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Evaluation of various biochemical parameters to Nitrazepam, Pentothal sodium and Ketamine anaesthesia in selected freshwater fishes

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ABSTRACT

Aim Aim: The study was aimed to ensure the suitability of three anaesthetics viz. Nitrazepam, Pentothal sodium and Ketamine in selected freshwater fishes.
Method and Materials: Calculation of appropriate doses for specific anaesthetics for a particular fish species and selected biochemical parameters were estimated for assessing probable impact of anaesthetic. The anaesthetic agents, Nitrazepam, Pentothal sodium and Ketamine, have been screened for the first time on two economically important fishes viz. Labeo rohita and Cirrhinus mrigala.
Results: The doses of anaesthetics employed did not cause any adverse effect on biochemical constitution of fish as evident from the analysis of selected blood and muscle parameters.
Conclusion: It was concluded that Nitrazepam, Pentothal sodium and Ketamine agents with used doses in Labeo rohita and Cirrhinus mrigala fishes found safe and effective.

Keywords: Anaesthesia, C. Mrigala, L. Rohita, Ketamine, Nitrazepam, Pentothal sodium.

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Introduction

Anaesthesia in fishes is quite useful for stress management caused by handling, sorting, transportation, artificial reproduction, tagging, administration of vaccines and surgical procedures in fish (Mylonas et al., 2005). Fish transport is one of the most stressful procedures in aquaculture facilities. It consists of several potential stressors, such as capture, on-loading, transport, unloading, temperature differences, water quality changes and stocking and its stress can result in immunosuppression, physical injury or even death (Ashley, 2007). Inappropriate concentrations of an anaesthetic may lead to adverse effects such as stress and its related hazards on fish. Therefore, the ideal and optimum concentration of an anaesthetic should be determined for various fish species (Hoseini and Ghelichpour 2012). Efficacy, cost effectiveness, availability, ease of use, as well as toxicity to fish, humans and the environment, are the criteria's which should be considered when choosing ananaesthetic (Akbulut et al, 2010).

Therefore, it is needed to access safe and effective fish anaesthetics, critically (Chambel et al, 2013). The anaesthetics of most common fishery use are

quinaldine and MS-222. Quinaldine in used for photographic work but also has a wide acceptance in fishery work (Gilder hus et al., 1977). It had been consistent endeavour of scientists to search for an ideal anaesthetic agent for application in various fishery procedures. In India notable contribution in this field are from Natrojan (1960), Sreenivasan (1962), Durve and Dharama Raja (1966), Jain (1981) and Sharma (1992).

Labeo rohita and Cirrhinus mrigala deserve higher economic importance due to customer preference. The original habitats of the three IMC are the rivers and backwaters of Northern India. Anaesthetic efficacy researches on Labeo rohita and Cirrhinus mrigala are scarce (Hasan et al, 2013). Therefore, the study was planned to find out appropriate anaesthetics with appropriate concentrations.

Methods and Materials

Calculation of appropriate doses for specific anaesthetics for a particular fish species and selected biochemical parameters were estimated for assessing probable impact of anaesthetic. Two concentrations of following three anaesthetics were used (Table 1). The injections were administered into muscles beneath the dorsal fin avoiding lateral line with the use of 2 ml hypodermic syringe with needle gauge 26 Following biochemical parameters were determinedly adopting standard methods (Plumer, 1980, Sachdev, 1988).

I. Fish flesh (muscles): Protein and glycogen levels.

II. Blood of fish : Blood cell counting and blood serum protein.

Results and Discussion

Biochemical analysis of L. rohita and C. mrigala fingerling using various concentration of anaesthetics such as nitrazepam, pentothal sodium and ketamine (Table 2 and 3).

Table 1. Dose rates of nitrazepam, pentothal sodium and ketamine in L. rohita and C. mrigala

S. No.	Nitrazepam (mg/l)		Pentothal sodium (ml/gm B.W.)		Ketamine (ml/gm B.W.)	
	L. rohita	C. mrigala	L. rohita	C. mrigala	L. rohita	C. mrigala
1	0.5	1.0	0.0005	0.0008	0.002	0.003
2	1.0	2.0	0.001	0.002	0.004	0.004

Table 2. Biochemical analysis of L. rohita treated with nitrazepam, pentothal sodium and ketamine

S. No.		Control	Nitrazepam		Pentothal sodium (ml/gm B.W.)		Ketamine (ml/gm B.W.)	
			0.5 mg/l	1.0 mg/l	0.005 ml/gm	0.001 ml/gm	0.002 ml/gm	0.004 ml/gm
(A)	**Fish Blood**							
1	Haemoglobin (gm/100ml)	6.2	6.9	6.9	6.5	6.5	6.3	6.4
2	WBC ($x10^4$/cumm)	8.0	7.60	7.62	7.69	7.71	7.77	7.75
3	RBC ($x10^6$/ cumm)	2.13	2.19	2.18	2.15	2.15	2.14	2.15
4	Blood serum protein (ml/100 ml)	1.40	1.452	1.452	1.40	1.40	1.452	1.452
(B)	**Fish Flesh (Muscles)**							
1	Protein (gm/100 gm)	12.36	13.04	13.04	12.00	12.00	13.04	13.04
2	Glycogen (%)	0.176	0.208	0.208	0.212	0.212	0.215	0.213

Table 3. Biochemical analysis of C. mrigala treated with nitrazepam, pentothal sodium and ketamine

S. No.		Control	Nitrazepam		Pentothal		Ketamine	
			1.0 mg/l	2.0 mg/l	0.0008 ml/gm	0.002 ml/gm	0.003 ml/gm	0.004 ml/gm
(A)	**Fish Blood**							
1	Haemoglobin (gm/100ml)	7.4	7.6	7.6	6.9	6.9	7.0	7.1
2	WBC ($x10^4$/cumm)	7.0	6.66	6.64	7.14	7.17	7.13	7.10
3	RBC ($x10^6$/ cumm)	2.22	2.28	2.29	2.14	2.15	2.17	2.18
4	Blood serum protein (ml/100 ml)	1.152	1.642	1.642	1.452	1.452	1.642	1.642
(B)	**Fish Flesh (Muscles)**							
1	Protein (gm/100 gm)	12.72	13.40	13.40	12.36	12.36	13.40	13.04
2	Glycogen (%)	0.180	0.194	0.194	0.212	0.212	0.204	0.205

Lebeo rohita

In general, no much difference in blood parameters and protein and glycogen levels were evident in the control and anaesthetic tried. Haemoglobin, red blood cells, blood serum protein, glycogen and protein were marginally higher all the concentration of nitrazepam, pentothal sodium and ketamine (Table 2). The low levels of mucles protein were observed in this case of pentothal sodium but blood serum protein did not change during anaesthesia were comparable the white blood cells counts were lower in all the anaesthetic concentration. Glycogen levels increase slightly in the case of pentothal sodium and ketamine.

Cirrhinus mrigala

In the nitrazepam treated fish haemoglobin and red blood cells counts were higher. However, with same anaesthetics slightly higher white blood cells counts were observe. Further, haemoglobin and red blood cells were lowered white blood cells were higher in the various concentrations of anaesthetics tried viz. pentothal sodium and ketamine. However, blood serum protein, glocogen levels and muscles protein were higher in all the concentration of anaesthetics. The lower muscle protein was observed in case of pentothal sodium but blood serum protein did not indicate variation at different doses of anaesthetics (Table 3). As regards glycogen, fishes are reported to have low glycogen (Milroy, 1908, Ramaswamy, 1953, Love, 1970). Bhandarl (1989) observed white muscle glycogen to vary from 0.79 to 1.26% in L. rohita and 0.176 to 0.215% in L. rohita and C. mrigala whereas in the present study such variation in glycogen was 0.176 to 0.215% respectively.

In the present observations, in general not much difference in biochemical parameters of blood and muscles were evident in control as well as anaesthetics fish (Tables 2 and 3). Haemoglobin red blood cells, blood serum protein, glycogen and muscles protein were found marginally higher with all the anaesthetic concentration, Such a marginal increase could be due to relative decrease in creation other biochemical parameters. The lower muscles protein was observed in the case of pentothal sodium but blood serum protein did not indicate difference at different doses of anaesthetics (Table 2 and 3).

The clearly justifies the doses of anaesthetics employee which did not cause any adverse impact on blood and muscle variation in total protein and glycogen were found to be influenced by the ovarian cycle in C. puncatus (Amita and Saxena, 1982). However, owing to short time exposure of experimental fish to anaesthetics, not much variation in biochemical composition was evident. Tort and Hernandez (1990) noted decrease in mean cells volume with increased red blood corpuscles and reduction is haemoglobin level after short team leathal Cadmium Scylorhinus caniculs. From this point of view variation in different blood parameters were marginal in the present study. Shastry et al (1994) while performing toxicity studies observed decrease in blood serum proteins.

Conclusions

It was concluded that Nitrazepam, Pentothal sodium and Ketamine agents with used doses in Labeo rohita and Cirrhinus mrigala fishes found safe and effective.

References

Akbulut B, Cakma E, Aksungur N and Cavdar Y (2010). Effect of exposure duration on time to recovery fromanaesthesia of clove oil in juvenile for Russian stur-geon. Turkish Journal of Fisheries and Aquatic Sciences11: 463–467.

Anita NB and Saxena OP (1982). Influences of maturation on quantity of protein and glycogen in the muscle of Channa punctatus (B1). Ictchyol. 3: 29-31 .

Ashley PJ (2007). Fish welfare: current issues in aqua-culture. Applied Animal Behaviour Science, 104: 199-235.

Bhandari K (1989). Architctural and biochemical studies of certion pro fishes in relation to their habits and environment. Thesis Sukhadia University, Udaipur. pp 1-265.

Chambel J, Pinho R, Sousa R, Ferreira T, Baptista T, Severiano V, Mendes S and Pedrosa R (2013). The efficacy of MS-222 as anaesthetic agent in four freshwater aquarium fish species. Aquaculture Research. doi:10.1111/are.12308.

Durve VS and Dharama Raja SK (1966). Effects of anaesthetics on the behaviour of mullet fingearlings and the scope of these in different fishery procedures. I. J. Mar. Biol. Assoc. Ind. 8(1): 28-55.

Gilderhus PA, Berger BL, Sills JB and Harman PD (1977). The efficiency of quinaldine sulphate, MS-222 mixtures for anaesthetization of fresh water fish. U.S. Bur. Sport Fish. Wild life, Fish Control. 54: 1-9.

Hasan M, Pinky NI, Kabir MA, Ahmed S and Rashid SMM (2013). Performances of 2 phenoxyethanol andquinaldine with oxygen in the live truck transportationof rohu fingerlings. Journal of Asiatic Society of Bangla-desh Science 39: 201-09.

Hoseini SM and Ghelichpour M (2012). Efficacy of clovesolution on blood sampling and hematological study inBeluga, Huso huso (L.). Fish Physiology and Biochemistry, 38: 493-498.

Jain SM (1981). Effects of anaesthetics and therapeutic compounds on freshwater fishes. Ph.D. Thesis, Univ. of Udaipur (Raj.).

Love RM (1970). The chemical biology of fishes. Vol. 1. Acadmic press, London and New York. pp. 1-547.

Milroy TH (1908). Changes in the chemical composition of the herring during the reproductiove period. Biochem. J. 3:366-389.

Mylonas CC, Cardinaletti G, Sigelaki I and Polzonetti-Magni A (2005). Comparative efficacy of clove oil and2-phenoxyethanol as anaesthetics in the aquacultureof European sea bass (Dicentrarchus labrax) and gilt-head sea bream (Sparus aurata) at different tempera-tures. Aquaculture 246: 467-481.

Natrajan MV and Ranganathan (1960). A note on the possibilities of utilizing quinaldine in transporting live fish curr. Sci. 29(10): 3930.

Plumer DT (1980). An introduction to practical biochemistry. IIIrd Edition. Tata Mc Graw Hill Publishing Company limited, New Delhi, India, pp. 332.

Ramaswamy TS (1953). Carbohydrate and fat contents of fishes. J. Madras Univ. 23: 232-238.

Sachdev KN (1988). Clinical pathology and bacteriology. Jaypee Botrothers, Medical Publishers, New Delhi, India, p 273.

Sharma SK (1992). Behavioural responses of selected fish species to an anaesthetics and their applicability in aquacultural practices, Ph.D. Thesis, Raj. Agril., Univ. Bikaner, Campus Udaipur, pp. 1-33.

Shastry KV and Gupta A (1994). Haematological study on the effects of cadmium and Di-methoate alone and in combination on a fresh water teleost fish. Channa punctatus. J. Envir. Pollution I. (3&4): 133-139.

Sreenivasan A (1962). Use of tranquilizing drugs and narcotics in reducing oxygen consumption by fish, Ind. J. Fish. 9(2): 738-745.

Tort L and Hernandez-Pascual (1990). Haematological effects in dog fish (Scylorhinus canicule) after short term sub-leathal cadmium exposure. Acta hydrochem. Hydrobiolo. 18: 379-383.

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