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REVIEW ARTICLE

THE IMPACTS OF AQUATIC EXTRACTS OF TWO MACROPHYTES (*TYPHA DOMINGENSIS* PERS. AND *LEMNA MINOR* EXTRACTS) ON THE CHEMICAL COMPOSITION OF COMMON CARP FISH (*CYPRINUS CARPIO* L.,1758) THAT WERE CULTIVATED IN FRESH WATER AND POLLUTED WATER

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ABSTRACT

This experiment aimed to investigate the impacts of aquatic extracts of two macrophytes (*Typha domingensis* Pers. And *Lemna minor* extracts) on the chemical composion, of common carp (*Cyprinus carpio*) fish when they were cultivated in polluted water, fresh water. The analysis rvealed that the highest value of protein was (15.635 ± 0.47) in the fish of polluted water-*Typha domingensis* Pers extract aquarium and the less one (12.983 ± 0.1) in the fish of. polluted water aquarium. The highest value of fat was (2.361 ± 0.21) in the fish of polluted water aquarium while the less one was (1.051 ± 0.05) in the fish of polluted water-*Typha domingensis* extract aquarium. As to the highest value of ash was (6.300 ± 0.19) in the fish of polluted water aquarium and less one was (2.455 ± 0.37) in the fish of polluted water - *Typha domingensis* extract aquarium. The moisture showed the highest value (81.649 ± 0.39) in the fish of fresh water aquarium while the less one (77.923 ± 0.29) was in fish of polluted water aquarium.

INTRODUCTION

In the last few decades, a possible influence of environmental pollution on the aquatic environment has gained considerable interest, fish have become a favorable subject for research in this area, because temperature changes, habitat and water quality deterioration as well as aquatic pollution adversely affect fish health, which may result in mortalities and population decline, a mong various biochemical, cellular and physiological systems, certain innate immune responses are considered as suitable biomarkers for monitoring biological effects of pollution (Bols *et al.*, 2001). Fish are frequently exposed to many pollutants in their aquatic environment, their nonspecific defense mechanism and specific immune response may also compromise with environmental contaminant such as cadmium compound, cadmium is a heavy metal commonly used in environmentalstudies because it is highly toxic (Faroon *et al.*, 1994) widely distributed in the environment (Camusso *et al.*, 1995; Cinier *et al.*, 1999). Essential here is aeration of the water, as fish need a sufficient oxygen level for growth, this is achieved by bubbling, cascade flow or aqueous oxygen, for instance Catfish, Clarias spp. can breathe atmospheric air and can tolerate much higher levels of pollutants than trout or salmon, which makes aeration and water purification less necessary and makes *Clarias* species especially suited for intensive fish production (Wales, 2011). An increasingly significant effect of intensive fish culture is water surrounding rearing pens or the rivers receiving aquaculture effluent, also fish excretion and fecal wastes combine with nutrients released from the breakdown of excess feed to raise nutrient levels well above normal, creating an ideal environment for algal blooms to form and once the resulting algal blooms die, they settle to the bottom where their decomposition depletes the oxygen, before they die, however, there is the possibility that algal toxins are produced, to compound the problem, most feed is formulated to contain more nutrients than necessary for most applications., any operation that relies on artificial feed to grow fish faces the quandary of increasing production at the expense of increasing pollution from farm effluent, Emerson (1999) Moreover, sedentary animals may die in water depleted of oxygen resulting from microbial decomposition, while the mobile population may migrate to other areas besides that antibiotics and other therapeutic chemicals added to feed (e.g. Ivermectin, Terramycin and Romet -30) can affect organisms for which they were not intended when the drugs are released as the uneaten pellets decompose (Grant and Briggs, 1998). Feed additives, however, are not the only source of potentially toxic compounds in culture operations (Emerson, 1999). Wild populations of saltwater fish from the St. Lucie estuary appear

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to be impacted by pollutants that have affected their health and population numbers, up to 14% of 5.655 fish sampled during a 9 month period (April 2000 to December 2001) had evidence of either compromised immunity (ulcers, hemorrhagic fins & skin) or development abnormalities (deletion of fins, misaligned lateral lines & scales)., these abnormalities have been documented and described by Browder *et al*. (2002). The cause of these effects appears to be related to pollutants entering the water system, potentially endocrine disrupting chemicals. Act in the liver to alter gene transcription., estrogen-like compounds cause plasma ferritin, transthyretin, and retinal binding protein levels to decrease (Funkenstein *et al*., 2000; Larkin *et al*., 2003).

MATERIALS AND METHODS

This experiment aimed to investigate the impacts of aquatic extracts of two macrophytes (*Typha domingensis* Pers. And *Lemna minor* extracts) on the chemical composion of common carp (*Cyprinus carpio*) fish when they were cultivated in polluted water, fresh water, polluted water- *Typha domingensis* Pers extract treated and polluted water -*Lemna minor* extract treated. The two aquatic plants (*T.domingensis* and *L. minor*) were carefully cleaned and left in aquaria of tap waters for one week and then dried. Aquatic extracts of these two aquatic plants were prepared. These two extracts were thoroughly mixed with the diet of common carp fish for one over night. Eighty fresh water common carp fish weighing about (38 ± 0.2) g were acquired from fish aquaria of Marine Science Center, Uiversity of Basrah, Iraq. Fish were individually examined, they were clear from pathological infections, were retained for the study. The physiochemical characteristics of water used for acclimation in control, polluted water, and the other two polluted water - aquatic plant extracts (*T.domingensis* and *L. minor*) exposed groups were daily recorded.The fish were divided into four groups of samples, each group of two repetitions, they were polluted water, fresh water (contro), polluted water- *Typha domingensis* Pers extract treated and polluted water -*Lemna minor* extract treated. Groups. Aquatic extracts of two aquatic plants (*Typha domingensis* Pers*., Lemna minor*) were prepared as they were described by (Heinrich *et al*., 2004). Fish's tissues analysis for protein, fat, moisture and ash contents were done (A.0.A.C,1981).

RESULTS

The analysis rvealed that the highest value of protein was (15.635 ± 0.47) in the fish of *Typha domingensis* Pers extract aquarium and the less one (12.983 ± 0.1) in the fish of polluted water aquarium.

Table 1. Chemical composition of experiment

Fish of experiment	%Moisture	%Protein	%Fat	%Ash
Fresh water(control) Fish	81.649± 0.39[a]	13.477 ±0 23[c]	1.232 ± 0.03[c]	3.129 ± 0.13[b]
Polluted water - *Typha domingensis* Pers extract treated fish	80.582 ±0.72[b]	15.635 ±0.47[a]	1.051±0.05[c]	2.455 ±0.37[c]
polluted water - *Lemna minor* extract treated fish.	80.106 ±0.72[b]	14.632±0.35[b]	1.474 ± 0.13[b]	3.448± 0.32[b]
polluted water fish	77.923± 0.29[c]	12.983±0.1[c]	2.361± 0.21[a]	6.300± 0.19[a]

The highest value of fat was (2.361 ± 0.21) in the fish aquarium of polluted water aquarium while the less one was (1.051 ± 0.05) in the fish of *Typha domingensis* extract aquarium. As to the highest value of ash was (6.300 ± 0.19) in the fish of polluted water aquarium and less one was (2.455 ± 0.37) in the fish of polluted water- *Typha domingensis* Pers extract treated aquarium. The moisture showed the highest value (81.649 ± 0.39) in the fish of fresh water aquarium while the less one (77.923 ± 0.29) was in fish of polluted water aquarium.As in the Table (1).

The following figures illustrate the chemical compositions (protein, fat, moisture and ash) of the studied fish;

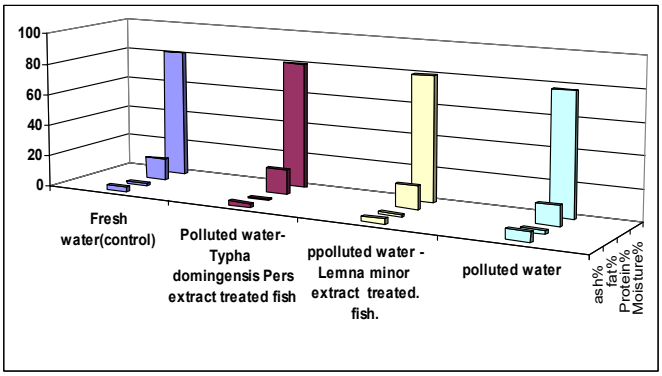

Figure 1. The histograms in percentages of protein, fat, moisture and ash contents of the studied fish

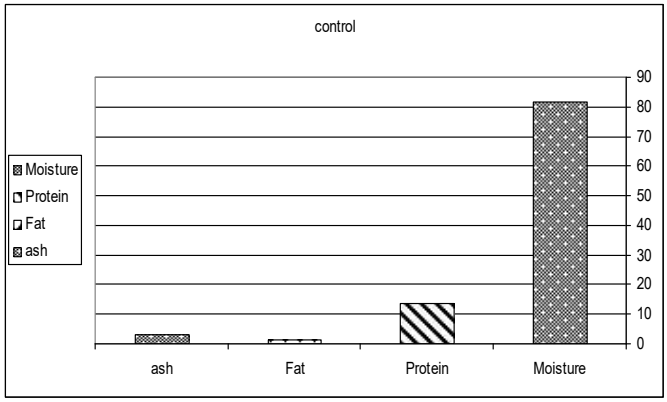

Figure 2. The histograms in percentages of protein, fat, moisture and ash contents of fresh water (control) fish

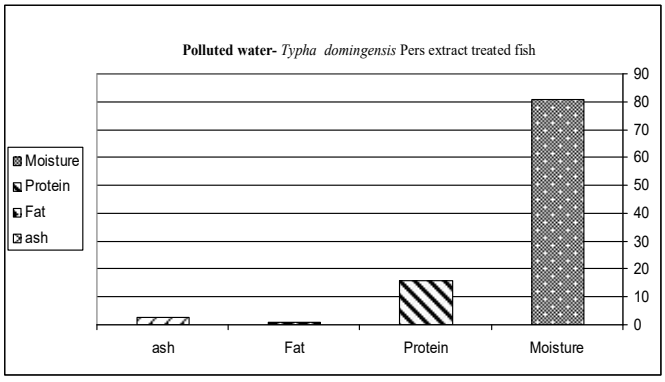

Figure 3. The histograms in percentages of protein, fat, moisture and ash contents of Polluted water- *Typha domingensis* Pers extract treated fish

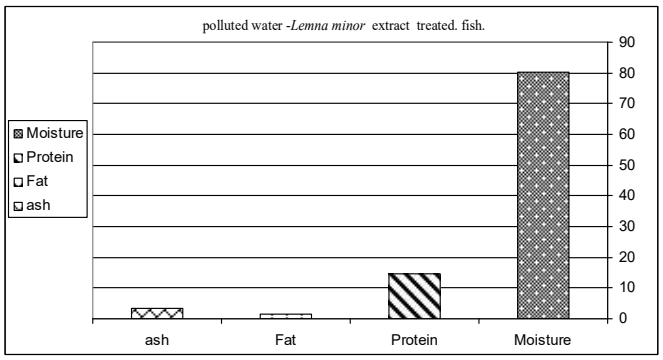

Figure 4. The histograms in percentages of protein, fat, moisture and ash contents of polluted water – Lemna minor extract treated fish

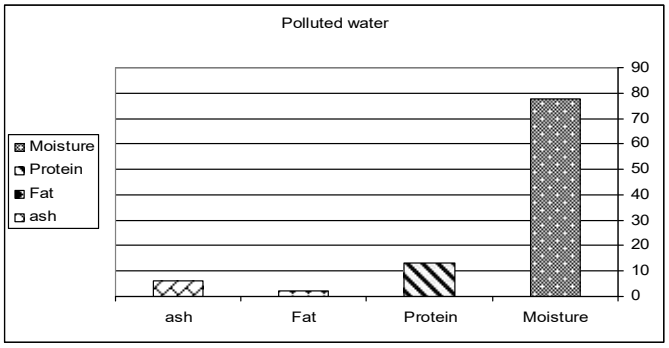

Figure 5. The histograms in percentages of protein, fat, moisture and ash contents of polluted water fish

DISSCUSION

The treatment (1) significantly differed at test level (P ≥ 0.05) With 2,3 and 4 treatments, while there were not significant differences (i.e. P≤ 0.05) between 2 and 3 treatments as concern the moisture percentage Whereas with respect protein content differences among treatments, treatment (1) significantly differed with 2 and 3 treatments, but did not significantly differ with treatment 4. As to fat %, 1 and 2 treatments did not significantly differ but they significantly differed with 3 and 4 treatments. With respect ash content, 1 and 3 treatments did not significantly differ, but 2 and 4 treatments significantly differed. Fish of the experiment showed the following protein, fat, ash and moisture content percentages: Protein content percentages were mentioned in descending order: (15.635 ± 0.47) water- *Typha domingensis* Pers extract treated fish (14.632 ± 0.35) polluted water -*Lemna minor* extract treated. Fish (13.477 ± 0.23) fresh water (control) and (12.983 ± 0.1) polluted water fish. The toxic waste impact on protein of fishmay lead to alteration in its structure, and subsequently in its building units of amino acids. In addition to the protein bound aminoacids, the cellular tissue and fluid of the livingorganisms contain a permanent reservoir offree amino acids, which take part in metabolicreactions. Certain amino acids may bemobilized preferentially from the muscle dueto exposure to various environmental influences (Wanbi *et al.*, 2004). Oikari *et al.* (1985); Kan (1987); Ghoneim (1989); EL – Sayed (1990); Khadre and Shabana (1991) and Wahbi (1992, 1998) found a decrease in protein contenton. Contamination with industrial effluents. Endocrine disrupting chemicals act in the liver to alter gene transcription and retinal binding protein levels to decrease (Funkenstein *et al*., 2000, Larkin *et al*., 2003). The St. Lucie area has historical documentation of abnormal deformities and evidence of depressed immunity, which may be the result from exposure to chemical compounds (Browder and Kandroshov, 2002). Protein content of gonads and flesh showed directly proportional reduction with effluent concentration compared to control. Wahbi *et al*. (2004) Fat content percentages were mentioned in descending order: (2.361 ± 0.21) polluted Water fish, (1.474 ± 0.13), polluted water -*Lemna minor* extract treated fish, (1.232 ± 0.03) Fresh water (control) fish and (1.051 ± 0.05) Polluted water - *Typha domingensis* Pers extract treated fish).

Active fish could consume the fat of their tissues,oxidize it to get the energy, in reverse inactive fish (polluted ones) they accumulated fat in their tissues. Many of the toxic substances are lipophilic and weren't adversely affected by water. These substances accumulate in fish fatty tissues or become protein bound, so it is of importance to know the critical concentration above which human being are affected and the commercial fish species become unsuitable food (ELEzaby, 1994). Ash content percentages were listed indescending order as follows: (6.300 ± 0.19) polluted water fish, (3.448 ± 0.32) polluted water -*Lemna minor* extract treated fish. (3.129 ± 0.13) Fresh waterfish) and (2.455 ± 0.37) Polluted water- *Typha domingensis* Pers extract treated fish.Increasing of ash content in polluted fsh compared to healthy ones it could be as a result of heavy metal depositions in fat, flesh and gonads as insoluble in water (ELEzaby, 1994). The low energy value of dried poultry excreta is due largely to the ash content (Al-Asgah and Ali, 1999) .The changes in fat body and ash content of fish appeared to be associated with the level of incorporation of dried poultry excreta (Al- Asgah and Ali, 1999). Moisture content percentades were mentioned in descending order as follows: (81.649 ± 0.39) Fresh water (control) fish (80.582 ± 0.72) Polluted water- *Typha domingensis* Pers extract treated fish (80.106 ± 0.72) polluted water -*Lemna minor* extract treated fish and (77.923 ± 0.29) polluted water fish. There is a reciprocal relationship between fat and moisture contents so Decreasing or increasing feeds content of moisture is inversely correlated with their contents of fat (Al- Habib, 1996).

Conclusion

The analysis rvealed that the highest value of protein was (15.635 ± 0.47) in the fish of *Typha domingensis* Pers extract aquarium and the less one (12.983 ± 0.1) in the fish of polluted water aquarium. The highest value of fat was (2.361 ± 0.21) in the fish aquarium of polluted water aquarium while the less one was (1.051 ± 0.05) in the fish of *Typha domingensis* extract aquarium. As to the highest value of ash was (6.300 ± 0.19) in the fish of polluted water aquarium and less one was (2.455 ± 0.37) in the fish of fresh water aquarium (control). The moisture showed the highest value (81.649 ± 0.39) in the fish of fresh water aquarium while the less one (77.923 ± 0.29) was in fish of polluted water aquarium. Protein content in polluted fish was reduced could be due to catabolic reaction, while fat was reduced in the healthy ones very active in swimming in reverse the polluted fish, were fatty and inactive. Fat and ash were incorporated hence they were inceased in polluted fish.

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