OPPORTUNITIES OF GENETIC POTENTIAL OF CROSS HYBRO-G BROILER CHICKS USING DIFFERENTLY ENRICHED FEED

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Abstract. Four (4) treatment groups were formed in 2001 with cross Hybro-G day-old broilerchicks. Each group comprised 26 males and 26 females. Chicks of the first (control) group were fed basic feed, for the second group basic feed was enriched by an enzyme Kenzyme W dry (1 kg/t), chicks in the third group received feed enriched by the antibiotics flavomycin (5 g/t) and for group 4 feed acidifier Bolifor FA 2000 (10 kg/t) was added. The duration of the study was 7 weeks. Liveability of broilerchicks among the treatment groups showed no statistically true ($p>0.05$) variations and it was the following: group 1 – 96.9%, group 2 – 96.0%, group 3 – 100% and group 4 – 95.7%. Using the mentioned additives live weight of group 2 chicks at the end was 9% more (♂ 2699 g, ♀ 2459 g), using flavomycin – 11.9 % more (♂ 2654 g, ♀ 2641 g), but using acidifier - 3.9% more (♂ 2513 g, ♀ 2394 g) than in the control group (♂ 2463 g, ♀ 2269g).

Assessing broiler productivity according to the productivity index we got the following results: group 1 – 227.3; group 2 – 279.2; group 3 – 300.2 and group 4 – 252.7. On the average each broilerchick consumed the following amount of the compound fodder: group 1 – 4.89 kg; group 2 – 4.61 kg; group 3 – 4.69 kg and group 4 – 4.70 kg.

Taking broilermeat, liver and blood analyses true ($p>0.05$) differences were not found within the figures among the groups. Analysing amount of breast muscles (% from live weight) we got the following figures: group 1: ♂♂ - 15.6%; ♀♀ - 18.3 %; group 2: ♂♂ - 15.2 %; ♀♀ - 15.2 %; group 3: ♂♂ - 17.1 %; ♀♀ - 19.0 %; group 4: ♂♂ - 16.6 %; ♀♀ 16.5 %. Assessing full value of broilermeat we measured two amino acids describing meat qualities – tryptophan and oxyprolin in muscles. If the proportion of the mentioned amino acids is higher, value of meat is higher too. The proportion of these amino acids was as follows: group 1 – 2.65; group 2 – 2.58; group 3 – 3.13 and group 4 – 2.42.

Keywords: broilers, feed, enzyme, antibiotics, feed acidifiers.

KROSO HYBRO–G BROILERIŲ VIŠČIUKŲ GENETINIO POTENCIALO GALIMYBĖS, NAUDOJANT SKIRTINGAI PAGERINTĄ LESALĄ

Santrauka. 2001 metais buvo suformuotos keturios (4) kroso Hybro-G vienadienių viščiukų broilerių grupės. Kiekvieną grupę sudarė 26 vyriškos ir 26 moteriškos lyties viščiukai. Pirmos grupės (kontrolinės) viščiukai buvo šeriami įprastu lesalu, antros grupės viščiukų lesalas buvo pagerintas sausu fermentu Kenzyme W (1kg/t), trečios grupės viščiukai gavo lesalą, pagerintą antibiotiku flavomicinu (5 g/t) ir ketvirtos grupės viščiukų lesalas buvo papildytas parūgštintoju Bolifor FA 2000 (10kg/t). Tyrimai truko septynias savaites. Vertinant viščiukų broilerių išgyvenamumą, tarp visų keturių grupių statistiškai patikimų ($p>0.05$) skirtumų nerasta: 1 grupės – 96,9 %, 2 grupės – 96,0 %, 3 grupės – 100 %, 4 grupės – 95,7 %. Naudojant minėtus priedus, 2 grupės viščiukų gyvas svoris buvo 9 % didesnis (♂2699g, ♀ 2459 g), naudojant flavomyciną – 11,9% didesnis (♂2654g, ♀ 2641 g), o naudojant parūgštintoją – 3.9 % (♂2513g, ♀ 2394 g) didesnis negu kontrolinės grupės (♂2463g, ♀ 2269 g). Įvertinę broilerių produktyvumą, naudojant produktyvumo indeksą, mes gavome sekančius rezultatus: 1 grupė – 227.3; 2 grupė – 279.2; 3 grupė – 300.2 ir 4 grupė – 252.7. Vidutiniškai kiekvienas viščiukas broileris sunaudojo tiek pašaro: 1 grupė - 4,89 kg, 2 grupė – 4,61 kg, 3 grupė – 4,69 kg ir 4 grupė – 4,70 kg. Atlikus broilerių mėsos, kepenų ir kraujo analizę statistiškai patikimų ($p>0.05$) skirtumų tarp gupių nebuvo rasta. Ištyrus krūtinės raumenį (% gyvo svorio) buvo gauti sekantys rezultatai: 1 grupė: ♂♂ - 15,6%; ♀♀ - 18,3%; 2 grupė: 15,2%; ♀♀ - 15,2%; 3 grupė: 17,1%; ♀♀ - 19,0%; 4 grupė: 16,6%; ♀♀ - 16,5%; Pilnam broilerių mėsos įvertinimui mes išmatavome dviejų aminorūgščių, apsprendžiančių mėsos kokybę, triptofano ir oksiprolino kiekį raumenyse. Kai minėtų aminorūgščių kiekis yra didelis, tai geresnė ir mėsos kokybė. Nustatyti sekantys aminorūgščių kiekiai: 1 grupė – 2,65; 2 grupė – 2,58; 3 grupė – 3,13; ir 4 grupė – 2,42.

Raktažodžiai: broileriai, lesalas, fermentai, antibiotikai, lesalo parūgštintojai.

Introduction. Latvia is mainly using cross Hybro-G of the company Euribrid for production of broilermeat. Productivity of this cross becomes increasingly better owing to the experts of the company, see table 1.

Proper housing and feeding conditions must be provided in order to achieve such a productivity level.

Though since December, 1998 significant changes have taken place in European Union regarding the content of feed additives. The Regulations EC 2821/98 and 2788/98 state that a feed additive group of growth promoters has altogether disappeared as well as the group of feed antibiotics has been significantly reduced (Grīnhofa, 2000).

Starting with January 1, 2000 according to the order No 34 issued by State Veterinary Service it is prohibited Latvia to give to animals in feed containing antibiotics,

except one of four currently authorised antibiotics – flavomycin, salinomycin, avilamicyn and sodium monensin. The use of the other antibiotics is prohibited.

In order to replace the antibiotics group and increase effectiveness of broilermeat production the early research with feed acidifiers has been done (Nudiens, 1999), additives of the botanical content were searched for and analysed (Vītiņa, Krastiņa, 2001), additives of enzymes and antioxidants were studied (Krastiņa, 2001) , application of betafine was investigated (Nudiens, 2001) and other studies were performed that would reduce feed costs and stimulate birds' immune system.

Table 1. **Recommended productivity of cross Hybro-G broiler chicks (non-sorted) of the company Euribrid (1)**

Year	Age, weeks								
	1.	2.	3.	4.	5.	6.	7.	8.	9.
1997	147	349	710	1162	1628	2097	2573	3059	3557
2000	150	356	724	1185	1661	2144	2624	3120	3628
2001	151	378	746	1236	1798	2375	2922	-	-

Recently enzymes have been widely used for a better use of feed because they reduce viscosity of feed in gastrointestinal tract thus favouring utilization process of feed and improving manure quality, allowing to feed better usage, dividing the existing feedstuffs there.

We were interesed in product Kenzyme® W dry, from the company Kemin Europa N.V. which contained α-amylase, ß – glucanase, cellulase complex, hemicellulase complex which included xylanase, lipase and protease. The company claims that this product is advantageous in: reducing inhibiting factors of pentosanes for broiler growth, especially using wheat in the diet; preventing liquid manure and an obnoxious smell in the farm; promoting live weight gain of broilers; enabling to use a great amount of wheat in the diet. The product is stable for 18 months and it can be used with a temporary heating for example, feed pelleting (Han van der Broek, 1997).

The antibiotics flavomycin has a wide range of action, it inhibits synthesis processes of cell membranes for gram positive bacteria and widely suppresses activities of gram negative bacteria.

Feed acidifier Bolifor FA 2000 contains 50% organic acid and active ingredients – formic acid, di and tetra formates; phosphoric acid, lactic acid, citric acid, natrium, phosphorus and a filler – diatomaceous earth , pH of the product – 3.4.

The aim of our study was to find out the effectiveness of the use of these products to achieve the genetic potencial of broiler chicks.

The object and methods of the study. Cross Hybro-G broilers were used in the study from the age of 1 to 49 days. The study was done in the year 2001 on the farm "Rasas." According to the analogous principle at day 1 when sorted according to the sex they were divided into four groups, each comprising 26 females and 26 males. The chicks had an individual mark – a ring. All the chicks were housed in cage batteries БКМ- 3Б in the similar housing conditions providing temperature, lighting, ventilation and similar housing density(385 cm^2/ chick).

The value of broiler feed was in accordance to the stated standards by Euribrid. Provision of vitamins, micro- and macro elements in the feed ration was the same for all the groups. Compound feed was fed to broilers of the control group without additives, but enzyme Kenzyme W dry, flavomycin or a feed acidifier Bolifor FA 2000 were included in the premix content of the study groups.

Live weight of broilers was determined individually by weighing each bird at the age of 1, 7, 14, 28, 35, 42 and 49 days. Feed consumption was estimated each day by weighing the feed amount meant for a certain group.

Table 2. **Scheme of trial**

Group	Feeding programme	Duration
1st group (control)	Basic feed for broilers	Whole period
2nd group (experimental)	Basic feed for broilers with enzyme preparation Kenzyme W dry	Whole period
3rd group (experimental)	Basic feed for broilers with flavomycin	Whole period
4th group (experimental)	Basic feed for broilers with Bolifor FA 2000	Whole period

Analyses of feed, blood and chemical analyses of meat were taken according to the methods of zootechnical analyses - Kjeldahl, Sokslet, by an atomabsorption spectrometre, amino acids analysator, etc.

The basic feed contained :

Corn, wheat, soya and sunflower cakes, fish meal, vegetable oil, feed grade phosphate, lime stone, salt, vitamins, minerals and enzyme Kenzyme W dry 1 kg/t or feed antibiotic flavomycin – 5g/t or a feed acidifier Bolifor FA 2000 10 kg/t of compound feed.

The following qualities were listed: chick survival, live weight at the end of each week, feed consumption. Feed conversion was calculated from the obtained data for 1 kg live weight gain, productivity index. Biochemical data of feed, meat and blood were analysed. Feed costs were analysed according to the price of compound broiler feed in the stock company "Dobeles Dzirnavnieks".

All weighing and measurements were done according to accepted methodical conditions of zootechnical studies.

Results. Liveability of broiler chicks among the study groups showed no statistically true ($p>0.05$) variations and they were the following: group 1– 96.9 %, group 2– 96.0 % group 3 – 100 %, and group 4– 95.7 %. The dynamics of chick live weight (see table 2) was more intense among the study groups. Using enzyme Kenzyme W dry in feed for chicks of group 2 live weight of this group at the end was 9.0 % more, but using flavomycin in feed, i.e, for chicks of group 3 – 11.9 % more, but using the acidifier, i.e., for chicks of group 4 – 3.90 % more than in the control group.

From the data in table 3 it is seen that broiler chicks of group 3 (both males and females) show a better growth intensity at the beginning of the growth period. This trend does not disappear in the further growth of chicks either. It should be noted that males of group 2 showed somewhat higher live weight: at the end of the study that was 1.7% more ($p< 0.05$) than the live weight of chicks of group 3. Though live weight of females in group 2 was relatively lower – by 181.6 g ($p< 0.01$) than for females of group 3, which did not give a chance to show the best growth intensity data of the group, on the whole.

Table 3. **Development of broilers' body weight , g**

	1st group (control)			2nd group (experimental			3rd group (experimental)			4th group (experimental)		
	♂♂	♀♀	Ø	♂♂	♀♀	Ø	♂♂	♀♀	Ø	♂♂	♀♀	Ø
Chickens at the beginning												
Age	26	26	52	26	26	52	26	26	52	26	26	52
Bodyweight in weeks												
1st day	40.4	38.8	39.6	41.5	39.1	40.3	39.1	39.4	39.2	40.8	39.1	39.9
±	±0.82	±0.78	±0.57	±0.60	±0.62	±0.46	±0.47	±0.59	±0.37	0.56	0.58	0.42
S%	10.40	10.36	11.45	7.49	8.17	8.28	6.20	7.69	6..93	7.05	7.59	7.58
1	129	128	128	135	133	134	145	139	142	139	138	138**
±	±3.65	±3.13	±2.38	±2.76	±2.60	±1.88	±2.49	±3.70	±2.24	4.20	3.12	2.59
S%	14.46	12.44	13.36	10.40	9.96	10.12	8.80	13.59	11.41	15.40	11.53	13.54
2	308	300	304	302	295	299	357	344	351	336**	331	334**
±	±7.19	±8.22	±5.44	±6.26	±7.27	±4.81	±6.00	±9.38	±5.59	7.06	13.09	7.37
S%	11.90	13.97	12.89	10.15	12.55	11.38	8.57	13.92	11.51	10.72	20.16	15.90
3	573	558	566	578	566	572	693	658	676	633	625	629
±	±13.9	±13.6	±9.70	±12.5	±15.4	±9.91	±15.0	±16.2	±11.22	12.99	16.26	10.23
S%	12.43	12.39	12.36	10.58	13.85	12.28	11.07	12.56	11.97	10.47	12.74	11.50
4	916	892	905	961	896	927	1099	1019	1059***	999**	980	990**
±	±22.7	±22.8	±16.1	±14.2	±18.5	±2.55	±22.2	±21.7	±16.35	22.12	33.59	19.34
S%	12.64	12.55	12.54	7.25	10.51	9.58	10.30	10.85	11.13	11.29	16.07	13.53
5	1386	1306	1346	1484	1395	1440**	1640	1531	1585***	1481	1454	1469**
±	±29.4	±33.7	±22.9	±22.2	±30.4	±19.7	±36.9	±30.0	±34.77	35.68	47.27	28.78
S%	10.44	12.69	11.81	7.31	10.66	9.48	11.49	10.00	11.27	12.29	15.25	13.57
6	1808	1636	1722	1953	1812	1883***	2047	1972	2009***	1927	1868***	1900***
±	±35.9	±55.1	±34.9	±31.2	±45.5	±29.2	±48.1	±44.9	±33.04	56.27	53.40	38.91
S%	9.72	16.50	14.03	7.81	12.30	10.73	11.99	11.63	11.86	14.89	13.41	14.19
7	2463	2269	2366	2699	2459	2579	2654	2641	2647***	2517	2430	2475
±	±40.9	±50.9	±35.3	±50.7	±62.9	±43.6	±59.8	±65.4	±43.90	63.51	69.72	46.88
S%	8.15	11.00	10.33	9.21	12.53	11.72	11.49	12.63	11.96	12.87	13.46	12.99

significance in comparison with control group
** $p< 0.01$; *** $p< 0.001$

Analysing the data from table 3 on equalization (S%) of live weight we see that there are no significant differences among the groups, which in this case partly suggests the provision of similar conditions in the study.

Live weight gain of the chicks per day was high (see table 4).From the data in table 4 we can see that on average the higher live weight gain per day was in group 3 during the whole period, it was also higher in certain growing periods. On average among the study groups this figure was 4.3 – 5.7 g more within 24 hours. The highest growing intensity of broiler chicks was observed for chicks of the study group with enzyme Kenzyme W dry additive in the period of 29 to 49 days when on average the chicks of this group exceed by 4.1% ($p<0.01$) the chicks of group 3 and by 11.3% ($p<0.001$) exceeded the chicks of the control group.

Assessing broiler productivity according to the productivity index (it includes chick survival, daily live weight gain, feed conversion) we got the following results:

group 1- 227.3; group 2- 279.2; group 3. – 300.2 and group 4 – 252.7 or on average among the study groups this figure was 22.8 – 32.0%higher.

On the average each broiler chick consumed the following amount of the compound fodder during the study period: group 1– 4.89 kg, group 2– 4.61 kg, group 3– 4.69 kg, group 4 – 4.70 kg. Thus broiler chicks of group 2 consumed 0.28 , but from group 3 –0.20 less feed than the chicks from the controls during the whole growing period, see table 5.

Table 4. **Average daily gain, g**

Ave-rage, day	1st group			2nd group			3rd group			4th group		
	♂♂	♀♀	Ø	♂♂	♀♀	Ø	♂♂	♀♀	Ø	♂♂	♀♀	Ø
1 – 14	19.12	18.65	18.89	18.62	18.30	18.45	22.73	21.75	22.24	21.07	20.86	21.00
15 - 28	40.57	39.53	40.08	44.08	40.10	42.00	50.19	45.45	47.82	44.79	43.22	44.00
29 – 49	71.70	63.72	67.68	80.81	72.58	76.76	72.18	75.33	73.75	70.33	67.19	68.81
Ave-rage of all the period	49.43	45.52	47.47	54.24	49.39	51.81	53.36	53.09	53.23	50.53	48.80	49.69
± to control				+4.81	+3.87	+4.34	+3.93	+7.57	+5.76	+1.10	+3.28	+2.22

Table 5. **Feed consumption and feed costs**

Group	Feed consumption per bird, kg	Feed conversion kg/kg	Feed price LVL/kg /	Total feed costs per bird, LVL	Feed costs per 1 kg of LWgain	
					Ls	%
1st group (control)	4.89	2,10	0,158	0,773	0,332	100
2nd group (experimental)	4,61	1,81	0,160	0,738	0,291	87,7
3rd group (experimental)	4,69	1,80	0,158	0,741	0,284	85,5
4th group (experimental	4.70	1.93	0.167	0.785	0.322	97.0

From the data in table 5 we see that there is practically no price difference of feed between groups 1 and 3 because cost of flavomycin (14.75 LVL/kg) per 1 t of compound feed was only 7.4 santims and thus was practically the same to the feed costs of the controls. Feed costs were higher using a feed acidifier – 8.5 LVL/t.

Feed costs per 1 kg live weight gain have significantly decreased using Kenzyme W dry –by 12.3 %, using flavomycin – by 14.5 %, using Bolifor FA 2000 – by 3.0 % . The achieved results are very high and here, apparently, they were enhanced by proper feeding and housing conditions.

Taking broilermeat , liver and blood analyses true ($p>0.05$) differences were not found within the figures among the group (see table 6).

Table 6. **Biochemical indices of broilers ′ muscles tissue mass and liver at the age of 42 days**

Group	Dry matter,%	Total protein,%	Total fat,%	Ash,%	Phosphorus,%
Biochemical indices of meat					
1st group (control)	23.32	21.36	1.0	0.94	0.21
2nd group (experimental)	22.71	20.75	0.88	1.09	0.20
3rd group (experimental)	23.09	20.57	1.58	0.93	021
4th group (experimental)	24.13	21.78	1.43	0.94	0.22
Biochemical indices of liver					
1st group (control)	22.30	18.88	1.82	1.58	0.19
2nd group (experimental)	23.50	18.73	2.79	2.01	0.21
3rd group (experimental)	24.76	19.02	3.58	2.18	0.23
4th (experimental)	23.35	18,16	3.33	1.85	0.20

Analysing blood samples the results were within the range ($p>0.05$):

- total blood albumin 4.18 - 4.61 g %
- calcium 13.84 - 15.57 g %
- phosphorus 5.71 - 7.25 g %
- carotine 1.27 - 1.86 g %
- vitamin A 0.19 - 0.23 g %
- yruvic acid 0.865 - 1.41 g %

Knowing that a rapid growth of broiler chick causes problems with skeletal bones or support functions we analysed the content of calcium and phosphorus for chicks in the study group in shank bone and the proportion of these elements. It should be noted that a little bit higher Ca level was in the shank bone of the controls ($p> 0.05$): group 1 (controls) – 15.0 % group 2 – 14.25 %; group 3– 14.02 %; group 4 – 14.56. The content of phosphorus also was similar in the shank bone ($p> 0.05$): group 1 (controls) – 7.21 %; group 2 – 7.35 %; group 3 – 6.90 % and group 4 - 7.42. The proportion of these two elements (Ca:P) was the following: group 1– 2.08; group 2 – 1.94; group 3 – 2.03 and group 4 - 1.96.

Analysing amount of breast muscles (% from live weight) we found out that at the live weight of (♂♂ - 2000 g; ♀♀ - 1820 g) as per Hybro-G standards breast muscle should be– 15.2 %, for males and – 15.4 % for females.

In our studies we got the following figures: group 1 - ♂♂ - 15.6 %,♀♀- 18.3 ; group 2 ♂♂- 15.2 %, ♀♀ - 15.2 %; group 3 ♂♂- 17.1 %, ♀♀ - 19.0 %; group 4 ♂♂- 16.6 %, ♀♀-16.5 %. The achieved figures are from 3 females

and 3 males slaughtered for the control and their figures are not true statistically, but they show trends. Individuality (inheritance, constitution, etc.) of broiler chicks influences these figures, of course.

Assessing the full value of broilermeat we measured two amino acids describing meat qualities – tryptophan and oxyprolin in muscles. If the proportion of the mentioned amino acids is higher, the value of meat is higher, too. The proportion of these amino acids was as follows: group 1 – 2.65; group 2– 2.58; group 3– 3.13 and group 4 – 2.42.

Conclusion. Adding enzyme Kenzyme W dry, feed type antibiotic flavomycin and a feed acidifier Bolifor FA 2000 to broiler chick feed we observed better productivity figures of broiler chicks than in the controls (without additives) for the following traits:

- -Increased daily live weight gain 4.6 –12.1 %,
- -Truly ($p<0.001$) increased broiler live weight by 3.9-11.9 %;
- -Reduced feed consumption per broiler chick during the growing period by 0.20 – 0.28 kg;
- -Did not increase the price of compound feed significantly: Bolifor Fa 2000 + 9.0 LVL/t, Kenzyme W dry - + 1.65 LVL/t, flavomycin- + 0.074 LVL/t of feed;
- -Total feed costs per 1 broiler chick were less by 4.1 – 4.6 %;
- -Feed costs per 1 kg daily live weight gain using Kenzyme W dry were 12.3%, flavomycin – 14.5% , Bolifor FA 2000 – 3.0% less;
- -Did not find true differences in the chemical contents of meat and liver;
- -A higher meat quality assessment was obtained using flavomycin - the proportion of tryptophan and oxyprolin was 3.13;
- -Higher productivity index among the treatment group – group 2 – 279.3; group 3– 300.2.
- -More breast muscle (per cent from live weight) for group 2 on average by 2.8%,

group 3 – 1.0% more than in the controls.

Efficacy of productivity figures of all studied broilerchicks confirms that compound fodder for broilerchicks should be enriched by enzyme or authorised antibiotics in order to achieve higher figures of chick live weight.

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