



Effect of Allzyme® SSF on digestion in poultry in relation to environmental pollution

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Objective

Our research goal was to evaluate the influence of Allzyme® SSF, an enzyme supplement produced by the solid state fermentation (SSF) of wheat bran, on the digestibility of nitrogen and phosphorus by poultry, the excretion of nitrogen and phosphorus compounds and on microflora in the manure.

Materials and methods

The trial was carried out between the ages of 1 to 49 days with two groups of broilers of cross Ross 308 (n=100) and laying hens of cross Lohmann Brown (n=100) at the age of 21 to 40 weeks.

The content of the control diet for the broilers and laying hens was balanced according to the standard of the cross. The test diet contained Allzyme® SSF at 150 g/ton (0.3 lb/ton).

During the trial period, the basic indices of broiler and layer productivity, feed conversion, intestinal pH level, coefficients of digestibility of feed nitrogen and phosphorus substances, nitrogen, nitrate, phosphorus, compound and microflora content in poultry manure were determined.

Results and discussion

Allzyme® SSF supplementation decreased the crude protein (0.18–0.50%), nitrogen compounds (0.06–0.07%), nitrate (0.24–0.84 mg/kg) and phosphorus (0.05–0.08%) levels in the manure (Table 1), which resulted in improved nutrient digestibility (Table 2).

Allzyme® SSF promoted the digestion processes in broilers and layers, as evidenced by increased levels of lactic acid bacteria in manure relative to the controls (Table 3).

Table 1. Chemical composition of poultry manure.

Parameters	BROILER MANURE		LAYER MANURE	
	Control	SSF	Control	SSF
Nitrate, mg/kg	3.96	3.12	0.92	0.68
Nitrogen, %	0.35	0.28	0.22	0.15
Total protein, %	2.21	1.71	1.37	1.19
Total phosphorus, %	0.28	0.23	0.39	0.31

Table 2. Nitrogen and phosphorus digestibility.

Parameters	Control	SSF	% diff
Broilers at 42 days			
Nitrogen, %	84.20	86.40	+2.20
Phosphorus, %	23.76	35.08	+11.32
Laying hens at 36 weeks			
Nitrogen, %	82.72	86.99*	+4.27
Phosphorus, %	43.34	49.24	+5.90

Continued on back.

Effect of Allzyme® SSF on digestion in poultry in relation to environmental pollution, cont'd.

Results and discussion, cont'd.

The improved digestive environment was also reflected in lower numbers of *Enterococcus faecalis* (71x10⁵ (broiler) and 15x10⁵ (layers) CFU/g) and 3x10⁵ lower *Staphylococcus spp.* CFU compared to controls (Table 3).

Higher productivity of layers and broilers was also associated with these responses (Table 4).

Table 3. Composition of microflora in poultry manure (CFU/g)

Parameters	In broilers' manure		In laying hens' manure	
	Control	SSF	Control	SSF
Total mesophilic aerobic and facultative anaerobic microorganisms	22x10 ¹⁰	0.12x10 ¹⁰	17.2x10 ¹²	1.67x10 ¹²
Lactic acid bacteria	3x10 ⁶	10x10 ⁶	46x10 ⁸	92x10 ⁸
<i>Escherichia coli</i> mesophilic forms	5x10 ⁵	3x10 ⁵	250x10 ⁵	94x10 ⁵
<i>Escherichia coli</i> thermophilic forms	7x10 ⁵	4x10 ⁵	142x10 ⁵	15x10 ⁵
<i>Enterococcus faecalis</i>	92x10 ⁵	21x10 ⁵	30x10 ⁵	15x10 ⁵
<i>Staphylococcus spp.</i>	3x10 ⁵	0	3x10 ⁵	1x10 ⁵

Table 4. Productivity of broiler chickens and laying hens

Parameters	Control	SSF	% diff
Productivity of broilers			
Live weight at 49 day, g	3014 ±148.6	3130±201.8*	+3.8
Feed conversion, kg/kg	1.91	1.85	-0.06
Index of productivity	322.0	349.1**	+27.1
Productivity of laying hens			
Laying intensity, %	89.19	91.49*	+2.3
Feed conversion, kg/kg	2.10	2.00	-0.10
Average egg weight, g	57.79	57.70	-0.09

Conclusions

Allzyme® SSF supplementation resulted in:

- Reduced excretion of nitrogen compounds (0.06–0.07%), undigested protein (0.18–0.50%) and phosphorus (0.05–0.08%) in the manure.
- Reduced presence of unfavourable microorganisms in excreta (*E. coli* thermophilic forms, *Enterococcus faecalis* and *Staphylococcus spp.*).
- Improved digestibility of nitrogen compounds by 2.2% for broilers and by 4.27% for layers.
- Promoted poultry productivity. Increased liveweight of broilers by 3.8% and hens' laying intensity by 2.3%.
- Allzyme® SSF reduced the environmental burden of poultry manure by improving N and P utilization.