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NUTRITIVE COMPOSITION OF *CHANNA STRIATUS* FISHES AFTER 2,4-D PESTICIDE TREATMENT

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Abstract

In the present study six commercially important fish *Channa striatus* were treated with different dose grade of 2,4-D pesticide. After a period of treatment the nutritional changes in the fish tissue was estimated biochemically. The moisture content in the *Channa striatus* fishes after treatment varies from 62.6% and the highest is found in non treated group. Analysis of protein showed much fluctuation. It ranged from 17.04% to 38.09% in treated group. The level of carbohydrate and fatty acid content is much reduced after 2,4-D treatment. This study focuses the deleterious effect of 2,4-D usage in aquaculture vicinity.

Key words: Nutritive value, proximate composition, fatty acid profile, *C.straitus*, protein

Introduction

Fish is an important source of food for mankind all over the world from the times immemorial. Fish is a very important source of animal protein in the diets of man. The importance of fish as source of high quality, balanced and easily digestible protein, vitamins and polyunsaturated fatty acids is well understood now. Fish having energy depots in the form of lipids will rely on this. A possible method for discriminating lean from fatty fish species is to term fish that store lipids only in the liver as lean, and fish storing lipids in fat cells distributed in other body tissues as fatty fish. The amount of protein in fish muscle is usually somewhere between 15 and 20 per cent, but values lower than 15 per cent or as high as 28 percent are occasionally met muscle is always low, usually below 1 per cent, and seasonal fluctuations in fat content are noticeable mainly in the liver, where the bulk of the fat is stored. Lipids occur in the fish muscles, adipose, and liver. All muscle lipids are highly unsaturated and thus unstable, but those of the dark muscle are the most unstable (Ackman,1974). The addition of omega-3 fatty acids to the diet lowers triglyceride levels, an effect that is pronounced in those with marked hyper triglyceridemia (Kestin et al., 1990).

Environmental contamination by pesticides may cause physiological and behavioral changes in fish and also affect functions such as reproduction and metabolism (Oruc Uner, 1999; Bretaud et al., 2000). The 2,4-D is a widely used herbicide in Southern Brazil due to its low cost and good selectivity. This herbicide has poor biodegradability and has been frequently detected in water of courses (Chingombe et al., 2006). The 2,4-D can be considered as having low contamination potential for surface waters and as a transitional contaminant of subterranean waters in Southern Brazil (Primel et al., 2005). According to Gallagher and Di Giuli, (1991) 2,4-D showed properties similar to natural plant hormones, being used therefore as a weed killer. This herbicide is generally considered to be non-toxic for fish at low doses (Gallagher and Di Giulio, 1991). Generally, biochemical parameters are very sensitive to sub lethal concentration of many stress agents (Sancho et al., 1997). Hence in the present study the effect of 2,4-D pesticide in *C.striatus* fishes nutritional effect was evaluated biochemically.

Materials and Methods

The proximate composition of commercially important fishes *C.striatus* was investigated. *C.striatus* fishes were procured from the landing centers and fish markets. They were brought to laboratory, washed thoroughly and

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analysed. The specimens were identified by referring standard literature of Fischer and Bianchi (1984).

Experimentation *C. striatus* fishes of 150 grams were grouped in culture tanks. Two groups of fish set up which constitutes Group I: Control, G roup II: 100 mg/L 2,4-D treated fishes.

Chemical treatments and assay 2,4-D pesticide was applied on water in fish tanks and acclimatized for a week time. After a week period fishes were sacrificed and their muscle tissues were dissected out and subjected for biochemical assays. The tissue was in good condition in all the fishes used. The identified fishes were cleaned and skin was removed. For the proximate analysis, muscle tissues were taken just below the dorsal fin and above the lateral line was used.

Estimation of moisture Drying is the method employed for the estimation of the moisture content of the given sample. A known quantity of the sample is taken in a weighed dish and the moisture is removed by heating in a hot air oven. Finally it is cooled in a desiccator and weighted. The difference between the weight of the sample before and after drying gives the moisture content and it is usually expressed as percentage (%) of the weight of the sample. The muscle tissue was weighed and the moisture content was estimated by the following hot air oven method of (Jain and Singh, 2000).

Estimation of carbohydrate The total carbohydrate content of the fish was estimated by using Anthrone reagent (Travelyan and Harrison, 1952).

Estimation of protein The total protein content of the fish was estimated by using Lowry eta l.,(1951).

Estimation of lipid The total lipid content of the fish was estimated by following the method of Bligh and Dyer (1959).

Table. 1 Percentage of moisture, carbohydrate, protein, lipid content of the muscle in 2,4- D treated group.

Fish	2,4 - D	Moisture	Carbohydrate	Protein	Lipid
Channa striatus	Non-treated	81.3	41.6%	17.04 %	12.8%
	Treated	62.6	18.3 %	38.09 %	49.6%

Results

Moisture content Moisture content in treated fishes was considerable reduced when compared to that of non-treated fishes (Table.1).

Protein Analyses of protein were carried out in treated and non treated group. However in the case of 2,4-D treated fishes the protein content showed much fluctuation. It ranged from 17.04%. In the case of non-treated group the protein content is seemed to be 38.09% (Table.1).

Carbohydrate The highest amount of carbohydrate was found in non-treated *C.striatus* fishes. The 2,4-D treated fish group exhibited much lesser carbohydrate content

Lipids The lowest level of 12.8% of lipid content was recorded in 2,4-D treated fish groups and the highest amount of 49.6% in non-treated group was observed (Table.1)

Discussion

Chemicals originating from agricultural activity enter the aquatic environment through atmospheric deposition, surface run-off or leaching (Kreuger et al., 1999) and frequently accumulate in soft-bottom sediments and aquatic organisms (Miles and Pfeuffer, 1997; Lehotay *et al.*, 1998; Kreuger *et al.*, 1999). In all parts of the world pesticides have been found in the aquatic ecosystem and often information of how these pesticides affect inhabiting organisms is missing. In canals in south Florida more than 700 pesticide detections were made between 1991 and 1995 (Miles and Pfeuffer, 1997). Atrazine, ametryn, and bromacil were most often detected in the water samples, whereas pesticides which bind strongly to soil, are highly persistent and/or used in large amounts, e.g. DDE, DDD and ametryn, were some of the more frequently found in sediments (Miles and Pfeuffer, 1997). In Chesapeak Bay, also USA, herbicides such as atrazine, simazine, cyanazine, and metolachlor were found in water samples, but not in oysters (Lehotay *et al.*, 1998). Another herbicide, trifluralin, was however detected in both water and oysters. In an oligotrophic coastal lagoon, the Mar Menor, located in the southeast of Spain, Pérez-Ruzafa *et al.* (2000) found mainly endosulfan, HCH, and endrin when analyzing water, sediment and organisms.

The chemical composition of the different fish species will show variation depending on seasonal variation, migratory behavior, sexual maturation, feeding cycles, etc. These factors are observed in wild, free-living fishes in the open sea and inland waters. In the present study the 2,4 – D pesticide treated fishes showed deleterious effect in nutritional status of *C.striatus* fishes. It is harmful that the 2,4-D intoxicated fishes will in turn produce serious damages to the humans who use to consume it.

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References

Ackman. R.G, Marine lipids and fatty acids. *In proceedings of Tech Conf.on Fish Prod,* Tokyo Dec. (pp.4-11). FAO, Publ., Rome. 1974.

Bligh,E.G. and Dyer,W.J. 1959. A rapid method for total lipid extraction and purification. Can.J.Biochem.Physiol. 37:911-917.

Bretaud, S., J.P. Toutant and P. Saglio, 2000. Effects of carbofuran, diuron and nicosulfuron on acetylcholinesterase activity in goldfish (*Carassius auratus*). *Ecotoxicology and Environmental*. Safety, 47: 117–124.

Chingombe, P., B. Saha and R.J. Wakeman, 2006. Effect of surface modification of activated carbon on the sorption of 2,4-dichlorophenoxyacetic acid and benazolin from water. *Journal of Colloid Interfere Science*, 297: 434–442.

Fisher, W & Bianchi G, FAO species identification sheets for fishery purposes. Western Indian Ocean: (Fishing Area 51). Prepared and printed with the support of the Danish International Development Agency (DANIDA0. Rome, Food and Agricultural Organization of the United Nations, Vol.1-6, 1984.

Gallagher, E. and R. Di Giuli, 1991. Effects of 2,4-D dichlophenoxyacetic acid and picloran on biotransformation, peroxisomal and serum enzyme activities in channel catfish (*Ictalurus punctatus*). *Toxicol. Letters*, 57: 65–72.

Jain, P.C.; and Singh, P. (2000). Moisture determination of jaggery in microwave oven. *Sugar Tech*, 2: 51-52.

Kestin M, Clifton P, Belling GB, Nestel PJ, 1990. n-3 Fatty acids of marine origin lower systolic blood pressure and triglycerides but raise LDL cholesterol compared with n-3 and n-6 fatty acids from plants, *Am J Clin Nutr*, 51: 1028-1034.

Kreuger J., Peterson M., and Lundgren E. 1999. Agricultural inputs of pesticide residues to stream and pond sediments in a small catchment in southern Sweden. *Bulletin of Environmental Contamination and Toxicology*, 62:55-62.

Lehotay S.J., Harman-Fetcho J.A., and McConnell L.L.1998. Agricultural pesticide residues in oysters and water from two Cheaspeake Bay tributaries. *Marine Pollution Bulletin*, 37: 32-44.

Lowry, 0. H., N. J. Rosebrough, A. L. Farr, and R. J. Randall. 1951. Protein measurement with the Folin phenol reagent. J. Biol. Chem. 193: 265-275.

Miles C.J., and Pfeuffer R.J. 1997. Pesticides in canals of South Florida. *Archives of Environmental Contamination and Toxicology*, 32:337-45.

Oruc, E.O., Y. Sevgiler and N. U¨ner, 2004. Tissue-specific oxidative stress responses in fish exposed to 2,4-D and azinphosmethyl. *Comparative Biochemistry and Physiology Part* C, 137: 43–51.

Pérez-Ruzafa A., Navarro S., Barba A., Marcos C., Cámara M.A., Salas F., and Gutiérrez J.M. 2000. Presence of pesticides throughout trophic compartments of the food web in the Mar Menor lagoon (SE Spain). *Marine Pollution Bulletin*, 40:140-151.

Primel, E.G., R. Zanella, M.H.S. Kurz, F.F. Gonçalves, S.L.O. Machado and E. Marchezan, 2005. Pollution of water by herbicides used in the irrigated rice cultivation in the central area of Rio Grande do Sul state, Brazil: theoretical prediction and monitoring. *Química Nova*, 28: 605-609.

Sancho, E., M.D. Ferrando and E. Andreu,1995. Sublethal effects of an organophosphate insecticide on the European eel, *Anguilla Anguilla*. *Ecotoxicol. Environ. Safety*, 36: 57– 65.

Trevelyan W.E, Procter D.P, Harrison J.S. (1950). Detection of sugars on paper chromatograms. *Nature.* 9: 444–445.