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# The effect of feeding dried powder of *Moringa oleifera* leaves on total cholesterol level and antibody titer against Parvo virus in dogs

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## Abstract

The aim of this study was to determine the effect of feeding dried powder of *Moringa oleifera* leaves as a supplemented food on total cholesterol level and antibody titer against parvo virus in dogs. *Moringa oleifera* leaves were collected from Fayoum Province of Egypt. A total 12 weaned (45 days) German shepherd dogs divided into 4 groups in each group 3 Animals: 1st as control, 2nd 200 mg/kg, 3rd 300 mg/kg and 4th 400mg/kg of *Moringa oleifera* leaves powder. The blood samples were collected from dogs before, half and after experiment (0, 15, 30 days) for analysis of total cholesterol and anti-body titer against parvo virus. The results revealed that: (1) There is a significant decrease ($P<0.05$) in cholesterol level than normal range (135-278mg/dL) indicated that *Moringa oleifera* leaves may have a promising effect for cholesterol-lowering (2) Administration of *the Moringa oleifera* leaves lead to increase ($P <0.05$) in antibody titer against parvo virus in all groups compared to control group. *Moringa oleifera* as an immune boosting agent.

**Keywords:** *Moringa oleifera*; Total Cholesterol Level; Antibody Titer; Parvo Virus; Dogs.

## 1. Introduction

Moringa is one of the most useful trees in the world, as almost every part of Moringa tree can be used for pharmaceutical, food and industrial purposes. People use its leaves, flowers and fresh horns as vegetables, while others use them as feed for livestock. *Moringa oliveira* leaves are added to food products to lower fasting blood sugar and may have a promising effect in decreasing blood cholesterol [1].

The use of *Moringa olivera* leaves has been reported as factors or agents of hypocholesterolemic and hypoglycemia, and the combination of dietary fats and drumstick leaves as a source of antioxidants has been beneficial since it decreases blood cholesterol and lipid peroxidation [2,3,4]. *Moringa oleifera* was also examined for its mechanism of action by estimating HMG CO-A reductase activity and was found to increase the excretion of cholesterol in the stool, indicating that *M. oleifera* has the effect of hypolipidemic [5].

Methanol extract stimulates both cellular and humoral immune systems [6]. Immunomodulatory potential of *M. oleifera* leaves could be attributed for the presence of flavonoids, polyphenols and terpenoids which may modulate one of the above-mentioned immune mechanisms [7]. The *Moringa oleifera* leaf extract may also have a beneficial therapeutic effect on improving immune diseases such as rheumatoid arthritis, systemic lupus erythematosus (SLE), psoriasis and another general trend obtained in the parameters used to assess the immune potential of the leaf aqueous extract. It is indicated that the extract is a good candidate as an immune modulation regime [8, 9].

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*M. oleifera* powder can be improve health status, accelerate immune recovery and increase the effectiveness of antiretroviral drugs against HIV / AIDS patients, so it be considered as a dietary supplement [10]. In Nigeria, leaf preparations of *Moringa oleifera* is widely used in folklore for the treatment of immune system related disorders [11]. The target of this work was to determine the effect of feeding dried powder of *Moringa oleifera* leaves on total cholesterol level and antibody titer against parvo virus in dogs.

## 2. Material and methods

The experiments and analysis were carried out in 2018 at the regional center for food and feed, agriculture research center and laboratory.

### 2.1. Materials

Fresh *Moringa oleifera* leaves were collected at February 2018 from Fayoum Governorate, Egypt. The collected samples were purified and allowed to air in shadow clean area daily till the sample attained constant weight. Leaves were crushed by a stainless-steel mill.

### 2.2. Animals

A total 12 weaned (45 days) German shepherd breed was acclimatized to clean house for 7 days before commencement of experiment. Animals take deworming and anti-ectoparasites and vaccinated against parvovirus (DHPPI virus during this period., Dogs were allowed free access of water and recommended diet and was used as basal diets 3time daily till end of experiment.

The dogs were divided into 4 groups in each group 3 Animals: 1st as control, 2nd 200 mg/kg, 3rd 300mg/kg and 4th 400mg/kg of *Moringa oleifera* leaves. Blood samples were collected from dogs before, half and after experiment (0, 15, 30 days) for analysis of total cholesterol and anti-body titer against parvovirus.

#### *2.2.1. Blood samples*

Blood samples collected in sterilized tube and then to centrifuge tube samples allowed to coagulate at room temperature and then serum was separated by centrifugation at 3000 rpm for 20 mi. Samples stored till analysis for total cholesterol and anti-body titer against parvovirus.

### 2.3. Methods

#### *2.3.1. Determination of serum total cholesterol*

Serum total cholesterol was determined by enzymatic colorimetric, end point as described by Allain (1974) [12], Kit provided by greiner diagnostic GmbH (Germany) and purchased from indomedics Egypt company.

#### *2.3.2. Canine Parvo Antibody titration ELISA (IgG ELISA Kit)*

Commercial range of kits for the diagnosis of Parvovirus infection (CPV) infection or vaccination control, a demonstration of antibody titer is the most commonly used method. The solid phase-related virus by the use of monoclonal antibodies holds the antibodies caused by infection or vaccination. After the attachment of the antigen (Parvovirus) sera containing antibodies are able are able to interact with the antigen. After antigen / antibody reaction, the attached antibodies can be detected using monoclonal conjugate (as described by Waner et al., [13].

#### *2.3.3. Statistical analysis*

The analysis was performed in triplicate for all decisions, and the results of the triplicate were expressed as mean ± "SE". SPSS software (version 22 SPSS Inc., Chicago, Illinois, USA) was used for variance analysis followed by Minitab 17 to make multiple comparisons of methods, and $P < 0.05$ between mean values was considered statistically significant.

## 3. Results and discussion

**Table 1** Effect of feeding *Moringa oleifera* powder on total cholesterol level in dog's serum.

| Group | Total cholesterol in dog serum(mg/dl) | | |
|---|---|---|---|
| | zero day | 15 days | 30 days |
| Control | 237.200a±13.22 | 235.000a±12.24 | 237.867a±13.62 |
| Group1 | 258.600a±16.42 | 249.567a±14.28 | 228.100a±17.25 |
| Group2 | 256.133a±16.22 | 305.667a±18.28 | 198.467a±19.92 |
| Group3 | 329.000a±13.62 | 282.800a±18.44 | 218.133a±20.22 |

Each value in the Tables was obtained by calculating the mean of the four groups (Mean ± S.E). The superscript letter indicated statistically significant difference, With P<0.05.

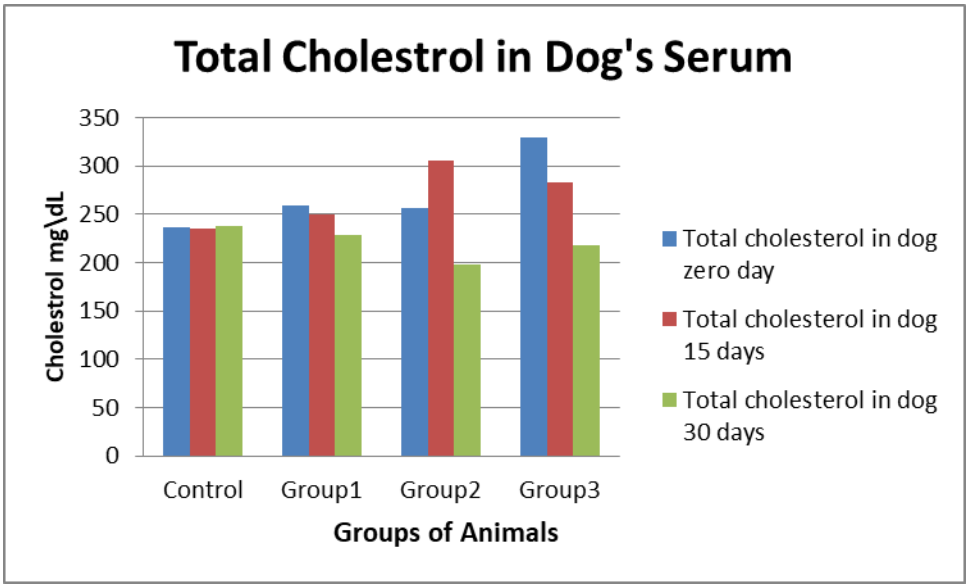


**Figure 1** Effect of feeding *Moringa oleifera* powder on total cholesterol level in dog's serum.

**Table 2** Effect of feeding *Moringa oleifera* powder on Antibody Titer in dog serum vaccinated against Canine Parvovirus (CPV).

| Group | Antibody Titer in dog serum (log) | | |
|---|---|---|---|
| | zero day | 15 days | 30 days |
| Control | $4.000^{c}$±0.04 | $64.000^{b}$±1.14 | $64.000^{b}$±2.77 |
| Group1 | $4.000^{c}$±0.03 | $64.000^{b}$±2.88 | $128.000^{a}$±6.08 |
| Group2 | $4.000^{c}$±0.045 | $64.000^{b}$±1.94 | $128.000^{a}$±5.88 |
| Group3 | $4.000^{c}$±0.04 | $64.000^{b}$±1.88 | $128.000^{a}$±6.55 |

Each value in the table was obtained by calculating the mean of four groups (Mean ± S.E). The superscript letter indicated statistically significant difference, with P<0.05.

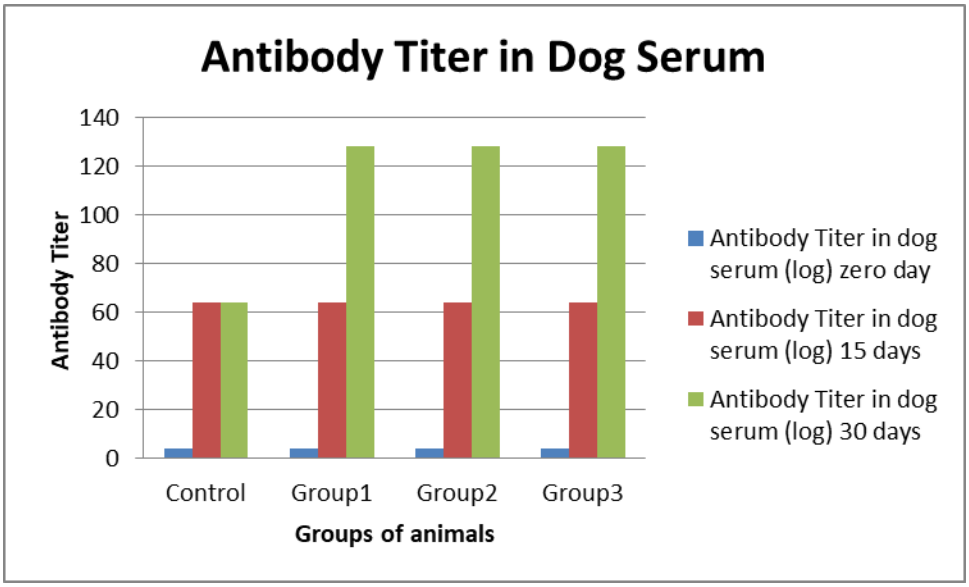


**Figure 2** Effect of feeding *Moringa oleifera* powder on Antibody Titer in dog serum vaccinated against Canine Parvovirus (CPV).

### 3.1. Total Cholesterol evaluation

The data presented in Table 1,and Figure 1, revealed that there is a decrease in Cholesterol level in dog serum in all groups after 30 days post feeding than the control group especially in group 3 and 4 (Fed:3rd300 mg/kg and 4th 400 mg/kg, respectively). The estimated levels of total cholesterol in G1, G2, G3 and G4 were 237.867, 228.100, 198.467and218.133, respectively.

The use of *Moringa olivera* leaves has been reported as factors of hypocholesterolemic and hypoglycemia, and the combination of dietary fats and drumstick leaves as a source of antioxidants was beneficial as it reduced blood cholesterol and lipid peroxidation [2,3,4]. In addition, the *Moringa oleifera* methanolic extract was also examined for its mechanism of action by estimating the HMG CO-A reductase activity and was found to increase the excretion of cholesterol in the stool, indicating that *M. oleifera* has the effect of hypolipidemic [5,14].

A sharp decrease was observed in group 3 and 4, indicating that *Moringa olivera* leaves may have a promising effect for lowering cholesterol when given longer [1].

### 3.2. Antibody Titer against parvo virus evaluation

The data presented in Table ,2and Figure,2 revealed that administration of the *Moringa oleifera* leaves were leading to increasing in Antibody Titer in dog serum vaccinated against Canine Parvo-Virus (CPV) in all groups (G2, G3 and G4) compared to control one(log 64).

The estimated levels of in Antibody Titer in dog serum (log) in G2, G3 and G4 30 days post feeding were 128, 128 and128, respectively.

The Immunomodulatory potential of *M. oleifera* leaves can be attributed to the presence of flavonoids, polyphenols and terpenoids [15,7]. *M oleifera* powder could be considered as nutritional supplement and would allow improvement of nutritional status, accelerate immunological recovery and also reinforce the effectiveness of antiretroviral (ARV) drugs in HIV/AIDS patients [10]. Our results are similar to those of Obiazi et al., [16, 17] (*Moringa oleifera* leaves extract is an immune enhancement agent).

## 4. Conclusion

Our results are confirming that *Moringa oleifera* leaves as a supplemented food possess a possible beneficial therapeutic effect and can be used as a hypocholesterolemic. Administration of *the Moringa oleifera* leaves lead to increase in antibody titer against parvovirus in vaccinated dogs and has a promising effect as an immune boosting agent.

## Compliance with ethical standards

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*Disclosure of conflict of interest*

The authors declare that there is no conflict of interest regarding the publication of this article.

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