Pakistan J. Zool., vol. 48(2), pp. 489-492, 2016.

Effect of Bay Laurel (*Laurus nobilis*) Extract on Growth of the African Catfish, *Clarias gariepinus* (Burchell, 1822)

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ABSTRACT

A preliminary study was conducted to evaluate the effect of the Bay laurel (*Laurus nobilis*) extract on growth performance and body composition of the African catfish (*Clarias gariepinus*, Burchell, 1822). Fish with an average body weight of 10.52±0.89 g were fed with different concentrations (0, 0.5, 1 and 1.5%) of bay laurel extract for 60 days. At the end of experiment, the highest weight gain, specific growth rate and food conversion rate were 13.19±0.18 g, 1.65±0.04 and 1.89±0.03, respectively at 1.5% bay laurel group. Also, the highest survival rates and PER were 100% and 1.10±0.02, respectively at 1.5% bay laurel dosage group. The best protein content (21.49%) was observed at 1.5% bay laurel dosage group. These results indicate that bay laurel extract, a feed additive of natural origin, may be considered as a potential growth promoter in catfish culture.

Article Information
Received 4 April 2015
Revised 1 October 2015
Accepted 10 October 2015
Available online 1 March 2016

Authors' Contributions
FT planned and provided theme of the project, analyzed the data and wrote the article. EG and UA mainly performed the experimental work.

Key words
African catfish, *Clarias gariepinus*, Bay laurel, *Laurus nobilis*.

INTRODUCTION

There is large number of feed additives available to improve fish growth performance. Some of these additives used in feed are chemical products especially hormones and antibiotics which may cause unfavorable side effects. The use of antibiotic growth promoters (AGPs) as feed additives in the aquaculture industry has been criticized by government policies and consumers because of possible development of microbial resistance to these products and their potential harmful effects on human health World Health Organization encourages using of medicinal herbs and plants to substitute or minimize the use of chemicals through the global trend to go back to the nature (Dada and Olugbemi, 2013). Herbs and herbal products are added in animal feeds instead of chemical products in order to stimulate or promote the effective use of feed nutrients which result in more rapid gain, higher production and better feed efficiency. Moreover, herbs contain active substances that can improve digestion and metabolism and possess bacterial and immunostimulant action of animals (Asimi and Sahu, 2013, Andleeb *et al.*, 2014). There are various reports of herbal fish diets promoting growth performance (Ji *et al*., 2007; Dada, 2012), increasing stress tolerance (Ji *et al*., 2009), and enhancing immune system efficiency (Dügenci and Candan, 2003; Dügenci *et al*., 2003**;** Bai *et al*., 2009). More recently such applications have begun to demonstrate positive effects in feeds for various fish species including African catfish, (*Clarias gariepinus*) (Turan and Akyurt, 2005; Turan and Çek, 2007), rainbow trout (*Oncorhynchus mykiss*) (Bilen and Bulut, 2010; Bilen and Bilen, 2012; Cagıltay *et al*., 2011) tilapia (*Oreochromis aureus*) (Turan, 2006), (*Oreochromis niloticus*) (Rawling *et al*., 2009), common carp (*Cyprinus carpio*) (Turan and Cek, 2007) and crayfish (*Astacus leptodactylus*) (Turan *et al*., 2012).

Bay laurel (*Laurus nobilis)* is a plant of industrial importance, used in foods, drugs, and cosmetics. The dried leaves and essential oils are used extensively in the food industry for seasoning of meat products, soups and fishes. Chemically it has found to contain sesquiterpene lactones such as 10-epigazaniolide, Gazaniolide, spirafolide, costunolide, Reynosin, santamarine, flavonoidglycosides, essential oil. It has been reported to possess wound healing, neuroprotective, antioxidant, antiulcerogenic, anticonvulsant, antimutagenic, antiviral, anticholinergic, antibacterial, antifungal activities (Patrakar *et al*., 2012).

The use of herbal extract (EOM-Heryumix) with bay laurel create some noticeable benefits on egg production and egg weight of white and brown laying hens (Bozkurt *et al*., 2012). Alcicek *et al*. (2003) reported that the EOC mix contained laurel leaf oil (*Laurus nobilis* L.) may be used as a potential growth promoter in broiler production. Cagıltay *et al*. (2011) reported that parallel to the concentration of Bay leaf (*Laurus nobilis* L.) in fee has increased amount of crude protein and crude lipid in rainbow trout. But, Bilen and Bilen (2012) reported that the effect of laurel on growth performance and feed

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0030-9923/2016/0002-0489 $ 8.00/0

efficiency of rainbow trout were determined to be negligible.

Although previous studies have mostly investigated on effects of bay laurel on meat composition and immune system of fish, there is a lack of data on the use of bay laurel in diets for fish growth. In the present study we intended to ascertain whether bay laurel included in the diet enhance the growth performance, feed utilization and carcass composition of the African catfish.

MATERIALS AND METHODS

Full-sibling fish (initial mean weight 10.52±0.89 g), produced in Iskenderun Technical University Fisheries Research Unit were randomly stocked into 100 L aquaria at a density of 15 fish per aquarium. The aquaria were equipped with aeration and supplied with continuously flowing water (2L min^{-1}), and controlled temperature (25±1°C). The photoperiod was maintained on a 12-h light: 12-h dark schedule.

African catfish were fed with trout diets (Aquamaks, Turkey: 48% protein, 18% lipid). Proximate composition of the experimental diets is determined by analysis (AOAC, 1990). The dried and powdered the leaves of Bay laurel 20 gr. were extracted in 400 ml chloroform by kept on a rotary shaker for 24 h. Then, it was filtered through Whatman filter paper. The sample were further concentrated to dryness under reduced pressure at 37ºC using a rotary evaporator (Mahansen, 1996). In the preparation of experimental diet, Bay laurel extract were mixed with a pulverized trout diet in which, water (450 mL kg^{-1}) was added and pelleted through a food grinder with a 2 mm diameter die plate. Three different dosages of bay laurel extract (0.5, 1 and 1.5%) were used in the experiment. The control diet was also mixed with 450 ml water. The pellets were broken into small pieces and stored in freezer until feeding and all the groups were fed with their respective diet to ca. 4% body weight day^{-1} twice daily for 60 days.

Water temperature and oxygen content were measured daily with a thermometer and a model 55 YSI oxygen meter (Yellow Springs Instruments Cy. Ohio), respectively. Weekly water samples were collected for analysis: pH was determined with Accumet pH meter (Model 915, Fisher Scientific, Pennsylvania), ammonia nitrogen N-NH_4 (Nessler method) and nitrite nitrogen N-NO_2 (sulphanil method) were determined colorimetrically with a spectrophotometer. The average water temperature was 24±1ºC, and the oxygen content of the water was 5.05±0.78. At pH 7.5±0.6, the ammonia nitrogen content did not exceed 0.1 mg N-NH_4/l, and nitrite nitrogen was not higher than 0.04 mg N-NO_2/l.

During the experiment, the mortality was recorded daily and fish in each aquarium were counted and weighed individually at biweekly intervals after anesthetization for 2.5 min in water that contained 0.4 g L^{-1} tricaine methanesulphonate (TMS) and 0.8g L^{-1} sodium bicarbonate as a buffer. Growth was monitored to determine the growth in each treatment groups during the experiment. Each fish was individually weighed and measured (total length) to the nearest 0.01 g and 0.01 cm, respectively. Weight gain feed conversion ratio, specific growth rate, protein efficiency ratio and survival rate were calculated in this experiment.

At the start of experiment, 15 fish randomly were treated with an overdose of phenoxyethanol (1.5 mg l^{-1}) solution, and stored at –20ºC for the determination of body proximate composition. At the end of the feeding trial, 5 fish from each dose group (n=20 fish\per dose) were analyzed for final whole body proximate composition (AOAC, 1990). All data were subjected to a one-way analysis of variance to determine if there is a difference in weight gain and body composition among treatments. Duncan test was used to compare the means of the treatments when differences occurred.

RESULTS AND DISCUSSION

The effects of different concentrations of dietary bay laurel extract on growth and survival of on the African catfish (*Clarias gariepinus*) for 60 days are shown in Table I.

Weight gain significantly increased in catfish fed with bay laurel extract-supplemented diets in comparison with the control groups ($P<0.05$). Among the bay laurel extract-supplemented groups, the fish fed diet with 1.5% bay laurel extract exhibited significantly higher growth than fish fed diets with 0.5, 1% and control groups (Table I). Specific growth rate (SGR) ranged from 1.21±0.17 (0.5% bay laurel extract-supplemented group) to 1.65±0.04 (1.5% bay laurel extract-supplemented group) and there was statistical difference between experimental and control groups. Feed conversion ratio (FCR) and protein efficiency ratio (PER) were also significantly improved in group fed diet with 1.5% bay laurel extract than that with control and other groups ($P<0.05$, Table II). Also, the best ADG ratio was observed at the 1.5% bay laurel extract-supplemented group. In the present study there was no adverse influence of diet with bay laurel extract on survival, weight gain and feed intake of fish in the present study. Among bay laurel extract-supplemented groups, the best growth rate and food conversion ratio were observed at group fed with 1.5% Bay laurel extract-supplemented diet. This finding indicated that the Bay laurel extract is a positive dietary

Table I.- The effects of different concentrations of dietary bay laurel extract on growth and survival of African catfish (*C. gariepinus*).*

	Bay laurel (*Laurus nobilis*) extract (%)			
	0	**0.5**	**1**	**1.5**
Weight gain (g)	9.46±0.47[a]	9.11±1.05[a]	10.44±0.48[a]	13.19±0.19[b]
SGR	1.32±0.04[ab]	1.21±0.17[a]	1.38±0.11[ab]	1.65±0.04[b]
FCR	2.66±0.13[b]	2.83±0.37[b]	2.40±0.10[ab]	1.89±0.03[a]
PER	0.79±0.04[a]	0.76±0.09[a]	0.87±0.04[a]	1.10±0.02[b]
ADG	0.19±0.01[a]	0.18±0.02[a]	0.21±0.01[a]	0.26±0.01[b]
Survival (%)	97.78±2.20	95.55±2.22	97.78±2.22	100

*Values (mean ± S.E. of triplicate) with different superscripts in each line indicate significant differences (P<0.05).
WG (Weight Gain) (g) = Final weight-Initial weight.
SGRW (Specific Growth Rate Weight) (%)= [(lnW^2-lnW^1) \ (T^2-T^1)] x 100, where W^1, and W^2 are mean body weight at times when the first and second samples were taken (T^1 and T^2)
FCR (Food Conversion Ratio) = Dry feed intake (g) / wet weight gain (g).
PER (Protein Efficiency Ratio) = Live body weight gained (g) / protein intake (g).
ADG (g/day) = Growth/Experimental duration

Table II.- The effects of different concentrations of dietary bay laurel extract on the chemical composition of the whole-body African catfish (*C. gariepinus*) .*

Chemical composition (%)	Initial	Bay laurel (*Laurus nobilis*) extract(%)			
		0	**0. 5**	**1**	**1.5**
Moisture	74.79±0.84	74.88±0.82[a]	75.72±0.43[a]	74.79±0.89[a]	74.95±1.03[a]
Crude protein	19.75±0.77	19.19±0.18[a]	20.31±0.30[b]	20.36±0.36[b]	21.49±0.46[c]
Crude lipid	6.45±0.85	5.97±0.12[a]	6.31±0.35[a]	5.74±0.53[a]	6.30±0.17[a]
Ash	1.04±0.09	1.01±0.03[a]	1.41±0.29[a]	1.08±0.09[a]	1.10±0.10[a]

*Values (mean ± S.E. of triplicate) with different superscripts in each line indicate significant differences (P<0.05; P<0.01). Body composition data presented on a wet basis.

additive to induce effective technical and economical propagations for catfish culture. Similarly, EOC mix contained laurel leaf oil (*Laurus nobilis* L.) improved feed conversion, efficiency of broilers (Alcicek *et al*., 2003). Also, Bozkurt *et al.* (2012) reported that the dietary addition of an herbal EOM contained laurel leaf oil was a viable alternative to AGP in layer hen nutrition. Cristea *et al.* (2012) suggested that various types of feed additives enhance the digestibility and utilization efficiency of nutrients in aquaculture.

The effects of different concentrations of dietary bay laurel extract on the chemical composition of the whole-body African catfish (*Clarias gariepinus*) for 60 days are shown in Table II.

Protein contents of the all bay laurel extract-supplemented groups were significantly higher than protein content of the control (P<0.05). The highest value of protein content (21.49%) was observed at 1.5% bay laurel extract-supplemented group (Table II). But, no significant differences were shown in whole body moisture, lipid and ash among the dietary treatments (P>0.05).Similarly, Cagıltay *et al.* (2011) reported that parallel to the concentration of Bay leaf (*Laurus nobilis* L.) in fed has increased amount of crude protein and crude lipid in rainbow trout.

In conclusion, this study established the efficacy of Bay laurel extract feed additives as a growth promoter in *C. gariepinus.* To best of our knowledge, no work has been reported using bay laurel extract as feed additive substance in catfish culture. This is a preliminary report to our knowledge regarding the potential use of Bay laurel extract as a feed additive in catfish culture. The use of herbs, especially of bay leaf extract in catfish, will be an efficient tool to achieve sustainable, economical, and safe fish production.

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