Effect of Adding Licorice *Glycyrrhiza glabra* Roots Powder on Growth Parameters and Blood Indicators of Common Carp *Cyprinus carpio* L.

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Abstract

This study aims to use licorice roots powder as animal food additive to support rations of common carp and improve growth parameters and blood indicators. It was carried out for period of 60 days from (6/4/2017 to 4/6/2017) at nutrition laboratory/Fish Department. 50 fish of common carp *Cyprinus carpio* L. with average weight (15 ± 0.66) gm were distributed to five treatments (T1, T2, T3, T4, and T5-as control) with two replications, fed on 0.2, 0.4, 0.6,0.8, and 0% of Licorice *Glycyrrhiza glabra* respectively as additive food in fish rations**.** Results showed that T4 (0.8%) was exceeded significantly (P≤ 0.05) all other treatments in all growth parameters (Weight Gain, Specific Growth Rate and Food Conversion Efficiency) and blood indicators measurement (RBCs, WBCs, PCV, and Hb) also results revealed that all licorice treatments were excelled control treatment in both parameters and indicators (Growth and Blood). In conclusion, the addition of 0.8% licorice roots powder achieved higher values of growth parameters and blood indicators measurement than the other concentrations**.**

Key Words: *Glycyrrhiza glabra*, Licorice Roots Powder, Growth Parameters, Blood Indicators and Common Carp.

تأثير إضافة مسحوق جذور عرق السوس *Glycyrrhiza glabra* في معايير النمو ومؤشرات الدم لأسماك الكارب الشائع *Cyprinus carpio* L

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بغداد – العراق

الخلاصـــة

هدفت الدراسة إلى إستخدام مسحوق جذور عرق السوس كإضافة غذائية لتدعيم علائق أسمال الكارب الشائع وتحسين مؤشرات النمو والدم. أجريت الدراســـة لمدة 60 يوماً في مختبر التغذية/ قسم الأســـماك للفترة مـــن (2017/4/6 الى 2017/6/4) أستخدمت فيها 50 سمكة كارب شائع بمعدل وزن (0.66 ± 15) غم وزعت على 5 معاملات (T1 و T2 و T3و T4و T5 - سيطرة) وبواقع مكررين لكل معاملة واستخدمت تراكيز مختلفة من مسحوق جذور عرق السوس *Glycyrrhiza glabra* في المعاملات كإضافات غذائية في علائق الأسماك *Cyprinus carpio* L. وبواقع (0.2 و0.4 و0.6 و0.8 فضلاً عن 0% كمعاملة سيطرة) على التوالي . أظهرت النتائج تفوق المعاملة T4معنوياً ($P \leq 0.05$) على باقي المعاملات في مؤشرات النمو وفحوصات الدم وكذلك تفوق جميع معاملات عرق السوس على معاملة السيطرة. وبينت فحوصات الدم ان جميع معاملات السوس تفوقت على معاملة السيطرة في المؤشرات الدموية RBCs و WBCs وPCV وHb. استنتج من هذه الدراسة أن اضافة مسحوق عرق السوس بتركيز 0.8% حقق أعلى قيم النمو ومؤشرات الدم مقارنة ببقية التراكيز.

الكلمات المفتاحية: مسحوق جذور عرق السوس، معايير النمو، مؤشرات الدم والكارب الشائع

Introduction

Fish was considered a very important source and a basic element for covering human nutrition requirements. In view of increasing demand as well as the high price of fish rations in markets, fish farmers depend on cheap and highly efficient sources which used as additional diets in fish rations to support and improve fish growth parameters and healthy status (Dimitroglou, *et al*., 2011). Licorice was logevous shrub distributed in many world regions, its root considered as a cheap, available and effective growth promoter, besides its healthy importance by improving the immunity response against virus and fungi in addition to regulate bio reactions inside animal body (Houguo, *et al*., 2013; Anita and Chauhan, 2018). Other studies investigated the effects of licorice as a medical herb on fish growth and immune system (Kumar, *et al*., 2007; Heiderieh, *et al*., 2013; Arulvasu, *et al*., 2013). The main active compound in licorice roots is glycyrrhizin which analyzed to Glycyrrhizinic acid and compounds of lipid, phenols, starches in addition to amino acids, vitamins, and minerals (Jang, *et al*.,1995).

This study aimed to use licorice roots powder as an animal food additive to support rations of common carp and improve growth and blood parameters.

Materials and Methods

The current study was carried out in nutrition laboratory at Fish Department along the period between 6April to 4 June 2017. 50 fish of common carp *Cyprinus carpio* L. with average weight (15 ± 0.66) gm were distributed randomly in ten aquarium (60x30x30) cm, each aquarium stocked with 5 fishes. Five dietary treatments Table (1) were prepared by mixing the licorice roots powder, T1(0.2%), T2(0.4%), T3(0.6%), T4(0.8%) and T5 as control (Free from Licorice). Growth parameters were measured as following:

Weight Gain (WG) = W2 – W1, whereas W1 (Initial Weight), W2 Final weight).

Specific Growth Rate (SGR) = (LinW2-LinW1 / t2 – t1) *100 Whereas t1(the Date of Beginning of Experiment), t2(the Date of Finishing of Experiment) (Chapman, 1978).

Food Conversion Efficiency (FCE) = Weight of food intake (gm) / Weight gain (gm) (Jauncey and Ross ,1982). Blood parameters analysis included Red Blood Cells (RBCs) counts, White Blood Cells (WBCs) counts Packed Cell Volume (PCV) and Heamoglobine (Hb). Blood samples were collected from caudal vein by using of single use strile medical plastic syring (Volume 1ml) and the blood samples were stored in heparinized tubes for blood parameters analysis.

1-RBCs and WBCs count the method of (Dacie and Lewis, 1984) was used for counting RBCs and WBCs by using champer as following:

Number of RBCs in 1ml = Number of counted RBCs in five squares * 2500.

Number of WBCs in 1ml = Number of counted WBCs in lateral large squares * 125.

2-Hb measurement

Cyanomethaemoglobin method was used by reading the optical density at 540 nanometers wavelength, then convert this reading to Hb as gm/100 ml. of blood (Balaxhall and Daislly,1973).

3-PCVmeasurement

(Balaxhall and Daislly,1973) method was carried out by using micro pipes read by micro haemtocrit reader which represent PCV in 100ml of blood.

Statistical program (SAS) was used to analyze the data (SAS, 2004).

Table (1) Ration Contents of Dietary Treatments

Ration Contents *	T1 %	T2 %	T3 %	T4 %	T5 Control %
Animal Protein Powder	10	10	10	10	10
Soybean	20	20	20		20
Yellow Corn	20	20	20	20	20
Barley	25	25	25	25	25
Wheat Bran	25	25	25	25	25
Minerals	1	1	1	1	1
Licorice Roots Powder	0.2	0	0.8	0.6	0.4

Table (2) Growth Parameters of Fishes Fed on Different Concentrations of Licorice Roots Powder

Treatments	Initial Weight Rate gm/fish	Final Weight Rate gm/fish	Weight Gain gm/fish	Weight of Food Intake (gm)	Specific Growth Rate %	Food Conversion Efficiency
T1	15.91a±0.32	21.05d±0.14	5.59c	21.54	0.51d±0.010	0.25c
T2	15.98a±0.4	22.39c±0.24	6.41c	22.58	0.57c±0.009	0.28b
T3	15.88a±0.35	23027b±0.27	7.39b	56.24	0.62b±0.006	0.30b
T4	15.88a±0.52	24.68a±0.29	8.80a	25.55	0.65a±0.004	0.34a
T5 Control	15.87a±0.57	20.88d±0.13	5.01d	21.45	0.46e±0.008	0.23d

Different letters in the same column mean significant differences between treatments ($p \leq 0.05$)

Significant differences between the treatment means were compared by using Dancan's multiple range test under probability level $P \leq 0.05$ (Duncan,1955).

Results and Discussion

Results indicated that licorice roots powder enhanced all growth parameters as well as improved health status of fishes. The results Table (2) revealed that there were significant differences ($p \leq 0.05$) between treatments as T4 (0.8%) exceeded all other treatments in all growth parameters: weight gain, relative growth rate, specific growth rate (SGR), food conversion efficiency (FCE) and blood parameters (RBCs, WBCs, PCV, Hb). Results showed that the highest SGR was recorded in T4 (0.65%) followed by T3 (0.62%) while the lowest was recorded in control treatment (0.46%). Also, the results indicated that T4 got higher weight gain and final weight rate than other treatments, as it recorded 8.80 and 24.68 respectively. The superiority of T4 may be due to the most suitable concentration of licorice in this treatment which contributed in improving all growth parameters, this result agreed with (Anita and Chauhan ,2018). whom recorded approaching results reached to 0.66 - 1 for SGR and 0.26-0.36 for FCE explaining that licorice roots powder supported growth and healthy status when it was used as nutrient addition in rations of common carp. the results also showed that all licorice treatments excelled control treatment Table (2), it may be related to use licorice as food additive which contributed to increasing growth parameters besides increasing the utilization of food elements, also may due to the sharing of licorice in producing matters which act as antibiotics to enhance immunity response, in addition to the positive effects of additive licorice on activity of immunity system, reducing stress (as

anti-stress agent), increasing food appetite as well as improving fish healthy status (Elabd, et al., 2016).

The positive changes in improving growth parameters for fish fed on licorice also related to its multiple benefits because of its components of vitamins, minerals, flavotides, antioxidants besides improving body immunity response, this result agreed with (Houguo, *et al*., 2013) who showed that licorice roots powder act as steroid hormones in increasing blood running into fish gut membranes, then increasing utilization of important nutrient elements. (Jang**,** *et al.,* 1995) found that the active substance in licorice roots powder is Glycyrrhizin and its metabolic product Glycyrrhizinic acid has the same activity of steroid hormones in raising proteins synthesis which increase muscles growth rate besides its role in increasing essential metabolic rate of Rainbow trout *Oncorhynchus mykiss*. This result was also recorded by (Kumar, *et al*., 2017) who proved that licorice was active promoter for fish growth parameters because it has substances might be activate thyroid gland which stimulates the growth hormone secretion.

Results of blood tests Table (3) showed that blood indicators (RBCs, WBCs, PCV and Hb) exceeded with increasing of licorice roots powder concentrations, so this result refers to the positive effect of licorice on blood indicators, as (Anita and Chauhan, 2018) who mentioned that these indicators especially RBCs increased with addition of licorice roots powder to the diets of common carp *Cyprinus carpio* L. in India. This addition contributed with raising oxygen transfer activity which leads to get high energy for essential metabolic activities such as food metabolism. Increasing of WBCs enhanced immunity system response against disease then improved fish healthy status and food intake (Kumar, *et al.*, 2017; Jang, *et al*.,1995).

Conclusion

The results appeared that the addition of licorice roots powder to fish rations enhanced all growth parameters, and all licorice treatments were superior significantly as compared to control. The concentration of (0.8%) achieved the highest values in all growth parameters and blood indicators.

Table (3) Fish Blood Parameters Measurement.

Treatments	RBCs Cell/(mm)	WBCs Cell/(mm)	PCV%	Hb
T1	10^6 ×1.375	10^3×14	32	10.6
T2	10^6 × 1.5	10^3×15	36	12
T3	10^6 ×1.625	10^3×17.5	36	12
T4	10^6 ×1.687	10^3×17.5	38	12.6
T5 Control	10^6 × 1.187	10^3×12.5	26	8.6

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