EFFECTS OF *TRIBULUSTERRESTRIS* EXTRACTON GROWTH PERFORMANCE AND BODY COMPOSITION OF CONVICT CICHLID (*CICHLASOMANIGROFASCIATUM*)

[1]SAKINEH YEGANEH, [2]AZAM SOTOUDEH, [3]AHMAD NOSRATI MOVAFFAGH

[1]Assistant Prof. of Fisheries Department, Sari Agricultural Sciences and Natural Resources University.
[2,3]MSc student of Fisheries Department, Sari Agricultural Sciences and Natural Resources University.

Abstract- This study evaluated the effects of diet containing 1 and 2 g kg-1 Tribulusterrestris extract on growth and body composition of Convict cichlid (Cichlasomanigrofasciatum). During 45 days of experimental period, fish fed 4 times a day at 3% of their body weight. For a completely randomized experimental design, 117 C. nigrofasciatum male with an average initial weight of 2.30±0.04 g were distributed into 9 glass aquaria (13 fish/tank) in 3 replicates. Biometry of the groups was done every 15 days. According to the results, the highest weight gain (WG) was obtained in 1 g kg-1 followed by 2 g kg-1T. terrestris extract and control. In groups that received T. terrestris extract, specific growth rate (SGR)increased significantly ($p<0.05$). Comparison of feed conversion ratio (FCR) and condition factor (CF) in different treatments indicates no significant differences ($p>0.05$). Survival rate of fish in all groups was 100%. As compared to control, protein levels for dried body decreased after feeding the fish with T. terrestris extract ($p<0.05$). Fish fed with T. terrestris extract showed higher lipid and moisture content than fish fed by control diet ($p<0.05$). There were no significant differences in ash content of fish body among experimental groups ($p>0.05$). The present results suggest that supplemented T. terrestris extract in feeds for C. nigrofasciatum improves growth performance.

Keywords- Body Composition, Cichlasomanigrofasciatum, Growth, Tribulusterrestris.

I. INTRODUCTION

Nutritional status of fish is an important factor in their resistance to diseases. In fact, by feeding them a proper diet, not only their health condition improves, but also the probability of diseases decreases;there is a positive correlation between increased resistance to diseases, growth rate and survival [1].Using of plant-based additives in aquaculture is one of the methods used to improve weight gain and feed efficiency in cultured fish [2].Plants are natural source of safer and cheaper chemicals. Beneficial effects of bioactive plant substances in animal nutrition may include the stimulation of appetite and feed intake, the improvement of endogenous digestive enzyme secretion, activation of immune responses and antibacterial, antiviral and antioxidant actions [3].

T.terrestris (Zygophyllaceae) is a ground-spreading herb widely distributed in India, China, Japan, Korea, western Asia, southern Europe, and Africa; it is traditionally used for treating liver diseases [4].*T. terrestris* is also consumed by people, allegedly for muscle building [5]. It contains different substancesincluding sapogenins, flavonoids, and alkaloids which have anti–inflammatory, anti–tumor, and immunomodulatory activities [6]. Flavonoids are one of the most widespread groups of natural compounds that have antioxidant and hepatoprotective properties [7]. These compounds have a broad spectrum of chemical and biological activities, including radical scavenging properties [8]. Gultepe et al (2014),studied the effect of *T. terrestris*extract on growth, feed utilization, hematological, immunological, and biochemical variables of Nile tilapia (*Oreochromisniloticus*) [5]. The effects of *T. terrestris* extract on performance and digestive system of broiler chicks also have been investigated in mice [9]. The aim of this study was to evaluate the effects of supplementary *T. terrestris*extract in diet on growth performance and body compositionof *C. nigrofasciatum.*

II. DETAILS EXPERIMENTAL

2.1. Materials and Procedures

T. terrestris seeds were prepared from the local plant market, washed in sterile distilled water, air-dried in shade and powdered. 250 g of powder extracted with 500 ml 70% ethanol[10]. The prepared crude extract was used for the entire experiment as a stock solution. Commercial food on the market (manufactured by Biomar France) was used to prepare the diets. Proximate composition of the diets was 42.88±0.55% protein, 28.25±0.58% lipid, 5±0% fiber, 8.27±1% moisture and 9.67±0.18% ash. 2 diets containing *T. terrestris* extract with amounts of 1 and2 g kg^{-1} of diet and a control diet (without *T. terrestris* extract) were prepared. The experiment was carried out in triplicatefor each diet. 9aquarium (80 l) were stocked with 117male *C. nigrofasciatum*with an average initial weight of 2.30±0.04 g (13 fish/aquarium). Thefish were fed four times daily (08.00, 10.00, 14.00 and 16.00 h) for 45 days (3% of their body weight). Biometry of the groups was done every 15 days. During theexperiment, water was exchanged daily at a rate of ~20% of the total volume. Water temperature was determineddaily (26.22±2ºC) .The average pH,dissolved oxygen, TDS (Total Dissolved Solids), salinity and electrical conductivity were 8.64±0.05, 7.75±0.21 ppm, 825.61±59 ppm, 0.8±0ppt

and 1649.93±119 µs/cm, respectively. Growth performance and feed utilization were calculated according tothe following formulae: Weight Gain (WG, %) = 100 × [(final fish weight – initial fish weight)/initial fishweight], Specific Growth Rate (SGR, %) = 100 × [(ln final fish weight) – (ln initial fishweight) / experimental days],Feed Conversion Ratio (FCR) = feed intake/ weight gain, Condition Factor (CF) = [weight of the fish / (length of the fish)3] and Survival Rate (SR) = [(total number of fish at the end of trial / total number of fish at the start of trial) ×100].Proximate analyses of the diets were performed using standard methods [11]. Dry matter was analyzed by drying at 50°C for 48 h in oven to a constant weight, crude lipidby ether extraction, crude protein by the Kjeldahl method, and crude ash by incinerationat 550°C for 6 h.Samples of fish in each treatment were weighed before putting them in an oven for 24 h at 105 °C, and then reweighed to estimate the moisture content.

2.2. Statistical Analysis

The effects of treatment on different parameters were analyzed by one-way analysis of variance (ANOVA) after checking for normality distribution of data by Kolmogorov-Smirnov test. Wherever significant differences were found, a Duncan's multiple range tests was performed for mean differences. Statistical analysis was performed using SPSS ver. 19. Data are expressed as mean ± SE.

III. RESULTS AND DISCUSSION

Data on growth performance and survival rate of *C. nigrofasciatum*is presented in Table 1. Between the groups, there was a significant difference ($p<0.05$) for final weight (FW), WG and SGR. The highest WG was obtained in 1gkg-1 followed by 2gkg-1 *T. terrestris* extract and control. In groups that received *T. terrestris* extract, SGRincreased significantly ($p<0.05$). Comparison of FCR and CF in different treatments indicates no significant differences ($p>0.05$). Survival rate of fish in all groups was 100%.

Table 1.Growth performance of *C. nigrofasciatum*fed diets containing different levels of *T. terrestris* extract for 45 days*

Growth parameters	Control	1 gkg^{-1} *T. terrestris*extract	2 gkg^{-1} *T. terrestris*extract
IW (g)	2.36±0.03^a	2.28±0.03^a	2.27±0.03^a
FW (g)	4.25±0.22^b	5.10±0.10^a	5.04±0.26^a
WG (%)	80.10±11.71^b	123.83±6.41^a	121.13±8.09^a
SGR (%)	1.30±0.14^b	1.76±0.10^a	1.79±0.07^a
FCR	1.652±0.21^a	1.27±0.12^a	1.22±0.05^a
CF	3.51±0.03^a	3.87±0.15^a	3.79±0.24^a
SR (%)	100.00±0.00^a	100.00±0.00^a	100.00±0.00^a

* Values (mean ± standard error of triplicate) superscripted by different alphabets within the same line are significantly different ($p< 0.05$).

Results of protein, moisture, lipid and whole body ash content are presented in Table 2.There were no significant differences between ash content of fish in all groups ($p>0.05$). Fish fed on *T. terrestris* extract had a significantly ($p< 0.05$) higher lipidand moisture content than fish fed the control diet. As Compared to controls, protein levels offish body decreased after feeding the fish with *T. terrestris* extract ($p<0.05$).

Table 2.Body Composition of *C. nigrofasciatum*fed diets containing different levels of *T. terrestris*extractfor 45 days*

Body Composition	Control	1 gkg^{-1} *T. terrestris*extract	2 gkg^{-1} *T. terrestris*extract
Moisture	60.49±1.11^b	66.09±0.07^a	66.26±0.39^a
Crude protein	54.79±1.31^a	50.20±0.94^b	40.28±0.80^c
Crude lipid	28.34±0.65^c	35.53±0.47^b	44.60±0.40^a
Crude ash	16.86±1.13^a	14.27±0.81^a	15.12±0.69^a

* Values (mean ± standard error of triplicate) superscripted by different alphabets within the same line are significantly different ($p< 0.05$).

The purpose of this study was to investigate the impact of *T. terrestris* extract as supplementary diet on growth and body composition of *C. nigrofasciatum*.Accordingto theresults, *T. terrestris* extract supplementation at 1 and 2 gkg-1 significantly increased WG and SGR as compared to control group in this study.*T. terrestris* extract in diets enhanced growth performance in *O.niloticus*[5]. Similar results were reported byce*et al* (2007a,b),who used the *T. terrestris* extract formasculinization ofGuppy *Poecilia reticulate* and *C. nigrofasciatum*[12,13].Feed additives were used to accede better production results in farm animals; previous studies showed that herbs stimulate secretion ofpancreatic enzymes, absorption and digestion of nutrient compounds [14].Fallahpour et al (2014) suggested that unknown factors in various medicinal herbs led to favourable results in fish growth trials [1].

The present study showed changes in body composition except for ash in fish that fed withdiet supplemented by *T. terrestris* extract when compared to the control.Gültepe et al (2014) reported that body composition of the fish was not influenced by dietary *T. terrestris* extract treatment and there were no significant differences between groups ($p>0.05$) [5].In present study, control sample revealed the highest level of crude protein, there was a significant differences between treatment groups and control ($p<0.05$). The highest amount of lipidwas observed in groups that containing 2 gkg^{-1}extract ($p<0.05$); also moisture percentage in 1 and 2 gkg^{-1} was more than control ($p<0.05$).It is reported that pumpkin (*Telfairiaoccidentalis*) leaf powder in diet of African

catfish (*Clariasgariepinus*) did not affect the contents of fish carcass moisture, protein and ash among treatments[2]. Fallahpour et al (2014) evaluated the effects of different concentration of marshmallow (*Althaeaofficinalis* L.) extract on carcass composition of common carp (*Cyprinuscarpio*); their results showed that slight changes in body composition of the fish fed with diet supplemented by marshmallow extract as compared to control ($p>0.05$) [1].*T. terrestris* is a natural herb which helps enhance testosterone levels in human and animals [12] and testosterone affects the basal metabolic rate in animals [15]; so in this study, it is possible that changes in the composition of fish carcasses due to changes in the testosterone levels in the fish.

CONCLUSION

The present results suggests that supplemented *T.terrestris* extract in feeds for *C. nigrofasciatum*improves growth performance and can be used as a supplement in fish diets. The use of medicinal plants in fish will be an efficient tool to achieve sustainable, economical, and safe fish production.

REFERENCES

[1] F. Fallahpour,M. Banaee, and N. Javadzade,"Effects of dietary marshmallow (*Althaeaofficinalis* L.) extract on growth performance and body composition of common carp (Cyprinuscarpio)",*International Journal of Advanced Biological and Biomedical Research*, 2, 2453-2460,2014.

[2] A.A.Dada, "Use of fluted pumpkin (*Telfairiaoccidentalis*) leaf powder as feed additive in African catfish (*Clariasgariepinus*) fingerlings",*International Journal of Biological and Chemical Sciences*, 9, 301-307,2015.

[3] T. Citarasu, "Herbal biomedicines: a new opportunity for aquaculture industry", *Aquaculture International*, 18, 403-414,2010.

[4] R. Pundir, G. Singh, A. A. Pandey, and S. A. Saraf, "Demand of herbal hepatoprotective formulations in Lucknow-A Survey", *The Pharm Res*, 1, 23-33,2009.

[5] N.Gultepe, Ü.Acar, O. S.Kesbic, S.Yılmaz, Ö.Yıldırım, and A.Turker, "Effects of Dietary *Tribulusterrestris* Extract Supplementation on Growth, Feed Utilization, Hematological, Immunological, and Biochemical Variables of Nile Tilapia *Oreochromisniloticus*",*The Israeli Journal of Aquaculture-Bamidgeh*, 66, 1-8,2014.

[6] M. Kumar, A. K. Soni, S. Shukla, and A. Kumar, "Chemopreventive potential of *Tribulusterrestris* against 7, 12-dimethylbenz (a) anthracene induced skin papillomagenesis in mice", *Asian Pacific journal of cancer prevention: APJCP*, 7, 289-294,2005.

[7] A. L. Miller, "Antioxidant flavonoids: structure, function and clinical usage", *Alt Med Rev*, 1, 103-11, 1996.

[8] P.Kavitha, R.Ramesh, G.Bupesh, A.Stalin, and P.Subramanian, "Hepatoprotective activity of *Tribulusterrestris* extract against acetaminophen-induced toxicity in a freshwater fish (*Oreochromismossambicus*)". *In Vitro Cellular & Developmental Biology-Animal*, 47, 698-706,2011.

[9] A.Şahin, M.Duru, "Effects of *Tribulusterrestris* (Puncture vine) supplementation on performance and digestive system of broiler chicks". *Journal of Agricultural Sciences*, 16, 271-277,2010.

[10] P.Kavitha, P.Subramanian, "Influence of *Tribulusterrestris* on testicular enzyme in fresh water ornamental fish *Poecilialatipinna*", *Fish physiology and biochemistry*, 37, 801-807,2011.

[11] AOAC, "Official Methods of Analysis. 16thed. Association of Analytical Chemists. Arlington", Virginia, USA,2000.

[12] S.Çek, F.Turan, and E.Atik, "The effects of Gokshura, *Tribulusterrestris* on sex reversal of guppy, *Poeciliareticulata*",*Pakistan journal of biological sciences*: PJBS, 10, 718-725,2007.

[13] Ş.Çek, F.Turan, and E.Atik, "Masculinization of convict cichlid (*Cichlasomanigrofasciatum*) by immersion in *Tribulusterrestris*extract". *Aquaculture International*, 15, 109-119,2007.

[14] T.Frankič, M.Voljč, J. Salobir, and V.Rezar, "Use of herbs and spices and their extracts in animal nutrition". *ActaAgriculturaeSlovenica*, 94, 95-102,2009.

[15] S.T .Welle, R.A. Jozefowicz, G.I.Forbes, and R.C. Griggs, "Effect of testosterone on metabolic rate and body composition in normal men and men with muscular dystrophy". *The Journal of Clinical Endocrinology & Metabolism, 74*(2), pp.332-335,1992.

★★★