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Hematological and Biochemical Parameters of Major Carps with Reference to Fish Production

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Abstract: The purpose of this research was to examine the connection between hematological andbiochemical parameters of main carps living in Goriara Dam in Sidhi, Madhya Pradesh. Bettermanagement methods and increased fish output may result from a deeper knowledge of hematologicaland biochemical characteristics, which are crucial markers of fish health and physiological state. Waterand fish samples were collected monthly from several places inside Goriara Dam during the course ofthe study's six-month duration. Blood counts, white blood cell counts, hemoglobin concentrations, andhematocrit ratios were measured in accordance with accepted laboratory protocols to determinehematological parameters. Biochemical parameters were also measured to evaluate the metabolic andphysiological state of the principal carps, and they included glucose, total protein, and cholesterol.

Keywords: Hematological, Biochemical, Carps, Fish Production , Goriara Dam Sidhi (M.P.)

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INTRODUCTION

Aquaculture is the most promising and quickly growing food production business to help fulfill the world's ever-increasing demand for food (Food and Agriculture Organization of the United Nations, 2005). Aquaculture is unique amongst methods of animal production in that it allows for the cultivation of a wide range of species in both natural and man-made settings. Aquaculture is crucial to the economic success of farmers. However, the rapid and sometimes uncontrolled growth of aquaculture poses a danger to the viability of the industry owing to the occurrence of diseases and illnesses.[1] As aquaculture output, commerce, and population increase, so too does the risk of fish diseases spreading. In recent years, aquaculture has flourished in a number of Asian countries. The goal is to optimize production in relation to available cultural space. In the great majority of facilities that raise marine animals. The origins of aquaculture may be traced back thousands of years to Asia. Because of technological advancements, aquaculture is now a more nuanced sector that incorporates a wider variety of aquatic species and agricultural methods and provides customers with more choices. This is because the food production industry is affected by political, social, economic, technical, and cultural variables.[2-3]

India's fishing sector is thriving, with abundant resources and bright future potential. After India won her independence, the country finally began to recognize the importance of the fisheries and agricultural industries. India is a major seafood exporter across the world. Multiple reports have highlighted the significance of inland fisheries to national food security and regional prosperity. Aquatic habitats in India have been monitored using chemical and biological techniques. Analyzing the influence of chemical intake on organisms, the biological technique is useful for detecting nutritional, metal, pesticide, radioactive, etc. levels. Microorganisms like these can only exist in the euphotic zone, the upper layer of freshwater lakes,

reservoirs, ponds, and rivers, where oxygen and nutrients are abundant. Fish is a vital element of the human diet because of its high protein content and health benefits. Fish may contain trace amounts of cholesterol and insoluble lipids. Fish have many positive effects on human life and prosperity. [4-5]

Endocrine

Many aspects of fish physiology and anatomy are similar to those of other vertebrates. Energy metabolism and development in teleost fish are subject to intricate endocrine regulation.[6]

The endocrine system of fishes is highly developed and on par with that of other vertebrates. When it comes to their anatomy and physiology, fish are quite similar to other vertebrates. Changes in plasma hormone or substrate concentrations, or alterations in erythrocytes properties, are all putative indicators of stress caused by environmental perturbations. The stress response in fish is sensitive to both short-term and long-term changes in their environment. Hormone levels and diurnal activity may be affected by shifts in the photoperiod, although stress does not seem to be a result.[7]

LITERATURE REVIEW

Gad N.S. (2019) The biological assessment of even transient or intermittent water pollution requires the use of microbiological water quality analysis, which has shown to be a significant and beneficial instrument. which programs for monitoring chemical samples may miss. Therefore, using bacterial type assessment in a monitoring program may help preserve the ecosystem's diversity. There are several potential hiding places for pathogens in an aquaculture facility's recirculation system. In this case, the fish themselves serve as the most crucial cold storage. Fish may be vectors for diseases with clear clinical manifestations. Fish illness diagnosis is a challenging part of aquaculture production operations. Parasite, viral, bacterial, and fungal infections, in addition to dietary and environmental variables, are common triggers for such illnesses.[8]

Brown L. (2015) Most infectious diseases are not caused by a single pathogen but rather by a collection of them. The only way to determine what's wrong with a sick fish is to examine and dissect it. Most fish diseases may be identified, however, by microscopic examination. In order to transport the necessary chemicals and energy to and from the body, all living organisms need an environment that is suitable for their life. Fish production is highly associated with biological output, which is in turn heavily influenced by the ecological and physicochemical status of the water body.[9]

Gill T.S., Epple A. (2020) Many fish in aquaculture facilities perish from diseases caused by parasites, bacteria, and viruses, all of which are exacerbated by pollution. Fish may be protected against disease with the use of medication. However, antibiotic and chemotherapeutic use has been heavily criticized for contributing to the spread of drug-resistant bacteria and for being hazardous to fish and the environment. As aquaculture production becomes more intensive, diseases such various infectious disorders become more widespread, causing significant economic losses. The spread of infectious illnesses is a major obstacle to expanding aquaculture. Multiple chemotherapeutants have been used successfully to treat and prevent disease. However, the widespread use of antimicrobials in aquaculture has resulted in the rise of microorganisms resistant to these drugs. Potentially harmful effects of these antibiotic-resistant bacterial strains on fish farms and human health cannot be ruled out.[10]

Erdem C., Kargin F. (2016) Catla catla and Labeo rohita, two species of large carp native to India, have high market demand and widespread public acceptance as a food source because to their delicious flavor and tender flesh. The production of these species represents a significant component of south India's fresh water fish industry. In India's aquaculture industry, bacterial infections are a major concern area. Although vaccinations, antibiotics, and other veterinary drugs have seen significant increases in usage over the last several decades for disease prevention and control, they are not sufficient as stand-alone disease control methods in aquaculture.[11]

Handy R.D. (2016) Phytochemicals, the active components found in medicinal plants, are very valuable and crucial to the economy. Non-nutritional plant compounds with antioxidant or disease-preventative qualities are called phytochemicals. the phenols, saponins, unsaturated lactones, and cytogenic glycosides are only a few examples of these classes of compounds. Plants produce compounds that aid in the upkeep of human and animal health. Many different phytochemicals are synthesized by plants, yet they all have common biochemical building blocks. As a byproduct of their metabolic processes, all plants exude chemical substances. Primary and secondary metabolites are included.[12]

METHODOLOGY

The purpose of this research was to examine the connection between the hematological and biochemical parameters of main carps and fish production at Goriara Dam in Sidhi, Madhya Pradesh.

Study area

The Indian state of Madhya Pradesh has many tribal districts, one of which is called Sidhi District. Sidhi is the administrative center of its own district. A portion of Rewa Division, this area is of interest.

Sidhi District, which forms the state's northern and eastern boundaries, is a representation of Madhya Pradesh's illustrious past. Natural and cultural artifacts abound in the Sidhi area. The river Son, which flows through the area, has helped earn this region a reputation for its abundant natural beauty and riches.

Collection of water sample

Subsurface water samples were taken at a depth of 15-20 centimeters in a pond. Multiple samples were taken from various locations, and then combined to create the final sample, so that it would be representative of the whole. The sample was kept and analyzed in a sterilized one-liter glass container with a screw-on closure.

Watertemperature

A mercury centigrade thermometer with a maximum reading of 110 degrees Celsius was used to measure the temperature of the water. The thermometer was lowered vertically into the water to record the water temperature.

pH

A portable digital pH meter from ELICO MAKE IN THE LABORATORY was used to test the water's pH

on the spot.

Dissolved Oxygen (DO)

The pond sample (20 ml) was mixed with 1 ml of managanous sulfate solution just after collection. Then we added 1 ml of alkalme potassium 10d1de (KI). The lid was screwed on tightly, and the contents were shaken repeatedly to ensure complete dispersion. Waited 10 minutes for the prec1p1tate 1f to form before discarding the bottle. Two milliliters of sulphuric acid of AR grade concentration were used to dissolve the resulting brown precipitate. The sample was titrated against a sodium thiosulfate solution (N/80 Na2S203) standard until a paint yellow color developed, and then 1 ml of starch was added as a md1cator before the content was titrated until the initial blue color faded to clear.

Total alkalinity

The total alkalinity was determined using the methyl orange medicator technique. The alkalinity of the water was measured by collecting a sample in a plastic container and analyzing it as soon as feasible (to prevent denaturation). The end point, a faint orange color, was reached by adding 0.1 ml of methyl-orange md1cator to 50 ml of material in an Erlenmeyer's flask and titrating against 0.021 N standard sulphuric acid.

$$\text{Total alkalinity } (mgl^{-1}) = \frac{(\text{Volume acid used})(\text{Normality of acid})(50{,}000)}{\text{Volum of sample (ml)}}$$

Total hardness·

The pH of a water sample obtained in an Erlenmeyer's flask was incorrectly timed at 12–13 after buffer solution was added. After adding 0.1 ml of Enchrome Black T (EBT) md1cator and stirring, the reaction was titrated against 0.01% ethylenediaminetetraacetic acid (EDTA) until a blue color developed. The following procedure was used to get the overall hardness.

$$\text{Total hardness } (mgl^{-1}) = \frac{(\text{Volume EDTA used}) \times 1000}{\text{Volume of sample (ml)}}$$

Totalsolublesolids

Water sample total solids were calculated by evaporation. One hundred milliliters of water were measured into a preweighed beaker and then evaporated in a 103 degree Celsius oven. After evaporation, the total solids were determined by weighing the beaker.

$$\text{Total solids } (mgl^{-1}) = \frac{\text{Increase in weight of beaker} \times 100{,}000}{\text{Volume of sample (ml)}}$$

Ammoma-Nitrogen

This value was determined using a phenate-based technique with certain modifications. The sodium phosphate buffer solution was used to treat the sample water, and the reagent was m1xed with the solution. Shlmadzu UV spectrophotometer (model UV1601) readings at 665 nm were taken from the final combination.

Haematology

Fish ranging in weight from 200 to 1200 grams of both sexes were used in this study. The fish that were purchased were sorted into three groups according to their relative size. According to their morphometric data, tiny fish (Wi=200–500 g), medium fish (W2=550–850 g), and giant fish (W3=900–1200 g) have been separated into three distinct groups.Wi groups ranged in length from 22.5" to 31.8% for Catla catla, 23.7% to 33.2% for Labeo rohita, and 25.2% to 34.6% for Cirrhinus mngala. The overall length of W2 groups in Catla catla is also comparable.The sizes of the Laheo rohita and the Cirrhinus mngala ranged from around 32 to 39.5 centimeters to between 33.5 and 40.8 centimeters. These fish ranged in size from 39.5 to 44.3 centimeters, 41.2 to 46.5 centimeters, and 43.8 to 51.4 centimeters among W3 groups.

Bio chemical analysis

During the course of the research, fish were taken from the pond. After the gathered specimens were thoroughly cleaned in the lab, their sex, total length in centimeters, and total weight in grams could be calculated. Fishes were divided into three groups according to their combined weight: Wi (200-500g), W2 (550-850g), and W3 (900-1200g). Biochemical components were measured in muscle and liver samples collected from each group throughout the year.

Statistical Analysis

MSTATC statistical software was used for the study. Mean Mean Standard Error (SE) was the data presentation format. One-way analysis of variance (ANOVA) was used to examine the data. Duncan's multiple range test (at the 5% significance level) was used to compare the significant means. Correlation coefficients (r) were also computed for biochemical parameters in relation to one another, water parameters, and biological indices.

RESULTS

Habitat study

A fish pond is a kind of ecosystem in which a wide variety of plant and animal species live and interact. Fish production may be affected by them. Table 1 and picture 1 show the range of values for each water quality indicator measured in the fish pond during the course of the research.

Table 1: Seasonal variations of various water parameters of pond (mean±SE)

Parameter	Unit	Spring (Feb-Mar)	Summer (Apr-Jun)	Ram (Jul-Sept)	Autumn (Oct)	Winter (Nov-Jan)
Watertemp(WT)	0°C	260±021	305±018	275±031	240±0 15	205±016
pH		78±008	76±011	68±021	72±009	74±006
Dissolvedoxygen(DO)	mg l-1	67±012	58±015	61±009	70±010	76±07
TotalAlkalinity(TAL)	mg l-1	1325±62	148 7±75	1113±65	1165±71	1208±7
AmmoniaNitrogen(AMN)	Mg l-1	018±0025	0 14±002	0 13±0 01	011±001	0 12±0015
Totalsolublesobd (TSS)	Mg l-1	2543±8l	2682±102	1754±67	1934±83	2357±93
Totalhardness(TH)	Mg l-1	1323±8 5	1217±80	1284±9 5	1196:1:72	1455±68

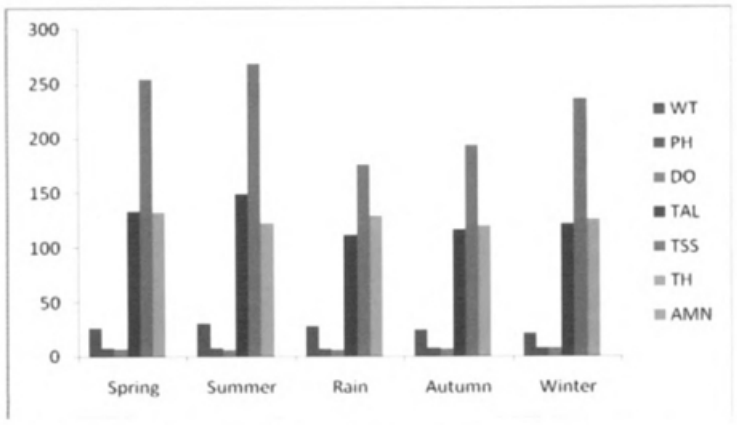

Figure 1: Seasonal variations of various water parameters of pond

- **Water Temperature(WT)**

  Since fish are cold-blooded, their body temperature, development, feed intake, and other bodily functions are all affected by the water's temperature. During the time period of the investigation, the average temperature exhibited a range of 20.5°C to 30.5°C. In the winter, lows dipped to 20.5 degrees Celsius, while summer highs reached 30.5 degrees Celsius.

- **pH**

  It is the concentration of hydrogen ions. pH levels varied on average between 6.8 and 7.8 during the course of the research. The pH of the water is neutral. The springtime (7.8) and the rainy season (6.8) had the highest and lowest values, respectively.

- **Dissolved Oxygen (DO)**

  One key indicator of water quality is the amount of dissolved oxygen present. Water's oxygen-holding capacity. The average concentration of dissolved oxygen was found to shift from 5.8 to 7.6 mgl"1 over the seasons. The lowest figure (58 mgr1) was recorded in the summer, while the highest (76 mgr1) was recorded in the dead of winter.

- **Total alkalinity (TAL)**

Carbonate and bicarbonate ions, typically in the form of calcium carbonate (CaCO3), are responsible for the alkalinity of the water sample. Alkalinity levels averaged between 111.3 and 132.5 mg"1 The alkalinity was lowest in the springtime (l113 mgr1) and highest in the summer (1325 mgr1).

Haematology

Haematological parameters of several fishes were determined by taking into account sex and seasonal fluctuations during the course of the research. Hemoglobin, total erythrocyte count, white blood cell count, packed cell volume, mean corpuscular volume, mean corpuscular haemoglobin, and mean corpuscular haemoglobin concentration were shown as averages for both sexes across all four seasons. Total protem, glucose, lipid, and cholesterol levels were also measured and evaluated in the participants' blood during the course of the research. Haematological and biochemical markers differed significantly by sex and season.

- **Haematological and blood biochemical parameters of Catla catla**

Table 2: Seasonal variations m haematological parameters of Cat/a cat/a

Haemoglobin										
Group	SPM	SPF	SUM	SUF	RAM	RAF	AUM	AUF	WIM	WIF
WI	680	645	751	670	653	621	620	600	580	520
SE(±)	015	023	012	016	015	014	012	012	010	0 09
W2	800	710	900	820	7 93	728	7 43	6 60	670	610
SE(±)	010	014	025	010	012	015	009	010	012	0 06
W3	7 41	650	845	712	720	630	640	533	540	460
SE(±)	0 08	010	013	015	017	021	010	013	0 06	008

RBC										
WI	1 60	150	169	161	157	151	150	144	1 28	1 26
SE(±)	009	006	003	002	0 08	003	003	0 06	003	0 01
W2	178	1 68	188	180	175	172	173	1 63	152	149
SE(±)	0 08	0 05	0 09	011	006	005	002	0 04	004	003
W3	171	158	177	1 69	170	153	1 67	1 25	136	115
SE(±)	0 06	0 08	0 04	007	005	004	005	007	0 03	0 02
WBC										
WI	558	561	642	673	581	604	527	560	420	460
SE(±)	0 08	012	008	019	007	0 03	019	025	006	006
W2	521	553	6 28	651	534	561	4 60	480	400	419
SE(±)	0 09	010	011	011	0 09	010	017	031	012	0 06
W3	3 90	445	512	561	416	441	303	310	270	300
SE(±)	015	009	0 08	014	012	006	009	019	021	007

PCV										
WI	2790	2475	3030	2670	2718	2320	2500	2180	2360	20 30
SE(±)	031	013	012	015	0 09	011	015	030	010	012
W2	3445	32 25	3580	34 28	34 20	3010	2980	2920	2810	2680
SE(±)	017	009	022	008	015	015	017	015	015	020
W3	3149	2630	3290	2700	3067	2490	2786	2210	2380	2070
SE(±)	013	0 10	0 15	0 10	007	013	020	013	020	016

MCV										
WI	17640	17590	181 40	18030	17680	17620	17470	17360	17420	17350
SE(±)	104	096	0 92	025	023	110	113	087	102	036
W2	17360	17270	18060	17980	17523	17590	17380	17280	17332	17260
SE(±)	135	103	085	023	020	125	112	107	093	071
W3	17210	17140	17990	17900	17579	17550	172 90	17100	17221	16980
SE(±)	120	105	113	055	075	122	1 28	103	113	0 61

MCH										
WI	5930	6010	5720	5910	5920	6020	5837	5990	6024	6070
SE(±)	0 93	085	072	053	082	077	042	051	052	115
W2	5670	5830	5540	5650	5723	5910	5810	5860	5610	5627
SE(±)	0 61	0 49	0 67	0 38	078	081	1 21	096	108	110
W3	5531	5700	5400	5520	5390	5400	5300	5316	5401	5301
SE(±)	076	055	085	046	087	060	104	074	081	0 60
MCHC										
WI	3040	2990	2840	3060	3270	3290	3150	3210	2940	3010
SE(±)	042	0 38	131	0 35	0 67	086	053	040	0 67	0 17
W2	3250	3280	3240	3320	3370	3410	3440	3460	3480	3320
SE(±)	0 36	0 35	023	021	084	0 38	046	070	021	1 56
W3	3160	3210	3150	3158	3180	3220	3100	3185	30 00	3115
SE(±)	021	0 30	046	0 62	055	015	021	024	025	0 35

Table 3: Seasonal vanatlons m blood b1ochemtcal parameter of Catla catla

PROTEIN										
WI	435	427	447	433	409	410	403	395	370	3 60
SE(±)	048	018	019	0 12	012	015	0 14	013	0 16	012
W2	470	424	485	431	430	418	420	410	415	385
SE(±)	041	014	0 18	0 16	0 15	006	0 36	021	019	028
W3	430	380	390	3 50	365	328	379	335	400	418
SE(±)	032	0 15	0 31	021	0 10	021	008	015	021	013

LIPID										
W1	262	273	291	315	237	230	244	235	225	232
SE(±)	010	012	015	014	013	011	015	o12	007	008
W2	323	328	354	365	311	300	314	318	308	303
SE(±)	014	013	0 21	019	016	017	018	016	010	014
W3	329	352	347	360	281	271	285	277	289	294
SE(±)	016	019	018	017	014	015	021	017	009	013

CHOLESTEROL										
WI	16200	17700	18100	18750	17500	18300	17000	17947	15500	15600
SE(±)	366	3 56	273	511	153	353	1 53	130	281	173
W2	14700	16500	17900	18200	16950	17520	16450	17480	15100	14500
SE(±)	231	3 53	200	250	200	181	276	135	273	304
W3	13200	13800	14000	14900	13500	14100	13100	13600	12100	12800
SE(±)	473	2.30	361	2.65	300	215	204	2.52	118	2.58

GLUCOSE										
WI	6150	6180	7500	7200	7250	7000	7003	6840	5650	5480
SE(±)	115	208	208	153	I01	153	167	104	112	050
W2	6920	7000	8400	8100	8120	7900	8020	8050	6500	6560
SE(±)	100	I15	180	252	145	163	I01	140	I53	070
W3	6050	6115	7700	7600	6900	7080	6500	6720	5920	5827
SE(±)	1.89	153	100	153	115	136	153	167	135	087

Biochemical analysis

- **Catla catla**

Tables 4 and 5 detail the biochemical characteristics of muscle and liver according to season, sex, and size.

Table 4: Seasonal variations in biochemical constituents of muscle of Catla catla

	SPM	SPF	SUM	SUF	RAM	RAF	AUM	AUF	WIM	WIF
MOISTURE										
WI	7730	7745	7750	7778	7883	7957	7751	7763	7820	7830
SE(±)	112	137	095	149	125	086	074	075	063	037
W2	7620	7647	7670	7717	7700	7763	7643	7691	7691	7651
SE(±)	060	075	0 88	104	123	122	076	043	041	I09
W3	74 60	7425	7502	7560	7558	76 67	7515	7531	7487	7492
SE(±)	069	078	0 85	034	113	132	071	124	069	085
ASH										
WI	158	143	I42	135	136	121	137	126	140	132
SE(±)	0 02	005	008	0 06	001	002	0 01	001	0 03	005
W2	142	138	135	1 28	130	116	119	1 21	136	139
SE(±)	0 02	005	014	010	002	004	001	002	005	0 06
W3	130	124	1 27	1 19	1 10	096	114	113	1 15	120
SE(±)	002	0 04	0 02	018	0 02	0 03	003	011	007	005
PROTEIN										
WI	1750	1707	16 80	1530	1620	1500	1631	1502	1660	1673
SE(±)	031	0 88	026	0 71	020	038	029	025	072	067
W2	1830	1700	1787	1627	1730	1610	1740	1618	1750	1680
SE(±)	061	025	052	039	045	015	026	0 80	047	036
W3	1900	1820	1740	1617	1673	1520	1710	1625	1780	1690
SE(±)	035	026	032	024	0 84	081	021	056	020	043
LIPID										
WI	150	2 20	140	150	110	107	130	140	128	141
SE(±)	0 06	025	056	023	020	022	021	030	009	012
W2	2 03	300	190	2 29	181	179	185	183	1 89	195
SE(±)	011	012	023	014	025	011	030	024	010	031
W3	243	350	240	254	170	163	193	177	207	250
SE(±)	023	017	027	021	012	038	037	042	019	018
FATTYACID										
WI	5650	56 67	5297	5560	5163	5430	54 10	5530	5480	5502
SE(±)	195	2 03	122	165	189	190	075	261	201	100
W2	5710	5913	5703	5860	5670	5730	5407	5350	5440	5570
SE(±)	167	159	158	152	131	168	099	117	160	046
W3	5790	6047	5690	5970	5080	5030	5540	5457	5670	5707
SE(±)	115	099	104	1 21	102	101	035	197	165	064

Table 5: Seasonal variations in biochemical constituents of liver of Catla catla

MOISTURE										
	SPM	SPF	SUM	SUF	RAM	RAF	AUM	AUF	WIM	WIF
WI	7230	7150	7280	7200	7370	7367	7289	7267	7360	7320
SE(±)	085	044	060	112	102	081	096	0 73	110	136
W2	7010	7058	7150	7193	7275	7295	7238	72 63	7180	7160
SE(±)	055	054	113	034	046	022	064	029	090	107
W3	6850	6770	7030	7117	7211	7274	7066	7121	6897	6970
SE(±)	1 18	I25	104	101	077	051	033	040	074	085

ASH										
WI	076	077	0 73	073	071	067	069	065	071	068
SE(±)	0 04	0 03	002	002	001	002	0 01	001	002	0 03
W2	0 73	075	072	072	068	067	065	063	069	066
SE(±)	0 02	0 02	001	001	002	004	0 01	0 02	005	0 03
W3	070	072	067	066	065	059	064	060	067	065
SE(±)	003	0 02	001	001	002	003	0 03	011	002	003
PROTEIN										
WI	1140	1108	1100	1092	1060	1030	1100	1097	1118	1115
SE(±)	025	041	040	023	035	026	021	027	025	023
W2	12 02	1190	1180	1150	1120	1100	1130	1127	1170	1140
SE(±)	017	023	036	040	023	030	026	023	031	021
W3	12 80	1260	1220	12 00	1140	1090	1180	1149	12 08	1190
SE(±)	026	038	035	025	035	047	032	014	032	041

LIPID										
WI	394	4 30	350	3 60	320	317	340	350	370	3 90
SE(±)	004	025	056	025	020	022	021	020	031	017
W2	450	510	400	439	371	411	3 90	415	410	4 30
SE(±)	021	012	023	014	023	011	030	024	025	032
W3	480	560	450	4 64	380	323	403	387	4 34	4 42
SE(±)	020	017	028	021	012	038	037	042	021	025

FATTYACID										
WI	5730	5183	5297	5660	5163	5430	5360	5370	5458	56 34
SE(±)	1 63	176	122	165	189	190	106	181	077	382
W2	6130	62 70	5803	5960	5670	57 30	5310	5448	53 70	55 60
SE(±)	244	1 15	0 58	052	1 31	168	0 85	140	121	I 5S
W3	6067	6443	5790	59 70	5080	5030	51 70	53.40	52 30	5660
SE(±)	2.40	097	104	1 21	102	1 01	1 81	082	0 82	092

Correlation analysis

The table displays the correlation between several biochemical markers measured in muscle and liver. Correlations between water parameters and biochemical markers in muscle and liver were also tabulated.

The moisture content of the liver of Labeo rohita was found to have a statistically significant inverse relationship with liver protein (r=-0.515, p0.01), liver lipid (r=-0.522, p0.01), and liver fatty acid (r=-0.380, p0.01), as well as an inverse relationship with muscle protein (r=-0.472, p0.01), muscle lipid (r=-0.654, p Liver ash and muscle ash were shown to have a significant positive connection (r=O 459, p0 01). There was a positive association between liver protein and muscle protein (r=0.565, p0.01), a positive correlation between liver lipid and muscle lipid (r=0.516, p0.01), and a positive correlation between muscle fatty acid and muscle protein (r=0.651, p0.01), but a negative correlation between liver protein and muscle moisture (r=-0.544, p0.01). There was a statistically significant positive association between liver lipid and muscle lipid (r=0.623, p.01) and between liver fatty acid and muscle lipid (r=0.706, p.50) and a statistically significant negative correlation between liver lipid and muscle moisture (r=-0.357, p.01). There was a statistically significant positive relationship between liver fatty acid and both muscle hpid and muscle fatty acid (r=O 425 and r=O 595, respectively, at p.SO 01).

CONCLUSION

The purpose of this research was to examine the relationship between the hematological and biochemical parameters of main carps and fish production at Goriara Dam in Sidhi, Madhya Pradesh. Variations in hematological and biochemical markers were found across main carp species, with water quality and seasonal fluctuations being the most influential. These measurements provide light on the principal carps' metabolic processes, general health, and environmental adaptations. Some hematological and biochemical markers were shown to have a favorable link with fish output, indicating they may serve as good indicators of fish health and productivity. Fish health monitoring, stressor identification, and optimal fish production in comparable aquatic habitats are all aided by these results, which have significant implications for fisheries management.

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