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Effect of oil seeds "*Citrullus colocynthis*" on weight change and nitrogen balance in rats male wistar strain receiving high-fat diet

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ABSTRACT

Colocynth (gourd) "Citrullus colocynthis, plants of cucurbitaceae family, native to arid soles, used as treatment of many diseases in traditional medicine in Mediterranean countries, rich in polyunsaturated fatty acid. This study aimed to compare the effect of diets rich in fat (MG) supplemented with colocynth oil (HC) and sunflower oil (HT) on weight changes and digestibility of nitrogen Wistar rats. In this work the male Wistar rats weaned to a weight of 80 ± 5 ,were divided into four groups and receive different food diets (R) for 2 months (R1: 16 % % casein + 8 HT, R2: 16 % casein + 8 % HC, R3: 16 % casein + 30 % MG + 8 % HT, R4: 16 % casein + + 30 % MG + 8 % HC) The weight of the rats and the amount of food ingested are taken daily, balances nutrition and nitrogen were made during the first, fourth, fifth and eighth week of the experiment. The extraction of oil from seeds of the gourd was made by the soxhlet apparatus and nitrogen determination was made by the Kjeldahl method. L (1883). The results show a slowing of weight change with increasing food intake, and decreased protein digestibility in rats fed with diets containing oil of gourd compared with rats (control) consumes diets of sunflower oil. The oil of gourd obstacle excess body fat in the body and it may be due to the influence of oil on the digestibility of proteins.

Keywords: Citrullus colocynthis, obesity, oil of gourd, nitrogen balance

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INTRODUCTION

The epidemic increase and global prevalence of obesity condemns us to worry about an issue that has become the main cause of metabolic syndrome and its attendant complications, vegetable oils rich in polyunsaturated fatty acids seem to affect weight loss and correct some metabolic abnormalities triggered by excess body fat, thus we are interested in the colocynth oil, it is a medicinal plant belongs to the Cucurbitaceae family native to tropical Asia and Africa.

The present study was to compare the effect of diets rich in fat (MG) supplemented oil bitter apple (HC) and sunflower oil (HT) on weight change and nitrogen balance in rats sore Wistar strain.

MATERIALS AND METHODS

1-Animals:
4 groups of adult male albino rats of the Wistar strain old 4 weeks were used after week adaptation. Each group included 5 rats an average weight of 80±5g and received one of four diets R1, R2, R3, and R4.

2-Diets:
First Set (R1): control rats receiving the diet with 16 %casein + 0.3 % methionine + 8 % sunflower oil for two months.

Second Set (R2): These rats received a diet of 8 % oil of colocynth + 16% casein + 0.3 % methionine.

Lot third (R3): He's given a balanced diet is 16% casein + 40 % -fat (10 % butter + 10 % Cheese + 10 % Margarine 8 % sunflower oil).

Lot Four (R4): This lot fed a diet low in 16 %casein + 40 % fat (10%butter + 10% Cheese + 10 % Margarine 8 % oil of bitter apple).

3-Sampling and analytical procedures :

The weights of the rats and the amount of food ingested are taken daily, nitrogen balances are made in the first, fourth, fifth and eighth weeks of experimentation.

Faeces collected and weighed during the week of balance sheets and were stored in the cold before being analyzed. The determination of nitrogen in feces is done following the method of Kjeldhal.

At the eighth week of experimental diet, the rats were fasted for 12 hours, then were weighed and anesthetized with chloral hydrate intraperitonial injection at a dose of (0.3 ml per 100 g body weight), then the rats were dissected.

4-**Nitrogen balance:**

This is to determine the percentage of nitrogen ingested or absorbed which effectively retained by the body, this involves the measurement of nitrogen intake of nitrogen loss in feces. By this means, it becomes possible to calculate the digestibility and retention of dietary nitrogen.

4-1 Analysis of fecal nitrogen (Kjeldahl, 1883):

Using the technique of Kjeldahl nitrogen compounds are converted into ammonium salts by mineralization in the presence of sulfuric acid (98 %) and a catalyst (Cu salt or Hg). The medium is alkaline by ammonia is driven by a current of water vapor on boric acid.

The Kjeldahl method is a means of determining the nitrogen content of organic and inorganic substances. [1]

Digestion - the decomposition of nitrogen in organic samples utilizing a concentrated acid solution. This is accomplished by boiling a homogeneous sample in concentrated sulfuric acid. The end result is an ammonium sulfate solution.

Distillation - adding excess base to the acid digestion mixture to convert NH4 + to NH3, followed by boiling and condensation of the NH3 gas in a receiving solution.

Titration - to quantify the amount of ammonia in the receiving solution.

The amount of nitrogen in a sample can be calculated from the quantified amount of ammonia ions in the receiving solution.

4-2Calculations

The calculations for % nitrogen or % protein must take into account which type of receiving solution was used and any dilution factors used during the distillation process. The equations given here are in long form. They are often simplified in the published standard methods. In the equations below, “N” represents normality. “ml blank” refers to the milliliters of base needed to back titrate a reagent blank if standard acid is the receiving solution, or refers to milliliters of standard acid needed to titrate a reagent blank if boric acid is the receiving solution. When boric acid is used as the receiving solution the equation is:

$$\text{NITROGEN \%} = \frac{(\text{ml standard acid} - \text{ml blank}) \times \text{N of acid} \times 1.4007}{\text{weight of sample in grams}}$$

Calculated digestibility of nitrogen:
The CUDn is defined by the formula

$$CUDn = \frac{\text{N ingested} - \text{N fecal}}{N\ ingested} \times 100$$

Calculated protein efficiency ratio (PER):
The PER is a measure of growth, it is calculated as follows:

$$PER = \frac{\text{Weight gain}}{\text{Quantity of protein ingested to weight gain}}$$

RESULTS

1- Rats weight change :

The weights of the rats subjected to different diets during the weeks of experimentation are expressed in g (Figure 1).

The kinetics of the change in weight of rats differs from one batch to another, this difference is significant in every week of the experiment between the rats receiving the fat diet for 8 % sunflower oil (R3) and rats receiving the standard diet (R1), so the difference is significant throughout the weeks between rats fed diet 8 % hyper lipid oil of colocynth (R4) and get the diet to 8 % of oil of colocynth (R2).

Moreover, the difference is significant in the final weeks of the experiment between the rats and rats R2 R1 instead of the first week in which the difference and not significant, the other weight gain is low in rats subject to the rules R4 compared to R3 rats subjected to the regime and the difference in weight is significant in the first week until the fourth and sixth weeks, the weight reduction reflects the effect of oil of bitter apple.

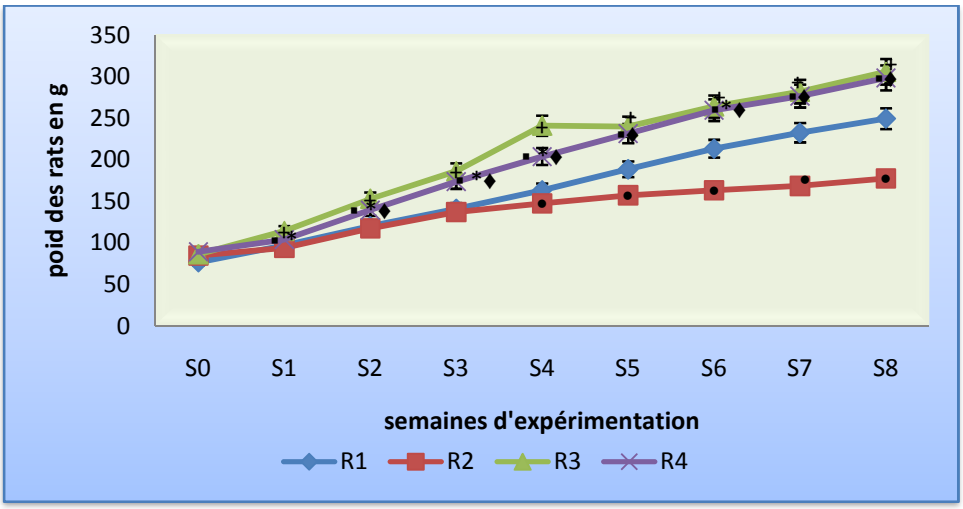

Figure 1: weight change of rats subjected to different experimental diets

2-Quantity of protein ingested nitrogen:

The amount of proteins and is expressed as nitrogen intake (g / d / 100 g bw), they represented in Figures 2,3.
(g/d/ 100g bw) : (gramme/ day/ 100 gramme body weight).

The amount of protein and nitrogen intake in rats receiving the diet (R4) was significantly higher at weeks 5 and 8 compared to the amount ingested by the rats receiving regimes (R2 and R3), for the other plans the amount of protein and nitrogen ingested is almost identical in all rats.

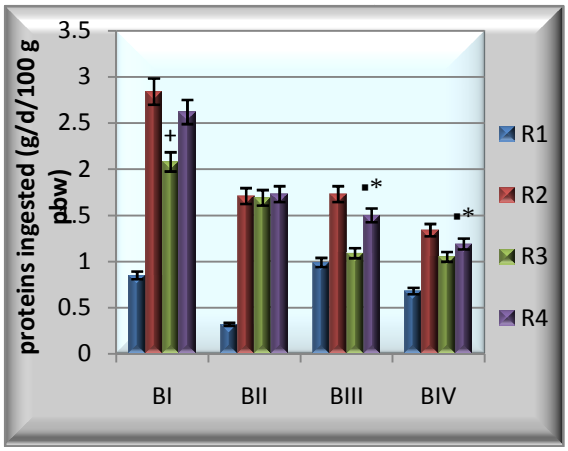

Figure 2: protein ingested (g/d/100 g bw) in rats subjected to different diets

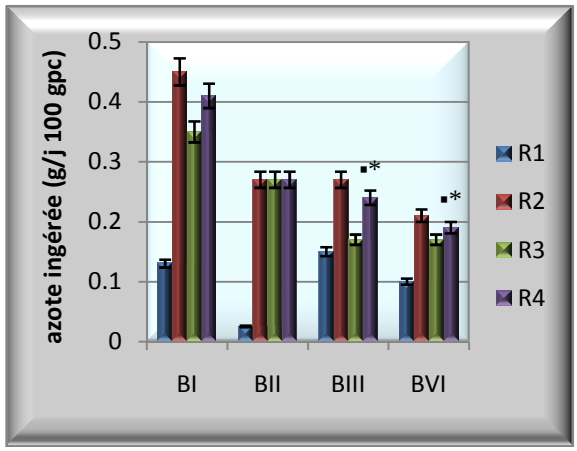

Figure 3: Nitrogen ingested (g/d/100 g bw) in rats subjected to different diets

2- Amount of faeces excreted and quantity of fecal nitrogen:

The amount of feces excreted is expressed as (g /d/100 bw) and The amount of fecal nitrogen is expressed as (mg/d/100 bw) and represented in (Figure 4.5).

The amount of feces excreted by rats given the diet (R3) (R4) is identical to the weeks of record, for against this amount is significantly higher in rats receiving the diets (R4) compared with rats fed diets of (R1 and R2), also the amount of faeces excreted by rats submitted to diets (R3) significantly elevated at weeks 1, 4, and 8, compared with rats subjected to the regime (R1).

Note that the amount of nitrogen excreted stool for weeks of balance is always higher compared to the amount excreted in the weeks preceding this explains adaptation of rats to diets.

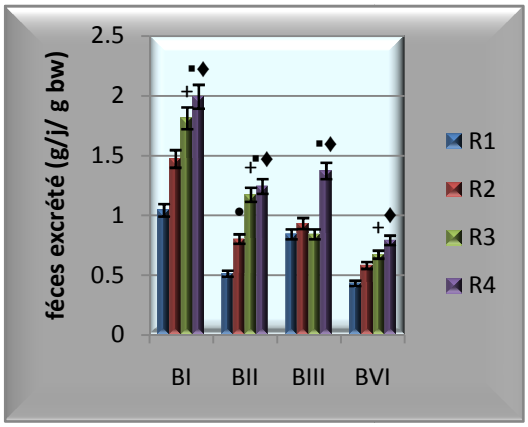

Figure 4: The amount excreted in faeces (g/d/100 g bw) in rats subjected to different regimes

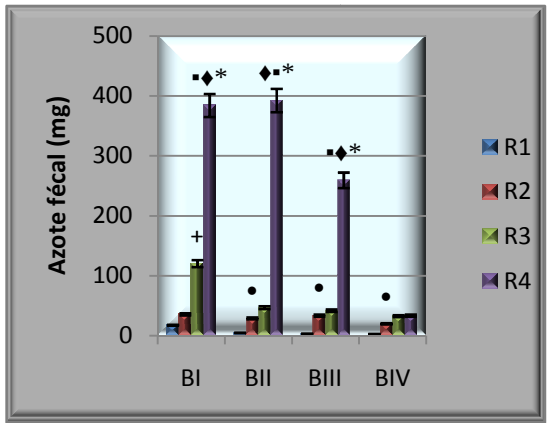

Figure 5: The amount of the nitrogen in fecal (mg/d/100 g bw) in rats subject to different regimes

3-Digestive coefficients of proteins and protein efficiency ratio:

The digestive coefficients proteins are expressed as a percentage they represented in Figures 6, the protein efficiency ratio represents the ratio of weight gain on the amount of protein intake (Figure 7).

The CUDn rats subjected to diets of oil of colocynth is lower than in CUDn rats subjected to diets of sunflower oil on the one hand; on the other hand the CUDn in rats fed of fat diet is still lower than in CUDn in rats fed isocaloric diets with.

As a result of the elimination of nitrogen, protein efficiency ratio in rats fed diets with oil of colocynth is still low compared to the PWR rats fed with diets of sunflower oil. And it's the same for rats submitted to the REP-fat diet are still low compared with REP in rats subjected to isocaloric diets.

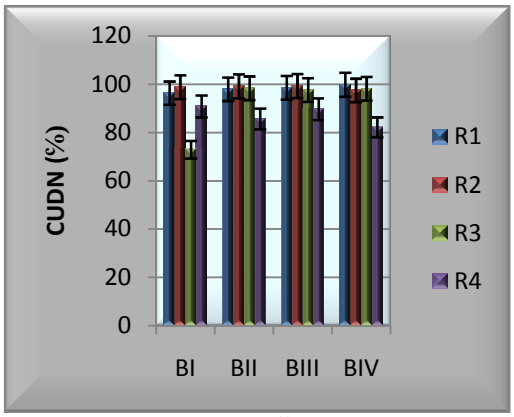

Figure 6: protein digestion coefficient (%) rats subjected to different diets

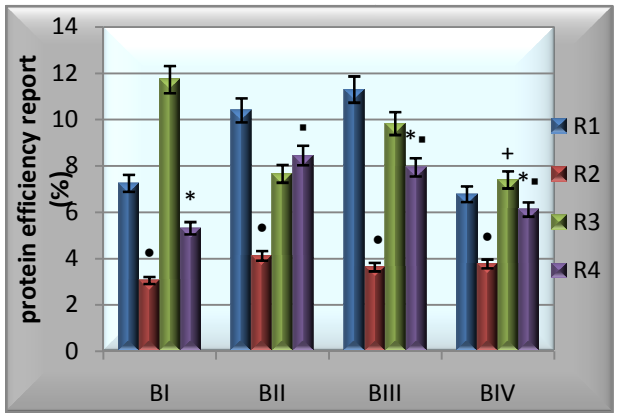

Figure 7: Protein Efficiency Report (EPR) in rats subjected to different diets

Each value represents the mean ± standard error (SE)

p <0.05 * Significant difference between R3 and R4
p <0.05 • Significant difference between R1 and R2
p <0.05 + Significant difference between R1 and R3
p <0.05 ▪ Significant difference between R2 and R4

BI: balance of the first week of the first month
BII: balance of the second week of the first month
BIII: balance of the first week of the second month
BIV balance of the second week of the second month

DISCUSSION

There are clear evidences of the fact that the nature of dietary fat may affect lipid metabolism and deposition of body fat, so it's not only the content but also the fatty acid composition of dietary fat that should be considered [2].

Studies show that lipids play a central role in the functioning of the organization, participating in various functions such as maintenance of cellular integrity, energy storage, transmission and cellular signal transduction and synthesis hormonal. Among the major components of lipids. Fatty acids which lead to more from their nutritional and metabolic. [3].

The first description of a high fat diet (HFD) to induce obesity with nutritional intervention was put in 1959 [4]. Diets rich in fat have been used for models of obesity, dyslipidemia and insulin intolerance in rodents, it was observed that the disturbances produced by feeding high fat resemble the human metabolic syndrome and it also extend to cardiovascular complications. [5.6]. in principle, all species of laboratory rodents are prone to develop metabolic disturbances in these diets. [7].

The difference between the nutritional values of a variety of oils and fats has been made the subject of several works and studies, and usually a special attention was given to the difference between butter and other oils and fats. [8.9].
dietary fat may have different effects on the physiology of the animal, and their weight changes. Excess weight is usually associated with a high fat diet [10], our results show that all rats fed the fat diets in overweight compared to rats fed isocaloric regimes.

Olso Our results show that the weight changes in rats receiving diets HC is positive and significant food intake seem comparable to the amount of food ingested by the rats receiving the diets HT, it indicates a from the acceptability of this oil despite its slight bitterness on the other hand show the effect of oil from the bitter apple on the regression of weight gain, which is probably due to the presence of heterogeneous compounds (wax, hydrocarbon, polyphenols) [11.12]

The ratio PUFA / SFA is in HC (5.14), for against this report is in HT (0.8), so the sunflower oil is characterized by a very high amount SFA compared to HC, this explains the difference of weight change in rats receiving diets based oil of colocynth comparable changes in rats fed diets with sunflower oil.

From our results on the coefficients of digestion of proteins suggests that the oil of colocynth has an effect on the decrease in protein digestibility with an increase in fecal mass and a significant removal of nitrogen. The nitrogen savings thus achieved could be a consequence of a decrease in the rate of protein turnover and catabolism of certain amino acids [13]. The weight gain in these groups of rats is reduced; this is also reflected in the lowest energy retention, due to a limitation of lipid deposition and retention of secondary protein.

Data on the protein efficiency ratio clearly shows the digestion of protein, a lower note of the report, despite a high consumption of proteins, which explains the low protein retention and use of one hand and a large fecal excretion of protein other.

CONCLUSION

A very important scientific research devoted to obesity, and understands their causes and risk factors. Most of the results suggested that genetic predisposition is a dominant factor with the role of diet and physical inactivity.

Vegetable oils are characterized by the fatty acid composition of monounsaturated and polyunsaturated, very beneficial for human consumption, appear to have effects on weight loss and to correct some metabolic abnormalities triggered by excess body fat. From our results can be seen that the oil of colocynth has an effect on weight gain and nutritional status and nitrogen in rats, the influence digestibility and nitrogen retention. A slowdown in the weight change with an increase in fecal protein is reported in rats exposed to diets with oil of colocynth.

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