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# Evaluation of fenugreek seeds meal as a feed ingredient on the productive and physiological performance of broiler chickens

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**Abstract**

This study was conducted to evaluate the impact of Fenugreek seed meal (FGSM) on Physiological and histological hemostasis of broiler chickens. A total of 144 unsexed, one day old chicks one day old (Ross) were used in the present study. They were divided randomly into four groups, each with 36 chicks, in four duplicates of nine chicks. The initial group (control group) received a conventional diet. while the second, third, and fourth groups (T1, T2, and T3) were fed a diet with 5%, 10%, and 20% Fenugreek seed meal, respectively. The duration of the experiment was five weeks. The main results demonstrated significant variations in live body weight (LBW), body weight gain (BWG), feed intake (FI), and feed conversion ratio (FCR) among the treatments at five weeks of age. Also, the total digestive tract length (cm) showed significant differences due to the applied treatments. while cecum length (cm) was not significantly affected. In addition, carcass characteristics, were significantly affected by different dietary treatments, except heart, bursa, and spleen. Also, none of the blood parameters showed significant changes except cholesterol. Also, intestinal enzymes activity was not significantly affected. Using FGSM (T1, T2, and T3) in broiler diets decreased the total bacterial count, while also increase the levels of clostridia and coliforms in comparison with the control group. Conversely, there is a decrease in lactic acid bacteria compared to the birds provided with the standard diets. while the histological analysis indicated a negative effect with the increased inclusion of (FGSM) in poultry feed.

**Keywords:** Fenugreek seed meal; Broiler; productive and Physiological performance; gut health and carcass characteristics.

## Introduction

Broiler chicken meat is widely favored by people due to its premium protein content, low lipid composition, and favorable lipid profile. With a rich nutrient profile and relatively low-calorie count, chicken meat is highly valued in human diets. The breast and thigh muscles, in particular, are appreciated for their nutritional density. Moreover, Chicken meat contains minimal fat and cholesterol. levels and contains a higher than usual concentration of polyunsaturated fatty acids (PUFA), which are recognized by Buyers for their Beneficial impact on health. Broiler chicken meat is also esteemed for its abundance of protein, minerals, and vitamins, further enhancing its nutritional appeal. Its excellent flavor, high dietetic value, and easy digestibility contribute to its popularity among consumers, as noted by **[1].**

Poultry nutrition Is crucial in the poultry industry, as a source of feed expenses account for 70 to 80% of total farm expenditures **[2],** and the elevated cost of poultry feed is mainly attributed to the limited availability of essential components, such as soybean as well as fishmeal **[3].**

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Identifying substitutes to conventional animals and their feed sources is essential to tackle the challenge of expanding populations in certain states **[4].**

Since 2005, Plant-based protein options, with a focus on soybean meal (SBM), have been in limited supply for broiler chickens in the poultry sector. As a result, alternative sources of protein are anticipated to be incorporated at higher incorporation rates to ensure optimal production **[5].**

Fenugreek is a promising alternative in poultry production, offering various physiological benefits, including antibacterial, anticancer, anti-ulcer, antihelmintic, hypocholesterolemic, hypoglycemic, antioxidant, and anti-diabetic properties. It also positively affects Breakdown and uptake. Fenugreek is abundant in the levels of protein, fat, and total carbohydrates, and essential minerals including calcium, phosphorus, iron, zinc, and magnesium **[6].**

Fenugreek seed meal results from manually extracting fenugreek oil from fenugreek seeds. Therefore, the study aims to evaluate the feed stuff on various levels of fenugreek seed meal, as an alternative, feed stuff on broiler productivity, gut health, and carcass characteristics.

**Materials and methods**

The present experiment was conducted in the Department of Animal and Poultry Production, Faculty of Agriculture and Natural Resources, Aswan University, during the period from October to November 2023.

**Experimental design and birds**

A total of hundred and forty-four unsexed one day old (ROSS) broiler chicks that were used and divided into four groups at random distribution. There were 36 chicks in each treatment group in four replicates, with 9 chicks each. Three periodical diets were used, starter phase (0- 14 days), grower phase (15–28 days), and finisher phase (29–35 days). The experimental groups were as follow: control group fed basal diet and groups T1, T2and T3 fed diets with 5, 10 and 20% fenugreek seed meal, respectively. **Tables (1)** describe the composition and calculated analysis of experimental diets.

**Birds managements**

Feed was provided *ad libitum* in stainless steel feeders in the form of pellets for grower and finisher feed and mash for starter feed. Nipple drinkers that work automatically have access to fresh water at all times. Excreta were removed daily to ensure keeping all birds in the same environmental, sanitary, and managerial circumstances throughout the entire experimental period. Every bird received a drinking water-based Newcastle immunization. at the age of 7 days, against Gambaro at 14 days, and both at 18 and 28 days, against Lasota. All vaccines were obtained from the Egypt-based Veterinary Serum and Vaccine Research Institute (VSVRI) for animal health.

The current study was conducted from October to November 2023 at Aswan University's Faculty of Agriculture and Natural Resources, Department of Animal and Poultry Production.

**Measurements and procedures**

1. Productive performance: upon completion of every stage of the birds age, feed consumption (FC) in grams, live body weight (LBW) in grams, body weight gain (BWG) in grams were

observed, feed conversion ratio (FCR) in grams of feed per gram of gain, and mortality rate were calculated. European Productive Efficiency Factor and performance index were calculated as follow: The performance index (PI) = (final LBW [kg] / FCR) As stated by [7] and European productive factor of efficiency (EPEF) = (final LBW [kg] * survival rate %) / (FCR * rearing periods [days]) According to [8].

2. Carcass characteristics: After 35 days of age, four chicks from each group were chosen at random, immediately weighed, slaughtered. then eviscerated percentage of carcass and Fat in the abdomen, bursa, spleen, liver, and empty gizzard in addition to length of digestive tract parts (cm) were recorded.
3. Digestive enzyme activity (U/dl): At 35 day of age, individual intestinal continents were collected in dry, clean tubes from four chicks within each treatment, quantitative determination of amylase, lipase, trypsin, and chymotrypsin activities was determined according to [9].
4. Cecum microbiology: Four birds per treatment was randomly selected for digesta sampling in Cecum at the conclusion of each experiment, one sample from each group was collected to determine the total bacterial count, coliforms, and the count of lactic acid bacteria in the microbiological laboratory of the Faculty of Agriculture, Ain Shams University, the contents of the cecum were collected. A suspension of microbes from each sample dilution was plated using the pour plate technique [10] And allowed to incubate at 37ºC for 24 hours. The pathogens were identified by culturing on selective media and performing biochemical tests.
5. Small intestine (Ileum) histopathological examination.

   At autopsy, tissue samples obtained from the ileum were collected to examine histological changes related to the experimental treatments. Morphometric analysis of digital images from light microscopy was conducted using the Image software, as per the method of [11]
6. Blood Serum parameters: Blood samples were obtained from the slaughtered birds and collected in non-heparinized tubes. The samples underwent centrifugation at 3000 rpm for 15 minutes, and the serum collected was kept at −20°C until further analysis. Blood biochemical parameters were measured by calorimetry utilizing commercial diagnostic kits (manufactured by Spectrum Company, Egypt). The levels of total protein, albumin, cholesterol, triglycerides, and the activity of AST and ALT were recorded.
7. Statistical analysis: The linear model of SAS software was utilized to statistically examine the data using the analysis of variance (ANOVA) method. SAS USER'S GUIDE (1994), derived from the model that follows:

If $Y_{ij}$ is any observation, then $Y_{ij} = \mu + T_i + e_{ij}$. Where- $\mu$ is the overall` mean. $T_i$ is the treatment's effect` ($i = 1– 4$), while $e_{ij}$ is the random error. The mean values of each experimental group and the control group were analyzed, and the data were compared with Duncan's Multiple Range Test. [12].

**Table 1 The composition and calculated analysis of starter, grower, and finisher phases.**

| phases | Starter (0-14 days.) | | | | Grower (15-28 days.) | | | | Finisher (29-35 days.) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingredients % | Control | T1 | T2 | T3 | Control | T1 | T2 | T3 | Control | T1 | T2 | T3 |
| Yellow corn | 52.96 | 50.84 | 48.11 | 41.79 | 55.96 | 54.22 | 51.34 | 46.61 | 61.77 | 59.50 | 56.54 | 52.76 |
| Soybean meal (46%) | 33.00 | 33.40 | 33.00 | 34.00 | 32.10 | 31.00 | 31.00 | 29.50 | 28.00 | 28.00 | 28.00 | 24.00 |
| Corn gluten meal (60%) | 7.00 | 5.00 | 3.80 | 0.00 | 5.00 | 4.00 | 2.30 | 0.00 | 4.20 | 2.50 | 0.85 | 0.20 |
| Fenugreek seed meal | 0.00 | 5.00 | 10.00 | 20.00 | 0.00 | 5.00 | 10.00 | 20.00 | 0.00 | 5.00 | 10.00 | 20.00 |
| Soybean oil | 2.40 | 1.55 | 1.00 | 0.30 | 2.80 | 2.00 | 1.50 | 0.00 | 2.80 | 2.10 | 1.65 | 0.00 |
| Monocalcium phosphate | 2.50 | 1.64 | 1.60 | 1.45 | 2.18 | 1.45 | 1.40 | 1.23 | 1.75 | 1.10 | 1.10 | 1.00 |
| Limestone | 0.96 | 1.35 | 1.33 | 1.30 | 0.88 | 1.25 | 1.20 | 1.22 | 0.55 | 0.82 | 0.80 | 0.80 |
| HCl- Lysine | 0.28 | 0.30 | 0.21 | 0.18 | 0.21 | 0.20 | 0.27 | 0.34 | 0.12 | 0.13 | 0.16 | 0.28 |
| DL- Methionine | 0.30 | 0.32 | 0.35 | 0.38 | 0.27 | 0.28 | 0.39 | 0.50 | 0.21 | 0.25 | 0.30 | 0.36 |
| NaCl | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 |
| Premix* | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 |
| Total | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 |
| Price LE/(ton)*** | 22217.8 | 20535.3 | 19403.5 | 17215.8 | 21424.0 | 19856.9 | 18944.8 | 16688.4 | 20241.9 | 18786.2 | 17781.3 | 15568.2 |
| Calculated chemical analysis | | | | | | | | | | | | |
| Metabolizable energy (Kcal/kg) | 3017.48 | 3003.77 | 3002.75 | 3003.99 | 3050.29 | 3052.66 | 3053.33 | 3040.35 | 3105.01 | 3101.11 | 3100.16 | 3106.76 |
| Crude protein (%) | 23.07 | 23.06 | 23.05 | 23.02 | 21.57 | 21.50 | 21.53 | 21.56 | 19.54 | 19.53 | 19.52 | 19.53 |
| Crude fiber (%) | 2.53 | 2.85 | 3.13 | 3.73 | 2.53 | 2.80 | 3.09 | 3.63 | 2.46 | 2.76 | 3.04 | 3.52 |
| Calcium (%) | 0.965 | 0.969 | 0.968 | 0.963 | 0.871 | 0.887 | 0.874 | 0.876 | 0.651 | 0.647 | 0.655 | 0.655 |
| Available phosphorus (%) | 0.486 | 0.478 | 0.484 | 0.482 | 0.437 | 0.433 | 0.437 | 0.428 | 0.366 | 0.354 | 0.369 | 0.371 |
| Lysine (%) | 1.403 | 1.467 | 1.404 | 1.456 | 1.293 | 1.295 | 1.294 | 1.296 | 1.089 | 1.078 | 1.085 | 1.076 |
| Methionine %) | 0.666 | 0.689 | 0.727 | 0.764 | 0.608 | 0.626 | 0.678 | 0.741 | 0.521 | 0.535 | 0.558 | 0.579 |
| Methionine + cystine (%) | 1.088 | 1.072 | 1.081 | 1.088 | 0.990 | 0.990 | 0.995 | 0.998 | 0.870 | 0.859 | 0.860 | 0.857 |

The premix contains 15000000 I.U. Vit A and 3000000 I.U. VIT D in 50g portions for every 3 kg. VIT E, 3000 mg K3. VIT, 3000 mg VIT. B1, 8,000 mg. VIT B2, 4000 mg. Vit B6, 20 mg, pantothenic acid, 15000 mg, niacin, 60000 mg, folic acid, 1500 mg, biotin, 200000 mg, and VIT B6 VIT C 700 g of choline chloride, 80 g of manganese, 80 g of zinc, 60 g of iron, 10 g of copper oxide, 1 g of iodine, and 0.2 g of millennium; 3 kg of premix per ton of feed was the inclusion rate, with CaCo3 being used as a carrier up to 3 kg. ** The experimental diets were formulated according to Brazilian feed stuffs (2017). *** Data Cost 2023.

## Results and Discussion

### *Productive performance*

**Table (2)** showed that, diets containing fenugreek seed meal FGSM (T1, T2, and T3) had a noticeable negative effect on live body weight (LBW), body weight gain (BWG), feed conversion ratio (FCR) and feed consumption (FC). In addition, Throughout the period (0–35 days), notable differences were observed between the treatments compared to the control diet. These results agree with **[13]** who reported that there was a negative effect on feed utilization, indicating that fenugreek seeds might not always be beneficial in enhancing feed conversion efficiency**. [14]** demonstrated that adding Fenugreek seed powder into the broiler diet led to a reduction in appetite, which in turn decreased growth performance.

On the other hand, **[15]** revealed that there was no significant influence observed on feed intake (FI) when feeding poultry on fenugreek in comparison with the baseline diet. **[16]** indicated that including fenugreek seeds in the diet led to a rise in the body weight of broiler chickens.

**Table (2): Impact of dietary treatment on productive performance of broiler chicks.**

| Items | Treatments | | | | SEM | Sig. |
|---|---|---|---|---|---|---|
| | Control | T1 | T2 | T3 | | |
| **live Body weight (g)** | | | | | | |
| At 35 days | 1996.39$^{a}$ | 1330.77$^{b}$ | 1084.17$^{c}$ | 914.17$^{d}$ | 107.34 | * |
| **Body weight gain (g)** | | | | | | |
| 0-35 days | 1950.14$^{a}$ | 1284.17$^{b}$ | 1039.97$^{c}$ | 869.67$^{d}$ | 107.25 | * |
| **Feed consumption (g)** | | | | | | |
| 0-35 days | 2921.25$^{a}$ | 2433.75$^{b}$ | 2346.25$^{b}$ | 1931.25$^{c}$ | 91.89 | * |
| **Feed conversion ratio (g feed/g gain)** | | | | | | |
| 0-35 days | 1.50$^{c}$ | 1.90$^{b}$ | 2.27$^{a}$ | 2.23$^{a}$ | 0.09 | * |

a, b and c mean in the same raw with different superscripts are significantly ($p<0.05$) different, SEM: standard error of means. Control: basal diets, T1: diet with 5% FGSM, T2: diet with 10% FGSM, T3: diet with 20% FGSM.

***Carcass characteristics***

**Table (3)** summarized the average values of carcass characteristics (carcass, liver, gizzard, heart, digestive tract without gizzard, abdominal fat, bursa, and spleen%). All parameters were a significantly affected by different dietary treatments except heart, bursa, and spleen. The results showed an increase in gizzard, liver and digestive tract.in birds fed FGSM (T1, T2, and T3) at all levels in comparison with the control group. While the results indicated the proportion of both abdominal fat and carcass decreases with increasing levels of FGSM in broiler diets. These results agree with **[17]** who reported that no significant differences absolute organ weights of liver, heart, spleen and bursa of Fabricius. On the other hand, when chicks were fed at 1% and 2% levels of fenugreek seed powder, a significant increase in dressing percentage was observed, and the weights of the control group, as well as the weights of the gizzard, decreased significantly. **[18]**

**Table 3: Carcass traits (%) of broiler chicks at market age as affected by different treatments.**

| Items | Treatments | | | | SEM | Sig. |
|---|---|---|---|---|---|---|
| | Control | T1 | T2 | T3 | | |
| **Carcass%** | 70.45$^{a}$ | 70.24$^{ab}$ | 69.49$^{bc}$ | 66.92$^{c}$ | 0.68 | * |
| **Liver%** | 1.62$^{b}$ | 1.96$^{ab}$ | 2.16$^{a}$ | 2.31$^{a}$ | 0.08 | * |
| **Gizzard%** | 1.27$^{c}$ | 1.53$^{bc}$ | 1.77$^{ab}$ | 1.90$^{a}$ | 0.09 | * |
| **Heart%** | 0.50 | 0.52 | 0.50 | 0.55 | 0.02 | N. S |
| **Abdominal fat%** | 1.41$^{a}$ | 0.78$^{b}$ | 0.28$^{c}$ | 0.03$^{c}$ | 0.15 | * |
| **Digestive tract%** | 5.01$^{b}$ | 8.62$^{ab}$ | 6.77$^{ab}$ | 9.02$^{a}$ | 0.67 | * |
| **Bursa of fabricus%** | 0.07 | 0.07 | 0.08 | 0.08 | 0.01 | N. S |
| **Spleen%** | 0.09 | 0.12 | 0.13 | 0.09 | 0.01 | N. S |

a,b,c and d means in the same raw with different superscripts are significantly ($p<0.05$) different, N.S.: non-significant. SEM: standard error of means. Control: basal diet, T1: diet with 5% FGSM (Fenugreek seed meal), T2: diet with 10% FGSM, T3: diet with 20% FGSM.

***Digestive tract length (cm)***

Data shown in **Table (4)** demonstrated that, the total length of the digestive tract and small intestines (cm) were significantly affected by dietary treatments; While cecum length (cm) was not significantly affected (T1, T2, and T3) compared to birds in control groups (basal diets) and the

corresponding values for the total small intestine varied among the birds were fed on FGSM (T1, T2, and T3) by 163.38,159.60 and 148.38 cm, respectively compared to control group (159.25 cm), In the same order for total digestive tracts, values ranged between 191.88,172.43 and 161.50 cm, respectively, compared to control group (192.75 cm).

These results are in contrast with **[14]** who reported that the weights of digestive system parts were similar among groups fed with fenugreek seed powder between the control and treatment groups. The beneficial effect on intestinal morphology, resulting in increased contact between digesta and the mucosal epithelium, this enhanced contact may facilitate better digestion and absorption of nutrients **[19]**

**Table (4): Impact of dietary treatments on the lengths of digestive tract parts (cm) in broiler chicks.**

| Items | Treatments | | | | SEM | Sig. |
|---|---|---|---|---|---|---|
| | **Control** | **T1** | **T2** | **T3** | | |
| Total digestive tract | 192.75$^{b}$ | 191.88$^{a}$ | 172.43$^{b}$ | 161.50$^{b}$ | 4.34 | * |
| Small intestine | 169.25$^{c}$ | 163.38$^{ab}$ | 159.60$^{ab}$ | 148.38$^{b}$ | 4.29 | * |
| Cecum length | 15.25 | 14.12 | 14.95 | 15.60 | 0.45 | N. S |

a,b,c and d means in the same raw with different superscripts are significantly ($p<0.05$) different, N.S.: non-significant. SEM: standard error of means. Control: basal diet, T1: diet with 5% FGSM (Fenugreek seed meal), T2: diet with 10% FGSM, T3: diet with 20% FGSM.

***Digestive enzymes activity (U/dl)***

The data presented in **Table (5)** showed the effects of using different levels of (FGSM) compared with a control diet on amylase, lipase, trypsin, and chymotrypsin.

Data in **Table (5)** Found that activity of amylase, trypsin, and lipase (U/dl) did not significant differ in birds fed diets containing FGSM compared with a control diet, while chymotrypsin were significantly differed in birds fed diets containing FGSM compared with a control diet, also, there is a numerical decrease in activity of chymotrypsin (T1, T2, and T3) began at 33.29, 33.76, and 33.83 U/dl compared to control group at 42.83 U/dl.

**Table (5): Impact of dietary treatments on digestive evzyme activities of broiler chicks.**

| Items | Treatments | | | | SEM | Sig. |
|---|---|---|---|---|---|---|
| | **Control** | **T1** | **T2** | **T3** | | |
| **intestinal enzymes activity** | | | | | | |
| **Amylase** | 3.84 | 4.72 | 4.79 | 4.48 | 0.20 | N. S |
| **Lipase** | 10.79 | 9.91 | 9.53 | 9.06 | 0.30 | N. S |
| **Trypsin** | 32.88 | 32.58 | 33.45 | 33.62 | 1.11 | N. S |
| **Chymotrypsin** | 42.83$^{a}$ | 33.29$^{b}$ | 33.76$^{b}$ | 33.83$^{b}$ | 2.19 | * |

N.S.: non-significant. SEM: standard error of means. Control: basal diet, T1: diet with 5% FGSM (Fenugreek seed meal), T2: diet with 10% FGSM, T3: diet with 20% FGSM.

***Cecum microbiota (CFU/G) of broiler chicks***

The obtained results in **Table (6)** showed that using FGSM (T1, T2, and T3) in broiler diets decreased the total counts bacteria also decrease the levels of clostridia and coliforms compared to the control group. On the other hand, there is an increase in lactic acid bacteria compared to the birds fed control diets.

**Table (6): Impact of dietary treatments on cecum microbiota of broiler chicks.**

| Items | Treatments | | | |
|---|---|---|---|---|
| | **Control** | **T1** | **T2** | **T3** |
| Cecum microbiology (CFU/G) | | | | |
| **Total counts * $10^5$** | 450 | 358 | 315 | 298 |
| **Clostridium * $10^1$** | 3 | 100 | 130 | 100 |
| **Coli forms *$10^3$** | 5 | 17 | 49 | 40 |
| **Lactic acid bacteria * $10^4$** | 120 | 109 | 99 | 52 |

Control: basal diet, T1: diet with 5% FGSM (Fenugreek seed meal), T2: diet with 10% FGSM, T3: d with 20% FGSM.

***Blood parameters***

The results shown in **Table (7)** indicated that there were no significant differences recorded in all blood parameters were not significantly affected except cholesterol. The present study revealed a significant impact of FGSM substitution in broiler diets up to 35 days of age, leading to a reduction in plasma cholesterol levels. This suggests that FGSM supplementation could influence lipid metabolism in broilers and the corresponding values for total cholesterol ranged between birds were fed on FGSM (T1, T2, and T3) by 59.14, 56.69 and 55.76, respectively compared to control group (88.28) mg/dl.

**Table (7):** Impact of dietary treatments on blood parameters of broiler chicks.

| **Items** | **Treatments** | | | | **SEM** | **Sig.** |
|---|---|---|---|---|---|---|
| | **Control** | **T1** | **T2** | **T3** | | |
| **Blood parameter** | | | | | | |
| **Total protein (g/dl)** | 4.68 | 4.52 | 4.25 | 3.96 | 0.22 | N. S |
| **Albumin (g/dl)** | 2.07 | 2.19 | 1.99 | 1.90 | 0.10 | N. S |
| **Globulin (g/dl)** | 2.61 | 2.33 | 2.26 | 2.06 | 0.12 | N. S |
| **Albumin \ Globulin (ratio)** | 0.80 | 0.95 | 0.88 | 0.92 | 0.03 | N. S |
| **AST (U/L)** | 59.07 | 44.50 | 40.07 | 35.07 | 3.88 | N. S |
| **ALT (U/L)** | 11.40 | 11.49 | 11.54 | 9.49 | 0.37 | N. S |
| **Total cholesterol (mg/dl)** | $88.28^a$ | $59.14^b$ | $56.69^b$ | $55.76^b$ | 4.29 | * |
| **Triglycerides (mg/dl)** | 46.02 | 41.71 | 36.25 | 35.65 | 1.71 | N. S |

a, b, c, and d represent means in the same row with different superscripts are significantly ($p < 0.05$) different. N.S.: non-significant. SEM: standard error of means. Control: basal diet. T1: diet with 5% FGSM (Fenugreek seed meal), T2: diet with 10% FGSM, T3: diet with 20% FGSM.

These results agree with **[18]** who indicated that the reduction in serum cholesterol levels could be attributed to the presence of saponins and resins in fenugreek seeds, which may inhibit bile acid and cholesterol absorption in the intestine. Additionally, the reduction in serum cholesterol levels may be due to the presence of saponins, resins, hemicelluloses, mucilage, tannins, and pectin in fenugreek seeds. These compounds are known to inhibit bile acid reabsorption, reduce LDL-cholesterol levels, and prevent intestinal cholesterol absorption, thereby contributing to lower blood cholesterol levels. **[16]**

***Histological observatios***

Histological examination of ileum sections from chicks of different treatments are illustrated in Fig. 1: A, B, C, and D.

It is clear from these sections that the villi shape and size was significantly affected by treatments. Results showed also that birds from the control group had an obvious increase in villus height and crypts depth as compared to those of treatment groups. The best results were recorded for the R3 and R6 treatment groups followed by R4 and R5, respectively. Histological sections also showed a shortening of the villi in the T3 and T4 treated chicks compared with T1 and the control chicks, respectively. It appears also that supplementation of FGSM caused negative effects on ileum histology, in terms of villi height and diameter with many well-developed crypts in the sub-mucosa layer. These observations were observed in all treatment groups, which may reflect a deleterious effect on the morphology of the ileum villi. It is assumed that the increased VH is paralleled by an increase in digestive enzymes activity and the absorptive function of the small intestine segments due to increased absorption surface area. In this respect **[20] and [21]** suggested that the greater VH is an indicator that the function of the intestinal villi is activated.

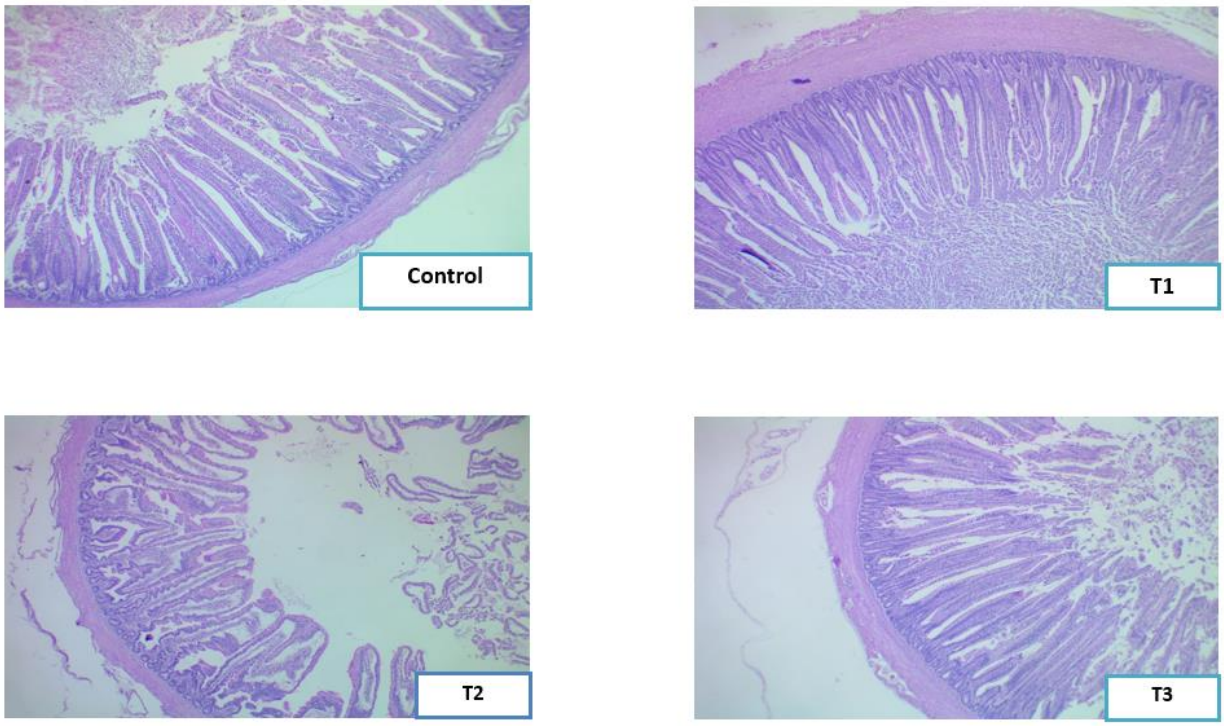


**Figure (1): Transverse section of the ileum from chicks subjected to different treatments.**

Control: basal diets, T1: with 5% FGSM (Fenugreek seed meal), T2: diet with 10% FGSM, T3: diet with 20% FGSM.

It is also well known that the crypts of Lieberkühn had the ability to secrete fluids containing different vital substances essential for enhancing the internal micro-environment of the intestine segments **[22]** These fluids are rapidly absorbed from the villi lumens, making a circulation from crypts to villi which results in a watery vehicle supply for improving absorption of nutrients, elaboration and production of antibodies and lymphocytes along with an increase in goblet cells which secrets substances responsible for reducing ph of the intestinal segment. Similarly, **[23] and [24]** showed that shortening of villi decreases the surface area for nutrient absorption, while a large crypt depth can lead to poor nutrient absorption and lower performance of broilers. This was the case for the performance of the FGSM groups in the present study, depending on the level of FGSM supplementation.

In the present study, increased villus height of the ileum in broilers fed, a traditional diet suggests an increase in the surface area that would be capable of greater absorption of the available nutrients, which is supported by the enhancement of growth performance.

**Conclusion:**

It is concluded that it could not use Fenugreek seed meal (FGSM) at a level of 20%, 10%, or 5% due to their negative effect on Physiological performance as alternative sources of protein in broiler diets with negative effects on chick viability.

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# تقييم كسب بذور الحلبة كمادة علف على الأداء الانتاجى والفسيولوجي لدجاج التسمين

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**الملخص**

أُجريت الدراسة التجريبية خلال شهرى أكتوبر ونوفمبر بكلية الزراعة والموارد الطبيعية – جامعة أسوان لتقييم المستويات المختلفة من كسب بذور الحلبة كمصدر للبروتين في علائق دجاج التسمين حيث تم استخدام 144 كتكوت عمر يوم وتوزيعهم عشوائياً في 4 معاملات وكانت كل معاملة مقسمة لأربع تكرارت وكل تكرار احتوى على 9 كتاكيت.

**وكانت العلاجات التجريبية الأربعة على النحو التالى :**

1- طيور غُذيت علي عليقة الكنترول بدون اضافات (معاملة الكنترول) .
2- طيور غُذيت علي عليقة تحتوي علي 5% كسب بذور الحلبة (المعاملة الأولى).
3- طيور غُذيت علي عليقة تحتوي علي 10 % كسب بذور الحلبة (المعاملة الثانية).
4- طيور غُذيت علي عليقة تحتوي علي 20% كسب بذور الحلبة (المعاملة الثالثة).

وقد أظهرت النتائج ما يلى :

- .بالنسبة لمعدلات الوزن الحي ووزن الجسم المكتسب ومعدلات استهلاك العلف: أدت جميع المعاملات المستخدمة الى انخفاض معنوى فى كل هذة المعدلات مقارنة بمعاملة ( الكنترول) كما أدت الى تدهور فى معامل التحويل الغذائي مقارنة بمعاملة (الكنترول).

- كما تأثرت بعض صفات الذبيحة معنويا لجميع المعاملات مقارنة بمعاملة (الكنترول) لكلا من الكبد والقانصة ودهون البطن واخيرا الجهاز الهضمى بينما لم يتأثر البعض الاخر لصفات الذبيحة للمعاملات الغذائية مقارنة بمعاملة الكنترول للقلب و البرسا والطحال مع وجود تدهور واضح فى أوزان الذبيحة لجميع المعاملات الغذائية مقارنة بمعاملة (الكنترول).

- أما بالنسبة لإجمالى القناه الهضمية والأمعاء الدقيقة لوحظ انخفاض معنوى فى جميع المعاملات الغذائية التى تحتوى على كسب بذور الحلبة مقارنة بمجموعة الكنترول التى لم تتلق أى اضافات .كما لوحظ عدم وجود معنوية بين المعاملات الغذائية ومعاملة (الكنترول) فى طول الأعور.

- وبالنسبة لنشاط الانزيمات لم يكن لكلا من انزيم الأميليز والتربسين والليباز ايضا أى تأثير معنوى بين المعاملات الغذائية ومعاملة الكنترول ولكن لوحظ انخفاض معنوى ملحوظ بين المعاملات الغذائية مقارنة بمعاملة الكنترول فى انزيم الكيموتربسين .

- كما أظهرت النتائج أن إضافة وجبة بذور الحلبة إلى علف دجاج التسمين أدت إلى انخفاض في العدد الكلي للبكتيريا مع زيادة في مستويات الكلوستريديا والإى كولاى مقارنة بمجموعة (الكنترول) في حين لوحظ انخفاض في بكتيريا حمض اللاكتيك مقارنة بالطيور التي تغذت على عليقة الكنترول.

- ولم يتم تسجيل أي تأثير معنوي في جميع مؤشرات الدم باستثناء الكولسترول.

- وأظهرت نتائج التحليل النسيجي والمورفومترى أن المعاملات الغذائية المختلفة كان لها عرض وارتفاع أقل فى الخملات مقارنة بمعاملة الكنترول مما قد يؤثر على صحة الأمعاء وامتصاص العناصر الغذائية .

من نتائج هذة الدراسة يمكن التوصية بعدم استخدام كسب بذور الحلبة بمستوى 20% و 10% أو 5 % أيضا وذلك لتأثيرها السلبى على الأداء الانتاجى والأداء الفسيولوجى لدجاج التسمين مع تأثيرها السلبى على حيوية الكتاكيت.