

## Reduction of the polluting effect of droppings using a dietary microbial preparation in broiler feeding

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### Abstract

*A monoculture of Lb. aviarus isolated from the digestive tract of broilers raised under conventional conditions, with a concentration of  $4 \times 10^{14}$  CFU/ml was administered to two experimental groups (E1 and E2) of day-old broilers, in doses of 2 and 5 ml/kg CF for 42 days. The purpose was to study the influence of the monoculture on the bacterial load of excreta (bacteria, fungi) and on broiler performance (final average weight, average daily gain, feed conversion ratio). The results show that bacteria count decreased by 7.36% (E1) and by 7.54% (E2), while fungi count decreased by 16.18% (E1) and 41.96% (E2). Broiler performance also improved: 2001.11 g (E1) and 1980 g (E2) final weight compared to 1968 g (C), for a feed conversion ratio of 1.948 (E1), 1.956 (E2) and 1.958 (C).*

**Keywords:** *lactic acid bacteria, aerobe bacteria, fungi, broiler, performance.*

### Introduction

Pollution is a phenomenon widely studied lately because by its consequences which alter the natural components of the environment or by the presence of foreign elements in the environment which, by accumulation, disrupt the ecological balance.

The life of organisms is permanently conditioned and influenced by the presence and environmental concentration of pollutants, which may disturb temporarily or permanently the functional balance of the organism.

In the rooms used to raise animals, pollutant removal is a continuous concern. The microorganisms (bacteria, fungi) for which the abundant nutritive substrate (feeds, droppings, litter), the high humidity and moisture provide optimal conditions of growth, development and replication and the chemicals (ammonia, sulfured hydrogen, carbon dioxide) resulting from the degradation of the organic matter from feeds and droppings under the action of microorganisms have to be kept under control so as to maintain a proper state of health, growth and development for the animals.

Animals eliminate a considerable number of microorganisms by their feces, partly normal inhabitants of their intestinal tract, partly ingested with the feed, which cross the digestive tract unaffected

by the biochemical processes at this level. When they get to the litter, they found optimal conditions of development on the account of the nutritive matter (feed leftovers spread on the litter, feces, and straws from the litter). The decomposing processes taking place under microorganisms action lead to the release and build up of toxic substances (ammonia, sulfured hydrogen, carbon dioxide), polluting the air of the growing rooms.

The use of lactic acid bacteria in animal diets contributes to the reduction of microorganism count because their proliferation in the digestive tract of the animals create an unfavorable environment for other species (Bottazzi and Mercenier, 1994). The specific effect of inhibition consists in the production of lactic acid and depression of local pH, formation of perhydrol with bactericide effect, production of antibiotic substances, change of the redox potential, which creates a hostile environment for the aerobe microorganisms (Lin, *et al.*, 1997 Scott, 1998).

### **Material and method**

A strain of *Lactobacillus aviarus* was isolated and selected from the digestive tract of broilers raised under conventional conditions and from day-old Shaver broiler chicks.

The selected *Lb. aviarus* strain was used to produce an inoculation and biomass with a concentration of  $24 \times 10^{14}$  CFU/ml. From this biomass we produced a preparation with  $4 \times 10^{14}$  concentration administered to day-old broilers throughout 42 experimental days.

The broilers were assigned to 3 groups (control and two experimental variants, E1 and E2). The broilers were raised according to the conventional technique on permanent litter. The broilers had free access to feed. The temperature varied according to the age of broilers: 32-39<sup>0</sup>C during the first two weeks of life, 27-25<sup>0</sup>C afterwards.

The compound feed used to feed the broilers consisted in formulations 21.1 and 21.2 administrated during periods 1-28 days and 29-42 days, respectively. The basal ingredients of the two formulations were corn, soybean meal, fish meal, plant fat, minerals (Ca, P), vitamin-mineral premix without antibiotics addition.

The diets for the control and experimental groups were equivalent in the main nutrients, except for the supplemental inoculation of *Lb. aviarus* supplied to the experimental groups. Variant E1 received 2 ml preparation/kg CF, while group E2 received 5 ml preparation/kg CF.

Samples of the two variants of compound feed were collected before and after the period of administration and assayed for bacteria and fungi count. At 28 and 42 days samples of feces were collected from all three groups and assayed for the bacterial load

and for the influence of the bacterial preparation (Tabata *et al.*, 1994).

The monitored parameters included the improvement of broiler performance (average weight, average daily gain, feed conversion ratio) and the decrease of microorganism load in excreta under the action of the tested preparation.

## Results and discussion

The diets supplemented with the *Lb. aviarus* monoculture had the following chemical composition expressed in g/100g sample:

**Table 1** Compound feed chemical composition

Group	DM 105 <sup>0</sup> C	CP	EE	CF	Ash	Total chloride	Ca	P
C	90.30	22.48	6.23	5.25	6.36	0.94	1.10	0.67
E1	90.60	18.82	8.10	3.74	9.54	0.70	1.12	0.68
E2	90.40	21.04	7.77	4.18	8.26	0.48	1.11	0.67

The microbiological analysis of the feeds showed a low bacterial and fungal contamination in group C; the higher NTG values in groups E1 and E2 are due to the addition of biopreparation (Tabata *et al.*, 1994).

**Table 2** Microbiological load of the compound feeds

Group	CF 21.1				CF 21.2			
	Initial		Final		Initial		Final	
	NTG	NTF	NTG	NTF	NTG	NTF	NTG	NTF
C	1480000	85000	1520000	83250	1650000	87250	250000	76500
E1	1620000	86500	1500000	78000	1950000	72500	1800000	52500
E2	1680000	83250	1460000	61500	2200000	82750	2000000	63500

The administration of biopreparation in broilers diets contributed to a better feed conversion ratio in variant E1 (2 ml biopreparation/kg CF), with higher values of body weight of the average daily gain and with a lower feed conversion ratio compared to groups C and E2 (5 ml biopreparation/kg CF) (Bottazzi and Mercenier, 1994; Walter and Henry, 1994).

**Table 3** Broiler performance

Group	C	E1	E2
Average day-old weight	32.30	34.20	34.40
Average weight at 28 days	1028.98	1036.12	1025.25
Average weight at 42 days	1968.00	2001.11	1980.00
Average daily gain per period	46.08	46.82	46.32
Feed conversion ratio, kg/kg CF	1.958	1.948	1.956

The microbiological examination of excreta samples collected at 28 and 42 days from the control and experimental groups showed that the biopreparation contributed to the considerable decrease of the bacterial load in the feces of group E2 compared to group E1 (5 ml versus 2 ml biopreparation/kg CF)

**Table 4** *Microbiological examination of excreta*

	28 days			42 days		
	C	E1	E2	C	E1	E2
NTG	7400000	7200000	6000000	6800000	6300000	5700000
%	100	97.20	93.20	100	92.64	83.82
NTF	74650	70500	69500	146000	135000	84750
%	100	94.40	93.10	100	92.46	58.04

### Conclusions

The administration of *Lb. aviarus* biopreparation in concentration of  $4 \times 10^{14}$  and dose of 2 ml/kg CF (E1) and 5 ml/kg CF (E2) had the following effects:

- the dose of 2 ml/kg CF administered to group E1 contributed mainly to the improvement of broiler performance (body weight, average daily gain, feed conversion ratio); it had a less significant role in depressing the microorganisms concentration in excreta;
- the dose of 5 ml/kg CF administered to group E2 contributed to the significant depression of bacterial and fungal load (16.18 and 41.96% respectively) of excreta; on the other hand it had a small influence as growth promoter.

### References

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