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The effect of adding thyme oil (Thymus Vulgaris L) and rosemary oil (Rosmarinus Officnalis L.) and their mixture on some growth traits of carp Cyprinus carpio L.

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Abstract

The effect of using different levels of thyme and rosemary oil on some growth parameters of carps were study, raised in experimental cages inside an earthen pond at the first agricultural research and experiments station, College of Agriculture (Umm Al-Akaf area), at Al-Muthanna Governorate. The experiment lasted for 82 days, including the acclimatization period of 7 days, it brought 108 fish (of 50-60 gm weight), it was divided into six groups. The results of the statistical analysis showed sig. differ ($P<0.05$) among groups in the studied grow parameters. T4 were sig. outperformed on final weight (142.90 gm), weight gain (74.00 gm), a daily growth rate (1.06 gm/day), T3 and T4 were recorded the highest relative growth rates, in addition to recording the highest specific growth rate.

Key words: thyme oil, rosemary oil, growth parameters, common carp *Cyprinus carpio L*.

Introduction

Fisheries in Iraq are one of the most important aspects of national agricultural development, due to the availability of wide water areas represented by the Tigris and Euphrates rivers and their branches and tributaries, in addition to marshes, lakes, dams and reservoirs (13). It overlooks a 50 km long sea coast (6). The waters of the Tigris and Euphrates rivers are warm waters suitable for fish farming, because of its physical and chemical characteristics suitable for the growth and

reproduction of fish (7). Functional feed additives improve growth, immune response, physiological functions and health performance of fish, compared with regular feed additives, many materials are used as food additives, including traditional ones, such as amino acids, vitamins, hormones, and binding materials (3,4,5) pointed out that probiotics and essential oils can be considered one of the most important effective quality additives, which is used to enrich relationships and raise their value, reflected positively in increasing fish activity, health and growth.

The rosemary plant belongs to the Erythraceae family, and is an evergreen shrub, characterized by a unique(9), of the three species of the genus Rosmarinus used to produce essential oils, Rosmarinus officinalis is one of the most productive species, this plant is native to Mediterranean environments (19). They are now widely cultivated globally due to their medicinal, aromatic and ornamental properties (15,16).

Thyme is an aromatic evergreen herb in the mint family, it is grown in the Mediterranean region, it has uses in cooking, medicine and decoration. The most common species grown and used for culinary purposes is Thymus vulgaris. (12).

Material and methods

The experiment was conducted at the first agricultural research and experiments station (Umm Al-Akf area), at Al-Muthanna Governorate for the period from 1/10/2023 to 22/12/2023, in a dugout pond, 45 m long, 35 m wide, and 1.5 m deep, it is about 570 meters away from the Euphrates/Al-Atshan River, according to the coordinates E 45.189309N, 31.321394.

Fish farming cages were used in the experiment, consists of two rectangular pieces of wood, leaving a distance of (10-20) cm at the ends, to allow this free space to provide each piece of wood from the bottom with plastic tubes with a diameter of 4 inches, consists of 4 pieces of pipes with lengths (215 cm x 2 + 95 cm x 2). They are connected to each other using glue and plastic tape, 4 inches in diameter and 4 in number, to form a continuous rectangular plastic tube that extends, fixed to the piece of wood using iron fasteners, these tubes contribute to supporting the piece of wood, it also acts as a supportive flotation device in addition to the natural buoyancy property of wood. these ponds are covered with a galvanized iron clamp surrounded by a circular iron collar to prevent fish from jumping out of the ponds and to protect

them from birds. Installing galvanized plates with edges 3 cm high at the bottom of the sinks by drilling them and attaching them to the bottom of the sink, using plastic tape to preserve the feed provided to the fish and reduce its waste. After that, the experimental cages were connected in two parallel rows and secured to the bridge next to them using galvanized iron wires. The experimental fish were distributed into 15 baskets and according to the experimental design: The remaining basket was used as a temporary storage cage for fish.

Both thyme oil and rosemary oil were obtained from the market, to be used in the formulation of relationships. A sample was taken from it for the purpose of conducting laboratory analyzes and determining the chemical composition. As for the rest of the materials used in formulating the diet, they were purchased from local markets, ground well, and transported to the site where the experiment was conducted, then the diets were distributed and weighed in an amount of 10 kg for each treatment, according to the percentage of each feed material used in it. Both rosemary oil and thyme oil were added to each treatment except the control diet (Table 1). Mix it well and repeatedly in order to ensure a more homogeneous distribution. The diets were stored in five sealed plastic tanks designated for each diet. 2 kilograms are withdrawn from each feed every time the feed is pressed, then the oil is added at a rate of 1%, then water is added in the amount of 800 ml for every 2 kg of the mixture, with continuous mixing and stirring until it becomes a solid dough consistency. The mixture is then placed inside a homemade press equipped with a 1-horsepower electric motor of Chinese origin. The feed is made in the form of a pellet with a capacity of 20 kg. A sample of the diet was taken for analysis and to determine its chemical composition (Table2)

Table (1): Composition of the diets used in the experiment.

Items	Treatments					
	T0	T1	T2	T3	T4	T5
Animal Protein concentrate	20	20	20	20	20	20
Soybean meal	30	30	30	30	30	30
Bran	20	20	20	20	20	20
Maize	15	15	15	15	15	15
Barley	10	10	10	10	10	10
Wheat flour	3	3	3	3	3	3
Oil	1	0.5	0	0.5	0	0
Vitamins and Minerals*	1	1	1	1	1	1
Thyme oil	0	0	0	0.5	1	0.5
rosemary oil	0	0.5	1	0	0	0.5

Table (2) Chemical analysis of experimental diets.

Treatments	Chemical Content				
	Protein (%)	Ether extract (%)	Ash (%)	Fiber (%)	Carbohydrates (%)
T0	16.62	2.44	11.98	2.81	66.15
T1	18.81	2.16	16.87	6.9	55.26
T2	18.37	1.93	21.74	2.72	55.24
T3	19.68	2.13	20.67	7.0	50.52
T4	14.00	2.35	20.16	11.8	51.69
T5	17.50	2.27	18.57	0.5	61.16

As for the studied characteristics were total Weight Gain(WG), Daily Growth Rate (DGR), Relative Growth Rate (RGR) and Specific Growth Rate (SGR).

Statistical Analysis

A Completely Randomized Design (CRD) was used, to study the effect of transactions on the studied traits. Significant differences between means were tested using the Duncan (1955) multiple range test at a significance level of 0.05, using the ready-made statistical program SPSS, version (20).

Results and discussion

Weight gain and daily growth rate

Table (3) shows that there are significant differences at the probability level (P≤0.05) in the rate of weight gain for fish in T4, T3, T2 and T1 treatments, respectively, while no differences appeared between T0 and T5. The fish of T4 treatment recorded 74.00 gm/fish, significantly superior to T3 treatment (59.50 g/fish), which in turn outperformed on T2 (56.64 g/fish), then T1 (49.76 g/fish). The control and T5 recorded the lowest values, were 45.11 and 41.69 g/fish, respectively. There were no significant differences between them and the initial weight. The lowest values for all experimental parameters were recorded in the first weight of the experiment. The highest value was for the fish of T4 (142.90 g), and the lowest value was for the fish of T2 (114.88 g), while the highest values were recorded in the weight increases for all parameters in the fourth weight. The lowest value was for the control treatment (41.69 g), then the values of weight increases gradually decreased until the end of the experiment period. T4 (1.06 g/day), was followed by T3 (0.85 g/day), then T2 (0.81 g/day), while no significant differences appear between the control treatment and T5, with each of them recording a daily growth rate of 0.65 and 0.59 g/day.

Relative Growth Rate:

Table (3) show that there are significant differences (P≤0.05) among the experimental parameters. The fish of T4 and T3 treatments recorded a significantly different relative growth rate of 107.40 and 86.35%, respectively, then they were followed by T2 (82.25%), T1 approached it with a value of 72.25% and T5 with a value of 65.48%, which in turn did not differ significantly.

Specific Growth Rate:

Table (10) that there are significant differences (P≤0.05) among the treatments, while the fish of T4 and T3 treatments were significantly superior in

the specific growth rate, with values of 1.04 and 0.89%/day, respectively. Came T2 (0.86%/day), and T1 (0.78%/day), then the control and T5 treatments amounted to 0.72 and 0.68%/day for each, which means they are not significantly different.

The specific growth rate values fluctuated between the experimental treatments and increased gradually for all treatments, starting from the first weight of the experiment and reaching the highest values in the fourth weight, the fish of T4 treatment recorded the highest value (1.04%/day). The lowest value was for fish in the control treatment (0.68%/day), then after that, the values of all parameters began to gradually decrease, reaching their lowest values in the fifth weight of the experiment.

Table (3) Some studied growth parameters (mean ± standard error) for common carp fish fed with diets containing different percentages of thyme and rosemary oil.

Treatments	Growth parameters					
	Initial weight (g)	Final weight (g)	Weight gain (g)	Daily growth rate (g/day)	Relative growth rate (%)	Specific growth rate (%/ day)
T0	68.90±0.10	110.59±3.32 d	41.69±3.41 d	0.59±0.05 d	60.51±5.01 d	0.68±0.04 e
T1	68.88±0.21	118.64±1.17 c	49.76±1.00 c	0.71±0.02 c	72.25±1.29 c	0.78±0.01 cd
T2	68.87±0.10	125.51±1.40 b	56.64±1.50 b	0.81±0.02 b	82.25±2.28 b	0.86±0.02 bc
T3	68.92±0.14	128.42±2.78 b	59.50±2.89 b	0.85±0.04 b	86.35±4.33 b	0.89±0.04 b
T4	68.91±0.38	142.90±1.29 a	74.00±1.35 a	1.06±0.02 a	107.40±2.20 a	1.04±0.01 a
T5	68.92±0.22	114.03±1.56 cd	45.11±1.76 cd	0.65±0.02 cd	65.48±2.74 cd	0.72±0.03 De
Sig.	N.S	*	*	*	*	*

T4, then T3, followed by T2, were superior in terms of final weight, total weight gain, and daily growth rate over the rest of the experimental treatments. As for the criteria of relative growth rate and specific growth rate, each of the fish from T4 and T3 treatments outperformed. The adding essential oils in low and safe proportions has a clear impact on growth standards, because of the chemical composition of essential oils, which contain a good mixture of essential amino acids that are important for body growth, such as arginine, methionine, leucine, and cysteine, in addition to being a good source of carbohydrates and crude fiber and possessing a rich mixture (10), perhaps one of the reasons for the increase in growth is the result of the diversity of protein sources in the experimental diets and filling the deficiency in amino acids necessary for fish growth, integrating diets and increasing their content of important mineral elements (18). The results of the current study were close to the results of the study conducted by (8). The researchers attributed that the increase achieved in some growth parameters occurred as a result of the high nutritional value of the oils after adding them to diets at low rates of 4.1 and 8.2 grams/kg diet, contains low levels of anti-nutrients or what are known as growth inhibitors, then, we benefited from the effectiveness of essential oils in stimulating fish growth without activating the negative effect of growth-inhibiting substances on them, while the results of our study did not agree with the results of the study conducted by. (2), note that the researcher added essential oils to the diets of African running fish in proportions similar to the proportions that were added to the diets of our current experiment, despite the mathematical superiority of the treatments in terms of final weight, weight gain, daily growth rate, and specific growth rate, however, this superiority is not significant and no significant differences were recorded between the addition treatments and the control treatment in all the growth standards studied. The researcher attributed the reason to the fact that the effect of adding essential oils to diets may not appear clear on fish after only 12 weeks of feeding.

Table (3) showed a decrease in all growth parameters studied in the experiment, which appear on the fish of T4 and continue to decrease until the values of these parameters in the fish of T5 treatment reach the lower limit, which were similar to the values recorded by fish in the control treatment. No significant

differences were recorded between these two treatments, meaning that adding essential oils to fish diets at a rate of 2% did not cause any increase or improvement in growth standards. We believe that the reason for this is that the increase in the rate of adding essential oils to diets is accompanied by an increase in their content of growth inhibitors such as tannin, saponins, and phytic acid, which limits the use and addition of high levels of essential oils to fish diets, by its negative effects on metabolic processes within the digestive tract, such as the presence of phytic acid, which negatively affects digestive enzymes and inhibits their work through its association with them. In addition to forming complexes with protein, phosphorus, and some mineral elements such as iron, magnesium, and calcium, leads to a reduction in the benefit of protein and important nutrients in feeds containing them by reducing their availability and absorption in the digestive tract.

Hence, reducing growth and weight gain (1,17). pointed out the inability of fish to benefit from the nutritional complexes formed by phytic acid due to the fact that fish have a single stomach and lack the phytase enzyme.

These results agreed with the findings of (20) standards positively or negatively, it did not cause significant differences with the control treatment fish. The results of the study conducted by . (11) also demonstrated that adding essential oils to the diet of Nile tilapia fish (Oreochromis niloticas), at high rates of 5, 10, and 15%. No significant differences appeared with the control treatment in most of the growth parameters studied, researchers have attributed the reason for not achieving an increase in fish growth to the presence of high levels of anti-nutritional factors such as phenols, saponins, and phytic acid.

References

1_Adorian, T.J., L.F.de Moura, A.C.K. Klinger, B.A.B. Bender, C.S. Speroni, G.F.R. Ferrigolo and P.L. da Silva (2023). Antioxidant Action of Phytic Acid in Processed Fish Waste and Cooked Fish Sausages. Journal of Aquatic Food Product Technology, 32(10):707-717.

2_Ajani, E.K., O. Orisasona, B.O. Omitoyin, and E.F. Osho, (2016). Total Replacement of Fishmeal by Soybean Meal with or without Methionine Fortification in the Diets of Nile tilapia, *Oreochromis niloticus*. Journal of Fisheries and Aquatic Science, 11: 238-243.

3_Al Salman, N.T.Sh.; and J.K.M. Al-Gharawi (2019). Effect of Eucalyptus leaves water extract on some productive traits of broilers. Plant Archives Vol. 19, Supplement 1: 920-923.

4_Al-Gharawi, J.K. and J.A. Ebade (2020). Effect of different levels of cardamom oil in diet on some productive traits of layer hens. Plant Archives, 20 (2): 4085-4088.

5_Al-Gharawi, J.K.M., A.H. Al-Helali and I.F. Al-Zamili (2018). Effect of using different ways to provide the Iraqi probiotics on some productive traits of broiler. Plant Archives Vol. 18(1): 1102-1108.

6_Al-Saadi, A.A. (2007). Ecology and taxonomy of parasites of some fishes and biology of Liza abu from Al-Husainia creek in Karbala province, Iraq. Ph. D. Thesis, Coll. Educ. (Ibn Al-Haitham), Univ. Baghdad: 155.

7_Al-Saadi, H.A., A.A. Al-Lami and T.I. Qasim (1999). Study of the environmental characteristics of the upper Tigris and Euphrates rivers and their relationship to the development of fish resources in Iraq. Journal of Environment and Sustainable Development Research. 1420(2): 24-31.

8_Ayoola, S.O., E.K. Ajani and O.F. Fashae (2013). Effect of Probiotics (*Lactobacillus* and *Bifidobacterium*) on Growth performance and Hematological Profile of *Clarias gariepinus* Juveniles. World journal of fish and Marine Sciences., 5(1): 01-08.

9_Ban, L., B. Narasimhamoorthy, L. Zhao, J.A. Greaves and W.D. Schroeder (2016). Antioxidant activities from different rosemary clonal lines. Food Chem., 201: 259-263.

10_Barakat, H. and G.A. Ghazal (2016). Physicochemical properties of *Moringa oleifera* seeds and their edible oil cultivated at different regions in Egypt. Food Nutr. Sci., 7 (06): 472.

11_Bbole I., C. Mumba, N. Mupenda and S.A. Kefi (2016). Analysis of growth performance and haematological

parameters of *Oreochromis niloticus* fed on a varying diet of *Moringa oleifera* Lam. leaf meal as an additive protein source. International Journal of Fisheries and Aquaculture, 8(11): 105-111.

12_Boruga, O., C. Jianu, C. Misca, I. Golet, A.T. Gruia and F.G. Horhat (2014). Thymus vulgaris essential oil: chemical composition and antimicrobial activity. Journal of Medicine Life, 7: 56-60.

13_Coad, B.W. (2010). Freshwater Fishes of Iraq. Pensoft Publishers, Sofia-Moscow. 294 pp.

14_Coad, B.W. (2015). Freshwater fishes of Iraq. Freshwater fishes of Iraq cheek list. www.Brian Coad. com. (downloaded 22 April 2015).

15_Derwich, E., Z. Benziane and R. Chabir (2011). Aromatic and medicinal plants of Morocco: chemical composition of essential oils of *Rosmarinus officinalis* and *Juniperus phoenicea*. Int. J. Appl. Biol. Pharm. Technol 2, 145–153.

16_Evans, J.D. and S.A. Martin (2000). Effects of thymol on ruminal microorganisms. Curr. Microbiol., 41: 336-340.

17_Hussain, S.M., M. Afzal, A. Javid, N. Aslam, M. Hussain, S.Z.H. Shah, H. Azmat and M.S. Mubarik (2015). Role of phytase supplementation in improving nutrient digestibility in *Labeo rohita* (Hamilton, 1822) fingerlings fed on cottonseed meal based diet. Indian J. Fish., 62(1): 78-84.

18_Jabbar, A.R., A.H. Salman and M.J. Muhammad (2018). Use of the leaves of the salt ragweed *Atriplex halimus* L. and the Nile flower plant *Echhornia grassipes* and their mixture in diets for common carp *Cyprinus carpio* L.. Thi Qar University Journal of Agricultural Research.. 7(2): 229-237.

19_Porte, A., R.L. Godoy, O. de Lopes, D. Koketsu, M. Gonçalves, and S.L. Torquilho, (2000). Essential oil of *Rosmarinus officinalis* L.(rosemary) from Rio de Janeiro, Brazil. J. Essent. Oil Res. 12, 577–580.

20_Yuangsoi B. and T. Masumoto (2012). Replacing moringa leaf (*Moringa oleifera*) partially by protein replacement in soybean meal of fancy carp (*Cyprinus carpio*). Songklanakarin J. Sci. Technol., 34 (5): 479-485.