ISSN 1068-3674, Russian Agricultural Sciences, 2011, Vol. 37, No. 2, pp. 168–171. © Allerton Press, Inc., 2011.
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ANIMAL HUSBANDRY

Effect of Yeast Extract on Intestinal Development and Productivity of Broilers

I. S. Shabaev

All-Russian Poultry Husbandry Research and Technology Institute, Moscow oblast, 141300 Russia
e-mail: shabaev_ivan@mail.ru

Received March 16, 2010

Abstract—During raising of chicks, mixed feed was used animal- and plant-origin feeds and also supplementing it with 2% yeast extract NuPro, which allowed improving intestinal morphology and increasing the rate of its development and poultry productivity.

Keywords: chicks, feed, yeast extract, intestine, productivity

DOI: 10.3103/S1068367411020200

It is known that the slaughter weight of a broiler depends on the live weight of the chick at the end of the first week of life [1]. In this period the greatest amount of energy is used for growth and not for maintaining physiological equilibrium. Optimization of live weight in the first week improves the efficiency and productivity of broilers during the entire growth cycle [2]. During the first days of life of the chick, a change occurs in the character of nutrition—a transition from nutrition by yolk and albumin to the intake of complex carbohydrates, proteins, and fats of a standard starter ration. However, the chick isn't able to elaborate an adequate amount of appropriate enzymes to digest nutrients of starter feeds [3]. Good indices of development of the gastrointestinal tract and its ability to absorb nutrients depend on the size of intestinal villi. Maximum development of villi in the duodenum occurs by age 4 days and villi of the small intestine and ileum by day 10. Consequently, the first 10 days of the chick's life are the most important for intestinal development [4, 5]. Under these conditions, for realization of genetic potential it is necessary to provide poultry with the necessary amount of readily available nutrients while keeping profitability of the ration at the same time.

The use of functional nutritional ingredients in feeding agricultural animals enhances functions of the immune system, reduces susceptibility to various diseases, and improves absorbability of nutrients, thereby accelerating growth and development of animals, especially poultry [6].

It has been proved that the use of dry yeast extract in feeding poultry improves growth rate indices [7] and development of the digestive tract [8], which makes yeast extract an excellent product for use in a poultry ration.

METHOD

The experiment was conducted at the experiment farm of the All-Russian Poultry Husbandry Research and Technological Institute on broilers of cross Cobb Avian 48 from an age of 1 to 39 days (design of experiment). The use of yeast extract (NuPro) was studied against the background of mixed feeds containing 4% feed yeast. Five groups of 40 head in each were formed.

Design of experiment

Group	Characteristics of feeding
I (control)	Basic ration (BR) nutritionally balanced and containing animal-origin feed (fish meal)
II	BR + 2% NuPro during entire raising period
III	BR + 2% NuPro during first 10 days, then mixed feed without NuPro
IV	BR with plant-origin feeds + 2% NuPro during entire raising period
V	BR with plant-origin feeds + 2% NuPro during first 10 days, then mixed feed without NuPro

The experimental mixed feed compositions are given in Table 1. The main zootechnical indices were recorded during the experiment.

RESULTS AND DISCUSSION

Differences in the live weight of broilers were noted already from the first days of life (Table 2). Thus, chicks of groups II and III that received mixed feed of the same composition for the first 10 days had, compared with the control, a higher live weight at an age of 11 days by respectively 7.22 and 5.5%. The live weight of birds of groups IV and V that for the first 10 days received mixed feed without animal-origin feed with a

Table 1. Composition of mixed feeds, %

Feed	First raising period				Second raising period			
	group							
	I and III	II and III	IV and V	V	I and III	II	IV	V
Corn gluten	8.00	6.04	8.00	8.00	8.00	8.00	8.00	8.00
Soybean oil	3.50	3.50	3.50	3.50	5.00	5.00	5.00	5.00
Corn germ	7.63	9.16	10.21	10.77	8.47	8.14	10.14	10.48
Premix	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
Wheat	52.05	49.52	46.71	46.54	52.35	52.03	48.98	49.32
Sunflower meal	4.41	4.61	1.66	0.81	–	–	–	–
Sunflower oil cake	–	–	–	–	8.30	9.45	5.02	3.87
Soybean meal	15.80	16.66	23.89	26.33	9.73	7.25	16.94	19.41
Fish meal	5.50	5.50	–	–	5.00	5.00	–	–
NuPro	–	2.00	2.00	–	–	2.00	2.00	–
Methionine	0.19	0.21	0.23	0.23	0.17	0.17	0.20	0.20
Lysine	0.42	0.33	0.41	0.41	0.49	0.49	0.48	0.47
Threonine	–	–	–	–	0.10	0.10	0.09	0.10
Defluorinated phosphate	0.77	0.67	1.55	1.64	0.98	0.91	1.66	1.73
Limestone	1.12	1.19	1.14	1.06	0.73	0.78	0.78	0.71
Salt	0.11	0.11	0.20	0.21	0.18	0.18	0.21	0.21
Ration contains, %								
dry matter	86.25	86.38	86.47	86.40	84.98	85.07	85.09	85.00
crude protein	23.00	23.00	23.00	23.00	21.00	21.00	21.00	21.00
crude fat	8.53	8.94	8.95	9.16	11.81	11.88	11.36	11.29
crude cellulose	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
crude ash	5.76	5.96	6.15	6.13	5.53	5.59	5.77	5.71
metabolizable energy, kcal	310	310	310	310	320	320	320	320
lysine	1.36	1.36	1.36	1.36	1.25	1.25	1.25	1.25
methionine	0.65	0.66	0.64	0.63	0.59	0.60	0.59	0.58
cystine	0.33	0.32	0.34	0.35	0.31	0.30	0.31	0.32
methionine + cystine	0.98	0.98	0.98	0.98	0.90	0.90	0.90	0.90
threonine, %	0.82	0.84	0.83	0.83	0.83	0.83	0.83	0.83
tryptophan	0.27	0.28	0.29	0.29	0.24	0.24	0.25	0.26
calcium	1.00	1.00	1.00	1.00	0.90	0.90	0.90	0.90
phosphorus (total)	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70
phosphorus (available)	0.41	0.42	0.40	0.39	0.41	0.43	0.41	0.40
sodium	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
potassium	0.57	0.62	0.74	0.75	0.54	0.55	0.66	0.66
chlorine	0.22	0.21	0.25	0.24	0.28	0.29	0.27	0.26

Table 2. Chick live weight and livability

Index	Group				
	I (control)	II	III	IV	V
Livability, %	95	100	100	97.5	100
Live weight, g					
11 days	241.9 ± 6.45	259.4 ± 4.47	255.3 ± 4.05	249.5 ± 4.30	250.9 ± 4.44
28 days	1205.4 ± 28.06	1311.5 ± 25.31	1301.5 ± 24.27	1258.1 ± 20.89	1246.0 ± 19.39
39 days:					
pullets	1948 ± 26.70	2041.0 ± 21.35	2027.4 ± 20.05	2062.1 ± 17.56	2039.8 ± 20.60
cockerels	2263.0 ± 23.57	2456.3 ± 42.00	2395.9 ± 29.39	2346.0 ± 33.03	2320.3 ± 34.44
Arithmetic mean	2105.5	2248.6	2211.6	2204.1	2180.0
Average daily gain, g	54.1	57.9	56.9	56.7	56.1
Feed intake per:					
head per day, g	96.69	95.77	95.76	97.92	95.75
1 kg gain, kg	1.79	1.66	1.69	1.73	1.71
Sex rati					
pullets	23	24	23	19	22
cockerels	15	16	17	20	18

2% NuPro content was higher than in the control by respectively 3.13 and 3.7% but was slightly lower than that of birds of groups II and III that received mixed feed with fish meal. An analogous tendency was noted at age 28 days.

With consideration that there was an equal number of pullets and cockerels, an analysis of the final live weight indices was performed on the basis of the arithmetic mean value. The best indices were obtained in group II birds that received mixed feed containing fish meal and 2% NuPro. The difference from the control at the end of raising the chicks was 6.79%. The live weight of group III broilers that received NuPro for 10 days and then the mixed feed of the control group was 5.04% higher than in the control. With the use of mixed feed of the plant type, the best indices were also obtained with the constant use of 2% NuPro. Thus, the difference in live weight of group IV broilers compared with the control at the end of raising was 4.68%. The brief use of NuPro in plant-origin mixed feeds (group V) also had a positive effect. The live weight of broilers of this group was 3.54% higher than that of the control group birds but lower than that of broiler that consumed NuPro during the entire raising period.

Feed consumption per head in groups II, III, and V was 0.97% lower than in the control and 1.27% higher in group IV, which was probably related to the greater number of cockerels in this group (Table 2).

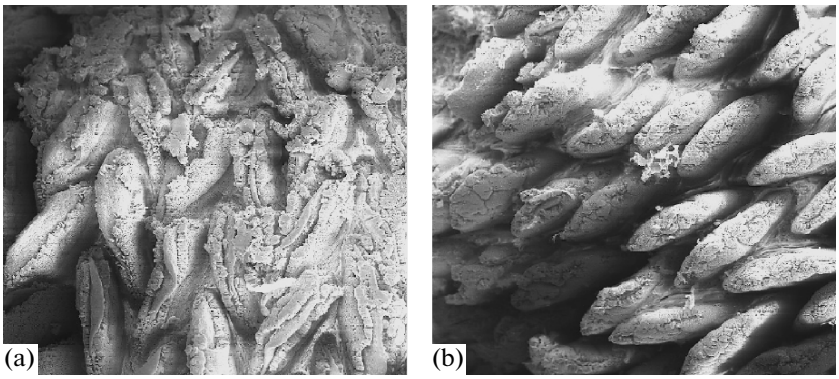
Since the growth rate of broilers of groups II–V was higher than in the control, this affected feed consumption per unit live weight gain. It was lowest in birds of group II, being 7.3% lower than in the control, and 5.6, 3.4, and 4.5% lower in broilers of groups III, IV, and V, respectively.

Livability of the chicks in all groups was quite high and didn't depend on the factors under study. The main cause of death was injury.

A tendency toward an increase in dressing percentage was noted in birds of the experimental groups. Thus, the difference from the control of broilers that received NuPro against the background of animal-origin feeds (groups II and III) was 1.34–1.51%, and of broilers of groups IV and V that received NuPro as part of plant-origin mixed feeds the difference was 1.53–2.29%.

We need point out that a tendency toward a decrease in the relative weight of the intestine was noted in broilers that received NuPro. The difference from the control with respect to this index was 0.32 and 0.05% in birds of groups II and III and 0.81 and 0.06% in those of groups IV and V. In this case, the length of the intestine and hence its absorbing surface were greater.

In birds of the experimental groups the height of the intestinal villi increased considerably and the depths of the crypts decreased compared with the control (figure). Similar data were obtained by A. Sacranie [9].



Development of intestinal villi of broilers that received control ration (a) and 2% NuPro (b)

Thus, the best results were obtained with the use of mixed feeds with the addition of 2% NuPro during the entire chick raising period. However, it is economically more efficient to use the supplement in mixed feed in the first 10 days.

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