			
		1-14 days	15-28 days	29-36 days	1-36 days
		g/kg WG	g/kg WG	g/kg WG	g/kg WG
T1	1	1162.06	1359.21	2105.03	1526.21
T2	2	1163.61	1355.72	2180.82	1539.31
T3	3	1149.80	1427.57	1952.22	1526.65
T4	4	1151.21	1384.42	1990.77	1516.35

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

Treatment	Tr. No.	Feed consumption			
		Starter (1-14 days)	Grower (15-28 days)	Finisher (29-36 days)	Total
		kg	kg	kg	kg
T1	1	216.10	685.71	552.67	1454.48
T2	2	217.66	706.96	564.36	1488.98
T3	3	217.05	696.22	547.97	1461.24
T4	4	218.41	695.65	568.89	1482.95

Mortality **Tab. No. 3**

Treatment	Tr. No.	Mortality in the period									Mortality according causes													
		Day 1 – 14		Day 15 - 28		Day 29 - 36		Day 1 - 36																
		birds	g	birds	g	birds	g	birds	g	%	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
T1	1	1	350	1	940	0	0	2	1290	0.48											2				
T2	2	0	0	2	1660	3	5360	5	7020	1.19											5				
T3	3	0	0	6	4170	0	0	6	4170	1.43											6				
T4	4	0	0	0	0	2	4780	2	4780	0.48											2				

Causes:
1 – Viral diseases
2 – Bacterial diseases
3 – Moulds diseases
4 – Parasitary diseases
5 – Tumors
6 – Wounds
7 – Digestive track diseases
8 – Respiratory tract diseases
9 – Reproduction tract diseases
10 – Locomotion apparatus diseases
11 – Sudden death syndrome
12 - Cannibalism
13 – Yolk sac. infam.
14 – Other causes
15 – Culling (excluded of calculation)

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	♂	2551	1803	145	23	0.92	611	23.96	33.91	528	20.70	29.29	1139	44.66	63.20	70.66	76.33
		♀	2243	1585	129	25	1.11	535	23.83	33.74	469	20.90	29.58	1003	44.73	63.31	70.65	76.40
		ø	**2397**	**1694**	**137**	**24**	**1.01**	**573**	**23.90**	**33.83**	**498**	**20.79**	**29.43**	**1071**	**44.69**	**63.26**	**70.65**	**76.37**
T2	2	♂	2507	1792	142	22	0.89	608	24.24	33.91	532	21.23	29.71	1140	45.47	63.62	71.48	77.16
		♀	2195	1563	127	21	0.96	514	23.43	32.92	459	20.93	29.40	974	44.36	62.31	71.19	76.96
		ø	**2351**	**1677**	**134**	**22**	**0.92**	**561**	**23.86**	**33.45**	**496**	**21.09**	**29.56**	**1057**	**44.96**	**63.01**	**71.35**	**77.06**
T3	3	♂	2577	1847	149	25	0.97	612	23.74	33.13	546	21.19	29.58	1158	44.93	62.70	71.65	77.41
		♀	2265	1625	129	25	1.12	540	23.83	33.22	483	21.33	29.74	1023	45.16	62.96	71.73	77.41
		ø	**2421**	**1736**	**139**	**25**	**1.04**	**576**	**23.78**	**33.17**	**515**	**21.26**	**29.65**	**1090**	**45.04**	**62.82**	**71.68**	**77.41**
T4	4	♂	2590	1813	149	23	0.89	611	23.58	33.67	541	20.90	29.85	1152	44.48	63.53	70.02	75.75
		♀	2262	1606	128	24	1.07	536	23.68	33.35	481	21.28	29.97	1017	44.96	63.32	71.00	76.64
		ø	**2426**	**1709**	**138**	**24**	**0.97**	**573**	**23.63**	**33.52**	**511**	**21.08**	**29.91**	**1084**	**44.70**	**63.43**	**70.48**	**76.17**

Statistical analysis - Body weight at 36 days of age **Tab. No. 5**

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	184	2496.32	249.43	9.99	234	2173.49	234.87	10.81
T2	2	196	2514.95	250.40	9.96	219	2208.32	211.32	9.57
T3	3	186	2517.62	210.50	8.36	228	2197.41	237.50	10.81
T4	4	187	2560.05	236.60	9.24	231	2211.53	236.23	10.68

Statistical analyses of performance results

Performance results were statistically evaluated using the ANOVA single-factor model (Scheffe 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	Kruskal-Wallis test			
					T1	T2	T3	T4
T1	1	6	38.59	0.74		o	o	o
T2	2	6	38.74	0.84	1.000000		o	o
T3	3	6	38.81	1.27	1.000000	1.000000		o
T4	4	6	39.05	0.39	1.000000	1.000000	1.000000	

Body weight - day 14 **Tab. No. 6b**

Treatment	Treat. No.	No. of birds	Average (g)	Standard deviation	Scheffe test			
					T1	T2	T3	T4
T1	1	419	481.67	47.62		o	o	o
T2	2	420	484.11	46.42	0.908783		o	o
T3	3	420	488.27	48.68	0.262970	0.662487		o
T4	4	420	490.77	48.55	0.055733	0.254525	0.902384	

Body weight - day 28 **Tab. No. 6c**

Treatment	Treat. No.	No. of birds	Average (g)	Standard deviation	Kruskal-Wallis test			
					T1	T2	T3	T4
T1	1	418	1687.49	233.55		o	o	o
T2	2	418	1729.98	247.34	0.306238		**	o
T3	3	414	1663.28	191.54	0.467970	0.001181		o
T4	4	420	1687.16	198.46	1.000000	0.839683	0.158385	

Body weight - day 36 **Tab. No. 6d**

Treatment	Treat. No.	No. of birds	Average (g)	Standard deviation	Scheffe test			
					T1	T2	T3	T4
T1	1	418	2315.59	289.60		o	o	o
T2	2	415	2353.14	276.66	0.303417		o	o
T3	3	414	2341.27	276.19	0.636874	0.947990		o
T4	4	418	2367.45	293.00	0.073360	0.912597	0.622348	

Body weight (BW) per box **Tab. No. 7a**

Treatment	Tr. No.	Box No.	Day 1		Day 14		Day 28		Day 36	
			Birds	BW	Birds	BW	Birds	BW	Birds	BW
				g		g		g		g
T1	1	3	70	39.14	69	480.80	69	1613.75	69	2333.81
		5	70	38.57	70	490.90	70	1694.80	70	2344.07
		11	70	37.23	70	475.53	70	1764.27	70	2294.39
		15	70	39.29	70	500.33	69	1687.94	69	2374.36
		20	70	38.86	70	449.94	70	1558.49	70	2145.37
		24	70	38.43	70	492.51	70	1804.64	70	2402.66
T2	2	4	70	39.71	70	488.54	69	1638.39	68	2389.24
		8	70	38.43	70	470.60	69	1654.77	69	2330.94
		12	70	37.43	70	498.50	70	1853.30	70	2358.73
		14	70	38.86	70	486.71	70	1698.33	69	2385.39
		17	70	38.43	70	463.51	70	1642.36	69	2274.16
		23	70	39.57	70	496.79	70	1890.33	70	2380.43
T3	3	2	70	40.14	70	495.66	70	1612.87	70	2310.66
		7	70	38.00	70	486.66	69	1612.09	69	2314.75
		10	70	38.00	70	485.94	69	1651.97	69	2310.29
		13	70	37.29	70	480.06	68	1633.16	68	2458.50
		18	70	39.00	70	487.80	68	1750.09	68	2327.25
		22	70	40.43	70	493.49	70	1720.21	70	2328.31
T4	4	1	70	39.43	70	498.94	70	1685.23	70	2414.14
		6	70	39.14	70	494.24	70	1661.87	70	2342.26
		9	70	38.29	70	485.30	70	1670.17	70	2343.13
		16	70	39.14	70	484.44	70	1646.81	70	2327.07
		19	70	39.14	70	501.33	70	1710.77	70	2415.33
		21	70	39.14	70	480.34	70	1748.11	68	2362.60

Weight gain (WG) and daily weight gain (DWG) per box **Tab. No. 7b**

Treatment	Tr. No.	Box No.	Day 1 - 14		Day 15 - 28		Day 29 - 36		Day 1 - 36	
			WG	DWG	WG	DWG	WG	DWG	WG	DWG
			g	g	g	g	g	g	g	g
T1	1	3	441.66	31.55	1132.96	80.93	720.06	90.01	2294.67	63.74
		5	452.33	32.31	1203.90	85.99	649.27	81.16	2305.50	64.04
		11	438.30	31.31	1288.74	92.05	530.11	66.26	2257.16	62.70
		15	461.04	32.93	1187.61	84.83	686.42	85.80	2335.07	64.86
		20	411.08	29.36	1108.54	79.18	586.89	73.36	2106.51	58.51
		24	454.08	32.43	1312.13	93.72	598.01	74.75	2364.23	65.67
T2	2	4	448.83	32.06	1149.85	82.13	750.84	93.86	2349.53	65.26
		8	432.17	30.87	1184.17	84.58	676.17	84.52	2292.51	63.68
		12	461.07	32.93	1354.80	96.77	505.43	63.18	2321.30	64.48
		14	447.85	31.99	1211.61	86.54	687.06	85.88	2346.53	65.18
		17	425.08	30.36	1178.84	84.20	631.80	78.98	2235.73	62.10
		23	457.22	32.66	1393.54	99.54	490.10	61.26	2340.86	65.02
T3	3	2	455.52	32.54	1117.21	79.80	697.79	87.22	2270.52	63.07
		7	448.66	32.05	1125.43	80.39	702.67	87.83	2276.75	63.24
		10	447.94	32.00	1166.03	83.29	658.32	82.29	2272.29	63.12
		13	442.77	31.63	1153.10	82.36	825.34	103.17	2421.21	67.26
		18	448.80	32.06	1262.29	90.16	577.16	72.15	2288.25	63.56
		22	453.06	32.36	1226.73	87.62	608.10	76.01	2287.88	63.55
T4	4	1	459.51	32.82	1186.29	84.73	728.91	91.11	2374.71	65.96
		6	455.10	32.51	1167.63	83.40	680.39	85.05	2303.12	63.98
		9	447.01	31.93	1184.87	84.63	672.96	84.12	2304.84	64.02
		16	445.30	31.81	1162.37	83.03	680.26	85.03	2287.93	63.55
		19	462.19	33.01	1209.44	86.39	704.56	88.07	2376.19	66.01
		21	441.20	31.51	1267.77	90.56	614.49	76.81	2323.46	64.54

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

Tab. No. 7c

Treatment	Tr. No.	Box No.	Feed conversion ratio		
			Day 14	Day 28	Day 36
			g/kg LW	g/kg LW	g/kg LW
T1	1	3	1003.13	1330.63	1501.46
		5	1147.75	1295.14	1508.12
		11	1061.68	1225.68	1513.38
		15	1051.88	1296.59	1476.72
		20	1114.43	1322.90	1540.26
		24	1036.95	1200.16	1468.73
T2	2	4	1024.04	1358.91	1491.49
		8	1075.53	1330.03	1550.05
		12	1067.20	1211.43	1515.83
		14	1123.57	1327.69	1502.71
		17	1097.82	1320.31	1554.20
		23	1037.24	1134.35	1472.00
T3	3	2	942.18	1393.61	1520.59
		7	1067.34	1349.25	1516.83
		10	1054.21	1324.65	1523.41
		13	1119.81	1352.79	1436.62
		18	1066.89	1244.61	1497.56
		22	1102.36	1254.08	1514.58
T4	4	1	1077.71	1324.62	1477.37
		6	994.88	1267.93	1463.79
		9	1077.39	1313.64	1525.07
		16	1105.25	1319.43	1527.30
		19	1054.06	1269.02	1475.81
		21	1049.25	1247.47	1479.96

Feed consumption per 1 kg of weight gain (WG) per box **Tab. No. 7d**

Treatment	Tr. No.	Box No.	Feed consumption per 1 kg of weight gain			
			1-14 days	15-28 days	29-36 days	1-36 days
			g/kg WG	g/kg WG	g/kg WG	g/kg WG
T1	1	3	1092.41	1471.08	1885.52	1527.39
		5	1245.61	1355.24	2064.07	1533.35
		11	1151.86	1286.19	2470.90	1538.35
		15	1141.52	1400.62	1923.23	1501.78
		20	1219.77	1407.51	2117.47	1568.67
		24	1124.71	1261.42	2279.21	1492.60
T2	2	4	1114.64	1501.79	1785.42	1516.90
		8	1171.17	1432.77	2090.19	1576.36
		12	1153.84	1264.50	2632.00	1540.27
		14	1221.06	1409.69	1937.92	1527.64
		17	1197.07	1407.80	2178.76	1581.12
		23	1127.01	1168.96	2774.36	1496.89
T3	3	2	1025.21	1593.89	1814.11	1547.48
		7	1157.74	1473.25	1902.28	1542.48
		10	1143.64	1438.30	2026.46	1549.10
		13	1214.12	1451.55	1605.22	1459.15
		18	1159.60	1315.22	2271.51	1523.66
		22	1200.74	1315.11	2251.51	1541.35
T4	4	1	1170.18	1428.47	1830.51	1501.90
		6	1080.45	1383.51	1942.18	1488.67
		9	1169.68	1410.40	2049.80	1550.40
		16	1202.39	1408.70	2030.53	1553.43
		19	1143.32	1358.12	1977.94	1500.12
		21	1142.33	1322.57	2140.52	1504.88

Feed consumption per box **Tab. No. 7e**

Treatment	Tr. No.	Box No.	Feed consumption			
			Starter (1-14 days)	Grower (15-28 days)	Finisher (29-36 days)	Total
			kg	kg	kg	kg
T1	1	3	33.63	115.00	93.68	242.31
		5	39.44	114.21	93.81	247.46
		11	35.34	116.03	91.69	243.06
		15	36.84	115.39	91.09	243.32
		20	35.10	109.22	86.99	231.31
		24	35.75	115.86	95.41	247.02
T2	2	4	35.02	120.37	92.09	247.48
		8	35.43	116.91	97.52	249.86
		12	37.24	119.92	93.12	250.28
		14	38.28	119.56	92.65	250.49
		17	35.62	116.17	93.80	245.59
		23	36.07	114.03	95.18	245.28
T3	3	2	32.69	124.65	88.61	245.95
		7	36.36	114.10	92.23	242.69
		10	35.86	116.43	92.05	244.34
		13	37.63	115.08	90.09	242.80
		18	36.43	113.03	89.15	238.61
		22	38.08	112.93	95.84	246.85
T4	4	1	37.64	118.62	93.40	249.66
		6	34.42	113.08	92.50	240.00
		9	36.60	116.98	96.56	250.14
		16	37.48	114.62	96.69	248.79
		19	36.99	114.98	97.55	249.52
		21	35.28	117.37	92.19	244.84