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Chemical Composition of river Ramganga and its effect on Elemental Bioaccumulation and Primary Chemical Reaction in the Plant Gram (C. arietinum)

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ABSTRACT
Finding of the present investigation reveal that the %age factor of the crops plays an important role in the manifestation of growth in terms of production of standing crop. River Ramganga Moradabad (U.P.) exhibits high magnitude of pollution and the and concentration of it is due to biotic and sources that poses a devastating health hazard to human Plant and edible fish life. The chemical analyses of its waters sample carried out with various parameters viz pH, COD, BOD, TSS, TDS, all and grease, free coz and chloride violated tolerance limit, Brownish black colour, foul odors and poor transparency indicated pour water quality. The Chemical analyses with the help of atomic absorption performed on its water sample demonstrated the accumulation of heavy metals such as Cr. Fe, Zn, As Fe and Pb, minerals like Na, K, Ca, Mg, SO_4^{2-}, PO_4^{3-} Total Nitrogen indicated organic and inorganic load, concentration of Ca, K, PO_4^{3-}, crude protein and lipids was significantly lower in the seeds of water treated cultivars PG-114 and C-235 of C. arietinum. However, concentration of Na, Ca, SO_4^{2-} total carbohydrates total ash and chloride increased significantly.
The Present study has been used to sensitivity monitor the extent of heavy metal pollution in the biotic aqua life of river Ramganga system and its suggested that the bioaccumulation of heavy metals in gram reached above. Permissible limit for human consumption indication of potential health risk, Necessary biological steps should be taken to handle such food pollution and prevent the environmental rise and food chain disruption. The adverse effect of the river Ramganga was also evident in case of survival of fish. Its water is much polluted where sewer, brass industries and glam industry effluent fall into it. However, may be mutable for farming fish when the water of it diluted in ratio 1.4. to the irrigation of crop, the rate of seed germination was increased. When river Ramganga was analyzed at a distance of 1 km. from Moradabad city has been found to be less for both crop and fish. This end that biodegradable Organic matter in the diluted effluent can enhance seed germination when present in appropriate proportions.

I. INTRODUCTION

Water is essential for all kind of life, Pure water used for drinking and domestic purposes in the first priority of human being, from the health and hygiene point of view, because fresh water resources contribute only 3% of waste from the earth's fresh water which is locked up in glaciers and the Caps on polis 30.1% of it b ground water which is use for drinking purpose and domestic needs in India Besides biological field of the crop (groom) the nutritional importance is the primary concess from the health and hygiene point of views.4

Nutritious of the crop includes all the substances that must be supplied that from out side. Growth of the Crop plant in the net result of the intake of minerals and their sales which on hydrolysis become lonised into cation and anions. Intake of these ions depends on the degree of permeability of plasma membrane, While there accumulation in different vegetative and reproductive parts imply influences then growth.

Ramganga river exhibit high magnitude of pollution due to indiscriminate disposal of water by large number of industrial units and sewage waste are being discharged either land an in the river Ramganga Moradabad has lead to raped deterioration in the river quality of aquatic en Moradabad. The water of river Ramganga to located al kathghar Moradabad is disposed of through several drains of glass, steel and brass industries which carry their pollution load into big cannels that ultimately causes pollution in the river Ramganga. Flowering at 45km East from Moradabad City, Cultivators of adjacent village irrigate their crops.

Several workers have studied the effect of river Ramganga on growth, yield, biochemical parameters of seeds of variety crops and fish.[5] No effect has been made to study the water pollution caused by brass industries and domestic waste of Moradabad city and irrigation impact on mineral bioaccumulation and primary Chemical reaction in different part of crop plant. Present study deals with physico-chemical and biological analyses of raw Ramganga Moradabad (UP.) India. The effect on seed germination and survival of fish along with the effect on the biochemical parameters of needs and fish were also studies. An attempt has, therefore been made to fulfill this lacuna.

The gross and the net production of phytoplankton in the fish o pond was gradually decreased with increase in the concentration of the pollutants in river Ramganga various studies on the toxic effect of different river water & industrial effluents on fish survival and some biochemical parameters revealed that decrease in oxygen content in water affected survival of fish.

II. EXPERIMENTAL

Seeds of gram were sown in the unglazed earthen pots, (30 cm Diameter) filled with garden loam soil mixed with farm yard manure, After one week of seedling emergence thinning was done to allow only one seedling to grow in each pot. Experiment was conducted in triplicate for crop (Gram). The control and treatment sets were maintained separately for crop gram under study. Physico-Chemical composition of soil was the same as in energy estimation experiments in control sets the pot were irrigated with tap water, whereas in the treatment sets water of river Ramganga was used for irrigation. The irrigation were made at weekly intervals in both the sets. The water from river Ramganga was collected from it disposal point at weekly intervals and Physico-chemical composition of tap water and water of river Ramganga was studied. Quantitative estimation of heavy metals in the river Ramganga made by Atomic absorption spectrophotometer.

Chemical analyses of root, steam, leaf and seed was dove according to Paper[9] Plant Were harvested at the time of seed ripening. Different plant viz root, steam, leaf and seed were collected from the plant of control and treatment sets and analyzed the total ash, Na, K, PO_4^{2-}, COD, BOD, DO, Total Nitrogen, Fe, SO_4^{2-} crude protein, lipids as per the methods described earlier, 10 Fresh water fish variety were collected from Narora Dam Near Bulandshahar Distt. (U.P.). The tires were kept in fish tanks in tap water and were fed commercially avoidable fish food. They were allow to acclimatize for seven days and were allowed to survive in control water as well as river Ramganga As the (25) fishes did not survive in the river water and the fish (25) in control water. After 8 days the fish were acclimatized and analyzed for biochemical parameters such as protein, lipids and minerals.

III. RESULT AND DISCUSSION

Physico-chemical characteristics of river Ramganga are compared with these of tap water in Table 1. The boon transparency the brownish black color, foul odor of the river Ramganga and evident in revealing the magnitude of pollution. pH was not conductive of aromatic life, Concentration of TDS, TSS, DO, BOD, COD, total alkalinity, Total N_2 , Ca, Mg, Na, K, EC(ms cm^{-1}), total hardness, dissolved silica, free CO_2, Cl, SO_4^{2-}. PO_4^{2-}, oil & grease, heavy metals. Cal, Cu, Pb, Mei, Re, Zn, Co, Mn, violated the recommended permissible limit, (APHA).

Table I: Physico-chemical analyses of river Ramganga and top water used in need germination and **irrigation** treatments (Nov 2012 - Aug 2013)

S No.	Parameter	River Ramganga	Tap Water
1	Color	Brown-Black	Colorless
2	Odour	Foul smelling	Odor less
3	Temp	18.9 -30.28	19.56-32.5
4	p**H**	4.1-9.2	7.0-7.2
5	Transparency (cm)	2.0-3.7	100
6	TDS mg/l	325-1210	98-182
7	TSS mg/l	172-189	10.0-13.2
8	DO	1.7-5.7	10.0-13.2
9	BOD mg/l (5days 22^0c)	31.52-1265.76	2.5-3.0
11	COD mg/l	63.0-1660.40	40-45
12	Total Alkalinity mg/l	49.4-351.10	13.-63
13	Total nitrogen mg/l	8.5-64.2	.- -
14	Na	15.7-22.3	2.0-2.4
15	K.	17.5-18.3	1.7-2.2
16	Ca	67.4-91.3	1.4-47
17	EC (ms cm-1)	4.11-5.4	9.5-14.5
18	Total Hardness	4.11-580.4	1.3-1.8
19	Mg	42.3-60.9	97-126
20	Dissolved silica mg/l	0.4-1.8	-
21	Free CO_2 mg/l	72-270	1.2-2.5
22	PO_4 mg/l	1.3-4.8	0.2-0.4
23	SO_4 mg/l	112-151	192-23.6
24	Cl mg/l	291-5030	19.2-23.6
25	Oil & grease mg/l	16-65	--
26	Heavy metals		
	Ca		-
	Cr		-
	Cu		-

	Pb		0.09
	Ni		-
	Fe		0.3
	Zn		1.2
	Co		-
	Mn		0.5

TABLE-2: Showing concentration of heavy metals in river Ramganga at two polluted sites.

	Site I	site II	Tolarance Limit
Cd	0.022	0.12	0.058
Cr	0.484	0.275	0.044
Cu	0.088	0.95	0.506
Pb	1.122	1.089	0.92
Ni	0.044	0.176	1.925
Fe	2.806	2.275	1.033
Zn	4.334	3.047	2.024
Co	0.055	0.057	0.528
Mn	0.08	0.0935	0.528

(concentration in reg/L)

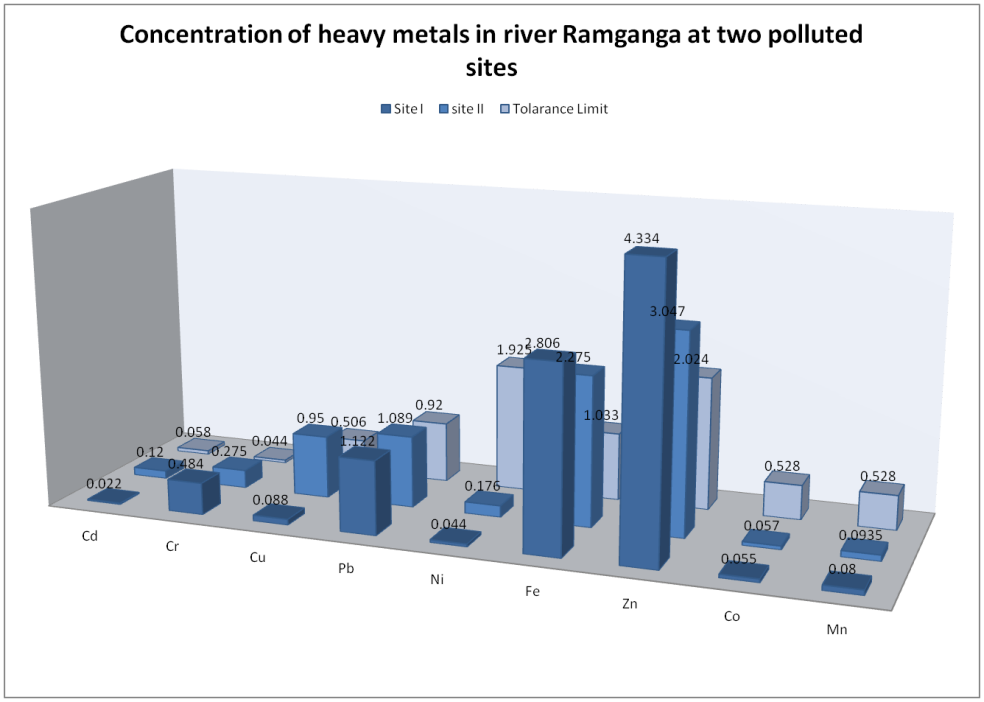

FIGURE 1: Bar diagram showing concentration of heavy metals in river Ramganga at two polluted sites

Sodium content in the vegetative part and seeds of the Ramganga treated plant was higher than the respective control. Sodium to one of the strongest monovalent cation whose highest concentration up-get the mineral composition of soil. [12] The concentration of sodium in the four component part of these PG 114 & C-235, maximum increase (400%) being obtained in the Case of root followed by stem 200%, leaf 143.46% and seed 106.08%. Higher Na content in the stem of treated crop may be attributed to rapid intake of Na+ ion. In there is sample evidence the Na+ ions always inhibit the entry of K+ ion. However Na+ ion is associated with Cl- ion and cause particles of plasma membrane to separate and enhance permeability. [12] Accumulation of Na+ ion events inhibitory effect on metabolism and growth play an important role in modifying the edaphic condition of soil. In association with week and strong anions it alters the pH of the soil solution and effect crop growth.[13]

Potassium content was lower in the vegetative part and seeds of the cultivars irrigated with the river Ramganga over their respective controls. However in river it was high than the tap water. Decrease was maximum (89.45%) in seeds of the treaded crop grown followed by stem (55.85%) hat 52.79 %) and root (49.70%). Potassium accurse in plant call only in the lonic form as macronutrients, It has a marked effect on the weight of seeds, hence its maximum reduction in seed may be attributed to its deficiency. Low pH has been reported in cause potassium deficiency and adverse effect on nitrogen metabolism

Chemical analyses of various part of plant viz, root stem, leaves and seeds of gram (PG-114 & C-235) revealed over-all reduction he the concentration of calcium treated plant as compared to control sets. The % age decrease in the root, need, leaf and stem being 7.007., 63.43%, 70-99% and 79.32%, respectively. Calcium is an important constituent of middle lamella which accumulates it in the form of calcium pectate.

The role of calcium is obviously much more fundamental there as elements of cells. There is also enough evidence to that protoplasm cannot maintain its living entity in absence of Ca++ ions.15 Low concentration of calcium in vegetative part the treated plants may be attributed due to its poor absorption as Ca++ ions through plasma membrane. Precipitation of calcium into calcium hydroxide and calcium carbonate as insoluble Ca residues seems to be potent causative factor, responsible for its restricted availability.[16]

Phosphate concentration was found to decreases in the root, stem, leaves and needs of the cultivars receiving the water of river Ramganga as compared to control sets. Decrease in phosphate content was in the order of leaf> stem>seeds>root, maximum decrease (38.6%) was observed in the leaf of treated crop. this effect was amply documented by phosphate deficiency symptoms such as premature leaves fall, development of necrotic areas on leaves and fruits turning of leaf colors from green tea blue-green during the culture studies. Exactly phosphorus is absorbed in the planet as a phosphates and forms an important constituent of nucleic acids, phospholipids, coenzyme, NAD, NADP and ATP, phospholipids along with proteins serve as important constituents of cell membranes. Poor intake of phosphate through plasma membrane is intimately associated with pH of the soil solution from ph Ramganga 4 to 6.5 and 7.5 to 8.5 phosphates remains poorly available. Al low pH Fe, Mn, Zn and Cu become toxic. This poor absorption of phosphate exerts suppressive of protein, respiration, carbohydrates and fat metabolism, concentration of sulphate in the treated plant has been found to be significantly higher over thin respective controls. Similarly in the river Ramganga sulphate had higher concentration as compared. increase in sulphate concentration in the crop was in stem (84.87%) > leaf (78.00%.), seeds (56.00%) and roots (30.20%). High concentration of sulphate may even this rendering effect mixed water of Ramganga misfit for potable use. Sulphate along with other inorganic solutes one absorbed of plasma membrane and is translocated through Xylem elements. Plant proteins contains sulphur, sulphurous anions acids like cystein, cystin, methionine, for a problems with other amino acids disulphide linkage help to stabilize the protein structure it is also a constitute of vitamins like biotin, thiamine and coenzyme A. Since the sulphate concentration in river Ramganga was permissible limit, then be accumulation in the vegetative part and seed does not seems to be invoked in the growth inhibition with in association with weak base like Ca++ and Mg++ ions they bring about lowering of pH the soil solution which has been observed during the study period. However, any involvement of SO_4^{--} in suppressing plant metabolism and growth can be ruled out. Under reducing conditions SO_4^{--} may be transformed into sulphides which in rempte possibilities might disturb the normal pH of cell sap by lowering its level and may be exert adverse effect on plant metabolism.

Concentration of Iron in the root (110.30%), stems (556.70%) leaves (49.30%) and seeds (23.807) was significantly higher in both cultivars of crop gram irrigated with the river. Ramganga as compared to control sets receiving tap water. Iron content in the river was also much higher then recommended tolerance limits. Due to low pH of major spars of Crop growth iron become excessively soluble and was absorbed mostly as Fe through plasma membrane and got accumulated me the cell of different vegetative part and needs. It appears that beyond the requisite concentration, iron had toxic effect on ferrodoxin which plays an important role in biological nitrogen fixation and serves as primary electron acceptor in primary photo chemical reaction to photosynthesis. Iron is an important, and activate constituents of s everal enzymes such as peroxidase, catalase on cytochromes which one rendered inactive due to its higher concentration and inhibit growth.

Data reveal that there are overall decreases in the concentration of total N2 in the treated plant over their respective control sets. The decrease was in the following order 28.50>12.10> 12.30>11.40 in the seeds stem, root and leaf, respectively. Through the concentration nitrites and nitrates was found to be higher in the river Ramganga yet the reduction of total-N2 in the seeds suggested impairment of nitrification process brought about by inactivation of microbes at low level of pH recorded in the river Ramganga for most of the period. Nitrogen to an important constituent of proteins, nucleic acid, Paraphyrins (important part of chlorophyll and cytochromes), alkoxide, some vitamins, co-enzymes etc. Effect of nitrogen starvation was manifested by yellowing of leaves in the both the cultivars (PG-114 & C-235). Poor availability of nitrogen leads to reduction in crude protein content and enhancement of total carbohydrates. 9,10 Reduction in growth and dry matter production may be attributed to inhibition in chlorophyll bio-synthesis, depressive effect on nitrogenous bases like purine and pyrimidine and also an protoplasm which is in predominantly poleinaceous .[15]

Chloride concentration increase and in all the form parts of treated plant as compared to control sets, maximum increase being observed in the case of seeds while minimum in case of leaf. Higher chloride content to considered to be an indicator of pollution created to be an indicator of pollutions created due to industrial discharge as well as organic waste of animals origin.[12] Along with other essential anions like SO_4^{--},PO_4^{---}, NO_3^{-} the chloride ion were also taken up through plasma membrane and got accumulated in the cytoplasm. Under judicial limits chlorides are required in catalytic amount to carry out reactions in the cells. However, when all

the negative charges on the particles of Protoplasm are neutralized and substituted by negative Cl- units, the permeability of plasma membrane is at its maximum, Chloride ions one among strong anions that Increase toxicity in water and also in the cell sap. To counteract toxicity of Cl-, it would be desirable to add lime as has been recommended by weaver and clements. 17

Total carbohydrates content showed overall increase in all the component part of river Ramganga treated plant as compared to its control sets. Maximum increase (17.604%) was obtained in the leaf followed by the seeds (54.20%), root (3.70%) and Stem (0.64%). Great concentration of carbohydrate was found to be associated with the decrease in Fat content. Increase in total carbohydrates may be attributed to poor intake of nitrogen and suppression of enzymatic activity during synthesis of lipids. There is ample evidence to indicate that high acidity within the range of 4 to 6 pH causes impairing nitrification process which involves larger number of ammonifying and nitrifying bacteria and subsequently results in nitrogen starvation. This imbalance thus created in the percentage of fats, proteins and total carbohydrates as unsound and indicates nutritional deficiency which may lead to malnutrition symptoms human consumption and live stock feed.

Crude protein decrease significantly are all the component part of treated plant %age decrease was the maximum in the seeds (28.50%), while the minimum (11.40%) value were obtained in the case of leaf. Protein content has been found to be positively correlated with both with total nitrogen in both the cultivars. Plant protein content sulphur, sulphurous, amino acids, methionine has an empirical formula $C_5H_{11}O_2N_5$. leaves must synthesized amino acid before they can make any protein. Inorganic nitrogen absorbed by crop in the form of ion is convert into the group before being elaborated into amino acids. Reduction of nitrates to the form to brought about by a molybdoflavo - protein, nitrate reductase, the election for reduction being provided by NAD(P)H with the formation of NH4+ ions, the evidence indicates that it quickly combines with various keto-acids to form amino acids.18 Protein breakdown in the amino acid is also adverse effect due to considered as causative factor for reduction In crude protein content in different part of the plant. Decrease in protein content has been found to be associated with increase in total carbohydrate at the expanse of protein to nutritionally unsound.

Total nitrogen showed significant decrease the treated plant over thier respective control sets. The decrease was in the following sequences 28.50%>12.10%>12.60%>11.40% in the seed, stem, root and leaf respectively. Though the concentration of nitrates and nitrites was found to be higher in the effluent. Yet the reduction of total nitrogen in the seeds suggested impairment of nitrification caused by inactivation of microbes at low pH level of recorded in the river Ramganga for most of the period. Nitrogen is an important constituent of protein, nucleic acid, prophyrines which are important part of chlorophyll and cytochromes. Effect of nitrogen starvation was manifested by yellowing of leaves in both cultivars (PG-1158 C-235). There is simple evidence on record that poor availability of nitrogen leads to the reduction in crude protein control and enhancement of total carbohydrates. Reduction in growth and dry matter production may be attributed in inhibition in chlorophyll biosynthesis, depressive effect on nitrogenous bare like purine and pyrimidine and also on protoplasm which is predominantly Protenecious. [13]

Ether extract concentration in root, stem, leaf and seeds of treated cultivars of crops under study was significantly lower as compared to respective control. Maximum decrease was observed in the seed followed by the root, leaf and stem, which may be attributed that to decline in carbohydrate reserves leading to back down of fat that one first hydrolyzed in the presence of enzymes (lipase) to yeild fatty acids and glycerol suppression of fat metabolism may be accounted to inhibitory active of polluted such as heavy metals Na+, Cl-, ions on the enzymes like glycophosphate, dehydrogenase, phosphates, acetyl-CoA Carboxydase, malonyl CoA, fatty acid synthesis and fatty CoA reduces whose activity is suppressive during various steps involved on the synthesis of glycerol, synthesis of fatty acids and condensations of fatty acids and glycerol to form phosphatidic acid and finally triglyceride (fat) as reported by Webb 1966.[19]

Percentage of total ash content was higher in the seeds of river Ramganga treated plant as compared to control. Ash content to the direct manifestation of bioaccumulation of minerals absorbed as macronutrient (C,H,O,N, P, K, Ca, S, Mg, Fe) and micronutrients (Mn, Zn, B, Cu, Mo) excessive solubility of Zn Mn, Pb, Cr, Fe and Cu at low pH levels to the chief factor creating toxicity, which leads to paralyzing effect on the catalytic reaction of chain of enzymes evolved in different metabolic process. [15]

Table 3: Bio Chemical Parameters of fish

Parameters %	Control water Mean ± SE	River Ramganga (Treatment)	River Ramganga with (1:4) dilutions	%Decrease/ increase	F	CD	SE_M±
Carbohydrate	5.87±0.5	0.34±0.5	14.50±0.14	-82.37	27.89**	0.24	0.006
Protein (N_2 x 6.25)	62.25±1.0	20.34±1.0	49.30±1.0	-51.67	430.69***	0.47	0.001
Total ash (mineral)	21.50±0.05	52.30±**0.56**	28.03±1.0	+7.59	87.28**	0.013	0.009
Total fat (content)	8.21 ± 0.6	1.82 ±0.5	1051±0.5	-72.67	127.35***	0.04	0.008

P <0.01 P<0.001

Intake of toxic metallic ion results in then bioaccumulation in plant tissues. Metabolic attributes such as lipids, crude problem and total carbohydrates being dependent on the offer of enzymes and intake of minerals from soil this exhibited variation in then concentration, soil pH plays a decisive role governing there in lake. It is therefore, desirable to ameliorate the pH of river Ramganga without much alteration in ECe levels.

Bio chemical parameters of fish

In the river Ramganga the fishes died within a short time, which may be due to lack of DO. The total ash, total fall, total nitrogen content of fish exposed to tap water, where they have survived for four days in the given Table. The higher value of Total ash indicates absorption and deposition of minerals[15].There was a significant decrease in total fat and protein content of the fish. The decrease in lipid level may be due to increased utilization of lipid to meet additional energy required under a stress of two oxygen up lake.[33] Some heavy metals Hg, Cd, Pb, As, Me, Cu, Zn which are above the tolerance limit somehow play an essential role in the normal biological processes and the insufficiency on excess amount cause a disturbance on the metabolic pathway and seviour illness. Essential heavy metals are which have known biological functions. Other groups of heavy metal, have no biological role and at higher concentration cause, a toxic effluent to the tissues beyond tolerance limit[20], metal ions induce reacting oxygen species (ROS) production, which causes an oxidation stress response in fish[21]. Redox active metals e.g. Cu a les generate reactive oxygen species. through redox cycling, whereas redox inactive metals e.g. Cu, Cr, generate reative oxygen species, through redox cycling. Ehereas redox inactive metals e.g., Hg, Na, Pb, As, and Cd bind to the sulfhydryl groups (SH) of poteins involved in antioxidant defenses, thereby impair the defense mechanism. Elevated RDS productions in the causes DNA lesions, oxidation of lipids and proteins and alternation of cellular redox states.[20]

In addition to detoxify the metal metallothioneins are the mayor cause of bioaccumulation of heavy metals in different tissues of fish[21]. The accumulate heavy metals not only effect of fish population in the aquatic ecosystem but also transfer through the food chain to the next tropic level. Transfer of these elements from aquatic to the terrestrial ecosystem has serious implications for human health by promoting different diseases including cancer, neuro-degenerative disease.

IV. CONCLUSION

Present study indicated that the river Ramganga may be beneficial for agriculture purpose on fishes when und in dilute form, whereas it is not useful for survival of fish as it **contain** high %age of Dissolved and suspended organic matter and low content of dissolve O_2. About the heavy metals toxicity of fish health suggested that essential steps should be taken to minimize the **toxic impact** of heavy metals on human health and the **environment**. The level of heavy metal on soil, water and sediment should be maintained regularly and sewage & industrial waste should be decontaminated effectively Before discharge into river Ramganga Moradabad,

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