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# Effect of adding different levels of ginger oil *Zingibar officinale* to the diets of common carp *Cyprinus Carpio* L. on some blood traits

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## Abstract

The current study was conducted to investigate the effect of using different levels of ginger oil *Zingibar officinale* to diets of common carp *Cyprinus carpio* L. on some blood traits, were reared at experimental cages inside an earthen pond in the first agricultural research and experiment station of the College of Agriculture in Umm Al-Akaf area in Al-Muthanna Governorate, the experiment lasted for 82 days from 1/10/2021to 20/12/2021, including the 10-day acclimation period. A total of 80 common carp fish, with an average weight of 77±0.56gm, were brought, it was distributed randomly to four treatments with four replicates, each replicate 5 fishes. The fish were fed on experimental diets divided into four equal treatments of protein content and different in the proportions of adding ginger oil, the percentage of oil added to the treatments was 0, 0.25, 0.5 and 1%, respectively, the fish were fed on the experimental diets at 5% of the live weight, divided into 4 meals a day, then reduced to 3% of the live weight, and it was divided into 3 meals per day. The results related to the hematological and biochemical parameters of the experimental fish were shown, there were significant (P≤0.05) differences between the treatments, control treatment was superior on white blood cells number compare with the other treatments, while the fish of the third treatment recorded a significant superiority on red blood cells number compare other treatments, control treatment also recorded a significant superiority on hemoglobin concentration, T3 treatment was significantly superior on PCV. As for the biochemical parameters of the blood, the fish of the control treatment recorded a significant superiority in the concentration of albumin and glucose in the blood.

**Keywords:** ginger oil *Zingibar officinale*, common carp *Cyprinus Carpio* L., blood traits.

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## Introduction

The global population growth and the demand for food are two main factors that led to the expansion of animal and fish production, recently, many efforts have called for the expansion of intensive fish farming, to meet the shortage of fish because of its great advantages compared to the rest of the animals (Dawood *et al*., 2016). Its meat is a healthy integrated food because it contains good quality protein, it contains essential amino acids, unsaturated fatty acids, vitamins and minerals (Hassan and Hashem, 2016).

Nutrition is an essential component of fish farming projects, which makes it at the forefront of the basic requirements, the cost of feeding is about 40-60% of the total production cost (Shokr and Mohamed, 2019). As there was an urgent need to find feed alternatives to replace the main ingredients in fish diets in order to reduce costs, some of the feed materials are efficient in producing good growth, but they are economically costly, therefore, there was a need to search for low-cost and high-productivity food alternatives (De Souza *et al*. 2020). Artificial feeding is one of the most important ways for the success of intensive or semi-intensive fish farming, as it is the best way to obtain weight increases in short periods compared to rearing with mud basins, therefore, the use of supplemental feed is necessary for the success of fish farming (Shahzadi *et al*., 2006).

Medicinal plants are characterized by combating stress, promoting growth, stimulating appetite, stimulating immunity and resisting microbes due to the active ingredients contained in them, such as alkaloids, flavanoid pigments, phenols, terpenoids, stimulants and essential oils (Bag, 2018).

The productive and health performance of fish is developed and improved in aquaculture, it is developed by including some food additives to fish diets (De Souza *et al*., 2019; Chung, 2021). As food additives were used for medicinal plants such as *Zingiber officinale*, which is a well-known and widely used spice, it is considered one of the most important medicinal plants belonging to the

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Zingiberaceae family. It is widely cultivated in hot areas, its roots growing under the soil are used, which contain volatile oil, have a pungent odor and a pungent taste, and their color is either squirrel or yellowish-white (Mahomoodally *et al*., 2021). It is native to Asia, Africa, India and other tropical regions (Singletary, 2010). Ginger consists of carbohydrates, fats, water, fiber, proteins and minerals, it is also used in most traditional herbal medicines in many countries of the world such as India, China and Africa, has been proven effective in treating headaches, osteoporosis, colds and asthma, as well as bone pain (Li *et al.*, 2019).

This experiment aims to demonstrate the effect of adding different levels of ginger oil to the diet of common carp *Cyprinus carpio* on the blood parameters of carp fish.

## Material and methods

The experiment was conducted at the first agricultural research and experiment station in Umm Al-Akaf area in Al-Muthanna Governorate for the period from 1/10/2021 to 20/12/2021, at an excavated earthen basin, Dugout ponds 45 m long, 35 m wide and 1.5 m deep.

In the coordinates (E45.930918, N 321394, 31) and it is about 1 km away from the Euphrates / Atash River, the water was pumped by an electric pump installed on the river, the water enters the basin through an iron pipe with a diameter of 8 inches, installed at a height of 1.25 m from the bottom of the basin, its nozzle is controlled by a plastic clip to prevent the entry of aquatic fauna and foreign objects from the river into the aquarium.

Periodic were monthly checks conducted to assess the water quality, its suitability for fish culture from the percentage of dissolved oxygen, pH and salinity, the water temperature was measured on a daily basis, and the basin was prepared and equipped with an iron bridge paved with wood, 24 m long and 60 cm wide, in a T-shape. It extends from the end of the land to the middle of the basin, and the bridge rests on five pillars, the bridge was provided with iron rings for the purpose of attaching it to the experiment cages by means of plastic belts. The bridge facilitates the process of accessing the

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experiment cages to perform all operations related to fish farming, such as feeding, weighing, measuring water temperature, and others. The basin was also provided with a mesh iron cage with a length of 1 m, a width of 1 m, and a height of 1.5 m, to store the fish before distributing it to the experiment ponds and to keep the rest of it for later.

The experiment lasted for 82 days with acclimatization, in which four different experimental diets of ginger oil addition rates were used, to know the effect of its use on some physiological and biochemical characteristics of common carp fish, the four experimental treatments were 0, 0.25, 0.5 and 1% ginger oil to T1, T2, T3 and T4 respectively, with a crude protein percentage of 28% in all diets.

## Results and Discussion

### Blood parameters

### Red Blood Cell

Table (1) shows that the highest value of the average red blood cells was recorded for the third treatment was 1.14 × $10^6$ cells/$mm^3$, which showed a non-significant superiority (P≥0.05) over all treatments of the experiment, as well as no significant differences were recorded among T1, T2 and T3 were 1.01, 1.04 and 1.06x$10^6$ cells/$mm^3$, respectively.

### White Blood Cells

The highest value of the white blood cell average was recorded for the control treatment (146.74×$10^3$ cells/$mm^3$), which showed an insignificant superiority (P≤0.05) compare the other treatments, then T2 and T3 followed with values It reached 141.36 and 140.54x$10^3$ cells/$mm^3$, respectively, while the lowest value was recorded by T4 was 139.30x$10^3$ cells/$mm^3$.

### Hemoglobin (Hb)

A non-significant superiority (P≥0.05) on the hemoglobin concentration for the control treatment, which recorded 8.70 gm/100 ml, which was significantly close in value for each of T3 and T2 treatments were 8.55 and 8.45 gm/100 ml, respectively, while no difference significant between T3 and T4 treatment, as the lowest values were recorded in hemoglobin concentration, and they reached 8.05 gm/ 100 ml.

### Packed Cells Volume (PCV)

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The third treatment recorded an insignificant superiority (P≥0.05) over the rest of the experiment treatments, as the recorded values for it amounted to 24.25%, in addition to that there is a convergence in the recorded values among T1, T2 and T4 were 22.75, 22.65 and 22. 70% respectively, which did not record a significant difference between them.

Table (1): Blood parameters (mean ± standard error) of common carp fish fed on rations containing ginger oil during the duration of the experiment.

| Treatments | RBC (Cell×$10^6$) | WBC (Cell×$10^3$) | Hb (gm/ 100 ml) | PCV (%) |
|---|---|---|---|---|
| T1 | 0.11±1.01 | 0.50±146.74 | 0.80±8.70 | 2.35±22.75 |
| T2 | 0.12±1.04 | 4.18±141.36 | 0.65±8.45 | 2.45±22.65 |
| T3 | 0.10±1.14 | 4.79±140.54 | 0.55±8.55 | 0.75±24.25 |
| T4 | 0.00±1.06 | 4.59±139.30 | 0.25±8.05 | 0.10±22.70 |
| Sig. | N.S | N.S | N.S | N.S |

From the previous results, we note the superiority of the third treatment over the rest of the experimental treatments, and these results are somewhat identical with Mohammadi et al. (2020)

The results showed a significant increase at the level (p≤0.05) in the numbers of red blood cells, white blood cells and hemoglobin, while the rest of the blood parameters such as (MCH, MCHC) did not register a significant difference between the treatments, as it was shown that the level of 0.2% effectively improves the growth and health status of the common carp (*Cyprnus carpio*).

The results of this study also matched with what was indicated by Oh *et al*. (2022) who used ginger juice residues in feeding young black rockfish (Sebastes Schlegelii) with percentages of 0.0, 0.25, 0.5, 0.75, and 1.00, respectively.

The researchers attributed the above to the improvement of health status and disease resistance, which may

be due to the rise of Superoyide dismutase, which significantly increased in the blood of fish fed on more than 0.5% of ginger juice residues. The researcher referred to the effect of terepen, known for its aroma and flavor, in improving feed consumption and feed conversion ratio. The increase in the number of red blood cells may have an effect in avoiding anemia and improving the transport of oxygen to the body tissues, and consequently an increase in growth parameters, the results also matched with Chung *et al*. (2021) when five levels of ginger oil were used to feed Nile tilapia young, it was concluded that a concentration of 0.5% improves white blood cells, red blood cells, hemoglobin and compacted blood cells. The results also matched to some extent with Abdelmagid *et al*. (2022), when four levels of ginger oil were used in feeding Nile tilapia, it showed a significant increase in the levels of red blood cells (RBC) and white blood cells (WBC), as well as a high percentage of protein, hemoglobin, and PCV, in treatments that were fed on ginger compared to a control treatment. The results also matched to some extent with Hosna *et al*. (2014), when 1 gm of ginger per 100 gm of feed was used to feed *Huso huso* fingerlings, it led to the emergence of significant differences with a statistical significance in the treatment with a level of 0.05 gm/kg on the control group through high levels of red blood cells and growth rate, as well as a high percentage of protein. The results also matched to some extent with Jafarinejad *et al*. (2020), when 0.5 of ginger was used in the feeding of common carp (*Cyprinus carpio*) showed a significant increase in the levels of red blood cells and white blood cells compared to the control treatment. The results also matched to some extent with Negm *et al*. (2016) when ginger oil was used at different levels (0, 1, 2 and 3%) in feeding Nile tilapia fingerlings, it showed a significant increase in the levels of red blood cells and white blood cells, as well as an increase in the proportion of protein, hemoglobin and agglutinated blood cells in treatments that were fed ginger oil compared to a control treatment, the results also matched to some extent with Jahanjoo et al. (2018) when three types were used (1% ginger, 1% garlic, 1% thyme), as the addition of ginger showed a significant increase in the levels of red blood cells and white blood cells, as well as a high percentage of Hb compared to the treatment. with control, the results also matched to some extent with Almeida *et al*. (2021), when four

different levels of ginger oil were used in feeding tropical catfish, as a percentage of 0.5% showed a clear increase in the number of white blood cells, red blood cells and hemoglobin. The results also matched to some extent with Haghighi *et al*. (2013), when he fed rainbow troun with ginger root powder by 1%. The results showed an increase on the number of white blood cells, red blood cells, hemoglobin and compacted blood cells compared to the control group. The results also matched to some extent with Gholipour Kanani *et al*. (2014), when ginger and garlic were used to feed *Huso huso* fingerlings, as it showed a significant increase in the number of white blood cells, red blood cells, Hb and PCV.

**Biochemical blood tests**

**Total protein concentration**

Table (2) shows that there are no significant differences among all experimental treatments in the percentage of total protein concentration in the blood, although T1 treatment recorded 3.20 gm/ dL compare other treatments, while T4 treatment recorded the lowest value It was 3.00 gm/ dL.

**Globulin concentration**

A non-significant superiority (P≥0.05) for T3 on the concentration of globulin protein in the blood, with a value of 2.20 gm/ dL, then T4 and T1 came in close proportions between them amounting to 1.95 and 1.90, gm/ dL respectively, while T2 treatment was in the lowest order with a value of 1.85 gm/ dL.

**Glucose concentration**

T1 recorded a non-significant superiority (P≤0.05) compare with other on blood glucose, was 35.30 mg/ dL, followed by T4, with a value of 34.95 mg/ dL, while T3 and T2 recorded results were close to each other, among them, the blood glucose concentration values, which amounted to 31.60 and 29.30 mg/ dL.

Table (2): Biochemical parameters (mean ± standard error) of common carp fish fed on rations containing ginger oil during the duration of the experiment.

| Treatments | Total protein (gm/ dL) | Abumin (gm/ dL) | Globulin (gm/ dL) | Glucose (mg/ dL) |
|---|---|---|---|---|
| **T1** | 0.00±3.20 | 0.01±1.30 a | 0.10±1.90 | 0.05±35.30 |
| **T2** | 0.05±3.05 | 0.00±1.20 ab | 0.05±1.85 | 5.20±29.30 |
| **T3** | 0.15±3.15 | 0.05±0.95 c | 0.20±2.20 | 4.90±31.60 |

| | | | | |
|---|---|---|---|---|
| **T4** | 0.00±3.00 | 0.05±1.05 bc | 0.05±1.95 | 0.50±34.95 |
| **Sig.** | N.S | 0.05 | N.S | N.S |

Through the results presented in Table (2), we note that the values of total protein concentration and globulin concentration in fish serum were close in all experimental treatments. No significant differences were recorded between them despite the mathematical superiority of the third treatment fish fed on rations containing ginger oil by 0.5%. The reason for this may be attributed to the consumption of protein absorbed in the metabolic processes inside the body, which discourages an increase in its concentration in the blood serum, the fish of the second treatment also recorded a non-significant decrease in the blood sugar value compared to the rest of the treatments. The results matched to some extent with Abdelmagid *et al*. (2022).

Four levels of ginger oil were used in feeding tilapia, which showed a significant increase in the percentage of total protein and albumin. Also, the results matched to some extent with Almeida *et al*. (2021), in which four different levels of ginger oil were used in feeding tropical catfish. The results matched to some extent with Mohammadi *et al*. (2020), as the common carp fish were fed in different proportions. The results showed a significant increase in the percentage of total protein and albumin compared to the control treatment. The results are in agreement to some extent with Negm *et al*. (2016), when ginger oil was used in feeding Nile tilapia fingerlings, as it showed a significant increase in the increase in total protein and albumin in the treatments that were fed on ginger compared to the control treatment. The results matched to some extent with Jahanjoo *et al*. (2018) when three types of oil were used (1% ginger, 1% garlic, 1% thyme), as between the addition of ginger showed a significant increase in the percentage of total protein and albumin compared to the control treatment. The results matched to some extent with Gholipour Kanani *et al*. 2014, when ginger and garlic were used in feeding Huso huso fingerlings, as it showed a significant increase in the increase in total protein, albumin and globulin in the blood compared to the control treatment.

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