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# EFFECT OF FORCED-FEEDING ON THE GROWTH PERFORMANCE AND LIVER QUALITY OF EGYPTIAN GEESE

Article · June 2013

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## EFFECT OF FORCED-FEEDING ON THE GROWTH PERFORMANCE AND LIVER QUALITY OF EGYPTIAN GESE

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### ABSTRACT

Twenty goslings one day old were purchased from the local market and transported in clean, well-ventilated boxes to the poultry house. During the first three weeks, goslings were brooded together and when they reached 3 months old, they were divided randomly into two groups. Geese of the first group were forced fed for 3 weeks with corn while geese of the second group fed *ad libitum* (control group). At the end of the experiment, geese were slaughtered and the livers were weighted. The obtained results showed that the body weight of forced fed group was highly significantly ( $P < 0.001$ ) heavier than that of the control group especially at the second and third weeks of the experiment ( $2760.00 \pm 74.07$  vs  $2393.00 \pm 74.07$  gm). In addition, the liver weight of forced fed group was highly significantly ( $P < 0.001$ ) heavier than the liver weight of control ( $214.00 \pm 15.32$  vs  $102.00 \pm 15.32$  gm) and characterized by steatosis, fatty degeneration and necrosis in histopathological examination.

**Key words:** Fatty liver, Forced-feeding, Geese, Liver, Performance

(BVMJ-24(1): 254-260, 2013)

### 1. INTRODUCTION

**F**orce-feeding is an ancient practice, first recorded in ancient Egypt, but until the 1950's foie gras production remained somewhat limited in volume. Foie gras is currently produced in various countries but approximately 80% of world production and consumption takes place in France. They also add that the tradition of force-feeding is very old, probably originating from Egypt; where there is early evidence in paintings. Geese produce the heaviest livers with the least fat loss, however they currently account for less than 5% of French production (approximately 8% of world production)[7]. Breeds of waterfowl differ greatly in their propensity to develop liver steatosis[5]. During fattening liver size increases up to 10-fold. Lipogenesis exceeds secretion, so the resulting liver

contains more than 50% fat [6]. Increased liver weight is accompanied by a substantial overall live weight gain (in the range of 85%) [9]. Fatty liver production is the process of force-feeding (cramming) geese, which are normally between 9-25 weeks of age, for a period of 14-21 days. During this period the weight of the liver will increase from an initial weight of about 80g to a final weight of between 600-1 000g. The feed normally used for force-feeding geese during the fatty liver production period is whole grain corn. Geese are usually force-fed three times a day (morning, noon, and evening) and with the force feeding period lasting approximately three weeks [3]. The most obvious change is the increase in the number of large fat globules visible in the cells. A limited increase in the presence of fat globules in liver can occur in normal liver in certain

conditions but no normal animal has steatosis of the liver to the extent that occurs in all forced-fed birds. During the force feeding period, liver function is impaired [16]. In domestic waterfowls, this specific capacity of large liver fat storage is exploited for foie gras production in a proportion not observed under natural conditions. In the goose, the liver weight can increase 10 fold in two weeks and account for 10% of the body [8].

## 2. Materials and Methods:

### 2.1. The birds

Twenty goslings, one day old were purchased from the local market and transported in clean, well-ventilated boxes to the poultry house. During the first three weeks, the goslings were brooded together in one compartment of the house (2m×2m). When they reached 3 months old they were divided randomly into two groups, the first group was forced-fed while the second one was left as control; the average weight of geese was 2000gm.

### 2.2. Housing system

Geese were housed in clean, disinfected house of about (6.0m×4.0m×3.5m), with a concrete floor covered by wood shaving. Before arrival of chicks, the house was cleaned and disinfected by using 10% formalin [13].

### 2.3. Feeding material

Yellow corn was used for forced-feeding and provided to the control group *adlibitum*.

### 2.4. Procedures:

- a) Each goose was weighted before the beginning of forced-feeding.
- b) Forced- feeding was occurred as following: the corn is cooked slightly in hot water until the kernels are just soft to a firm squeeze. Geese were force-fed three times a day (morning, noon, and evening) for three weeks [3].

- c) Body weight of geese was recorded at the end of each week of the experiment (Table1).
- d) After the end of the experiment, the geese were slaughtered, the liver was separated and weighted(Table2).
- e) Sample from each liver was taken for histopathology. At the end of experiment (3 weeks), autopsy samples were taken from liver of birds in different groups then fixed in 10% formalin saline for twelve hours, then sent to the histopathological laboratory of faculty of medicine Benha university. Serial dilutions of alcohol (methyl, ethyl and absolute ethyl) were used. Specimens were cleared in xylene embedded in paraffin at 56°C in hot air oven for 24 hours. Paraffin bees wax tissue blocks were prepared for sectioning at 4-micron thickness by slide microtome. The obtained tissue sections were collected on glass slides, deparaffinized and stained by Hematoxylin and eosin Stain (H&E) [1] for histological examination through the light microscope (40x,100x).

2.5. *Statistical analysis of results was carried out by [14].*

## 3. RESULTS AND DISCUSSION

The results in table (1) revealed that the means and standard errors for geese body weight (g) as affected by a forced- feeding. The results showed that means of geese body weight were (2616.00 ± 52.49, 2355.00 ± 52.49) g and (2760.00 ± 74.07, 2393.00 ± 74.07) g for forced fed geese and control geese at the second and third week respectively. From the obtained data it is clear that there were high significant differences(p<0.001) in the body weight of geese due to forced feeding, which appeared at the second and third week of forced –fed process The obtained results in the present

Table (1). Least square means and standard errors ( $\bar{x} \pm S.E$ ) for geese body weight (g) as affected by forced- feeding

Group	Geese body weight(g) at			
	0	1	2	3
Forced-fed group	2271.00±59.68a	2415.00±59.53a	2616.00±52.49a	2760.00±74.07a
Control group	2207.00±59.68a	2285.00±59.53a	2355.00±52.49b	2393.00±74.07b

Means  $\pm$ S.E within column with different letters are significantly different, at  $p < 0.001$ .

study agreed with the results reported by EL-Medany et al., [4] who reported that the body weight gain and feed conversion were improved for forced –feeding geese compared to *adlibitum* feeding group at the end of the experiment.

Table (2). Geese liver weight (g) as affected by forced- feeding at the end of the experiment

Group	Geese liver weight(g)
Forced-fed group	214.00±15.32a
Control group	102.00±15.32b

The results in table (2) revealed the means and standard errors for geese liver weight (g). The results showed that the means of geese liver weight were (214.00±15.32 and 102.00±15.32) g for forced –fed group and control one respectively. From the obtained data it is clear that there were high significant differences ( $p < 0.001$ ) in the liver weight due to forced feeding. These results agreed with Nir and Perck [11] who reported that the modifications occurring in the liver of the forced-fed geese were mainly due to an excess of triglycerides deposited in the hepatic cells and partly to the increase of the total protein content. The results also agreed with Nitsan et al., [12], who said that the liver enlargement was due to both hypertrophy and hyperplasia, as shown by the increase of the total amount of nucleic acids in the liver and

the slight increase in the N-DNA ratio during the cramming period, also in agreement with [8] who reported that In domestic waterfowls, this specific capacity of large liver fat storage is exploited for foie gras production in a proportion not observed under natural conditions. In the goose, the liver weight can increase 10 fold in two weeks and account for 10% of the body. The results also in agreement with Benard [2] who founded that when a goose or duck is forced- fed, there is an increase in carcass weight and a substantial increase in relative size of liver. The results agreed with Souad and Amany [15] who found that Liver and fat percentages were significantly affected with type of feed and forced-feeding. The highest percentage of liver was founded in case of corn.

Results of histopathology shown that: The livers of the control geese showed normal histological criteria of the hepatic cords, hepatocytes, central veins and portal areas (Fig1). Livers of forced-fed geese showed single large vacuoles of adjacent hepatocytes that displace the nucleus to the periphery coalesce forming irregular spaces or small fat cyst (Fig 2). Focal areas of hemorrhages in between degenerated hepatocytes and accompanied by destruction of few hepatic cells were observed in some cases (Fig 3). Occasionally, focal coagulative necrosis of hepatocytes infiltrated with mononuclear inflammatory cells was seen (Fig4). The necrotic hepatocytes characterized by loss of

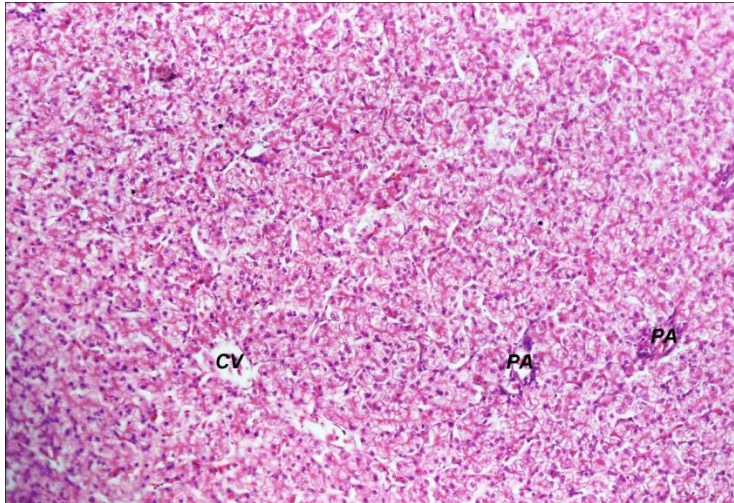


Fig (1) Normal histological criteria of the hepatic cords, hepatocytes, central veins and portal areas. CV= central veins.PA= portal areas (control group).

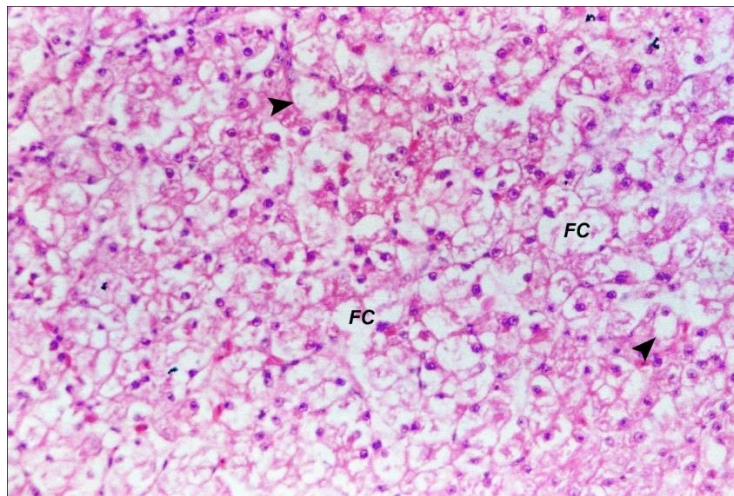


Fig (2). The single large vacuoles of adjacent hepatocytes that displace the nucleus to the periphery coalesce forming irregular spaces or small fat cyst. FC= Fat cyst (forced fed group).

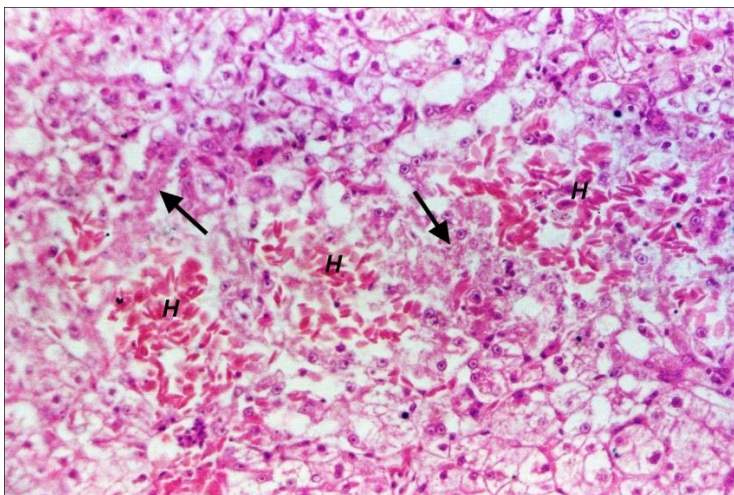


Fig (3) Focal areas of hemorrhages in between degenerated hepatocytes and accompanied by destruction of few hepatic cells were observed in some cases. H=Hemorrhages (forced-fed group).



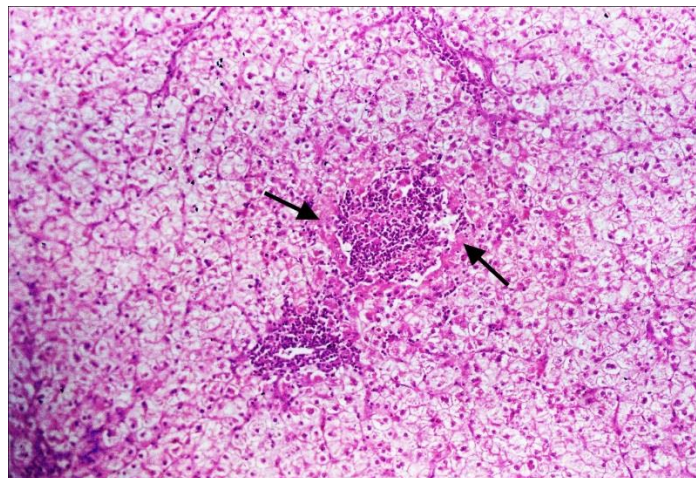


Fig (4) Focal coagulative necrosis of hepatocytes infiltrated with mononuclear inflammatory cells was seen (forced-fed group).

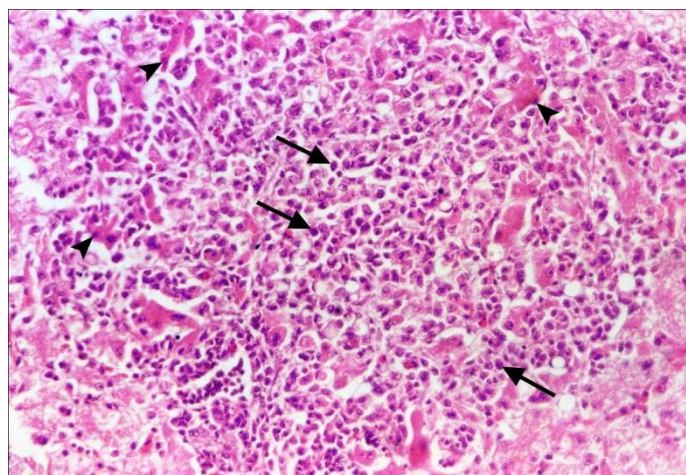


Fig (5). The necrotic hepatocytes characterized by loss of cellular details and hypereosinophilic cytoplasm with pyknosis or absence of nuclei (forced- fed group).

cellular details and hypereosinophilic cytoplasm with pyknosis or absence of nuclei (Fig 5 ).This results in accordance with McKenna[10] who reported that forced feeding caused a fatty degeneration or steatosis in the cell of the liver , liver steatosis caused by(gavage) is a pathological process that shown itself firstly by fatty degeneration of liver cells then by necrosis.

#### *CONCLUSION*

From the obtained results, it can be concluded that forced-feeding process in geese for 3 weeks leads to high body weight

of the geese and leads to increase the liver weight and fatty liver.

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## تأثير التغذية الإجبارية على إنتاجية وجودة الكبد فى الاوز المصري.

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### الملخص العربي

اجريت هذه التجربة بغرض دراسة تأثير عملية التغذية الإجبارية (التزغيط) على إنتاجية وجودة الكبد فى الاوز المصري. استخدم فى هذه الدراسة عدد 20 من الاوز المصري مشتراه من الاسواق عند عمر يوم وتم نقلها الى مكان التجربة فى أقفاص نظيفة وجيدة التهوية وتم تحضين الطيور مع بعضها لمدة 3 اسابيع وعند بلوغها 3 شهور تم توزيعها عشوائيا الى مجموعتين بكل واحد منهما 10 من الاوز ومتوسط وزن الأوز 2000 جرام. وكانت المجموعتين على النحو التالي: المجموعة الاولى: يتم فيها عملية التغذية الإجبارية باستخدام الذرة الاصفر لمدة 3 أسابيع. المجموعة الثانية: تأكل بالمعدل الطبيعي بحريتها. اظهرت النتائج:

1. ان التغذية الإجبارية كان لها تأثيرا معنويا على وزن الجسم بالنسبة للأوز حيث ان الاوز المتعرض للتغذية الإجبارية اكتسب وزنا اعلى من الاوز الذي يأكل بالمعدل الطبيعي حيث وجد ان وزن جسم الاوز فى نهاية التجربة كان  $(74.07 \pm 2393)$  و  $(15.32 \pm 214.00)$  جرام للكبد حيث وجد ان هناك اختلاف معنوي بين وزن الكبد فى المجموعتين حيث كان وزن الكبد  $(15.32 \pm 214.00)$  جرام للأوز المعرض للتغذية الإجبارية و  $(15.32 \pm 102.00)$  جرام للأوز الذي يأكل بالمعدل الطبيعي. اضافة الى وجود بعض التغيرات الباثولوجية فى الكبد مثل تراكم الدهون. خلصت الدراسة الى انه يمكن تغذية الاوز اجباريا لمدة 3 اسابيع للحصول على وزن اعلى للجسم والحصول على الكبد المسمن.

(مجلة بنها للعلوم الطبية البيطرية: عدد 24 (1)، يونيو 2013: 254-260)