ACIDIFIER – A MODERN ALTERNATIVE FOR ANTI-BIOTIC FREE FEEDING IN LIVESTOCK PRODUCTION, WITH SPECIAL FOCUS ON BROILER PRODUCTION

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Summary. The potential of organic acids in feed preservation, protecting feed from microbial and fungal destruction, but also directly in the animal nutrition is already known for decades and was proven in uncounted laboratory and field trials. However, the knowledge of effects from synergistically acting organic acid blends of high biological value together with organic or inorganic physiologically active carriers to the animal is relatively new. A trial with broiler chicken over a period of 35 days was carried out with an organic acid blend on an inorganic carrier (3 kg inclusion rate per ton of feed) against a control without an acidifier. Results proved significantly ($p < 0.05$) the growth enhancing action of the acidifier. From this results it can be concluded that acidifiers containing well balanced acid combination can increase the growth of broiler chicken under controlled conditions without the use of anti-biotic growth promoters.

Keywords: acidifier, organic acid blends, broiler chicken, growth performance.

RŪGŠTIKLIAI – MODERNI ALTERNATYVA PAŠARINIAMS ANTIBIOTIKAMS AUGINANT BROILERIUS

Santrauka. Organinių rūgščių panaudojimo galimybės konservuojant lesalus, apsaugant juos nuo mikrobiologinio užterštumo ir naudojant tiesiogiai gyvūnų mityboje, žinomos jau dešimtmetį. Tačiau žinios apie aukštos biologinės vertės organinių rūgščių mišinių poveikį kartu su organiniais ir neorganiniais fiziologiškai veikiančiais užpildais gyvūnams yra pakankamai naujos.

Lesinimo bandymas pradėtas su 240 vienadienių broilerių, suskirstytų į dvi grupes – kontrolinę ir tiriamąją. Bandymo trukmė – 35 dienos. Paukščiai lesinti iki soties (*ad libitum*). Į tiriamosios grupės lesalus buvo įmaišytas rūgštiklis (0,3%). Lesalai paruošti be pašarinių antibiotikų. Bandymo pabaigoje tiriamosios grupės, į kurios lesalus buvo įmaišytas rūgštiklis, broileriai svėrė 5,8% daugiau ($p<0,05$) palyginti su kontroline grupe. Vidutinis broilerių masės priesvoris tiriamojoje grupėje bandymo pabaigoje buvo taip pat didesnis. Lesalų sąnaudos per visą broilerių auginimo laikotarpį, lesalų sąnaudos 1kg priesvorio gauti, broilerių išsaugojimas abiejose grupėse buvo panašus ir nenustatyta jokių statistiškai patikimų skirtumų, tačiau Europos efektyvumo faktorius (EEF) tiriamojoje grupėje buvo didesnis palyginti su kontroline grupe (indeksas: kontrolinės gr. – 291,7, o tiriamosios gr. – 310,5).

Apibendrinant bandymo rezultatus galima teigti, kad gerai subalansuotas rūgštikis lesaluose gali statistiškai pagreitinti viščiukų broilerių augimą.

Raktažodžiai: rūgštikliai, organinių rūgščių mišinys, viščiukai broileriai, augimo intensyvumas.

Introduction. Both, the feed industry and the food production sector still suffer from huge losses due to the contamination of feed with pathogenic bacteria and their related impacts in the animal, such as lower weight gains or even increased mortality. The proposed ban on the use of antibiotics in livestock in the EU furthermore puts pressure on both agricultural sectors, but is also a challenge to innovative animal nutrition as we understand it. There is the possibility to gain back and secure the trust of the people in the safety of agricultural products. Nowadays, other alternative feed additives are being adopted in order to fill the gap from the antibiotics. Under this point of view, acidifiers can be part of the feeding concept to replace anti-biotic growth promoters (Lückstädt, 2003).

The potential of single organic acids in feed preservation, protecting feed from microbial and fungal destruction, but also directly in the animal nutrition due to its effect on stomach pH and gutflora is already known for decades and was proven in uncounted laboratory and field trials (Eidelsburger et al., 1992; Eidelsburger and Kirchgessner, 1994; Freitag et al., 1999). An increase in broiler performance due to the use of single acids were noticed for instance for formic acid (Vogt et al., 1981) and fumaric acid (Kirchgessner et al., 1991). However, the knowledge of effects from synergistically acting organic acid blends of high biological value together with organic or inorganic physiologically active carriers to the animal is relatively new. Therefore, a test trial with this new product under controlled conditions was set up.

Materials and methods. A trial was set up at Trakya University, Turkey. 240 pieces one-day-old (Ross) chicken were used. Each of the two applications has been repeated 12 times and 10 chicken were put in one replicate and the sections were completely randomly selected. The trial was finished after 35 days.

An acidifier (combination of formic and propionic acid based on an inorganic phyllo-silicate carrier) was added with a dosage rate of 3 kg per ton feed. The trial feed was formulated accordingly and was prepared in the feed unit of the Department of Animal Science at the university (Table 1). The feed was applied as starter (0 - 14 days), grower (15 - 28 days) and finisher feed (29 - 35 days).

The trial feed were given to the chicks ad libitum and their need for water was supplied through nipel type

vessels. The trial hatcheries were illuminated for 23 hours and they were dark for 1 hour a day. The data derived from the trial were subject to variance analysis and the efficacy of the acidifier was defined according to the control group.

The minimum and maximum inner temperatures were recorded daily. The heat was normal until the end of the experiment.

In this broiler trial, the following parameters were obtained: weekly feed intake, weekly live weight, average weekly weight gains, weekly FCR and weekly mortality ratio as well as the European Broiler Index (Average Daily Weight Gain (g) x Survival (%) / 10 x FCR). Results are given as mean ± SD.

Table 1. **Basal Diet for Broiler (for both treatments)**

Ingredients	Starter (0-14 days)	Grower (15-28 days)	Finisher (29-35 days)
Corn	543.8	545.7	582.7
FullFat Soybean	100.0	150	200
Soybean meal(48% CP)	265.8	217.8	147.6
Fish meal (70% CP)	30.0	10	-
Soybean oil	20.4	38.6	32.6
Dicalciumphosphat	17.8	17.1	17.2
Limestone	11.7	10.7	10.0
Salt (NaCl)	3.0	3.5	3.8
Vitamins premix	2.5	2.5	2.5
Minerals premix	0.5	0.5	0.5
DL-Methionine	1.9	2.0	2.0
L-Lysine HCl	2.6	1.6	1.1
Total	1000.1 kg	1000 kg	998.4 kg
ME, Kcal/kg	3010	3175	3225
Crude Protein, %	23	21	19
Ca %	1.00	0.90	0.85
Avia. Phosphor., %	0.50	0.45	0.43
Na, %	0.16	0.16	0.17
Arginine, %	1.55	1.42	1.28
Lysine, %	1.50	1.28	1.10
Methionine, %	0.58	0.55	0.51
Met+Cys, %	0.94	0.90	0.84
Threonine, %	0.90	0.82	0.74
Tryptophane, %	0.27	0.25	0.22

Results. The effect of the acidifier on weight performance in broiler chicken is displayed in Table 2. The acidifier affected the body weight of the chicken from week 1 until the termination of the experiment.

Table 2. **Performance Data for Broiler Live weight in g**

	n	Control	Acidifier (3 kg / t)[+]	p-level
1. week	120	142±7.05	147±4.22	0.01
2. week	120	368±21.77	375±11.32	0.01
3. week	120	731±46.47	773±27.15	0.01
4. week	120	1194±82.27	1263±62.08	0.05
5. week	120	1662±115.24	1759±97.67	0.06

[+] used acidifier: Biotronic® SE forte (acid blend of formic and propionic acid on inorganic phyllo-silicate carrier)

Table 3. **Average Daily Weight Gain (ADWG) in broiler (g)**

	n	Control	Acidifier	p-level
1. week	120	14±1.01	15±0.60	n.s.[+]
2. week	120	26±2.84	26±1.86	n.s.
3. week	120	52±4.84	57±2.62	0.01
4. week	120	66±11.66	70±6.78	n.s.
5. week	120	67±6.08	71±5.79	n.s.

[+] n.s.: not significant

The same effect was observed in weight gain (Table 3). However, this time only at week 3 a significantly higher daily growth in the acidifier treated group was observed.

Comparing the feed intakes (Table 4), it can be observed that the group taking the acidifier had consumed more feed than the control group throughout the whole experimental duration. However, in week 5 feed intake was already below recommended levels, probably because of increasing temperatures in the farm house.

FCR data show that there was not significant difference between the applications (Table 5). The data had been derived very similar to each other until week 5.

Table 4. **Average Daily Feed Intake (g)**

	n	Control	Acidifier	p-level
1. week	120	12±0.52	19±0.52	0.01
2. week	120	42±1.64	43±1.25	0.01
3. week	120	76±5.38	81±3.63	0.05
4. week	120	107±7.15	114±6.81	n.s.
5. week	120	121±10.69	126±12.46	n.s.

Table 5. **Weekly Feed Conversion Ratio (FCR)**

	n	Control	Acidifier	p-level
1. week	120	0.857±0.04	0.882±0.04	n.s.
2. week	120	1.125±0.04	1.148±0.03	n.s.
3. week	120	1.298±0.08	1.291±0.02	n.s.
4. week	120	1.424±0.06	1.426±0.05	n.s.
5. week	120	1.531±0.05	1.524±0.06	n.s.

Mortality ratio also shows that there are not significant difference between the applications and it was only observed during the first week. The observed mortality during this period; one chicks from the control group and two chicken from the acidifier treatment.

The European Broiler Index (EBI) was increased in the acidifier treatment (310.5) compared to the negative control (291.7).

Discussion and conclusion. The inclusion of single organic acids in broiler often showed a growth performance increase in the chicken (Vogt et al., 1981; Skinner et al. 1991). For formic acid it was concluded, that only inclusion rates of lower than 0.5% can increases the animal performance (Eidelsburger and Kirchgessner, 1994). Dosage rates of commercially produced acidifier usually recommend rates between 0.2% and 1.0%. However, new research on organic acid blends based on inorganic carriers is still missing. But results from commercially managed poultry farms with this type of acidifier are promising. Therefore, an approach of this study was to test such kind of acidifier under controlled conditions.

The mode of action of acidifier in poultry will be mainly due to its anti microbial action and not like in pig farming on the reduction of the stomach-pH. It is therefore of high importance to balance the acidifier according to this approach. The effect on gram-negative bacteria is increased if the organic acid is not dissociated. Because of this mode of action acidifier need to contain organic acids which are undissociated at different pH-values, so that the anti microbial action is prolonged over a wider pH range.

In this trial increased animal performance could be monitored. Especially the final body weight of the treated broiler chicken was significantly increased. But also the other performance data showed better results. Average daily weight gain was higher in the acidifier group, partly significantly and the FCR was slightly reduced, even if this reduction was not significantly.

It can be finally concluded, that the addition of the balanced acidifier product Biotronic® SE forte, containing an organic acid blend of formic acid and propionic acid based on an inorganic carrier, increases in the absence of anti-biotic growth promoters the performance of broiler chicken. However more studies shall be done to verify the achieved results from the university trial.

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Statement. The authors herewith certify, that the "Principles of laboratory animal care" (NIH publication No. 86-23, revised 1985), as well as the specific national laws on the protection of animals were followed.

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