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Effects of beet vinasse (desugarized molasses) on performance, blood parameters, morphology, and histology of various organs in broilers*

Einfluss von Vinasse auf Mastleistung, Blutstatus, Morphologie und Histologie verschiedener Organe von Mastküken

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Introduction

In sugar factories, sugar in sugar beet is crystallized, and two main products are obtained; sugar beet pulp and molasses. Sugar beet pulp is generally used in animal nutrition. Molasses is used directly as an animal feed or to obtain different fermentation products. These products are yeast, ethyl alcohol, citric acid, glutamic acid, lysine, betaine and antibiotics (BESANCENOT and MOREL D'ARLEUX, 1989). Another fermentation product of molasses is vinasse. Vinasse is obtained by distillation. It can also be obtained by direct diffuse fermentation of it's concentrated extract. Vinasse is rich in nitrogenous matter (48%), betaine (10%), and potassium (5–18%) which can be reduced to 2–6% by physicochemical techniques.

Vinasse is used 4–8% in mixed feed and 15–20% in liquid forms in ruminant rations. BENCZE et al. (1985) have reported that 10% vinasse had no negative effect on cattle. WEIGAND and KIRCHGESSNER (1980a) noted a small increase in weight gain of pigs, feeding a diet containing 23% vinasse. Another study by the same investigators (1980b) revealed that there was an increased absorption of Ca, P, K, and Na.

KIRCHGESSNER and WEIGAND (1980) reported that 5.00% vinasse on as fed basis could be included in broiler diets without adverse effects on performance. GALLO et al. (1986) are the first researcher who used vinasse containing 7.80% dry matter in drinking water of broilers in ratios of 0, 25, 50, 75 and 100%. They noted that vinasse up to 50% did not effect performance adversely.

ASHTIANI et al. (1998) fed four isoenergetic diets (ME 2900 kcal/kg) containing 0, 2, 4 and 6% beet vinasse, and reported that the use of beet vinasse in broiler diets was uneconomical.

In summary, the evaluation of literature dealing with the use of vinasse in broiler diets revealed only limited knowledge. Therefore, the objectives of the present study have been to determine the effect of dietary supplementation of vinasse on broiler feed intake, feed conversion, growth, abdominal fat deposition, carcass yield, blood parameters, bone mineralisation, and possible toxic effects on organs.

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Materials and Methods

Animals and housing

This study consisted of two experiments. In the first and second experiment, 165 day-old unsexed Cobb chicks (330 total) for each trial were obtained from commercial hatcheries. The broilers were housed under continuous lighting and warm room heating with temperatures maintained at approximately 31 °C for the 1st wk, 29 °C for the 2nd wk, 27 °C for the 3rd wk, and 24 °C from 4th wk until the end of the experiment. Birds were maintained on a 24-h continuous light schedule and allowed *ad libitum* access to feed and water. Each group was supplied with nipple drinkers and tube feeders. A complete randomized design was used with three floor pens (3.0 m^2) of 55 chicks assigned to each of three dietary treatments. Experiment I was conducted for 42 days while experiment II was run for 35 days. The chicks were placed in the trial pens of the Animal Nutrition and Nutritional Diseases Department of the Faculty of Veterinary Medicine, University of Istanbul.

Diets and feeding

Dietary treatments included: A – basal diet without supplementation with additives (control); B – basal diet supplemented with 2.5% vinasse; C – basal diet supplemented with 5% vinasse (dry matter 73%). Two basal diets were formulated for the requirements as established by the NRC (1994). The starter diets were fed from days 0 to 21 and the grower diets from days 21 to 42 (experiment II: from 21 to 35). The basal diets were mixed under commercial conditions as one batch, divided into respective parts and then supplemented with vinasse by means of a horizontal mixer. The composition of diets, calculated and analysed contents of nutrients are presented in Table 1. Diets were fed in mash form. The diets given were prepared isocaloric (3030–3100 kcal/kg of diet) and isonitrogenous (22–20% crude protein). The chemical composition of vinasse is shown in Table 2.

Table 1. Composition and calculated nutrients of starter and grower diets (%)
Zusammensetzung und kalkulierte Inhaltsstoffe der Versuchsrationen (%)

	Starter			Grower		
	A	B	C	A	B	C
Ingredients						
Corn	58.53	59.00	57.25	59.06	59.71	60.27
Soybean meal	27.00	24.00	23.72	27.79	24.33	20.94
Fish meal	8.00	8.00	7.00	6.96	7.16	7.32
Vegetable oil	3.00	3.00	3.50	3.80	3.89	4.00
Vinasse	0.00	2.50	5.00	0.00	2.50	5.00
Limestone	1.30	1.30	1.30	1.17	1.15	1.17
Dicalcium phosphate	1.00	1.00	1.00	0.29	0.30	0.30
Vitamin-mineral premix[1]	0.55	0.55	0.55	0.45	0.45	0.45
Salt	0.43	0.43	0.43	0.43	0.43	0.43
Lysine	0.02	0.02	0.02	0.02	0.02	0.02
DL-methionine	0.12	0.15	0.18	0.03	0.06	0.10
Coccidiostat	0.10	0.10	0.10	0.10	0.10	0.10
Total	100.00	100.00	100.00	100.00	100.00	100.00
Calculated analysis						
ME, Kcal/kg	3038	3030	3025	3100	3100	3100
Analysed values						
Dry matter	87.84	87.55	87.15	88.00	87.85	87.35
Crude protein	22.25	22.10	22.30	20.50	20.35	20.15
Calcium	1.00	1.05	0.99	0.88	0.85	0.90
Total phosphorus	0.64	0.65	0.63	0.44	0.46	0.42

[1] Composition of premix: vitamin A, 1204 µg; cholecalciferol, 25 µg; vitamin E, 4.5 mg; riboflavin, 2.25 mg; niacin, 15.0 mg; d-pantothenic acid, 4.0 mg; folic acid, .25 mg; vitamin B_{12}, 5 µg; choline chloride, 200 mg; thiamine, .5 mg; biotin, 25 µg; ethoxyquin, 12.5 mg; menadione sodium bisulfite, 1.25 mg; pridoxine, .50 mg; manganese, 24.9 mg; zinc, 22 mg; iodine, .2 µg; iron, 13.6 mg; and copper, 1.6 mg.

Table 2. Chemical composition of the vinasse (JOURNET, 1974; %)
Inhaltsstoffe von Vinasse (%)

Nitrogen matter	48	Ash	9.0	Nitrogen-free extract	16
Total nitrogen	7.7	Potassium	2.6	Ether extracts	1.3
Ammonia nitrogen	3.3	Sulphate	0.9	Glucose	2.7
Organic nitrogen	4.4	Sodium	1.3		
Betaine nitrogen	1.7	Calcium	0.2		
Betaine	10	Phosphor	0.1		
Amino acids	14	Magnesium	0.1		
		Chlorine	4.5		

Experimental Procedures

Performance

In all the experiments, weight gain was determined on replicate basis. Feed consumption per pen was monitored weekly and feed conversion ratio was calculated as feed consumed per unit of gain. After sacrificing, the head, feathers, feet, and internal organs of each bird were removed and carcass weights with neck were recorded. Carcass yield was calculated as a percentage of live weight. Furthermore, the abdominal fat tissue adjacent to cloaca was removed and weighed, and the abdominal fat content was calculated as a percentage of live weight.

Blood samples collection and tibial bones

At the end of the experiments, 15 broilers per treatment were randomly selected and slaughtered. Blood samples were collected from veins of the neck and centrifuged to obtain sera. The sera were kept at −20 °C until they were analyzed. Right tibiotarsal bones were taken, as well.

Pathology

For pathological studies, a total of 60 chicks were slaughtered, 10 chicks from each of the two treatments and the control groups at the 6th and/or 5th week at the end of the experiments. Postmortem examinations were performed and findings were recorded. Consequently, specimens in appropriate size were collected from liver, heart, spleen, kidney, brain, cerebellum, gut, testes, and pro-ventriculus of the birds and immersed into 10% formol- saline solution for fixation and remained in this solution for 4 days. These organ specimens were subjected to routine slide preparation procedures (LUNA, 1968), embedded into paraffin blocks and 5–7 µm thick sections were cut and stained with H & E (hematoxylin and eosin). Additionally, in order to reveal the fat globules, liver specimens of 0.5 to 1 cm were taken out of the fixative and rinsed with tap water. Section of 10 to 12 µm were obtained by using a cryostate and these sections were stained with Sudan IV (CULLING, 1975). All slides were examined under the light microscope.

Table 3. Effect of vinasse on growth performance of broilers (n = 55; mean ± SE; experiment I and II).
Einfluss von Vinasse auf die Mastleistung

Dietary Treatments	Weight gain g/bird/day							Feed intake, g/bird/day			Feed to gain ratio, F/G		
	A		B		C			A	B	C	A	B	C
	Mean	SE	Mean	SE	Mean	SE	F	Mean	Mean	Mean	Mean	Mean	Mean
Day 0													
Experiment I	41	0.55	42	0.50	41	0.47	0.01						
Experiment II	45	0.49	45	0.60	45	0.51	0.01						
Day 0–7													
Experiment I	131[a]	1.95	128[ab]	1.58	123[b]	1.75	6.34	125	123	122	1.39	1.43	1.51
Experiment II	130[ab]	1.31	134[a]	1.80	128[b]	1.28	3.69	120	125	119	1.41	1.40	1.43
Day 0–14													
Experiment I	357[a]	4.99	361[a]	4.96	327[b]	5.42	8.25	490	504	471	1.55	1.58	1.65
Experiment II	391	5.87	383	7.68	369	6.18	2.86	509	504	490	1.47	1.49	1.51
Day 0–21													
Experiment I	710[ab]	11.29	727[a]	10.12	686[b]	8.56	7.56	1065	1084	1062	1.59	1.58	1.65
Experiment II	710	24.27	731	25.76	701	28.78	0.34	1064	1084	1063	1.60	1.58	1.62
Day 0–28													
Experiment I	1133	18.90	1151	17.88	1116	15.72	2.03	1795	1829	1810	1.64	1.65	1.68
Experiment II	1198	14.88	1203	16.54	1181	17.58	2.50	1822	1830	1806	1.58	1.58	1.59
Day 0–35													
Experiment I	1668	30.02	1679	27.13	1675	26.38	2.54	2736	2747	2750	1.68	1.68	1.68
Experiment II	1702	28.40	1714	27.13	1715	26.38	0.10	2734	2754	2756	1.65	1.65	1.65
Day 0–42													
Experiment I	2197	43.15	2207	42.23	2201	35.43	3.05	3823	3789	3850	1.77	1.75	1.78

[a–b] Means in row with no common superscript differ significantly ($p < 0.05$)

Chemical Analyses

Diets were chemically analysed for dry matter, crude protein, calcium and total phosphorus (AOAC, 1984) in the laboratory of the Animal Nutritional Diseases Department of the Faculty of Veterinary Medicine, University of Istanbul. Tibial bone ash, Ca and P levels were determined according to the method described by AOAC (1984). Serum total lipid[1] (chabrol-charonnat, colorimetric), sodium[2] (Na = sodium reagent set, colorimetric method), potassium[2] (K = potassium reagent, reagent set, colorimetric method), cholesterol[3] (cholesterol, total, colorimetric), calcium[3] (Ca = calcium, colorimetric), phosphorus[3] (P = phosphorus, inorganic, colorimetric) glutamic-oxaloacetic transaminase[3] (GOT/AST = aspartate aminotransferase, colorimetric) and glutamic-pyruvic acid transaminase[3] (GPT/ALT = alanine aminotransferase, colorimetric) analyses were performed using the commercial kits.

Statistical Analysis

Data for feed conversion ratio could not be statistically analysed because of group feeding. The other data were analysed by ANOVA using statgraphics (SNEDECOR and COCHRAN, 1980). Significant differences between treatment means were compared using multiple range test (MINITAB, 1991). All statements of significance are based on a probability of 0.05.

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Results

Performance

The results concerning the effects of vinasse on broiler performance are presented in Table 3. In experiment I, live weights in the experimental groups were lower than for the control group in the 1st, 2nd and 3rd week (131, 357 and 710 g, respectively). However, the main effect of 2.5% vinasse supplementation on weight gain was significant ($p < 0.05$) from 7 to 14 and 14 to 21 days of age. In experiment II live weight for 2.5% vinasse supplementation group was higher than for the other groups in the 1st week (130, 134, 128 g, respectively, $p < 0.05$). No difference was observed in 35-d body weight by feeding vinasse at 2.5 and 5% levels. In both experiments feed intake and feed conversion of broilers was not influenced by treatments.

Abdominal fat percentage and carcass yield differed between groups (Table 4). In experiment I, abdominal fat percentage was lower in the experimental groups than in the control group (1.40, 1.42 and 1.60, respectively; $p < 0.05$). Carcass yields were higher in the experimental groups than in the control group (76.99, 75.87, 74.08, respectively; $p < 0.05$). In experiment II, the level of vinasse in the diet did not effect carcass characteristics of broilers ($p > 0.05$).

Blood samples and tibial bones

The levels of various biochemical parameters obtained from blood sample analyses of control and experimental groups taken at 6th and/or 5th week and the statistical comparisons of the groups are presented in Table 5.

Table 4. Effects of dietary vinasse on the carcass characteristics (n = 55) in broilers (mean ± SE; experiment I and II).
Einfluss von Vinasse auf die Schlachtkörperqualität von Mastküken

Measurement		A		B		C		
		Mean	SE	Mean	SE	Mean	SE	F
Carcass characteristics								
Experiment I	Abdominal fat, %	1.60[a]	0.16	1.40[b]	0.15	1.42[b]	0.14	6.95
Experiment II		1.50	0.08	1.45	0.10	1.44	0.11	1.95
Experiment I	Carcass yield, %	74.08[b]	0.17	76.99[a]	0.22	75.87[a]	0.15	5.58
Experiment II		77.31	0.74	77.25	0.52	78.85	0.25	2.12

[a–b] Means in row with no common superscript differ significantly ($p < 0.05$).

In experiment I, biochemical parameters obtained on serum samples were significantly different between control and experimental groups, except for GOT and GPT. Total lipid, calcium, phosphorus, sodium, and potassium levels were higher in the experimental groups than in the control group ($p < 0.05$). The total cholesterol levels were lower in the experimental groups than in the control group ($p < 0.05$). In experiment II, no differences were found between control and experimental groups, except for total lipid, and phosphorus.

Effects of dietary vinasse on tibia of the experimental groups analyzed on the 6th and/or 5th week and the statistical comparisons of the groups are presented in Table 5, as well. In all experiments no effect of dietary vinasse was recorded on tibia morphology and mineralisation. In both experiments, supplementation of vinasse at 2.5% or 5% seems to increase the dietary calcium levels of the grower diets, but did not result in significant differences in phosphorus and calcium concentrations of the tibia.

Pathology

Macroscopic Examination

In experiment II, birds of both trial groups (2,5%, 5% vinasse) slaughtered on the 5th week showed excessive amounts of lipid accumulations especially on the abdom-

Table 5. Effects of dietary vinasse on biochemical constituents of serum and tibia of broilers (n = 15; mean ± SE; experiment I and II).
Einfluss von Vinasse auf Blutparameter und Tibiakennwerte von Mastküken

Measurement		A		B		C		
		Mean	SE	Mean	SE	Mean	SE	F
Serum								
Experiment I	T.Cholesterol, mg/dl	168.21[a]	9.28	134.63[b]	6.07	143.64[b]	4.02	6.51
Experiment II		157.77	15.04	152.70	7.18	151.66	12.51	1.04
Experiment I	Total lipid, G/l	3.42[b]	0.25	4.33[b]	0.16	4.67[a]	0.15	15.48
Experiment II		3.11[b]	0.18	3.34[b]	0.23	4.70[a]	0.28	16.74
Experiment I	Ca, mg/dl	10.69[b]	0.17	12.95[a]	0.63	12.26[a]	0.40	6.79
Experiment II		10.30	0.10	10.42	0.34	10.38	0.73	0.01
Experiment I	P, G/l	3.45[b]	0.40	7.15[a]	0.93	7.79[a]	0.45	8.52
Experiment II		2.77[b]	0.81	6.06[a]	1.37	3.21[b]	0.88	7.98
Experiment I	Na, mEq/l	104.66[b]	10.08	133.99[a]	12.00	147.82[a]	6.67	5.02
Experiment II		119.06	24.15	107.80	33.80	123.41	8.61	3.02
Experiment I	K, mEq/l	2.83[b]	0.22	3.63[a]	0.19	4.39[a]	0.38	8.00
Experiment II		3.30	0.81	3.41	0.83	3.16	0.89	2.00
Experiment I	GOT, IU/l	120.75	4.74	118.32	1.67	116.60	2.86	2.98
Experiment II		117.07	8.98	115.63	11.30	119.75	9.25	2.62
Experiment I	GPT, IU/l	4.19	0.35	4.71	0.58	5.58	0.61	2.65
Experiment II		2.05	0.18	2.05	0.18	2.09	0.22	1.24
Tibia								
Experiment I	Tibia weight, gr	8.32	0.56	8.14	0.43	8.26	0.52	0.03
Experiment II		7.84	0.39	7.79	0.49	7.56	0.84	0.05
Experiment I	Tibia diameter, mm	1.63	0.08	1.62	0.09	1.62	0.10	0.01
Experiment II		1.72	0.10	1.66	0.10	1.55	0.21	0.25
Experiment I	Tibia ash, %	54.29	0.54	53.07	0.68	55.20	0.88	2.25
Experiment II		53.89	0.57	54.02	0.91	54.35	1.41	0.07
Experiment I	Ca, %	12.42	0.27	12.95	0.35	13.58	0.36	3.19
Experiment II		12.61	0.22	13.64	0.42	13.10	0.61	2.05
Experiment I	P, %	8.28	0.21	8.00	0.16	8.55	0.16	2.47
Experiment II		8.46	0.39	7.96	0.14	8.58	0.15	2.75

Table 6. Macroscopic results of organs
Makroskopische Befunde der Organe

	0.00%			2.50%			5.00%		
	N	Liver	Kidney	N	Liver	Kidney	N	Liver	Kidney
Experiment 1	0	–	–	6	Fatty change	Hyperemic	5	Fatty change	–
Experiment 2	0	–	–	4	Fatty change	–	3	Fatty change	–

N: number of animals

inal membranes, regions around the kidneys, and over pericardium when compared to the control group. For four birds of the first trial group (2,5% vinasse) and three birds of the second trial group (5% vinasse) livers were observed to be slightly yellowish and containing foci of petechial haemorrhages on their surface. In experiment I, these lipid accumulations at the regions indicated above were more pronounced than for experiment II. Six birds from the first trial group slaughtered in the 6th week showed yellowish and friable livers containing linear or petechial haemorrhages on their surface and hyperaemic kidneys. Five birds from the second trial group had slightly yellowish livers (Table 6).

Microscopic Examination

In experiment I, it was observed that livers of six birds from the first trial group (2,5% vinasse) and six birds from the second trial group (5% vinasse) which were slaughtered on the 6th week showed irregular remark chords and the parenchymal cells were gathered into groups made up of 5–6 cells. The general view of the livers was edematous. Furthermore, an increase in the number of kupffer cells was also noticed. Vacuolization in variable degree was also observed in the cytoplasm of the parenchymal cells of these livers (Figure 1). The lipid stain (Sudan lV) revealed these vacuoles to be fat globules.

For the kidneys of birds in the first trial group slaughtered in the same week the nuclei of the majority of the tubular epithelial cells were pyknotic and showed karyorrhexis or karyolysis in the nuclei of the remaining cells. The cytoplasm of these cells had a dark pinky-red appearance and necrosis was observed in these cells. Also, mesengial cells of some of the glomeruli were observed to be proliferated (Figure 2). In experiment II, these changes occurring especially in the liver as stated above were more pronounced in four birds of the first group and three birds from the second group which were slaughtered on the 5th week. No pathological changes were determined in the other organs.

Discussion

In the present study over all, vinasse supplementation of feed significantly improved broiler performance. It was observed that up to 5% vinasse could be included in the diet without adverse effects on performance (KIRCHGESSNER and WEIGAND, 1980). In another study, ASHTIANI et al. (1998) reported no differences in body weight gain and feed intake. However, the estimated cost of feed per unit increase of body weight differed between treatments ($p < 0.05$), the higher the amount of vinasse in the diet, the higher the cost. ASHTIANI et al. (1998) suggested that the use of beet vinasse in broiler diets is not economically feasible.

In this study, significant differences were observed on serum total lipid levels ($p < 0.05$). The levels in the experimental groups were found to be higher. It was reported that in chickens feed materials are utilized better and the digestion and absorption of oils could be improved (HURWITZ et al., 1973). Tibia criteria analyzed in tibial bones were not found to be statistically significant between control and experimental groups in chicks fed with vinasse.

Vinasse may have a slight toxic effect as noted from findings like edema of the liver, kuppfer cell proliferation, and the necrotic changes in the tubular cells of the kidney. From findings on the liver it is noted that fatty change occurred in the birds from both groups depending on nutrition. The liver is directly associated with fat metabolism.

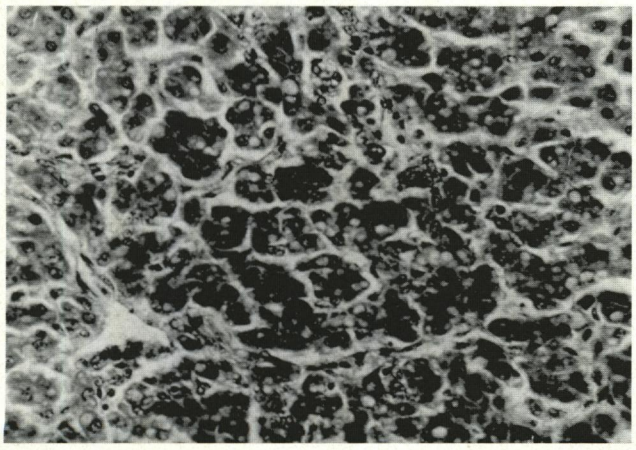


Fig. 1. Vacualisation in the cytoplasm of parenchyma cells of - Livers (H & E × 100)
Hohlraumbildungen im Cytoplasma der Parenchymzellen im Lebergewebe

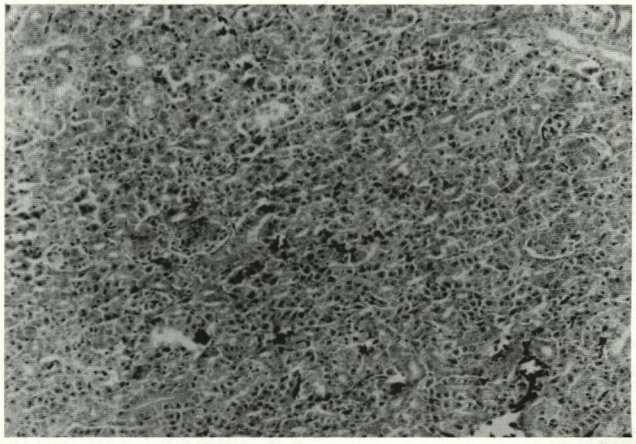


Fig. 2. Proliferated mesengial cells of Kidneys (Photomicrograph, H & E × 100)
Vermehrung der Mesengialzellen der Niere

The accumulation of fat in liver parencyhmal cells is due to a loss of normal lipolytic function of these cells by a slight toxic effect caused by a consequent malfunction of fat and accumulation of fat in cell cytoplasm. Accumulated fat causes a pressure on the cell nucleus and pushes it to the periphery of the cytoplasm which may result in cell death (JUBB et al., 1985; ALIBASOGLU and YESILDERE, 1988; HAZIROGLU and MILLI, 1997). It is suggested that slight toxic effect of vinasse may be responsible for the cause of fat vacuoles accumulation in liver parenchymal cells observed in both experimental groups. In our study, these fatty changes in fat accumulation or in fat deposition were reversible (lipid infiltration) hence there were no significant changes in the nuclei.

Also, the variety in the intensity of lesions in the liver and kidney section of different birds can be evaluated as vinasse was not thoroughly dispersed in the feed, thus causing some of the birds to consume more than others. In conclusion, vinasse inclusion in diets in the range of 2.5% to 5% will not have any adverse effects on broilers as long as the dispersion of vinasse in the diet is uniform. An inhomogeneous dispersion of vinasse in diets may lead to increased uptakes of vinasse by single birds resulting in a slight toxic effect.

Summary

The effects of vinasse supplementation on broiler performance, abdominal fat deposition, blood and tibial parameters, morphology and histology of various organs of broilers were studied. A corn- soy meal-based diet was used without vinasse as control, Vinasse was added at low (2.5%) and high levels (5%). Three hundred and thirty day-old (Cobb) broiler chicks were divided into three treatments using 55 broilers in each group (experiment I and II).

The live weights were lower in the experimental group (5% vinasse) than in the control group on the 1st, 2nd and 3rd week (131, 357 and 710 g, respectively) (experiment I). However, the main effect of added 2.5% vinasse on weight gain was significant ($p < 0.05$) from days of age 7 to 14 and 14 to 21. No difference was observed on days 42 (experiment I) and 35 (experiment II) for body weight by feeding vinasse at 2.5% and 5% levels, respectively. Feed intake and feed conversion of the broilers was not improved in both experiments.

In experiment I, abdominal fat percentage was lower in the experimental groups than in the control group (1.40, 1.42 and 1.60, respectively) ($p < 0.05$). Carcass yields were higher in the experimental groups than in the control group (76.99, 75.87, 74.08, respectively, $p < 0.05$). In experiment II, the level of vinasse in the diet had no effect on the carcass characteristics of broilers ($p > 0.05$).

In experiment I, biochemical parameters analyzed in serum samples were significantly different between control and experimental groups ($p < 0.05$). Total lipid, calcium, phosphorus, sodium, and potassium levels were found to be higher in the experimental group than in the control group. Total cholesterol levels were lower in the experimental group compared to the control group. In experiment II, serum samples did not indicate any differences between control and the experimental groups, except for total lipid and phosphorus.

Tibia analyses showed that ash percentage was markedly increased at the highest vinasse dose (5%), but there were no significant differences in the phosphorus and calcium concentrations of the tibia. In experiment I livers of six birds of the first trial group (2,5% vinasse) and five birds of the second group (5% vinasse) were slightly yellowish and contained foci of petechial hemorrhages on their surface. In experiment II for birds on 2,5% vinasse and for birds on 5% vinasse yellowish and friable livers containing linear or petechial hemorrhages on their surface and hyperemic kidneys were observed.

It can therefore be concluded that vinasse addition to feed from 2.5% to 5% does not have any adverse effects on poultry, but the conditions for uniform dispersion must be provided, otherwise toxic effect can be observed.

Keywords

Broiler, nutrition, vinasse, performance, blood parameters, tibia criteria, morphology, histology

Zusammenfassung

Einfluss von Vinasse auf Mastleistung, Blutstatus, Morphologie und Histologie verschiedener Organe von Mastküken

Das Ziel der vorliegender Arbeit war, den Einfluss eines Einsatzes von Vinasse im Futter auf Mastleistung, Abdominalfettgehalt, Blut- und Knochen(Tibia)-Parameter sowie auf morphologische und histologische Kriterien verschiedener Organe zu untersuchen. Eine Soja-Mais-Ration wurde als Kontrollration verwendet. Vinasse wurde in den Stufen 2,5% und 5% eingesetzt. Insgesamt standen 330 Eintagsküken für die beiden Untersuchungen (Experiment I und II) zur Verfügung. Jede Behandlung umfasste 55 Tiere.

Die Lebendmasse war in Experiment I in der Versuchsgruppe mit 5% Vinasse in den ersten drei Mastwochen niedriger als in der Kontrollgruppe (131, 357 und 710 g). Bei einem Zusatz von 2,5% Vinasse waren die Gewichtszunahmen für die Zeiträume 7. bis 14. sowie 14. bis 21. Lebenstag signifikant höher als in der Kontrollgruppe. In keinem der beiden Versuche wurden am Mastende (Experiment I 42 Tage, Experiment II 35 Tage) in den Behandlungsgruppen Unterschiede im Lebendgewicht beobachtet. In beiden Versuchen war auch die Futterverwertung durch den Einsatz von Vinasse nicht verändert.

Der Abdominalgehalt war in Versuch I in den Versuchsgruppen geringer als in der Kontrollgruppe (1,40, 1,42 gegen 1,60 %; $p < 0,05$). Die Schlachtausbeute war dagegen in den Behandlungsgruppen höher als in der Kontrolle (76,99, 75,87 gegen 74,08; $p < 0,05$). In Versuch II hatte der Gehalt an Vinasse im Futter keinen Einfluss auf die Schlachtkörpermerkmale.

Die biochemischen Parameter des Blutes waren in Versuch 1 signifikant verschieden für die Kontrolle und die Behandlungsgruppen ($p < 0,05$). Gesamtlipide, Calcium-, Phosphor-, Natrium- und Kalium-Gehalte waren in den Versuchsgruppen höher als in der Kontrolle. Gesamtcholesterin war dagegen bei den Versuchsgruppen niedriger als bei der Kontrolle. In Versuch II wurden außer für Gesamtlipide und Phosphor keine Unterschiede zwischen den Behandlungsgruppen ermittelt.

Die Untersuchungen an der Tibia haben gezeigt, dass der höchste Zusatz an Vinasse (5%) den Aschegehalt des Knochens erhöht hatten. Für Phosphor und Calcium lagen dagegen keine Unterschiede vor.

In Versuch I wurde bei 6 Tieren der Behandlung 2,5% Vinasse und bei 5 Tieren der Behandlung 5% Vinasse eine leichte Gelbfärbung und eine Anhäufung von punktförmigen Hämorrhagien auf der Leberoberfläche registriert. In Versuch II wurde für die beiden Behandlungen mit Vinasse-Zusatz gelbe und krümelige Veränderungen der Lebern in Verbindung mit linien- und punktfömigen Hämorrhagien beobachtet. Die Nieren waren z. T. mit Blut gefüllt.

Es kann daher der Schluss gezogen werden, dass die Verabreichung von Vinasse in Dosierung von 2,5% oder 5% keine signifikanten negativen Einflüsse auf Masthühner hat, mit Ausnahme leichter Veränderungen von Leber und Niere.

Stichworte

Broiler, Fütterung, Vinasse, Leistung, Blutparameter, Tibiamerkmale, Morphologie, Histologie

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