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Effect of Ration Contents on Morphology of Digestive System of Chickens and Turkeys

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Fifteen cocksof Fayoumi chickensand nine toms of Bronze turkeys were used in this experiment. Birds used were from90 to 180 days of age. The effect of protein sources and fiber levels in the ration on the morphological measurements of the digestive system was done on chickens. Five groups were used one of which was control. Two other groups received the same level of crude protein once from animal (fish and blood meal) and other from plant (Decorticated cotton seed meal) sources. The remaining two groups had taken two levels of crude fibers, namely 4% and 12%. While in turkeys three groups were used of which one served as control. The other two groups received the same level of crude protein once from animal (fish and blood meal and the other from plant (Decortticated cotton seed) sources. The ration of plant and animal protein sources, being of the same level of crude protein, had no effect on all the measurement of the digestive system. No clear effect of bulky(high fiber level) and compacted (low fiber level) rations on the different values of esophagus, crop, proventriculus, gizzard and rectume was observed. Small intestine, actual and relative weight and length decreased and its volume increased by using bulky ration. While, the contrary observed in the small intestine when compacted ration was used. Also the bulky ration caused an increase in all the measurements of caeca as the level of fibers was high.

Bulky ration increased gizzard weight (Hill and Dansky, 1954). Relative gizzard weight was greater in chickens given mash and grain, followed by all mash, pellets and grain and pellets only (Haye, 1958). The semi-purified or simplified or simplified diets fine in texture resulted in smaller gizzard than those fed on the usual type of practical ration (Branion, 1963). There was no consistent effect of protein upon the weight of gizzard, small intestine, or large intestine in chickens (Gleaves and Staban, 1971). Daader (1972) noticed that, increasing the volume of the diet from 1.76 cc/g to 2.66 cc/g; increased the relative weight of the full and empty digestive tract and the length of gastrointestical tract and caeca.

Material and Methods

Fifteen cocks of Fayoumi chickens and nine toms of Bronze turkeys were used in this experiment. Birds used were from 90 to 180 days of age. The effect of protein sources and fiber levels in the ration of the morphological measurements of the digestive system was done on chickens . Five groups were used. One of which was control. Two other groups received the same level of crude protein (17%) once from animal (Fish and blood meal) and the other from plant (Decorticate cotton seed meal) sources. The remaining two groups had taken two groups had taken two levels of crude fibers ; namely, 4% and 12%. The effect of protein sources in ration on the morphological measurements of the digestive system was done on turkeys. Three groups were of which one served as control. The other two groups received the same level of crude protein (22%) (Decorticated cotton seed meal sources) once from animal (fish and blood meal) and the other from plant. The digestive systems were obtained after slaughtering. Three birds were slaughtered from each groups. The absolute and relative physiological volume, lenght and weight of different segments were determined.

Results and Discussion

Physiological volume

a. *Chickens*

The ration of animal protein source (groups 2) increased the abtual and relative physiological volume of all digestive parts than the control (group 1) except the crop and the caeca (Table 2). While that of plant protein source (group, 3) decreased the abtual and relative physiological volume of crop and the actual physiological volume of other digestive parts than the control (Table 1). The bulky ration (group 4) increased the actual and relative volume of all digestive parts than the control except the crop and the gizzard (Table 1). Also, the compact ration (group 5) increased the actual and relative physiological volume of all digestive parts than the control except the caeca (Table 1).

b. Turkeys

In general, no clear trends could be detected due to the effect of differences of ration contents of the physiological volume of the digestive system(Table1).

II. *The length*

a. *Chickens*

The ration of animal protein source (group 2) increased the actual and relative length of proventriculus and duodenum than control (group 1). It decreased the other digestive parts (Table 2). The ration of plant protein source (group 3) increased only the actual and relative length of proventriculus and the relative length of small intestine than the control. While the other digestive parts were not affected (Table 2). The bulky and compact

rations (groups, 4 and 5 respectively) increased the actual and relative length of all the digestive parts than the control except the rectum in the bulky and the caeca in the compact (Table 2).

b. *Turkeys*

The ration of animal and plant protein sources (groups 2 and 3 respectively) decreased the actual and relative length of proventriculus, caeca and rectum than the control (group 1).It increased the other digestive parts (Table 2).

III. *The tissue weight*

a. *Chickens*

The ration of animal protein source (group, 2) increased the actual and relative weight of esophagus, crop, gizzard, duodenum, rectum and liver than the control (group 1) and decreased the other digestive parts (Table 3). The ration of plant protein source (group 3) decreased the actual and relative weight of all digestive parts than the control except the gizzard and the rectum (Table 3). It seems that the ration of animal protein origin is more bulky than that of the plant protein origin.

No clear trends were observed in the effect of bulky and compact reactions (groups 4 and 5 respectively) on the actual and relative weight of digestive parts (Table 3).

b. *Turkeys*

The ration of animal protein source (group 2) decreased the actual and relative weight of all digestive parts than control except jejunum and ileum and pancrease (Table 4). The ration of plant protein source (group 3) decreased the actual and relative weight of all digestive parts than the control except escophagus, proventriculus, liver and pancreas (Table 4).

The bulky ration (high fiber level) have large volume than the compact ration low fiver level due to the differ in fibers level (Table 1). Therefore, the bulky ration increased the actual and relative volume of small intestine (Tables 2,3 and 4). On the other hand, the decreased length and weight, while increased volume were due to the thinner of small intestine wall. The compact ration, increased the actual and relative length and weight, and decreased the volume of small intestine (Tables 1,2 and 3). This may be due to thicker the wall of small intestine. The caeca is the part of digestive tract that digest the fibers in ration by the microbes fermentation. Therefore, the bulky ration increased the actual and relative length, volume and weight. While, the compact ration decreased all the other measurements of the caeca. The rations of plant or animal protein sources do not take clear trend from the actual and relative length volume and weight of all digestive parts (Tables 1,2,3 and 4). However, Hindaway (1976) found that the bulky and compact does not effect the gastro intestinal tract volume, length and weight Fayoumi chicks. Also Gleaves and Styavan (1971) found that the dietary volume does not effect the weight of the digestive parts in chickens. While, Lenkeit (1934) and Daader (1972) found that the bulky ration increased gizzard weight. Also Daader (1972) found that, the bulky ration increased the length and weight of the whole digestive tract and separate parts of digestive tract (esophagus, crop, dudenum and caeca) in chicks.

TABLE 1. **Absolute and relative physiological volume of crop, gizzard, doudenum jejunum and ileum and caeca of chickens and turkeys of different treatments.**

Segments	The treatment									
	Mean					Relative volume				
	1	2	3	4	5	1	2	3	4	5
chickens crop ± S.E	43.3 ±3.6	21.7 ±1.2	17.7 ±1.7	430 ±3.0	48.3 ±4.2	57.8 ±4.2	30.1 ±9.6	34.7 ±3.0	32.4 ±1.5	58.2 ±3.0
Gizzard ± S.E	11.0 ±0.7	12.0 ±0.0	10.0 ±1.7	10.7 ±2.1	12.3 ±1.5	14.7 ±0.2	16.7 ±2.9	19.6 ±1.0	13.0 ±1.5	16.0 ±2.6
Duodenum ± S.E	4.7 ±0.7	7.0 ±0.3	3.3 ±0.5	6.3 ±0.8	4.7 ±1.0	6.2 ±1.8	9.5 ±1.5	6.5 ±2.0	7.7 ±1.1	6.9 ±0.4
Jejunum & ilum ± S.E	12.0 ±1.5	30.3 ±2.7	16.7 ±2.3	18.3 ±1.8	12.3 ±1.8	16.0 ±2.6	42.1 ±4.6	32.7 ±3.8	22.4 ±1.1	16.3 ±2.6
Caeca ± S.E	4.0 ±0.6	1.0 ±0.0	3.3 ±0.5	3.7 ±0.9	2.0 ±0.3	5.3 ±1.0	1.4 ±0.5	6.5 ±1.7	4.5 ±1.8	2.6 ±1.0
Turkeys Crop ± S.E	96.0 ±81	63.0 ±5.2	43.3 ±5.7			49.6 ±3.2	47.4 ±3.0	34.4 ±3.8		
Gizzard ± S.E	34.0 ±3.0	24.2 ±1.6	30.7 ±1.3			13.3 ±2.2	19.7 ±2.2	25.3 ±2.7		
Duodenum ± S.E	13.3 ±2.3	16.0 ±1.7	13.7 ±2.2			77.2 ±1.1	12.3 ±2.2	10.8 ±1.8		
Jejunum & ilum ± S.E	42.3 ±3.6	19.3 ±2.1	28.7 ±2.2			20.8 ±1.2	12.5 ±1.5	20.7 ±1.1		
Caeca ± S.E	18.3 ±1.9	10.7 ±1.6	10.0 ±1.4			9.0 ±1.3	8.2 ±1.5	8.7 ±1.0		

TABLE 2. Absolute and relative length of esophagus, proventriculus, duodenum, jejunum and ilum, caeca and rectum of chickens and Turkeys of different treatments.

Segments	Treatment									
	Mean					Relative volume				
	1	2	3	4	5	1	2	3	4	5
Chickens										
Esophagus	20.0	19.7	15.5	22.0	15.0	10.8	99.4	9.1	11.1	11.0
± S.E	±2.7	±2.0	±1.3	±2.1	±2.3	±1.3	±0.8	±1.0	±1.3	±1.3
Proventriculus	3.6	4.4	3.7	3.9	3.7	1.8	2.8	2.2	2.0	1.9
± S.E	±0.9	±1.5	±1.1	±1.1	±1.0	±0.9	±0.9	±0.3	±0.8	±0.5
Duodenum	30.3	30.8	27.7	30.3	32.0	15.7	17.9	16.1	15.7	15.8
± S.E	±2.4	±3.8	±2.8	±2.6	±3.8	±1.6	±1.9	±2.0	±2.1	±1.8
Jejunum & ilum	129.7	121.0	118.0	129.7	137.7	66.1	65.3	68.5	67.1	67.5
± S.E	±4.6	±6.4	±4.4	±4.9	±5.2	±2.8	±3.1	±4.6	±4.0	±6.4
Caeca	15.6	14.0	12.8	15.7	15.8	8.4	8.1	7.3	9.8	8.1
± S.E	±1.6	±1.3	±2.6	±3.0	±2.8	±2.0	±1.5	±1.6	±2.9	±2.2
Rectum	9.3	8.8	7.3	8.5	9.9	5.5	4.6	4.3	4.2	5.7
± S.E	±2.7	±2.5	±1.9	±1.4	±2.1	±1.6	±1.2	±1.3	±1.8	±1.9
Turkeys										
Esophagus	29.7	35.3	36.3			11.5	13.6	11.7		
± S.E	±1.6	±3.2	±4.1			±2.1	±3.5	±1.0		
Proventriculus	5.5	5.0	—4.8			2.3	1.6	1.5		
± S.E	±1.0	±1.3	±1.2			±0.9	±0.9	±0.7		
Duodenum	47.7	47.7	47.7			18.3	18.6	18.4		
± S.E	±5.4	±4.7	±4.9			±2.1	±2.0	±2.6		
Jejunum & ilum	159.7	155.3	161.3			60.9	60.1	64.2		
± S.E	±8.2	±8.9	±8.0			±5.8	±4.8	±6.5		
Caeca	31.0	28.7	27.3			12.9	11.2	10.5		
± S.E	±1.2	±1.1	±2.4			±1.5	±2.1	±1.4		
Rectum	15.7	16.0	15.0			56.0	16.0	5.1		
± S.E	±1.9	±1.7	±1.4			±1.6	±1.4	±1.1		

TABLE 4. Absolute and relative of weight of different digestive segments and parts of chickens of different treatments.

	Treatment														
	Mean (g)					Rel. wt. to body wt.					Rel. wt. to empty dig.tr. wt.				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Esophagus	5.53	6.93	4.47	6.00	5.51	0.43	0.56	0.30	0.46	0.41	5.58	7.04	6.20	6.03	4.99
× S.E	±0.86	±0.93	±1.25	±1.76	±1.31	±0.03	±0.12	±0.09	±0.12	±0.08	±1.31	±2.05	±1.67	±1.04	±0.98
Crop	6.50	7.20	6.47	7.73	6.63	0.51	0.58	0.43	0.55	0.51	6.59	7.37	6.39	7.86	6.86
	±1.53	±1.68	±1.98	±2.04	±1.09	±0.05	±0.15	±0.09	±0.08	±0.09	±0.23	±1.56	±1.57	±2.56	±1.56
Proventriculus	5.33	5.13	4.33	4.53	5.60	0.42	0.41	0.29	0.32	0.42	5.39	4.24	4.87	4.25	5.77
× S.E	±0.99	±1.05	±1.81	±1.01	±1.12	±0.09	±0.11	±0.05	±0.03	±0.02	±1.23	±1.35	±1.51	±0.99	±1.01
Gizzard	28.80	31.67	29.53	29.87	28.60	2.27	2.52	2.44	2.13	2.19	29.36	31.90	33.84	31.02	25.73
× S.E	±3.39	±3.87	±3.11	±2.58	±2.76	±0.67	±1.03	±0.76	±0.89	±1.01	±4.32	±2.56	±4.53	±3.67	±4.97
Dudoenum	9.40	9.60	8.47	7.87	11.86	0.73	0.77	0.56	0.56	0.81	9.41	9.69	9.33	7.61	10.73
× S.E	±2.57	±2.68	±1.78	±1.92	±1.99	±0.08	±0.09	±0.10	±0.08	±0.10	±1.25	±1.67	±1.78	±1.68	±2.68
Jejunum & ileum	34.20	29.73	24.33	31.80	39.13	2.67	2.37	1.58	2.24	2.90	33.45	29.66	28.30	31.65	35.34
× S.E	±3.87	±3.78	±2.93	±4.11	±4.03	±0.38	±0.59	±0.68	±0.78	±0.92	±2.86	±2.96	±3.18	±4.28	±4.67
Caeca	6.13	5.80	5.07	6.33	5.53	0.48	0.46	0.34	0.55	0.41	6.12	5.14	5.76	6.35	4.99
× S.E	±1.67	±1.43	±1.19	±2.36	±3.87	±0.11	±0.09	±0.10	±0.09	±0.11	±1.36	±1.57	±1.32	±1.57	±1.11
Rectum	4.20	4.73	4.87	5.40	6.73	0.33	0.38	0.36	0.39	0.50	0.04	5.00	5.99	5.43	5.68
× S.E	±1.01	±0.99	±1.11	±1.23	±1.67	±0.03	±0.05	±0.06	±0.04	±0.11	±1.0	±1.02	±1.13	±1.36	±1.15
Liver	34.80	35.00	34.33	31.33	33.73	2.73	2.79	2.26	2.24	2.51					
× S.E	±2.78	±2.13	±3.33	±2.76	±2.63	±0.87	±0.76	±0.39	±0.45	±0.99					
Pancreas	3.00	2.77	2.93	2.20	2.67	0.23	0.22	0.19	0.18	0.19					
× S.E	±0.87	±0.91	±0.83	±0.66	±0.71	±0.03	±0.04	±0.11	±0.09	±0.05					

1 = Control 2 = Plant protein source 3 = Animal protein source.
4= High fiber level. 5 = Low fiber level.

TABLE 5. Absolute and relative weight of different digestive segments and parts of turkeys of different treatments.

Segments	Treatment								
	Mean (g)			Rel.wt. to body wt.			Rel. wt to empty dig. tract wt.		
	1	2	3	1	2	3	1	2	3
Esophagus	15.00	14.33	16.67	0.43	0.42	0.45	5.29	5.18	6.36
±S.E	±1.33	±1.24	±2.01	±0.04	±0.04	±0.03	±1.21	±1.76	±1.33
Crop	24.67	23.33	23.33	0.72	0.68	0.63	8.68	8.65	8.51
±S.E	±2.11	±2.03	±2.71	±0.11	±0.09	±0.08	±1.51	±1.67	±2.33
Proventriculus	11.33	11.33	11.67	0.33	0.36	0.31	3.97	4.84	4.39
±S.E	±1.67	±1.44	±1.54	±0.50	±0.05	±0.03	±0.77	±1.12	±1.35
Gizzard	101.33	92.33	94.67	2.96	2.67	2.51	±35.59	±34.63	±35.43
±S.E	±7.43	±8.11	±7.55	±0.76	±0.53	±1.00	±3.21	±3.22	±3.51
Duodenum	32.67	28.00	29.00	0.95	0.81	0.77	11.45	10.54	10.91
±S.E	±2.33	±2.91	±2.67	±0.13	±0.21	±0.09	±1.11	±1.31	11.53
Jejunum & ileum	60.33	61.67	55.67	11.76	1.79	1.49	21.18	24.14	20.96
±S.E	±3.11	±3.25	±4.09	±0.36	±0.53	±0.54	±2.11	±2.31	±1.67
Caeca	22.33	22.00	21.00	0.67	0.664	0.56	7.84	7.21	7.80
±S.E	±2.51	±2.13	±1.76	±0.13	±0.14	±0.35	±1.76	±1.35	±1.56
Rectum	17.00	13.67	14.00	0.50	0.40	0.38	5.99	5.41	5.27
±S.E	±2.11	±2.00	±1.34	±0.09	±0.10	±0.07	±1.00	±1.11	±1.61
Liver	67.00	77.67	68.33	1.95	1.85	2.14			
±S.E	±5.17	±5.67	±5.35	±0.98	±0.78	±1.11			
Pancreas	7.30	7.67	9.33	0.21	0.22	0.25			
±	±2.00	±1.67	±1.53	±0.03	±0.11	±0.14			

1 = Control, 2 = Plant protein source, 3 = Animal protein source.

TABLE 3. Absolute and relative weight of different digestive segments and parts of chickens of different treatment.

	Treatment														
	Mean (g)					Rel.wt. tod body wt.					Rel.wt.to empty dig. tr.wt.				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Esophagus	5.53	6.93	4.47	6.00	5.51	0.43	0.56	0.30	0.46	0.41	5.58	7.04	5.20	6.03	4.99
± S.E	±0.86	±0.93	±1.25	±1.76	±1.31	±0.03	±0.12	±0.09	±0.12	±0.08	±1.31	±2.05	±1.67	±1.04	±0.98
Crop	6.50	7.20	6.47	7.73	6.63	0.51	0.58	0.43	0.55	0.51	6.59	7.37	6.39	7.86	6.86
± S.E	±1.53	±1.68	±1.98	±2.04	±1.09	±0.05	±0.15	±0.09	±0.08	±0.09	±1.23	±1.56	±1.57	±2.56	±1.56
Proventriculus	5.33	5.13	4.33	4.53	5.60	0.42	0.41	0.29	0.32	0.42	5.39	4.24	4.87	4.25	5.77
± S.E	±0.99	±1.05	±1.81	±1.01	±1.12	±0.09	±0.11	±0.05	±0.03	±0.02	±1.23	±1.35	±1.51	±0.99	±1.01
Gizzard	28.80	31.67	29.53	29.87	28.60	2.27	2.52	2.44	2.13	2.19	29.36	31.90	33.84	31.02	25.73
± S.E	±3.93	±3.87	±3.11	±2.58	±2.76	±0.67	±1.03	±0.76	±0.89	±1.01	±4.32	±2.56	±4.53	±3.67	±4.97
Dudoenum	9.40	9.60	8.47	7.87	11.86	0.73	0.77	0.56	0.56	0.81	9.41	9.69	9.33	7.61	10.73
± S.E	±2.57	2.68	±1.78	±1.92	±1.99	±0.08	±0.09	±0.09	±0.08	±0.10	±1.25	±1.67	±1.78	±1.68	±2.68
Jejunum & ileum	34.20	29.73	24.33	31.80	39.13	2.67	2.37	1.58	2.24	2.90	33.45	29.66	28.30	31.65	35.34
± S.E	±3.87	±3.78	±2.93	±4.11	±4.03	±0.38	±0.59	±0.68	±0.78	±0.92	±2.86	±2.96	±3.18	±4.28	±4.67
Caeca	6.13	5.80	5.07	6.33	5.53	0.48	0.46	0.34	0.55	0.41	6.12	5.14	5.76	6.35	4.99
± S.E	±1.67	±1.34	±1.19	±2.36	±3.87	±0.11	±0.09	±0.10	±0.09	±0.11	±1.36	±1.57	±1.32	±1.57	±1.11
Rectum	4.20	4.73	4.87	5.40	6.73	0.33	0.38	0.36	0.39	0.50	4.04	5.00	5.99	5.43	5.68
± S.E	±1.01	±0.99	±1.11	±1.23	±1.67	±0.03	±0.05	±0.06	±0.04	±0.11	±1.01	±1.02	±1.13	±1.36	±1.15
Liver	34.80	35.00	34.33	31.33	33.73	2.73	2.79	2.26	2.24	2.51					
± S.E	±2.78	±2.13	±3.33	±2.76	±2.63	±0.87	±0.76	±0.29	±0.45	±0.99					
Pancreas	3.00	2.77	2.93	2.20	2.67	0.23	0.22	0.19	0.18	0.19					
± S.E	±0.87	±0.91	±0.83	±0.66	±0.71	+0.03	±0.04	±0.11	±0.09	±p.05					

1 = Control. 2 = Plant protein source. 3 = Animal protein source.
4 = High fiber level. 5 = Low fiber level.

Therefore, we can conclud that the ration of plant and animal protein sources being of the same level of crude protein had no effect on all the measurements of the digestive system. No clear effect of the bulky or compacted rations on the different values of esophagus, crop, proventriculus, gizzard and rectum was observed. Small intestine actual and relative weight and length decreased and its volume increased by using bulky ration while the contrary observed in the small intesting when compacted ration was used. Also the bulky ration increased all the measurements of caeca as the level of fibers was high.

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تأثير مكونات العليقة على التغيرات المورفولوجية للجهاز الهضمى بالدجاج والرومى

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استخدم فى هذه التجربة «١٥» ديك فيومى ربيت من أغسطس حتى نوفمبر وكذلك استخدم «٩» ديوك رومى ربيت من يوليو حتى أكتوبر وقد بدأت التجربة وعمر الطيور ٩٠ يوما وانتهت عندما وصل العمر الى ١٨٠ يوما ٠

بالنسبة للدجاج درس تأثير مصدر البروتين ونسبة الالياف بالعليقة على المقاييس المرفولوجية للجهاز الهضمى لذلك قسمت الطيور الى خمسة مجاميع كانت المجموعة الأولى هى مجموعة المقارنة أما المجموعة الثانية والثالثة فان العليقة يكون بها نفس نسبة البروتين الخام ولكن احداهما مصدر البروتين فيها نباتى والاخرى مصدر البروتين فيها حيوانى أما المجموعة الرابعة والخامسة فيها يختلفان فى نسبة الالياف حيث احداهما تحتوى ٤٪ والاخرى ١٢٪ أما بالنسبة للرومى فقد درس تأثير مصدر البروتين على المقاييس المرفولوجية للجهاز الهضمى لذلك فقد قسمت الى ثلاثة مجاميع الأولى تعتبر مجموعة مقارنة أما المجموعة الثانية والثالثة فهما يحتويان على نفس نسبة البروتين الخام ولكن أحداهما مصدر البروتين فيها نباتى والاخرى مصدر البروتين فيها حيوانى ٠

وكانت أهم النتائج المتحصل عليها هى :

١ ـ لا يوجد تأثير للعلائق التى تختلف فى مصدر البروتين على كل المقاييس المرفولوجية للجهاز الهضمى ٠

٢ ـ لا يوجد تأثير واضح للعلائق المالئة (نسبة الالياف مرتفعة) وايضا العلائق المركزة (نسبة الالياف منخفضة) على كل المقاييس المورفولوجية للمرىء ـ الحوصلة المعدة ـ الغدية ـ القونصة ـ المستقيم ٠

٣ ـ بالنسبة للامعاء الدقيقة نجد أن العلائق المالئة سببت نقص فى الطول الوزن المطلق والنسبى ولكنها سببت زيادة فى الحجم المطلق والنسبى ، ولكن حدث عكس ذلك بالنسبة للعلائق المركزة ٠

كذلك لوحظ أن العلائق المالئة سببت زيادة فى كل المقاييس المورفولوجية الخاصة بالاعور وذلك لاحتوائها على نسبة عالية من الالياف ٠