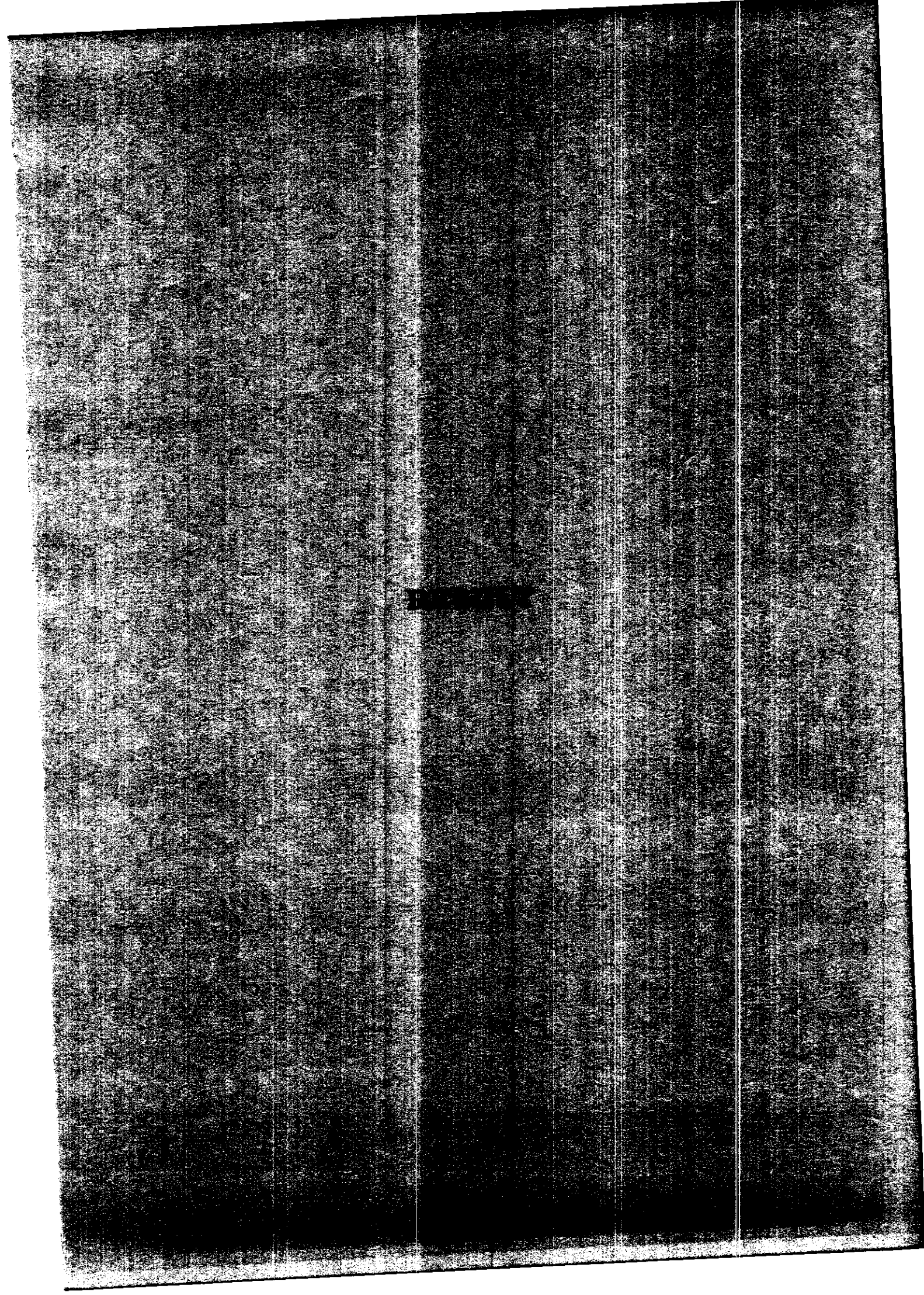

RESULTS

Clinical symptoms

Fishes under the influence of oxadiazon in water showed some toxic symptoms manifested by convulsions and rapid swimming followed by sluggishness, disorientation, marked reduction in resistance to capture and extension of the pectoral fins forward. However, the influenced fishes were observed togather eagerly around the air supply inlets; sometimes, the fishes stood vertically directly within the air bubbles zone. Later on, they were observed to behave in this way even more eagerly. This condition lasted for 1 - 3 hours, excitation was lowered until the treatment process.

A marked reduction in feeding activity was noted in the treated fish during the early days post - treatment. The aggregate form of the fish in the tanks which resembled a school, started to deteriorate in the treated groups. In general paleness of the body colour and the release of foam from the gill openings were observed.

In the second period after the fishes were transported to fresh water, the state of excitability, rapid swimming and reduction of feeding rate which are noted during the treatment period begin to disappear. In the following days the fishes restored their normal condition.

(1) Leucocyte enzyme cytochemistry : -

Changes observed in the leucocyte enzyme cytochemistry of *Clarias lazera* and *Cyprinus carpio* during and after oxadiazon treatment are given in (51) figures as indicated in the following observation : -

(1-a) Carbohydrate content of leucocytic cells as affected by oxadiazon

(I) *Clarias lazera* : -

All types of leucocytes in the blood of normal fish are positive for PAS reaction; granulocytes show moderate (+ +) to strong (+ + +) reaction which appear as a red cytoplasmic stain granulation, while monocytes, thrombocytes and lymphocytes are stained faintly (+) (Figs. 1 - 4).

After subjecting the fish to the concentration of 2 ppm oxadiazon, a slight increase in the intensity of PAS reaction has been observed in neutrophils 7 day post - treatment, while the thrombocyte still have a faint reaction (Figs 5 & 6). However, after 14 day of exposure to the same concentration a detectable increase particularly in the number of neutrophils and their precursors is observed with concomitant increase in the intensity of PAS reaction in granulocytic cells in general (Fig.7).

After transportation of fish to the fresh water for 3 day, the basophils do not show clear separation of nuclear lobes with moderate (+ +) to intense (+ + +) PAS reaction (Fig.8). After 7 day of transportation, undifferentiated granulocytes show a strong (+ + +) PAS reaction with cytoplasmic vacuoles, some cells of granulocytic series appeared hypertrophied with disturbed contours (Fig. 9).

When the fish were subjected to the concentration of 4 ppm oxadiazon for 7 day, the cells showed the same staining affinity as that of the normal cells (Fig. 10). After 14 day, the reaction increased in its intensity, some cells had disturbed contours, the cells had coarse nuclear chromatin staining, band neutrophils are also observed (Fig. 11 & 12), very weak reaction in lymphoblast is also detected (Fig. 13).

After 3 days of transporting fish to fresh water, a moderate (+ +) reaction have been observed in reactive cells with faint staining nuclei (Fig. 14). Later, 7 days in fresh water, the leucocytic cells have PAS activity closely resembled the normal level, but some cells appear with densely staining nuclei and fine weak (+) diffused granular reactions, this stage is considered as a preparatory stage of degeneration.

(II) *Cyprinus carpio* : -

The granulocytes of control fish have an intense (+ + +) PAS reaction. However it is weak (+) in lymphocytes, monocytes and thrombocytes (Figs. 15 & 16).

There is a slight increase in the intensity of PAS reaction at the periphary of the cell in the samples treated with 2 ppm oxadiazon for 3 days (Fig. 17). More increased intensity of carbohydrate content in the cytoplasm of the reactive leucocytes are observed in blood cells of fish treated with 2 ppm oxadiazon for 14 day (Fig. 18).

After transportation of fish to fresh water, granulocytes have a strong (+ + +) PAS reaction (Fig.19).

The PAS activity of fish subjected to 4 ppm oxadiazon for 3 day, revealed no noticable increase in the intensity of the reactive cells (Fig. 20). After 7 day of treatment moderate (+ +) cytoplasmic reactions are observed but the inclusions at the periphary of the reactive cells are strongly reacted (Fig. 21). The feature of the reactive cells after 14 day of treatment revealed weak (+) PAS activity (Fig. 22).

After the fish had been transported to fresh water, the cells appear to have a moderate (+ +) staining (Fig. 23).

Concerning the carbohydrate content, the cells show a tendency to restore their normal levels.

List of Abbreviations used in the figure

B	Basophil
E	Eosinophil
Er	Erythrocyte
GR	Undifferentiated Granulocyte
LB	Lymphoblast
LL	Large Lymphocyte
M	Monocyte
N	Neutrophil
SL	Small Lymphocyte
TH	Thrombocyte

PLATE - I

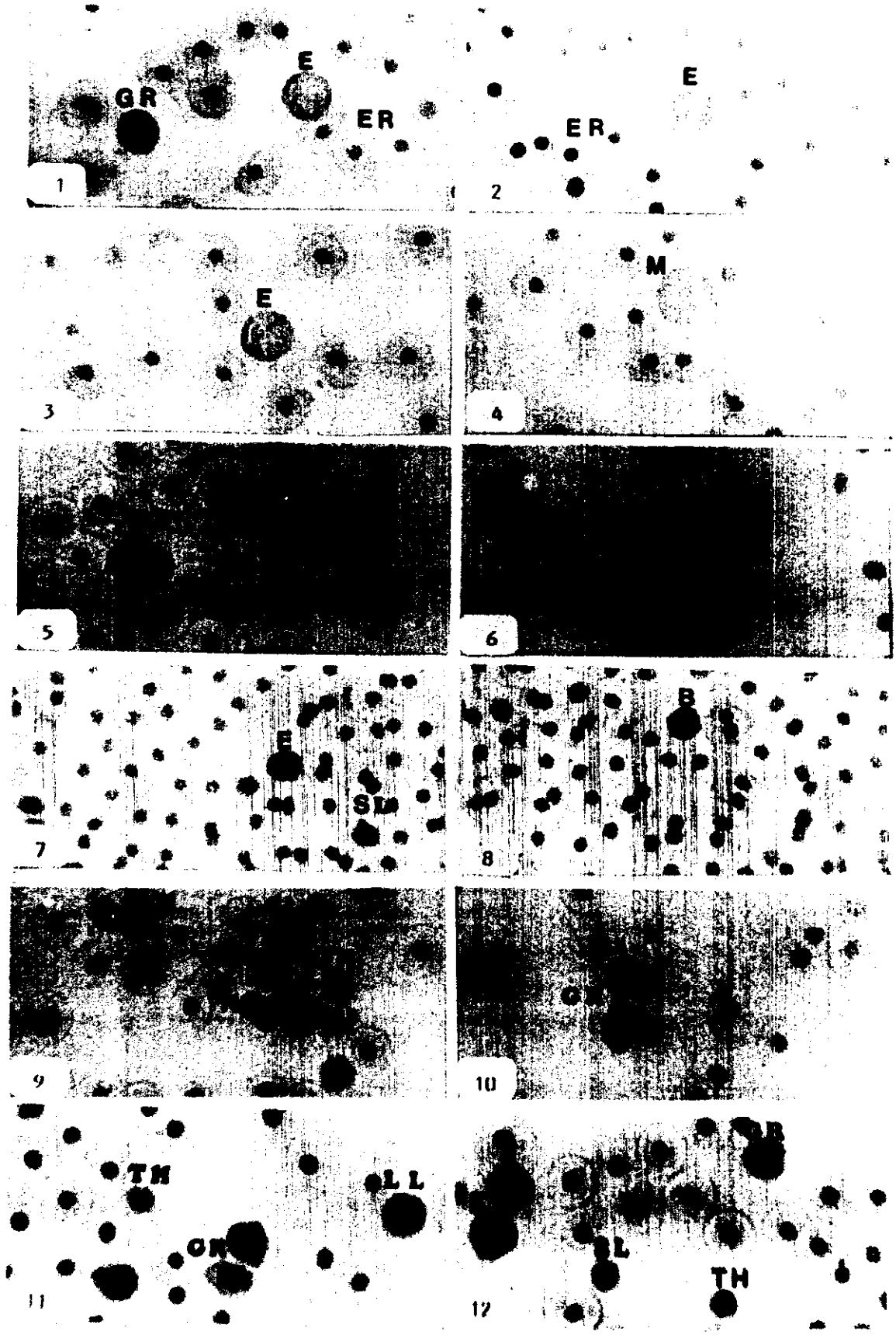

PLATE (I)

Material (Blood cells of ***Clarias lazera***) fixed in formalin - ethanol solution and processed according to the PAS technique (**Davey and Nelson**, 1977) for the cytochemical demonstration of carbohydrate content of blood cells.

Figs. (1 - 4) Blood cells of control fish demonstrating a moderate (+ +) to strong (+ + +) PAS reaction. X 250

Figs. (5 & 6) Blood cells of oxadiazon (2 ppm) treated fish 7 day post - treatment, revealing a slight increase in the intensity of PAS reaction in one neutrophilic cell, but the thrombocyte appeared still having a faint (+) reaction. X 250

Fig. (7) Blood cells of oxadiazon (2 ppm) treated fish 14 day post - treatment, illustrating more increased intensity of the reaction, as compared with the preceding treatment, appeared in eosinophilic cell. In the field lymphocyte appeared having a weak reaction (+) in their scant cytoplasm. X 250

Fig. (8) Blood cells of fish which transported to fresh water after (2 ppm oxadiazon), 3 day post-transportation, revealing strong (+ + +) reactive basophilic cell which do not show clear separation of nuclear lobes, but the thrombocyte show weak (+) reaction. X 250

Fig. (9) Blood cells of fish which transported to fresh water after (2 ppm oxadiazon), 7 day post-transportation; the reactive cells tried to restore the normal level of intensity, but some cells appeared abnormally defected in their morphology. X250

Fig. (10) Blood cells of oxadiazon (4 ppm) treated fish, 7 day post - exposure, revealing a slight or no marked change in the intensity of reaction in the reactive cells with weak staining nuclei. X 250

Figs. (11 & 12) Blood cells of oxadiazon (4 ppm) treated fish, 14 day post - treatment, indicating more increased reaction and the cells had coarse nuclear chromatin staining. X 250

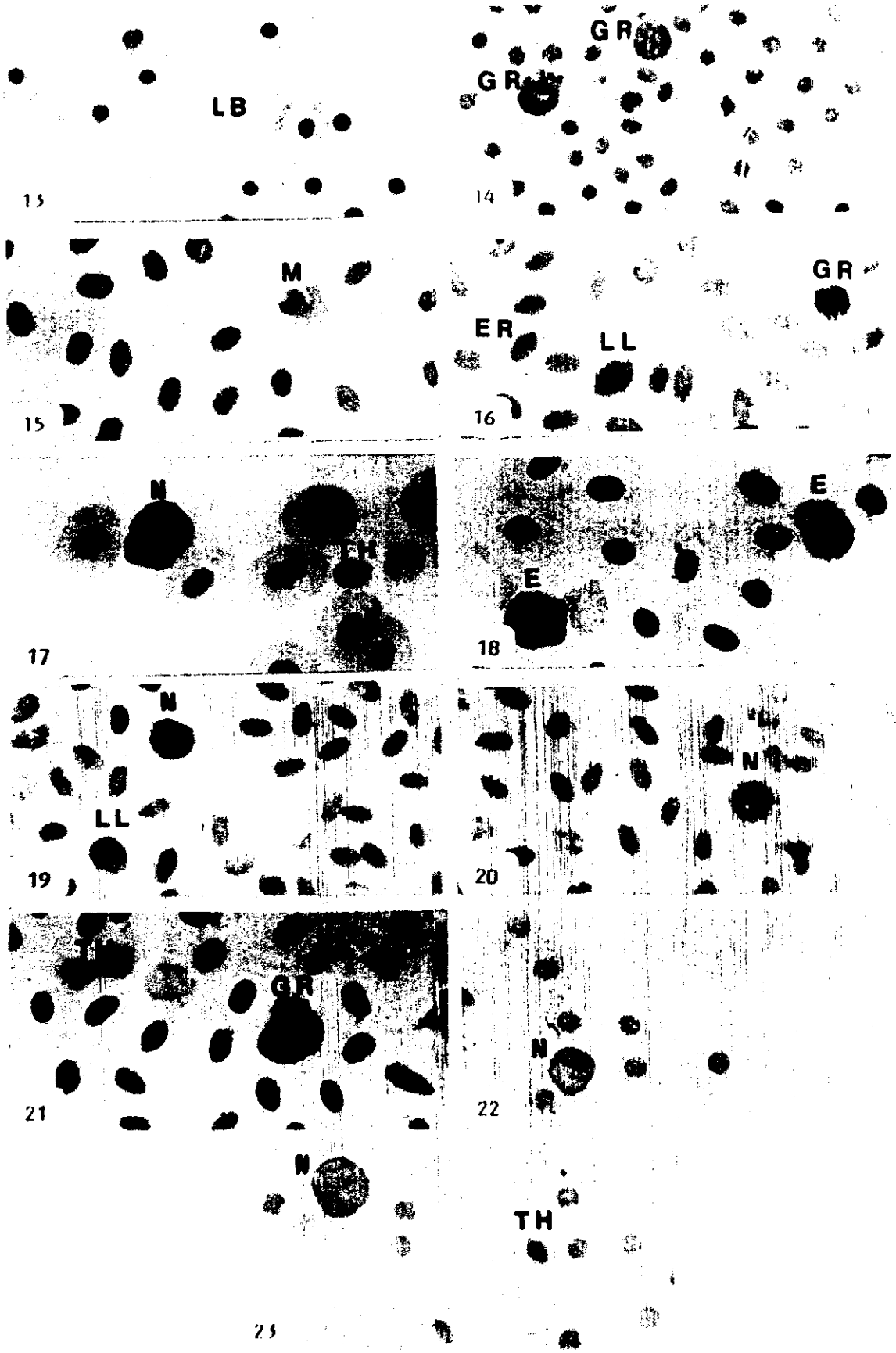
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PLATE (II)

Material Blood cells of ***Clarias lazera*** and ***Cyprinus carpio*** fixed in the same way and processed for the same purpose mentioned in the foregoing plate NO.I

Clarias lazera

Fig. (13) Blood cells of oxadiazon (4 ppm) treated fish, 14 day post - treatment, revealing a very weak PAS reaction in lymphoblast. X 250

Fig. (14) Blood cells of fish which transported to fresh water after (4 ppm oxadiazon). 3 day post-transportation, demonstrating a low level of intensity as compared with the previous treatment. X 250

Cyprinus carpio

Figs. (15 & 16) Blood cells of control fish, illustrating weak (+) to strong (+ + +) PAS reaction in the leucocytic cells. X 330

Fig. (17) Blood cells of oxadiazon (2 ppm) treated fish, 3 day post - treatment, revealing increased PAS intensity at the periphary of the reactive cell. X 330

Fig. (18) Blood cells of oxadiazon (2 ppm) treated fish, 14 day post - treatment, illustrating much more increased intensity of carbohydrate - stained material in the cytoplasm of the reactive leucocytes. X 330

Fig. (19) Blood cells of fish which transported to fresh water after (2 ppm oxadiazon). The neutrophil have strong (+ + +) intensity, but lymphocyte is weakly reacted. X 330

Fig. (20) Blood cells of oxadiazon (4 ppm) treated fish, 3 day post - exposure, showing strong (+ + +) PAS reaction in the neutrophil. X 330

Fig. (21) Blood cells of oxadiazon (4 ppm) treated fish, 7 day post - exposure, revealing strong (+ + +) PAS reaction in the form of inclusions at the periphary of reactive cell. X 330

Fig. (22) Blood cells of oxadiazon (4 ppm) treated fish, 14 day post - exposure, illustrating weak (+) PAS activity in the leucocytic cells. X 250

Fig. (23) Blood cells of fish which were transported to fresh water after (4 ppm oxadiazon). 7 day post - transportation, showing moderate (+ +) PAS reaction. X 250

(1-b) Peroxidatic activity of leucocytic cells as affected by oxadiazon

Clarias lazera

The normal blood cells of ***Clarias lazera*** have a strong (+ + +) peroxidase activity which could be observed in the neutrophils and eosinophils. These appeared as brown black intracellular granulations (Fig. 24).

The peroxidase activity in reactive cells appears to be increased gradually with the time of exposure to 2 ppm concentration, reaching an intense (+ + + +) degree, where the reacted granulation are clearly observed after 3, 7 and 14 day of treatment (Figs. 25 - 27).

After transportation of fish to the fresh water, the granulocytes showed a strong (+ + +) peroxidase reaction (Fig. 28).

Fish subjected to oxadiazon 4 ppm for 3 and 7 day showed an increase of peroxidase reaction in granulocytic series and attained high intensity (+ + + +) after 14 day (Fig. 29).

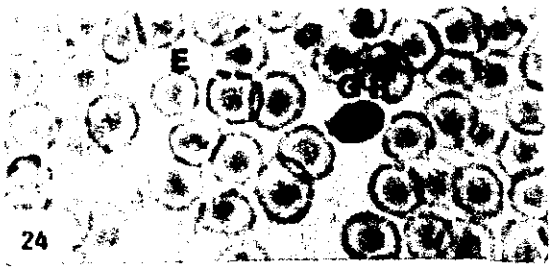
After transportation of fish to fresh water, the strong (+ + +) reactive blood cells are hypotrophied with disturbed contours, abnormal shape of cell is observed (Figs. 30 & 31).

Cyprinus carpio

In normal fish strong (+ + +) peroxidatic activity has been detected in neutrophils (Fig. 32).

After the fish had been exposed to 2 ppm oxadiazon for 3 days, the granulocytes showed a moderate (+ +) peroxidase reaction (Fig. 33). The reactive granulocytic series revealed a moderate (+ +) to weak peroxidase activity 7 day post - treatment with 2 ppm oxadiazon (Fig. 34). Moderate reaction is observed after 14 day of treatment and also after the fish transported to fresh water.

The peroxidatic activity in granulocytes of fish treated with 4 ppm oxadiazon are similar to those observed after treatment with 2 ppm oxadiazon.



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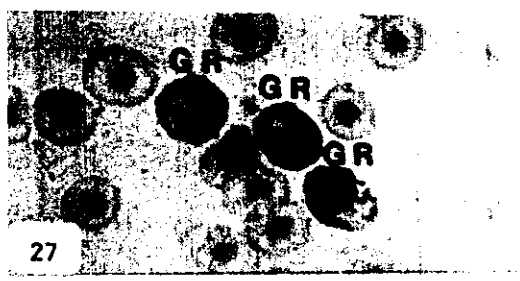

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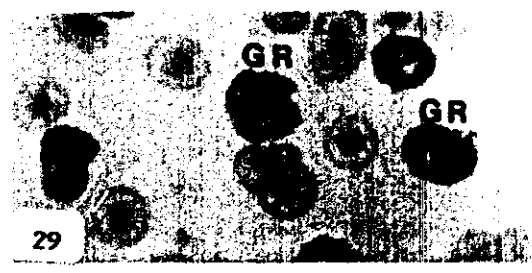

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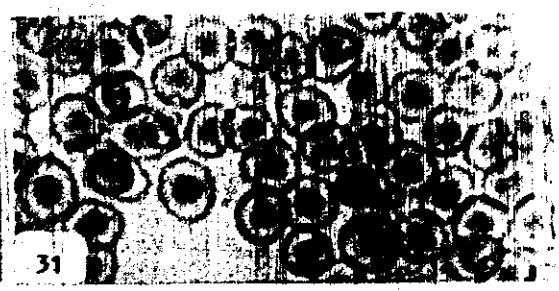
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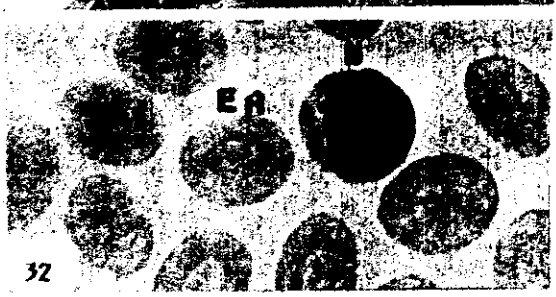

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PLATE (III)

Material (Blood cells of ***Clarias lazera*** and ***Cyprinus carpio***) fixed in formaldehyde- ethanol solution and processed according to the method of **Hanker** et al. (1977) for the demonstration of the peroxidatic activity.

Clarias lazera :-

Fig. (24) Blood cells of control fish, illustrating neutrophilic cell showing strong (+ + +) peroxidase activity. X 250

Figs. (25 - 27) Blood cells of oxadiazon (2 ppm) treated fish, 3, 7 and 14 day post - treatment respectively showing gradual increase of the peroxidatic activity in the reactive cells with increasing the time of exposure. X 250

Fig. (28) Blood cells of fish which transported to fresh water after (2 ppm oxadiazon), revealed peroxidatic activity more than normal. X 250

Fig. (29) Blood cells of oxadiazon (4 ppm) treated fish, 14 day post- exposure, revealing granulocytic series showing very high (+ + + +) intensity of peroxidase reaction. X 250

Figs. (30 & 31) Blood cells of fish which transported to fresh water after (4 ppm oxadiazon), showing a slight decrease in the intensity of the peroxidase reaction (strong degree + + +) while the cells appeared destructed. X 250

Cyprinus carpio

Fig. (32) Blood cells of control fish, illustrating peroxidase activity in a cell of granulocytic series (neutrophil) showing strong (+ + +) reaction. X 400

Fig. (33) Blood cells of oxadiazon (2 ppm) treated fish, 3 day post - exposure, revealing moderate (+ +) reaction in reactive granulocytic cell. X 400

Fig. (34) Blood cells of oxadiazon (2 ppm) treated fish, 7 day post- treatment, illustrating moderate (+ +) intensity of the peroxidase reaction in reactive cell. X 400

(1-c) Sudan black - B activity of leucocytic cells as affected by oxadiazon

(I) Clarias lazera

Staining affinity of sudan black - B in normal fish is moderate (+ +) in neutrophils; the reaction appears as blue black intracellular granulation, the other types of cells are negative for this reaction (Fig. 35).

There is a slight increase in the intensity of sudan black - B reaction in neutrophils 3 and 7 day post - treatment with 2 ppm and 4 ppm oxadiazon, while 14 day post - treatment, an intense (+ + + +) reaction is observed in hypertrophied cells (Fig. 36).

After transportation of fish to fresh water for 3 and 7 day respectively, the reactive cells show an intense (+ + + +) reaction, and are hypertrophied with disturbed contour (Figs. 37 & 38).

(II) Cyprinus carpio

Neutrophils of *Cyprinus carpio* reacted strongly (+ + +) with suden black - B, the reaction appears as brown black intracellular granules (Fig. 39). However, negative reaction could be detected in other types of leucocytic cells.

The fish exposed to oxadiazon (2 ppm) for 3, 7 and 14 day revealed a slight increase in the intensity of sudan black - B particularly around the nucleus (Figs.40 & 41).

When the fish were transported to fresh water, the mentioned reactive cell showed moderate (+ +) reaction (Fig.42).

After the fish had been treated with 4 ppm oxadiazon, the neutrophil appeared to have the same staining affinity as that of the treated one with 2 ppm oxadiazon. But when the fish were transported to fresh water, the same reactive cell showed a strong reaction.

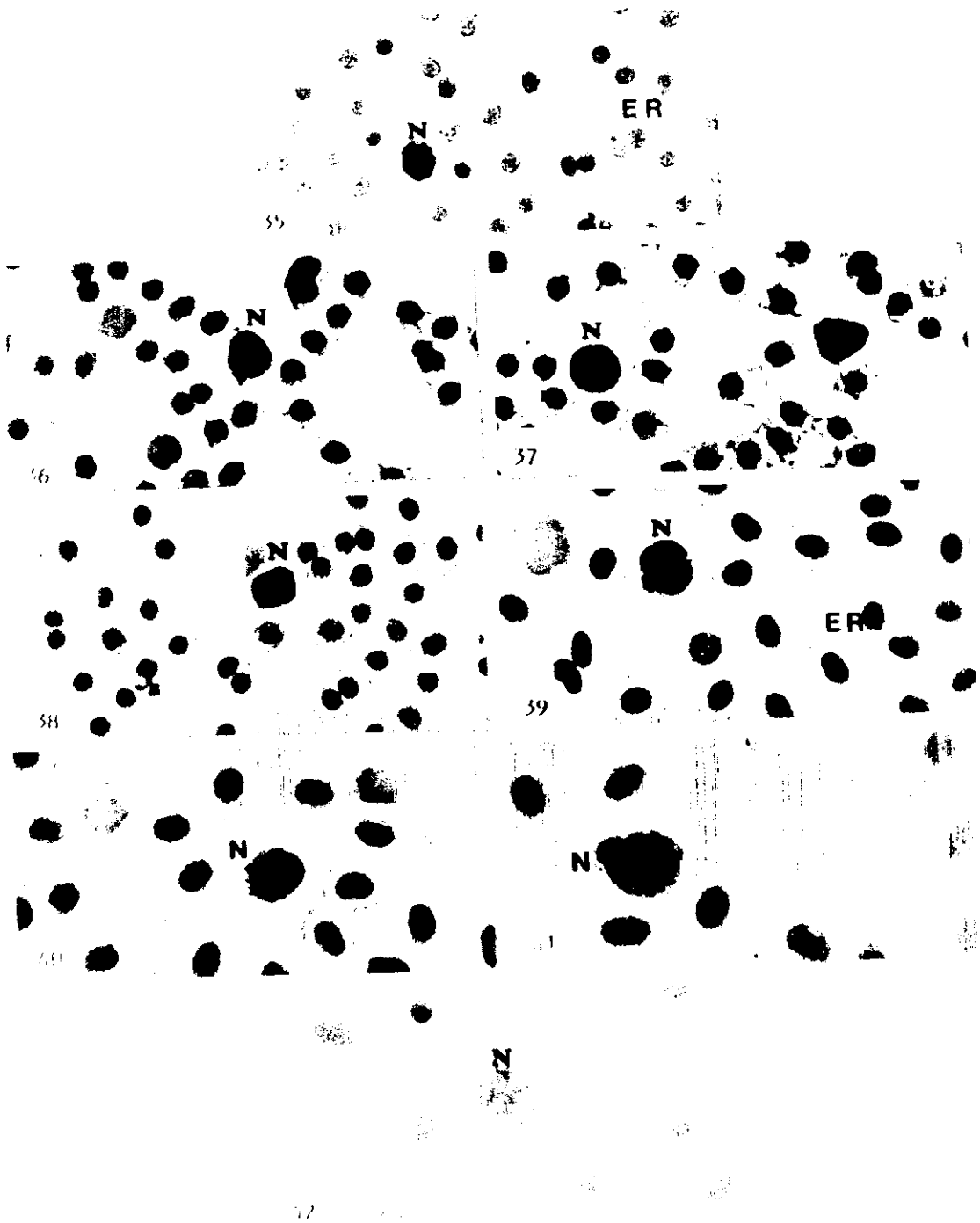
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PLATE (IV)

Material (Blood cells of *Clarias lazera* and *Cyprinus carpio*) fixed in glutaraldehyde - acetone solution and processed according to sudan black - B technique (Davey and Nelson, 1977), for the cytochemical demonstration of lipid content of blood cells.

Clarias lazera

Fig. (35) Blood cells of control fish illustrating neutrophilic cell showing moderate (+ +) sudan black - B reaction. X 250

Fig. (36) Blood cells of oxadiazon (2 ppm) treated fish, 14 day post - treatment showing very strong (+ + + +) reactive and hypertrophied neutrophilic cells. X 250

Figs. (37 & 38) Blood cells of fish which transported to fresh water after (2 ppm oxadiazon) 3 and 7 day post - transportation respectively, revealing very strong (+ + + +) intensity with disturbed contour. X 250

Cyprinus carpio

Fig. (39) Blood cells of control fish, demonstrate strong (+ + +) reactive neutrophilic cell. X 330.

Figs. (40 & 41) Blood cells of oxadiazon (2 ppm) treated fish, 7 and 14 day post - treatment respectively, showing strong sudan black-B reaction particularly around the nuclei. X 330

Fig. (42) Blood cells of fish which transported to fresh water after (2 ppm oxadiazon), showing neutrophil has moderate (+ +) sudan black- B activity. X 330

(1-d) Non - specific esterase reaction of leucocytic cells as affected by oxadiazon

(I) Clarias lazera

This enzyme is weakly detected in monocytes, lymphocytes and thrombocytes (Figs. 43 - 45).

No detectable change in the intensity of the reaction is observed after subjection of the fish to 2 ppm, 4 ppm oxadiazon and even after its transporattion the fish to fresh water.

(II) Cyprinus carpio

The enzyme is weak (+) in its activity as observed in the leucocytic cells.

After the fish were subjected to 2 ppm or 4 ppm oxadiazon, the reaction increased with the duration of treatment (Fig. 46).

Post transportation to fresh water, the reactive cells lost some of their staining affinity, the cells revealed moderate (+ +) activity, but some cells had a hypotrophic picture.

(1-e) Alkaline phosphatase reaction of leucocytic cells as affected by oxadiazon

(I) Clarias lazera

Only the neutrophils reveal a very weak (+) reaction in normal fish (Fig. 47).

The reactive cells under the influence of 2 ppm oxadiazon did not reveal any significant change in the intensity of alkaline phosphatase reaction (Fig. 48).

After the fish had been transported to fresh water, the neutrophils showed a weak (+) reaction.

The reaction of alkaline phosphatase is faint (+) after the fish subjected to 4 ppm oxadiazon and even after transported to fresh water.

(II) Cyprinus carpio

Leucocytes are virtually devoid of this enzyme except neutrophils which appear to have a very weak reaction in normal fish.

There is no marked change in the intensity of the reaction between the control and those treated with 2 ppm and 4 ppm oxadiazon and also after the fish were transported to fresh water.

(1-f) Acid phosphatase reaction of leucocytic cells as affected by oxadiazon

(I) Clarias lazera

The reaction of acid phosphatase in normal fish appeared as moderate (+ +) in eosinophil and neutrophil, weak (+) in monocyte and lymphocyte, while it was negative in basophil and thrombocyte.

There was no change in the intensity of the reaction in the reactive cells of fish subjected to the concentration 2 ppm and 4 ppm oxadiazon.

When the fishes were transported to fresh water, a moderate (+ +) reaction was observed in reactive cells, also some cells were disturbed.

(II) Cyprinus carpio

The reaction of acid phosphatase in normal blood smears exhibited fine reddish cytoplasmic granules which is strong (+ + +) in the neutrophils and eosinophils, weak (+) in monocytes and lymphocytes (Figs. 49- 51).

After the fishes had been exposed to oxadiazon 2 ppm and 4 ppm the reaction decreased slightly in its intensity with progression of time.

Post transportation of the fish to fresh water the reactive granulocytic cells showed moderate (+ +) reaction and other cells were weakly (+) reacted.

PLATE - V

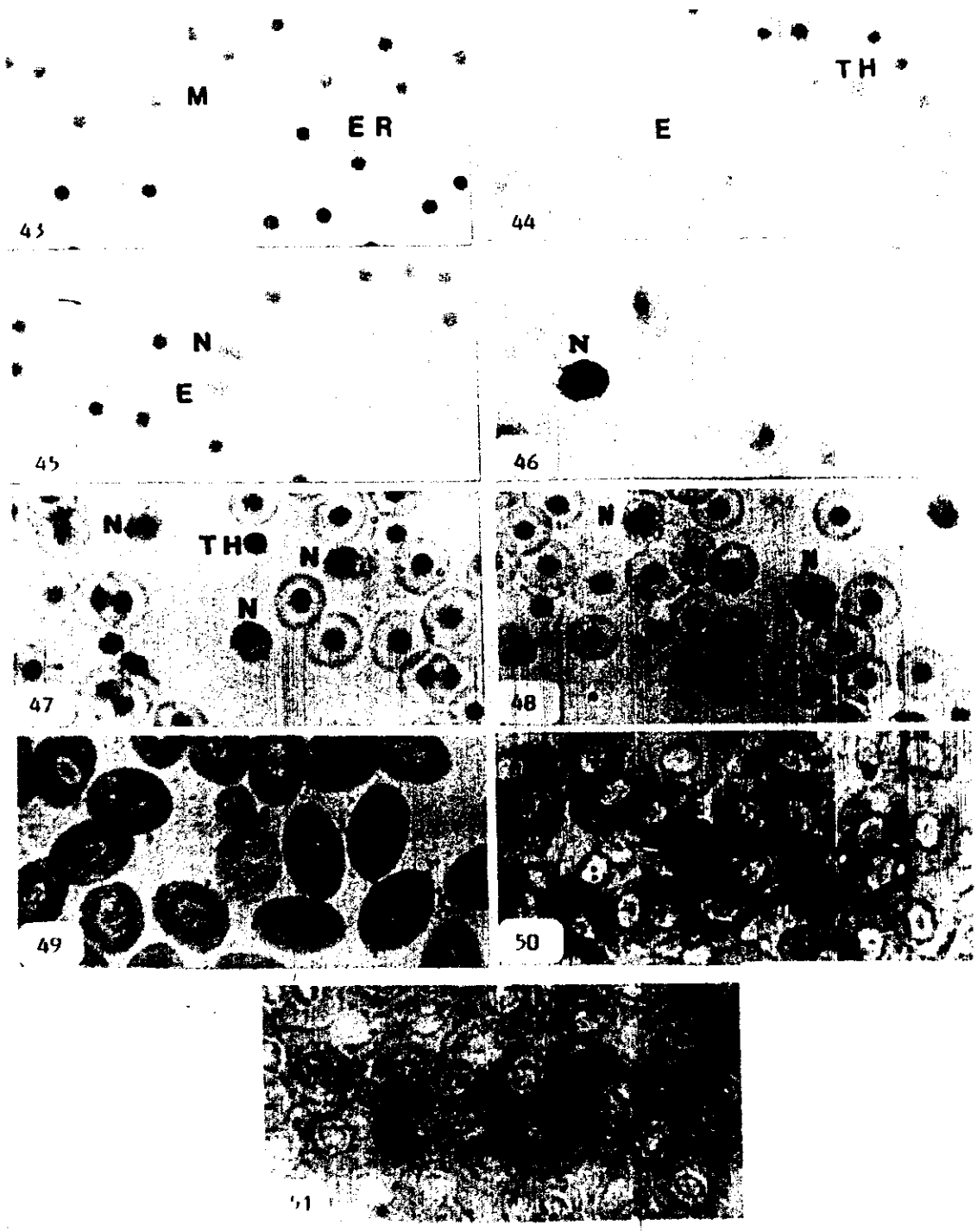


PLATE (V)

Figs.(43-46) Material (Blood cells of ***Clarias lazera*** and ***Cyprinus carpio***) fixed in citrate - acetone-methanol solution and processed according the method of Yam et al. (1970), for the cytochemical demonstration of non - specific esterase.

Clarias lazera

Figs. (43 - 45) Blood cells of control fish revealing very weak (+) reactive monocyte, eosinophil and neutrophil leucocytic cell. X 250

Cyprinus carpio

Fig. (46) Blood cells of oxadiazon (2 ppm) treated fish, 14 day post - treatment, indicating strong (+ + +) reactive neutrophil. X 250

Figs. (47-48) Material (Blood cells of ***Clarias lazera*** and ***Cyprinus carpio***) fixed in citrate - buffered acetone and processed according to the method of **Ackerman (1962)** for the demonstration of the alkaline phosphatase activity.

Clarias lazera

Fig. (47) Blood cells of control fish, illustrating very weak reactive cells. X 250

Fig. (48) Blood cells of oxadiazon (2 ppm) treated fish, 14 day post - treatment, revealing a weak reactive cells. X 250

Figs. (49-51); Material (Blood cells of Clarias lazera and Cyprinus carpio) fixed in citrate - Acetone solution and processed according to the method of Goldberg and Barka (1962), for the cytochemical demonstration of acid phosphatase.

Cyprinus carpio

Figs. (49 - 51) Blood cells of control fish revealing weak and strong reactive leucocytic cell. X 330

Table (1): **Blood cytochemistry of *Clarias lazera***

Enzyme	Lymphocyte	Thrombocyte	Monocyte	Neutrophil	Eosinophil	Basophil
Periodic Acid Schiff	+	+	+	++	++	++
Peroxidase	-	-	-	+++	+++	-
Sudan black-B	-	-	-	++	-	-
Non-Specific esterase	+	+	+	+	+	+
Alkaline phosphatase	-	-	-	+	-	-
Acid phosphatase	+	-	+	++	++	-

Table (2): **Blood cytochemistry of *Clarias lazera* post oxadiazon treatment**

Enzyme	Lymphocyte	Thrombocyte	Monocyte	Neutrophil	Eosinophil	Basophil
Periodic Acid Schiff	+	+	+	+++	+++	+++
Peroxidase	-	-	-	++++	++++	-
Sudan black-B	-	-	-	++++	-	-
Non-Specific esterase	+	+	+	+	+	+
Alkaline phosphatase	-	-	-	+	-	-
Acid phosphatase	+	-	+	++	++	-

- Negative reaction; + Weak reaction; ++ Moderate reaction; +++ Strong reaction; ++++ Very strong reaction.

Table (3): **Blood cytochemistry of *Cyprinus carpio***

Enzyme	Lymphocyte	Thrombocyte	Monocyte	Neutrophil	Eosinophil	Basophil
Periodic Acid Schiff	+	+	+	+++	+++	+++
Peroxidase	-	-	-	+++	+++	-
Sudan black-B	-	-	-	+++	-	-
Non-Specific esterase	+	+	+	+	+	+
Alkaline phosphatase	-	-	-	+	-	-
Acid phosphatase	+	-	+	+++	+++	-

Table (4): **Blood cytochemistry of *Cyprinus carpio* post oxadiazon treatment**

Enzyme	Lymphocyte	Thrombocyte	Monocyte	Neutrophil	Eosinophil	Basophil
Periodic Acid Schiff	+	+	+	+++	+++	+++
Peroxidase	-	-	-	++	++	-
Sudan black-B	-	-	-	++ +	-	-
Non-Specific esterase	+	+	+	++	+	+
Alkaline phosphatase	-	-	-	+	-	-
Acid phosphatase	+	-	+	++	++	-

- Negative reaction; + Weak reaction; ++ Moderate reaction; +++ Strong reaction; ++++ Very strong reaction.

2- HORMONES

The data of the effects of oxadiazon on hormones and biochemical parameters of ***Clarias lazera*** and ***Cyprinus carpio*** were statistically analysed and given in (9) tables and (18) figures as indicated in the following results :

(2.a). Effect of different concentrations of oxadiazon on the plasma prolactin level of *Clarias lazera* and *Cyprinus carpio*.

Table (5) and figures(1-2) show the effect of 2 ppm and 4 ppm oxadiazon on the plasma prolactin level of ***Clarias lazera*** and ***Cyprinus carpio***. It is evident that the prolactin concentration in ***Clarias lazera*** increased significantly with increasing the time of treatment. The hormone level of fish in the aquaria treated with 2 ppm increases from 25.7 to 39.4 ng/ml after 3 days and from 25.8 to 48.05 ng/ml after 7 days, another significant increase is found also after 14 days (26.05 to 49.4 ng/ml). A further significant increase is recorded in the next fish group (4 ppm oxadiazon in water) where it reaches 44.35, 46.65 and 55.45 ng/ml plasma respectively after 3,7 and 14 day of treatment.

The prolactin level in treated ***Cyprinus carpio*** increases as the concentration of oxadiazon increase, after 3 days the mean level of hormone in control and

treated fish are 0.32,0.53 and 0.72 ng/ml. The mean levels of hormone in the control and treated fish after 7 days are 0.30, 0.63 and 0.77 ng/ml plasma. These values indicate that the increase of hormone level in 2 ppm group after 7 days is not significantly higher than control value, but that of 4 ppm group is significantly higher than that of the control one. The same phenomenon is observed also after 14 days of treatment (0.31, 0.73 and 0.86 ng/ml plasma).

After transporting *Clarias lazera* to fresh water the prolactin level decrease with the increase in time of transportation but the value of treated groups is significantly higher than that of the control. The mean values of the control and treated group after 3 days are 25.07, 42.55 and 40.15 ng/ml and that after 7 days are 24.92, 35.36 and 43.73 ng/ml.

There is no significant change in the concentration of prolactin either in the control or in the treated *Cyprinus carpio* after 3 and 7 days of transportation to the fresh water. The mean values of the control and treated fish after 3 days are 0.29, 0.66 and 0.71 ng/ml and that after 7 days are 0.32, 0.54 and 0.65 ng/ml for each separately.

Table (5)

Changes in the level of plasma prolactin (ng/ml) of *Clarias lazera* and *Cyprinus carpio* exposed to 2 ppm and 4 ppm oxadiazon

Species	Group	Treatment period			Recovery period	
		3 day	7 day	14 day	3 day	7 day
Clarias lazera	control	25.7±0.28	25.8±0.05	26.05±0.14	25.07±0.09	24.92±0.05
	2 ppm	39.4±0.05	48.05±0.02	49.4±0.11	42.55±0.21	35.36±0.26
	4ppm	44.35±0.14	46.65±0.02	55.45±0.08	40.15±0.11	43.73±0.23
Cyprinus carpio	control	0.32±0.01	0.3±0.05	0.31±0.04	0.29±0.03	0.32±0.01
	2 ppm	0.53±0.05	0.63±0.04	0.73±0.01	0.66±0.02	0.54±0.06
	4 ppm	0.72±0.02	0.77±0.01	0.86±0.03	0.71±0.06	0.65±0.01

Statistical analysis of plasma prolactin level

Items	Treatment period		Recovery period	
	F-Value	L.S.D.	F- Value	L.S.D.
Fish	304684.4 **	0.149	34322.5 **	0.254
Time	818.6 **	0.182	238.9 **	0.254
Oxadiazon	11178.8 **	0.182	2478.7 **	0.311
Fish x Time	764.0 **	0.258	226.8 **	0.359
Fish x Oxadiazon	10338.2 **	0.258	2289.5**	0.440
Time x Oxadiazon	189.7 **	0.316	29.55 **	0.440
Fish x Time x Oxadiazon	176.26 **	0.447	25.53 **	0.622

*** P < 0.05**
**** P < 0.01**
N.S. Non Significant
L.S.D. Least Significant Differences at 0.05 level of the factor studied

Fig. (1) Changes in the level of plasma prolactin (ng/ml) of *Clarias lazera* and *Cyprinus carpio* exposed to 2 ppm and 4 ppm oxadiazon .

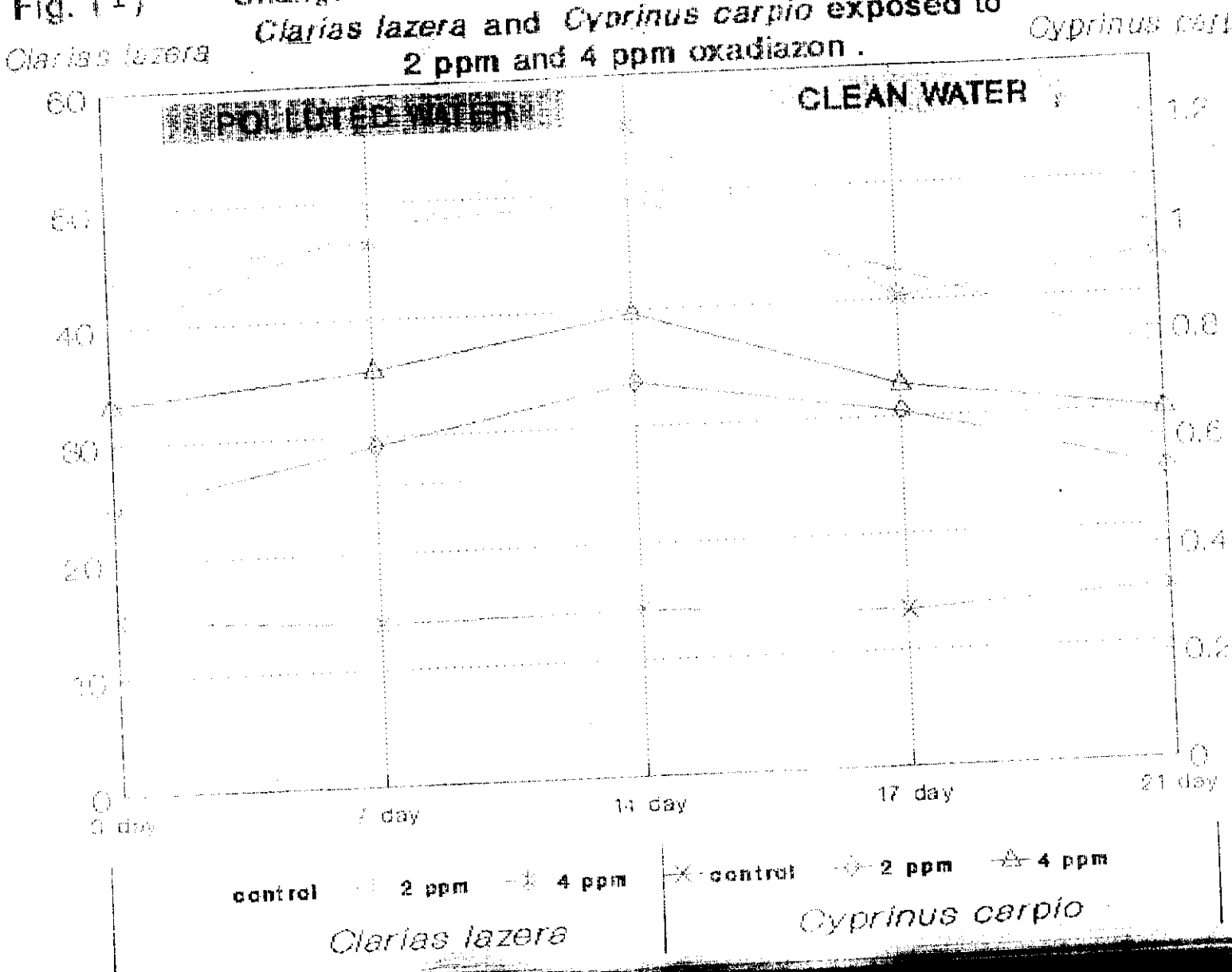
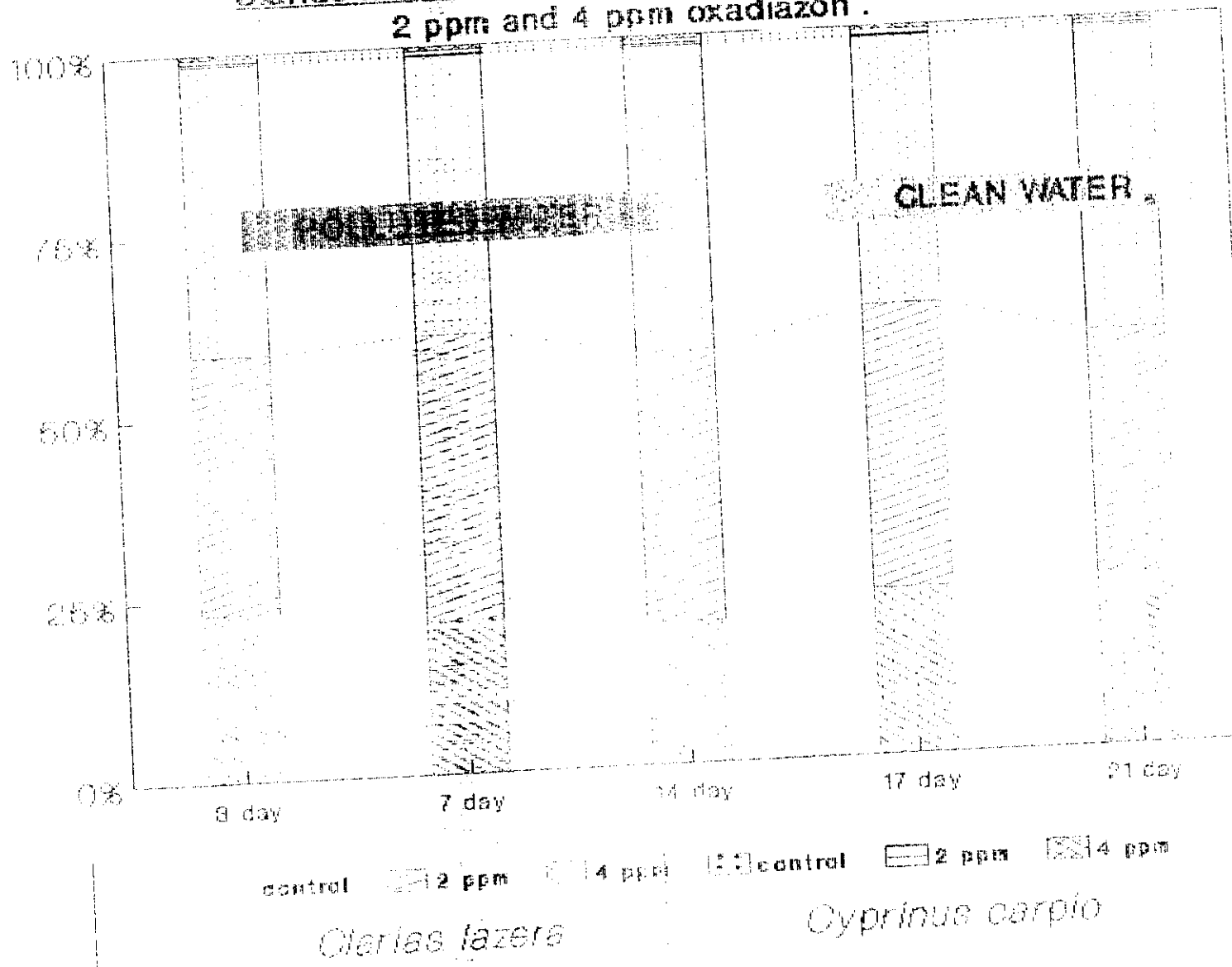


Fig. (2)

Changes in the level of plasma prolactin of *Clarias lazera* and *Cyprinus carpio* exposed to 2 ppm and 4 ppm oxadiazon .



(2.b) Effect of different concentrations of oxadiazon on the plasma insulin level of *Clarias lazera* and *Cyprinus carpio*.

Table (6) and figures (3-4) show fluctuation of plasma insulin level for control and treated group of *Clarias lazera*. The result clearly shows that oxadiazon, at both concentration significantly decreased the insulin levels in plasma during 3 and 7 days of exposure (16.4, 15.37 and 15.89) μ IU/ml; 16.07, 10.91 and 11.53 μ IU/ml for control and treated fish respectively. After 14 days of treatment this decrease is followed by increase to a level not significantly higher than the control, the mean values of the control and treated fish are 16.6, 15.95 and 16.01 μ IU / ml plasma in the order mentioned.

A decrease of plasma insulin level in *Cyprinus carpio* is recorded after oxadiazon treatment at both concentration. However, this decrease is not significant after 3 days. The mean levels of the control and treated fish after 3 days are 5.23, 4.98 and 4.76 μIU / ml respectively. While the decrease is significant after 7 days of treatment, as the mean values of the control and treated fish are 4.66, 2.63 and 2.33 μIU / ml plasma for each separately. After 14 days the insulin levels restored to about the normal values (5, 5.07 and 4.77 μIU / ml plasma respectively).

After *Clarias lazera* had been transported to fresh water, the plasma insulin level showed a little decrease than that of the control value. The mean level of the treated groups after 3 days is found to be 15.78 and 15.6 compared to the control value (15.9 μ IU / ml plasma) and that after 7 days are 14.1 and 13.63 at both treated concentration compared to the control value 15.7 μIU / ml plasma .

In *Cyprinus carpio* after its transportation to the fresh water, the plasma insulin levels show a decrease with time either for fish exposed to 2 ppm or 4 ppm oxadiazon, after 3 days the mean recorded levels of control and treated groups are 5.01, 4.51 and 4.46 μIU / ml plasma and after 7 days are 4.88, 4.15 and 3.98 μIU / ml plasma respectively.

Table (6)

Changes in the level of plasma insulin (μIU / ml) of *Clarias lazera* and *Cyprinus carpio* exposed to 2 ppm and 4 ppm oxadiazon

Species	Group	Treatment period			Recovery period	
		3 day	7 day	14 day	3 day	7 day
Cyprinus carpio Clarias lazera	control	16.4±0.27	16.07±0.12	16.6±0.18	15.9±0.17	15.7±0.23
	2 ppm	15.3±0.36	10.91±0.66	15.95±0.31	15.78±0.24	14.1±0.11
	4ppm	15.89±0.44	11.53±0.34	16.01±0.39	15.6±0.38	13.63±0.25
	control	5.23±0.18	4.66±0.12	5±0.15	5.01±0.17	4.88±0.14
	2 ppm	4.98±0.19	2.63±0.26	5.07±0.15	4.51±0.19	4.15±0.20
	4 ppm	4.76±0.27	2.33±0.20	4.77±0.29	4.46±0.11	3.98±0.26

Statistical analysis of plasma lactate level

Items	Treatment period		Recovery period	
	F-Value	L.S.D.	F- Value	L.S.D.
Fish	6030.0 **	0.274	6300.06 **	0.265
Time	127.48 **	0.336	48.315 **	0.265
Oxadiazon	44.04 **	0.336	12.488 **	0.325
Fish x Time	7. 986 **	0.476	20.063 **	0.376
Fish x Oxadiazon	5.934 **	0.476	0.135 N. S.	-
Time x Oxadiazon	4.075 **	0.583	3.230	0.460
Fish x Time x Oxadiazon	2.180 *	0.651	1.097 N. S.	-

*** P< 0.05**
****P <0.01**
N. S. Non Significant
L. S. D. Least Significant Differences at 0.05 level of the factor studied

Fig.( ) *Changes in the level of plasama insulin (Miu/ml) of Clarias lazera and Cyprinus carpio exposed to 2 ppm and 4 ppm oxadiazon .*

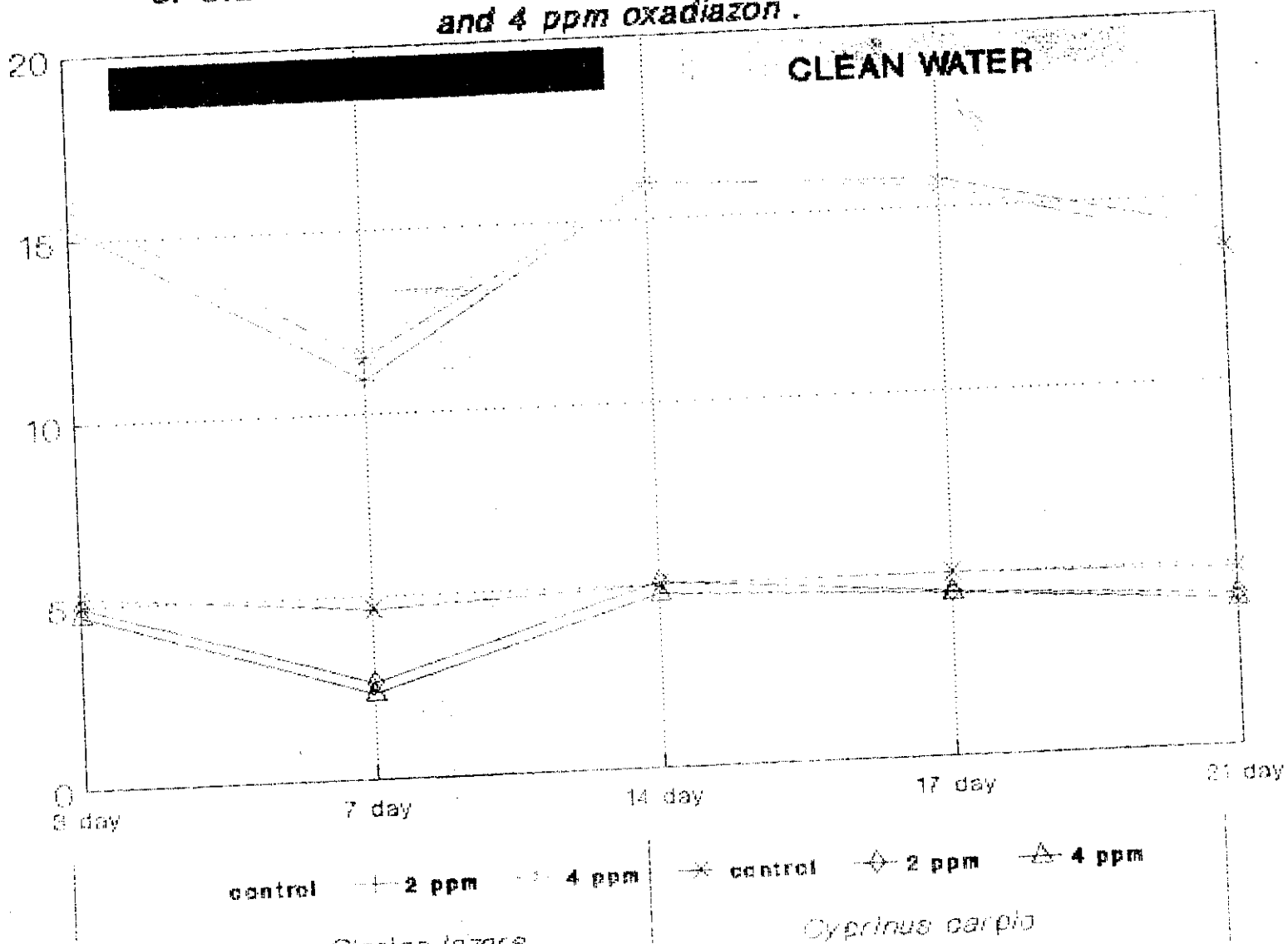
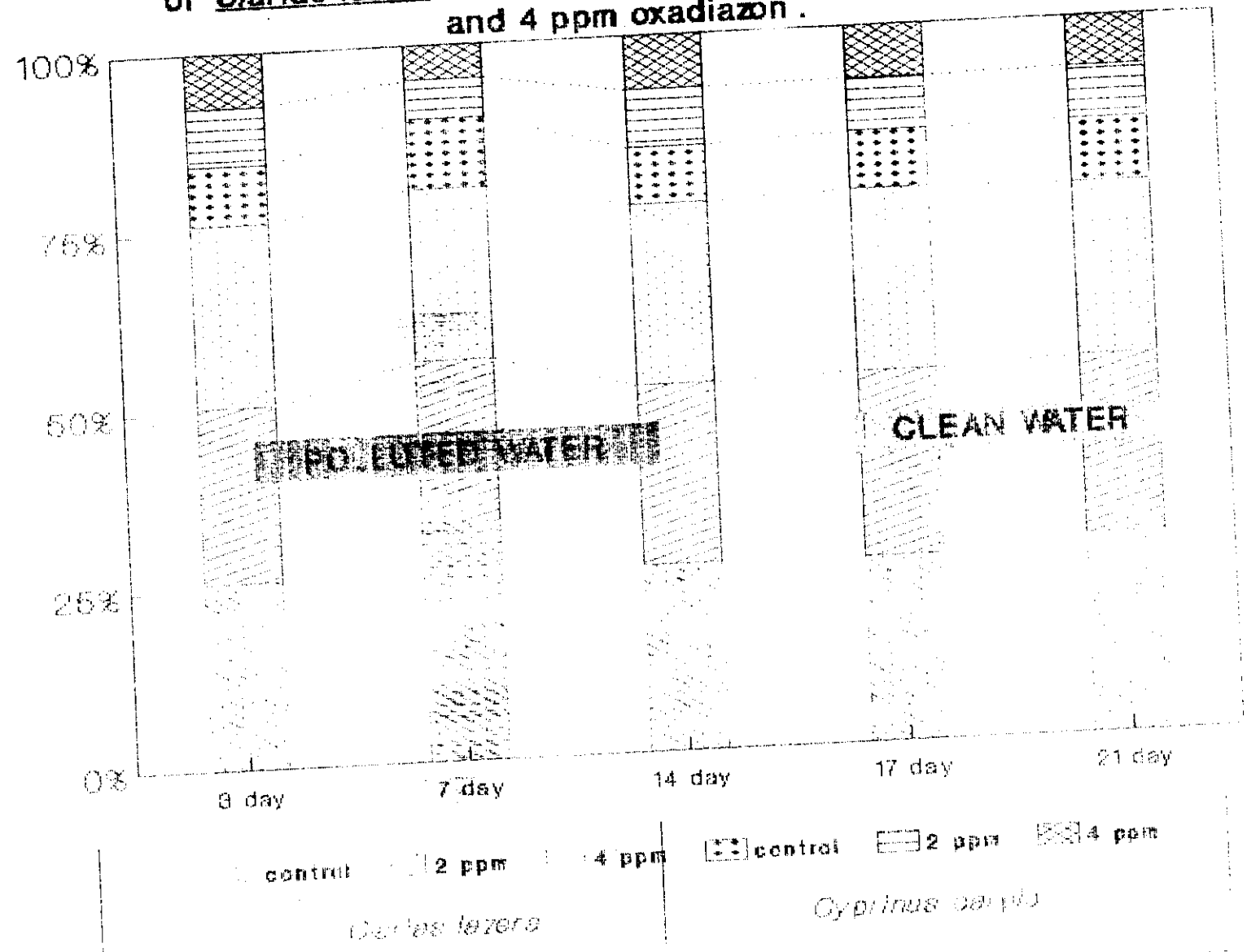


Fig.(4) Changes in the level of plasma insulin of *Clarias lazera* and *Cyprinus carpio* exposed to 2 ppm and 4 ppm oxadiazon .



(2.c) Effect of different concentrations of oxadiazon on the plasma glucagon level of *Clarias lazera* and *Cyprinus carpio*.

The plasma glucagon values are presented in table (7) and figures (5-6).

Application of oxadiazon as 2ppm and 4 ppm increased significantly the hormone level in ***Clarias lazera***. After 3 days of treatment the mean values of the control and treated fish are 915.83, 988.33 and 1029.16 pg/ml. Further increase is also observed after 7 days of treatment, the mean hormone values of the control and treated fish are 920.83, 1126.66 and 1153.33 pg/ml respectively. After 14 days of treatment the glucagon level of the fish groups treated with oxadiazon is found to be significantly higher than that of the control, but the level have been restored to about initial values which have been observed after 3 days of treatment (913.33, 971.66 and 1014.16 pg/ml).

In ***Cyprinus carpio*** the mean glucagon values of the control and oxadiazon treated groups after 3 days are 51.5, 61.33 and 58.0 pg/ml and that after 7 days are 51.33, 66.66 and 69.33 pg/ml. Exposure to both concentration for 14 days of treatment recorded the values of 52.0, 55.83 and 58.66 pg/ml for each separately. These results show that the increases hormone level increases after 3 , 7 and 14 days is significant .

Transported *Clarias lazera* to fresh water for 3 days show almost the same plasma glucagon level (972.5 and 1033.33 pg/ml) compared to that of the 14 days exposed groups, by increase of the time in fresh water (7 day) the hormone level reach about the control value (932.5) either in 2 ppm or 4 ppm treated groups (946.66 and 938.65 pg/ml) respectively.

The glucagon level in *Cyprinus carpio* after it had been transported to fresh water decreased with the increase of time and with the decrease in oxadiazon concentration. The mean values of the control and treated fish after 3 days are 51.83, 55.33 and 57.83 and that after 7 days are 52.66, 52.64 and 54.5 pg/ml respectively. In the fish group treated with 2 ppm oxadiazon the glucagon level has been restored to its normal value after 7 day of transportation to fresh water.

Table (7)

Changes in the level of plasma glucagon (pg/ml) of *Clarias lazera* and *Cyprinus carpio* exposed to 2 ppm and 4 ppm oxadiazon

Species	Group	Treatment period			Recovery period	
		3 day	7 day	14 day	3 day	7 day
Cyprinus carpio Clarias lazera	control	915.83±4.77	920.83±5.05	913.33±6.42	925.83±9.2	9325±8.3
	2 ppm	988.33±4.81	1126.66±8.13	971.66±6.52	972.5±5.98	946.66±5.09
	4ppm	1029.16±5.32	1153.33±9.1	1014.16±7.11	1033.33±13.68	938.65±11.22
	control	51.5±0.80	51.33±0.56	52.0±0.47	51.83±0.54	52.66±0.65
	2 ppm	61.33±0.47	66.66±0.73	55.83±0.54	55.33±0.60	52.64±0.30
	4 ppm	58.0±0.45	69.33±0.69	58.66±0.38	57.83±0.43	54.50±0.31

Statistical analysis of plasma glucagon level

Items	Treatment period		Recovery period	
	F-Value	L.S.D.	F- Value	L.S.D.
Fish	117206.62 **	6.262	30949.9 **	10.314
Time	160.02 **	7.670	12.92 **	10.314
Oxadiazon	334.64 **	7.670	13.18 **	12.632
Fish x Time	123.94 **	10.847	10.62 *	14.586
Fish x Oxadiazon	249.32 **	10.847	10.19 **	17.864
Time x Oxadiazon	30.61 N. S	-	7.64 **	17.864
Fish x Time x Oxadiazon	22.14 **	16.439	6.507 **	25.264

*** P< 0.05**
****P <0.01**
N. S. Non Significant
L. S. D. Least Significant Differences at 0.05 level of the factor studied

Fig.( ) *Changes in the level of plasama glucagon (Pgq/ml) of Clarias lazera and Cyprinus carpio exposed to 2 ppm and 4 ppm oxadiazon .*

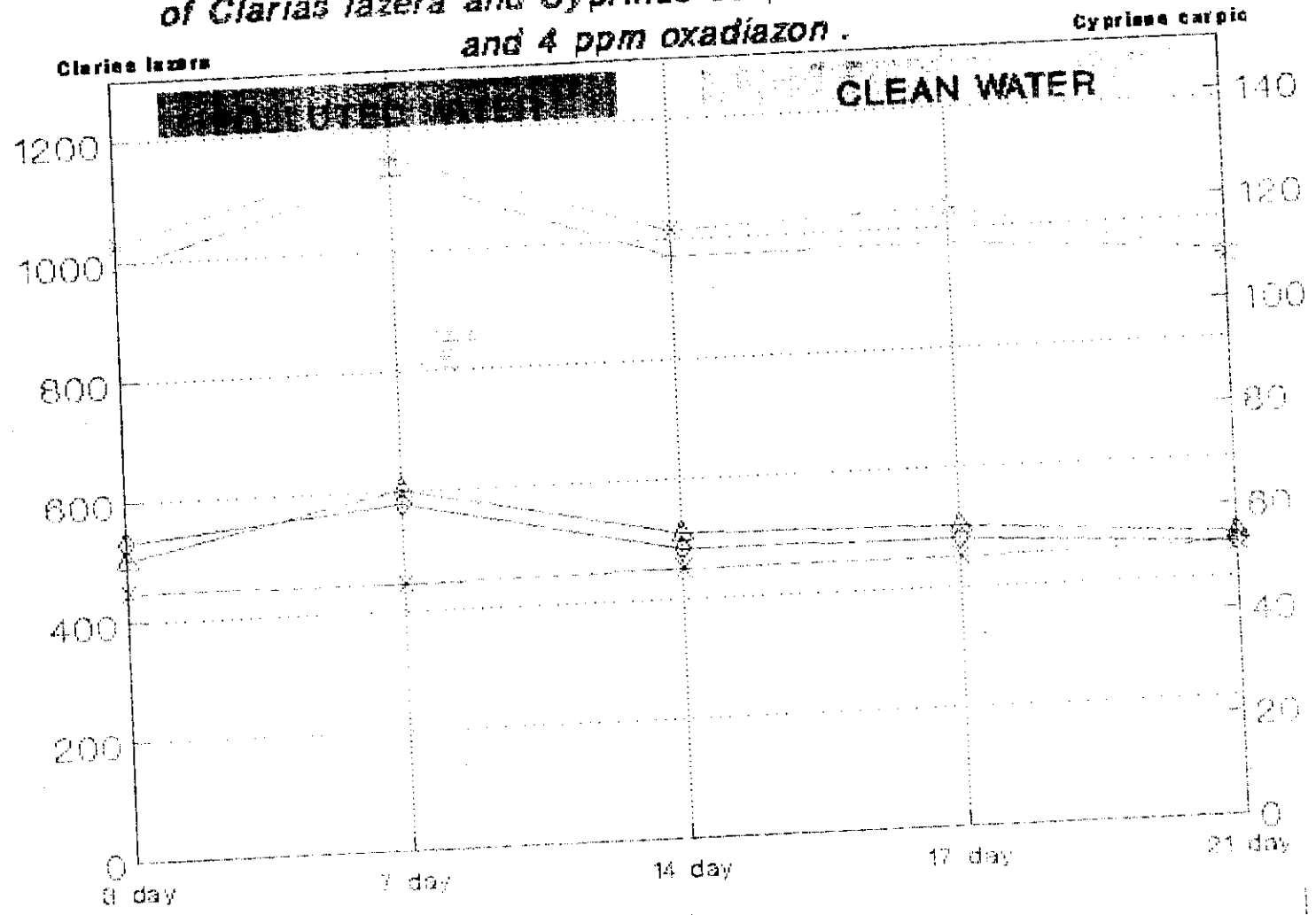
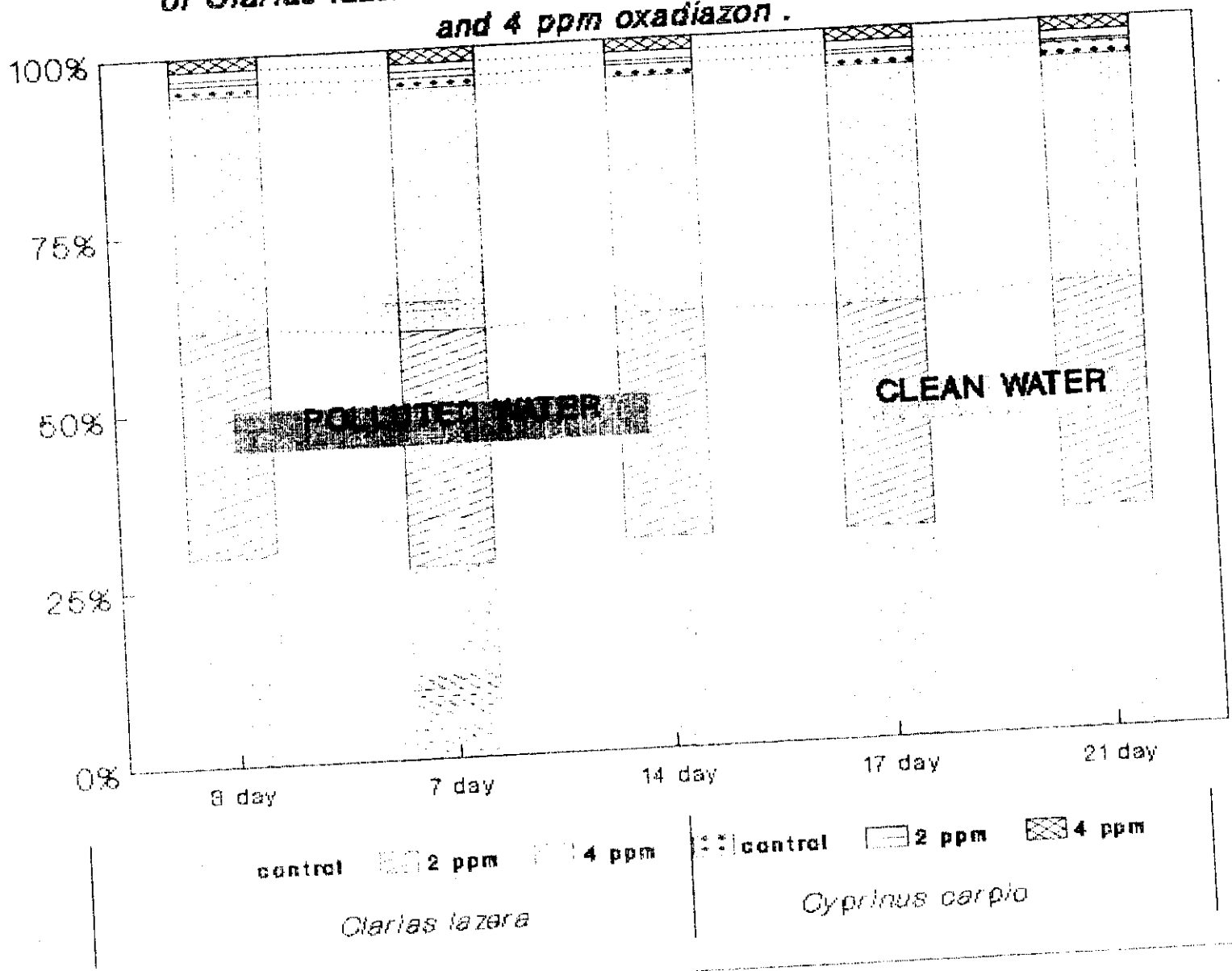


Fig.( ) *Changes in the level of plasama glucagon (Pgq/ml) of Clarias lazera and Cyprinus carpio exposed to 2 ppm and 4 ppm oxadiazon .*



(2.d) Effect of different concentrations of oxadiazon on the plasma cortisol level of *Clarias lazera* and *Cyprinus carpio*.

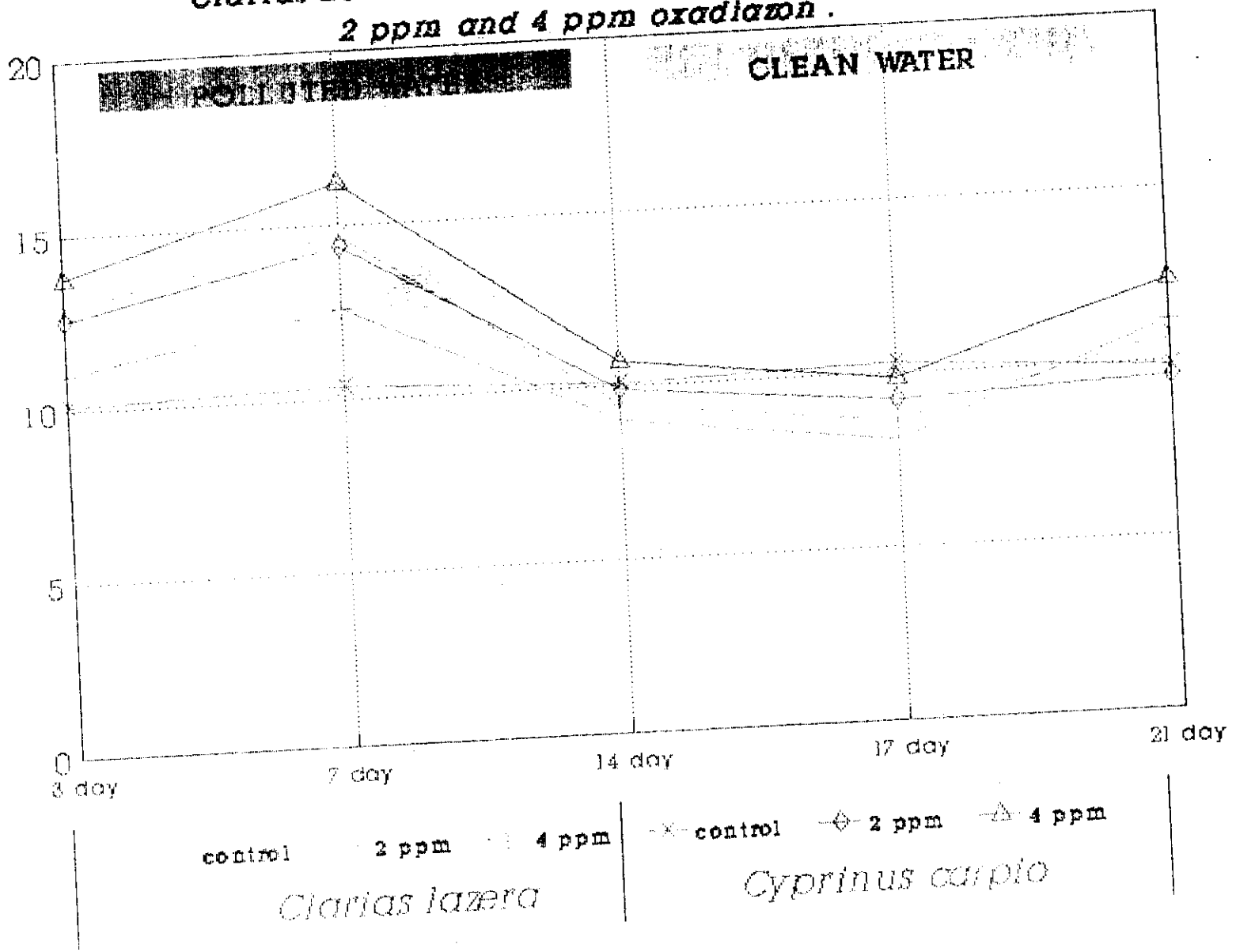
Table (8) and figures (7-8) show significant increase of the mean levels of plasma cortisol of ***Clarias lazera*** after 3 and 7 days of exposure at both concentration (2 ppm and 4 ppm) oxadiazon. The mean hormone levels of the control and treated fish after 3 days are 8.41, 10.97 and 12.88 ug/dl plasma, and that after 7 days are 9.13, 12.58 and 14.7 ug/dl plasma respectively. Fourteen days of exposure to 2 ppm and 4 ppm oxadiazon, the mean plasma cortisol values of the fish are 9.01 and 9.45 ug/dl respectively compared to 8.38 ug/dl level for the control. These values show that plasma cortisol level of treated groups after 14 day is lower than that after 3 and 7 day of treatment, but the value still higher than control.

The plasma cortisol mean values of ***Cyprinus carpio*** are 10.11, 12.56 and 13.76 ug/dl for the control and oxadiazon treated fish respectively after 3 days. The results show that plasma cortisol is a dose-dependent increase . This level reach its maximum value after 7 days of treatment (14.4 and 16.23 ug/dl), followed by a significant depression of plasma cortisol level after 14 days of treatment, the mean level of plasma cortisol in the control and treated fish are 10.05, 9.88 and 10.68 ug/dl, respectively.

When the treated *Clarias lazera* was transported to fresh water, the mean level of plasma cortisol of fish after 3 days of transportation are 8.1 and 8.65 ug/dl compared to 8.68 ug/dl for the control group, that after 7 days are 11.21 and 10.76 ug/dl compared to 9.2 for the control group. This shows that the hormone level has been decreased and restored approximately to the normal value during 3 days of the recovery period.

After *Cyprinus carpio* had been transported to fresh water, the plasma cortisol level decreased with time and the decrease is not significant. The mean level of cortisol in control and treated fish after 3 days are 10.3, 9.23 and 9.86 ug/dl and that after 7 days are 9.6 and 12.38 ug/dl plasma in comparison with their control value 9.88 ug/dl.

Fig. ( ) ***Changes in the level of plasma cortisol (Ug/dL) of Clarias Lazera and Cyprinus carpio exposed to 2 ppm and 4 ppm oxadiazon .***



(2.e) Effect of different concentrations of oxadiazon on the plasma ACTH level of *Clarias lazera* and *Cyprinus carpio*.

Table (9) and figures (9-10) show the effect of 2 ppm and 4 ppm oxadiazon on ***Clarias lazera*** and ***Cyprinus carpio***. From the table and the figures, it is clear that the plasma level of ACTH increases gradually after 3 and 7 days post treatment. The mean values of the hormone in control and treated ***Clarias lazera*** are 102.53, 112.48, 115.1; 102.48, 116.45 and 119.7 pg/ml for each separately. Fourtenn days of exposure to both oxadiazon concentration caused significant depression of the hormone level but the value remains higher than that of the control (101.33, 107.74 and 110.53 pg/ml) for the control and treated fish, respectively.

In ***Cyprinus carpio*** ACTH mean values of the control and treated fish after3 days are 12, 16.91 and 24.9 pg/ml and that after 7 days of treatment are 12.19, 19.99 and 28.68 pg/ml in the order mentioned. These values showed that the ACTH level increase significantly with the increase of oxadiazon concentration and prolongation of the time of treatment. After 14 days of treatment the ACTH level of 2 ppm oxadiazon treated group decrease than that of the control but the decrease is not significant, while the ACTH level of the fish treated with 4 ppm oxadiazon is significantly higher (18.4 pg/ml) than that of the control value (12.64 pg/ml).

After transporting ***Clarias lazera*** to fresh water there is gradual decrease in the hormone level but the decrease is not significant. The mean hormone values of the control and treated fish after 3 days are 103.15, 106.90 and 109.55 pg/ml and that after 7 days of transporting are 103.5, 105.78 and 109.01 pg/ml respectively.

In ***Cyprinus carpio*** the mean hormone values of the control and treated fish after 3 days of transporting to fresh water are 11.7, 12.71 and 18.68 pg/ml and that after 7 days are 11.83, 12.05 and 17.38 pg/ml in the order mentioned. These results show that the hormone level in 2 ppm oxadiazon treated group reach about the control value rapidly in a short duration(3 days) than 4 ppm oxadiazon group.

Table (9)

Changes in the level of plasma ACTH (pg/ml) of *Clarias lazera* and *Cyprinus carpio* exposed to 2 ppm and 4 ppm oxadiazon

Species	Group	Treatment period			Recovery period	
		3 day	7 day	14 day	3 day	7 day
Cyprinus carpio Clarias lazera	control	102.53±0.43	102.48±0.47	101.33±0.38	103.15±0.33	103.5±0.18
	2 ppm	112.48±0.31	116.45±0.13	107.74±0.40	106.9±0.35	105.78±0.17
	4ppm	115.1±0.36	119.7±0.22	110.53±0.21	109.55±0.2	109.01±0.16
	control	12.0±0.27	12.19±0.24	12.64±0.14	11.70±0.26	11.83±0.11
	2 ppm	16.91±0.33	19.99±0.24	12.1±0.26	12.71±0.64	12.05±0.16
	4 ppm	24.9±0.27	28.68±0.3	18.4±0.42	18.68±0.40	17.38±0.19

Statistical analysis of plasma ACTH level

Items	Treatment period		Recovery period	
	F-Value	L.S.D.	F- Value	L.S.D.
Fish	310260.8 **	0.365	300863.7 **	0.336
Time	441.68 **	0.447	15.29 **	0.336
Oxadiazon	1911.7 **	0.447	505.46 **	0.411
Fish x Time	1.982 N.S.	-	0.061 N. S.	-
Fish x Oxadiazon	92.11 **	0.633	32.36 **	0.552
Time x Oxadiazon	116.56 **	0.775	2.186 N.S.	-
Fish x Time x Oxadiazon	1.899 **	1.899	1.629 N.S.	-

*** P< 0.05**
****P <0.01**
N. S. Non Significant
L. S. D. Least Significant Differences at 0.05 level of the factor studied

Fig.( ) *Changes in the level of plasma ACTH (Pg/ml) of Clarias lazera and Cyprinus carpio exposed to 2 ppm and 4 ppm oxadiazon .*

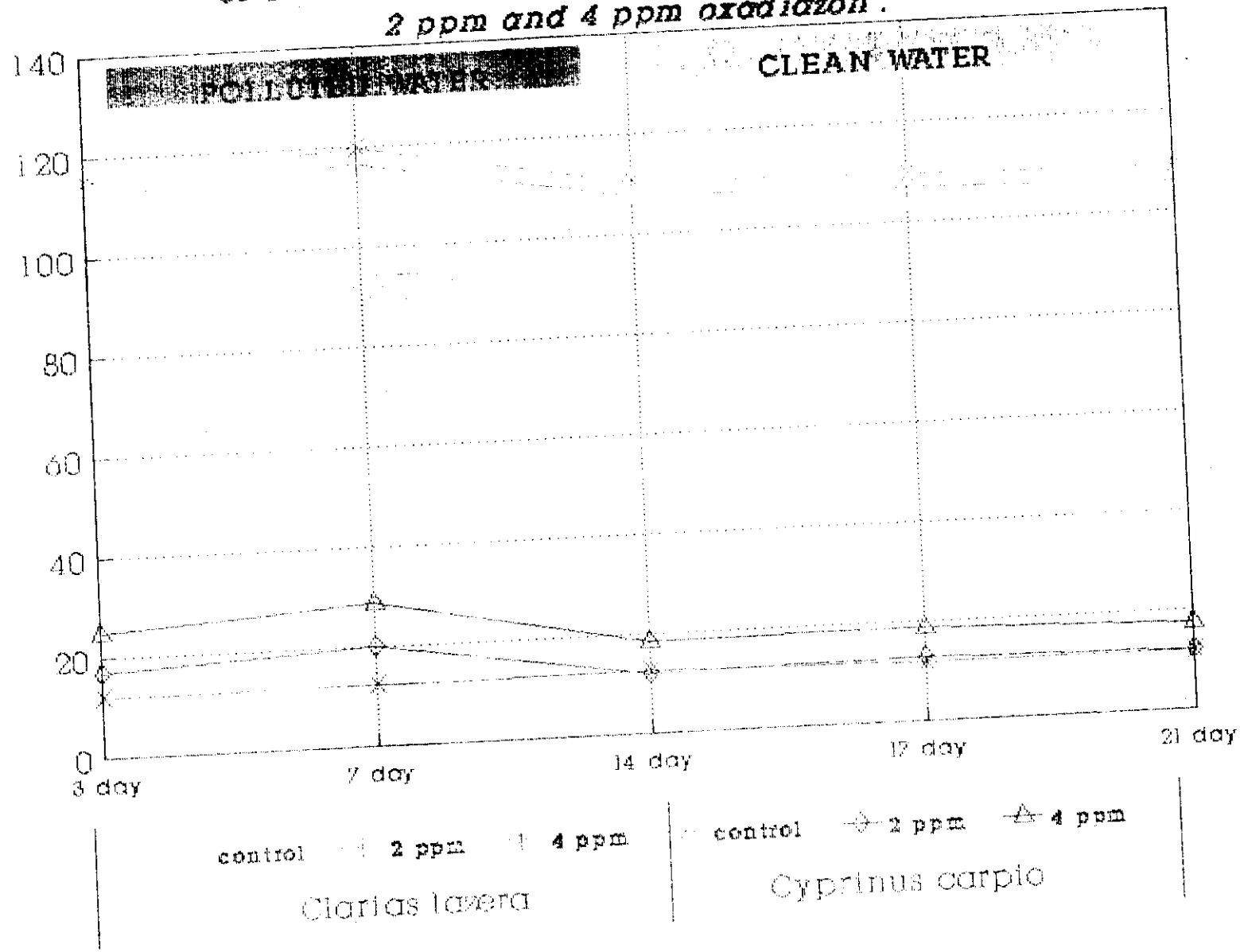
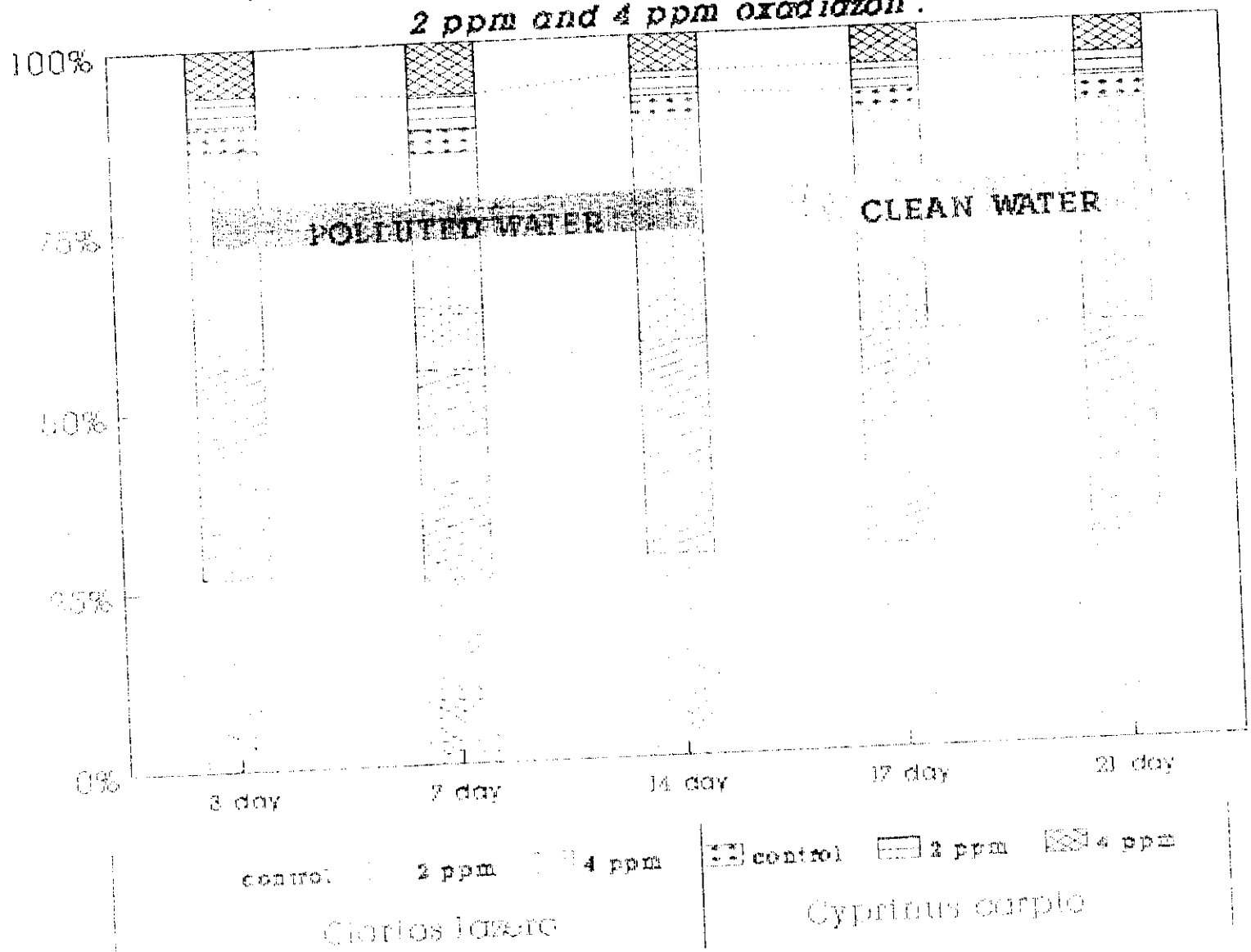


Fig.( )

Changes in the level of plasma ACTH (Pg/ml) of Clarias lazera and Cyprinus carpio exposed to 2 ppm and 4 ppm oxadiazon .



(3.a) Effect of different concentrations of oxadiazon on plasma sodium level of *Clarias lazera* and *Cyprinus carpio*.

In table (10) and figures (11-12), the mean values of plasma sodium for the control group of ***Clarias lazera*** is 142.11 mEq/L. Treatment of fish with 2 ppm and 4 ppm oxadiazon caused significant increase of plasma sodium (147.43, 154.32, 157.51; 152.61, 153.8 and 161.62 mEq/L) after 3 , 7 and 14 days of exposure. These results indicate that plasma sodium level attains its maximum after 14 days of treatment.

The mean plasma sodium values of the control and treated groups of ***Cyprinus carpio*** after 3 days are 163.77, 172.13 and 171.03 mEq/L. The observed results show that the sodium level increases significantly after treatment, but there is no significant difference between the value of 2 ppm and 4 ppm oxadiazon treated groups. Further, increase in plasma sodium has been observed after 7 days of treatment (163.47, 174.86 and 176.19 mEq/L respectively). This plasma electrolyte shows a significant increase where it reaches the higher value after 14 days of treatment the mean values of the control and treated groups are 163.34, 175.52 and 178.43 mEq/L respectively.

After transporting the fish to fresh water the plasma sodium in the treated ***Clarias lazera*** decrease to

a level higher than the control values. The mean values of the treated groups during 3 days of the recovery period are 145.67 and 148.26 mEq/L and that after 7 days are 140.01 and 149.54 mEq/L for each separately.

The level of plasma sodium in the treated ***Cyprinus carpio*** during the phase of transportation to fresh water is not significantly higher than the control group and decrease with the increase of time of the recovery period. The mean values of the treated groups at both concentration during 3 days of recovery time are 173.42 and 172.10 mEq/L and that after 7 days are 167.06 and 169.47 mEq/L, respectively.

Table (10)

Changes in the level of plasma sodium (mEq/L) of *Clarias lazera* and *Cyprinus carpio* exposed to 2 ppm and 4 ppm oxadiazon.

Species	Group	Treatment period			Recovery period	
		3 day	7 day	14 day	3 day	7 day
Cyprinus carpio Clarias lazera	control	142.11±0.48	142.1±0.20	141.8±0.75	142.14±0.78	141.8±1.67
	2 ppm	147.43±0.67	154.32±0.80	157.51±0.69	145.67±0.47	140.01±0.68
	4ppm	152.61±0.57	153.8±0.26	161.62±0.54	148.26±1.05	149.54±0.37
	control	163.77±0.23	163.47±0.86	163.34±1.09	163.48±0.79	162.23±0.55
	2 ppm	172.13±0.53	174.86±0.11	175.52±0.32	173.42±0.91	167.06±1.14
	4 ppm	171.03±0.98	176.19±0.28	178.43±0.58	172.1±0.91	169.47±0.58

Statistical analysis of plasma sodium level

Items	Treatment period		Recovery period	
	F-Value	L.S.D.	F- Value	L.S.D.
Fish	4745.7 **	0.61	15815.5 **	1.106
Time	86.9 **	0.747	29.76 **	1.106
Oxadiazon	711.1 **	0.747	92.39 **	1.355
Fish x Time	10.31 **	1.057	0.902 N. S.	-
Fish x Oxadiazon	6.05 **	1.057	4.262 *	1.971
Time x Oxadiazon	26.0 **	1.295	4.902 *	1.971
Fish x Time x Oxadiazon	3.51**	1.831	1.039 N. S.	-

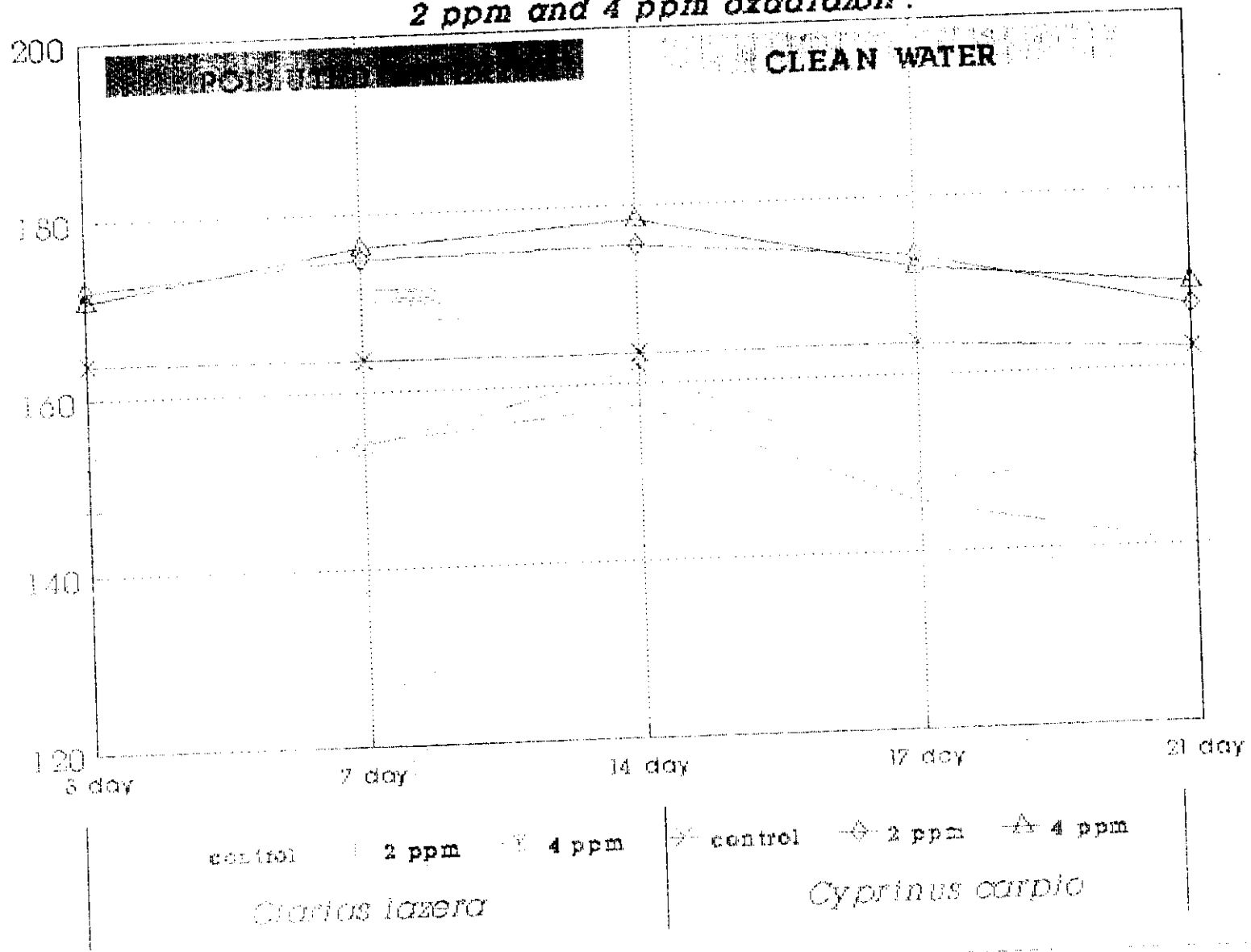
* P< 0.05

**P <0.01

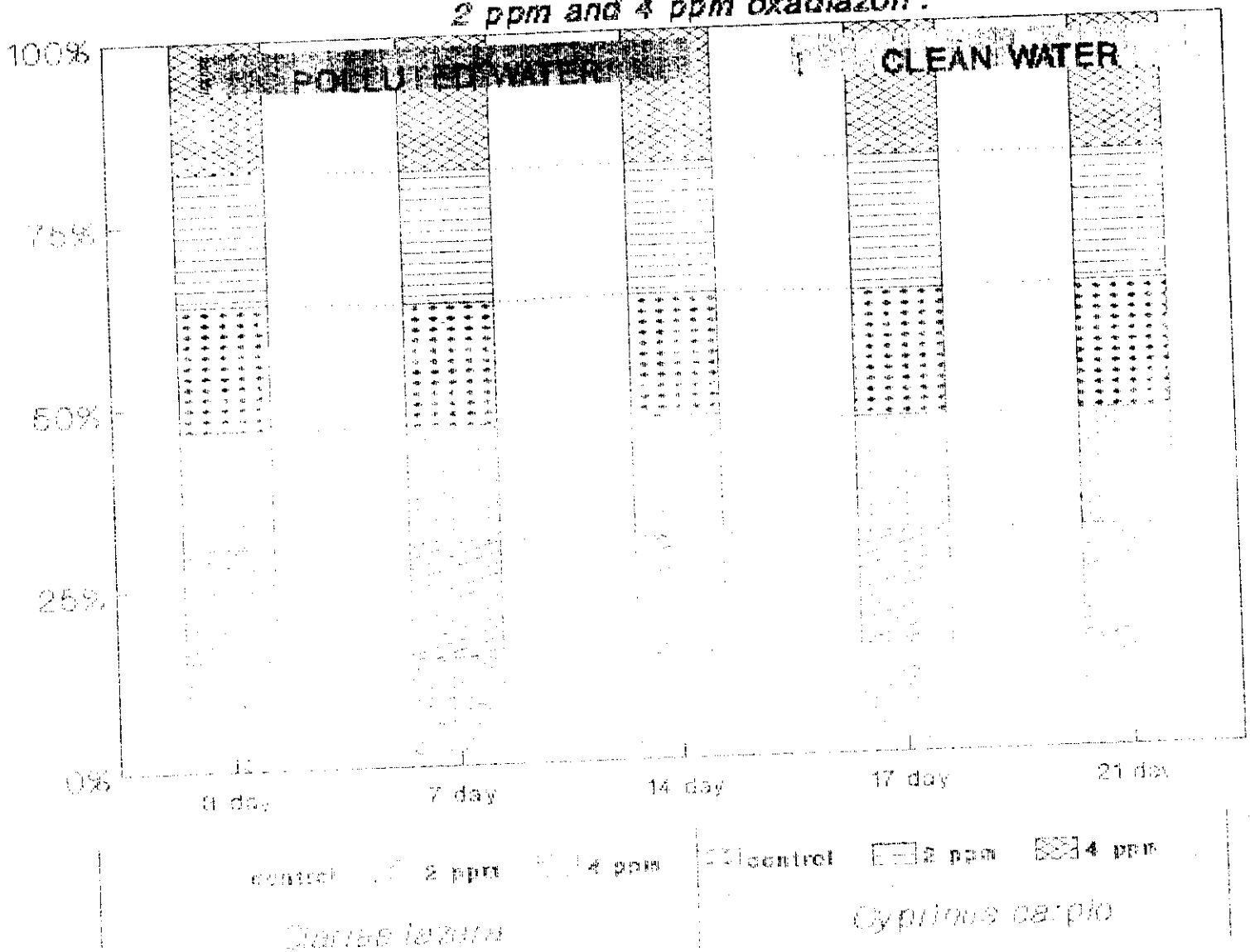
N. S. Non Significant

L. S. D. Least Significant Differences at 0.05 level of the factor studied

Fig.( ) ***Changes in the level of plasma Sodium (MEq/L) of Clarias lazera and Cyprinus carpio exposed to 2 ppm and 4 ppm oxadiazon .***



Fig( ) *Changes in the level of plasma Sodium (MEq/L) of Clarias lazera and Cyprinus carpio exposed to 2 ppm and 4 ppm oxadiazon .*



(3.b) Effect of different concentrations of oxadiazon on the plasma potassium level of *Clarias lazera* and *Cyprinus carpio*.

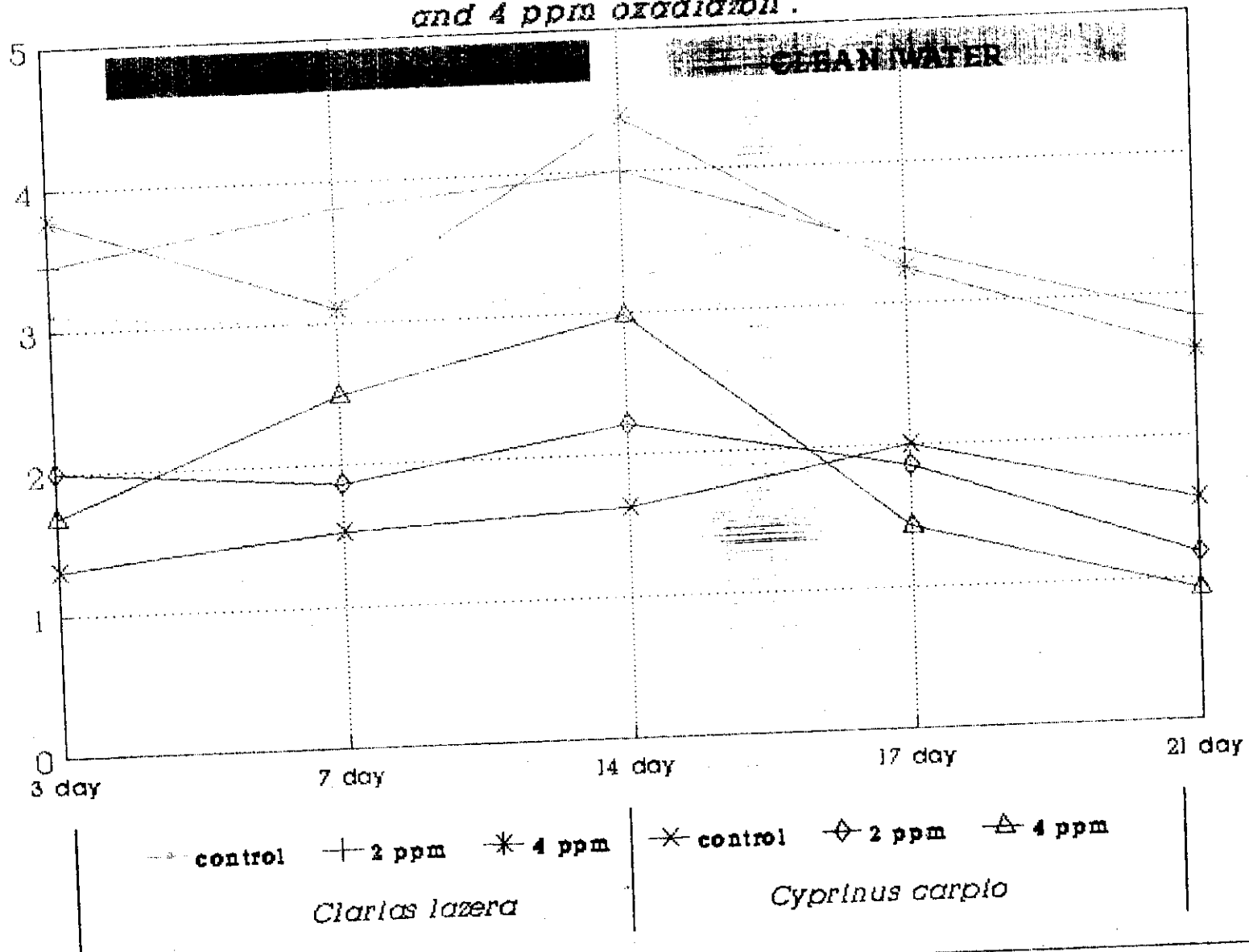
As observed in table (11) and figures (13-14) the treatment with different concentrations of oxadiazon for 3 days increases the level of plasma potassium in ***Clarias lazera*** but, the increase is not significant (3.46 and 3.78 mEq/L plasma), while, after 7 days of exposure the plasma potassium in the control and treated groups are 2.98, 3.81 and 3.1 mEq/L plasma respectively. On the other hand, after 14 days of treatment the mean level of plasma potassium in both treated groups are 4.00 and 4.38 mEq/L plasma respectively compared to 3.22 for the control group.

Exposed ***Cyprinus carpio*** to both oxadiazon concentrations (2 and 4 ppm) for 3 days show insignificant changes to its plasma potassium level (2.00 and 1.68 mEq/L respectively). Insignificant increase in this plasma ion is observed also after 7 days, the mean level of both concentrations treated fish are 1.87 and 2.49 mEq/L plasma compared to that of the control (1.53 mEq/L). The mean level of the control and treated fish after 14 days of exposure are 1.63, 2.21 and 2.98 mEq/L plasma respectively, these results show that the level of plasma potassium increases with the increase of the exposed time, and the concentration of oxadiazon.

During the recovery period in fresh water the plasma potassium level of *Clarias lazera* has been decreased gradually with the time. The mean values of treated groups after 3 days are 3.38 and 3.25 compared to that of the control value (3.72 mEq/L). After seven days the level value is noticed to be lower than that of the control. The mean level values of the control and treated fish are 3.18, 2.85 and 2.61 mEq/L respectively.

In *Cyprinus carpio* : after transporting the fish to fresh water the plasma potassium level values decrease gradually with time and the decrease is not significant. The mean values of the control and treated fish after 3 days are 2.00, 1.86 and 1.43 and that after 7 days of transporting are 1.18 and 0.92 compared to their control value 1.56 mEq/L plasma respectively.

Fig.( ) *Changes in the level of plasama Potassium (MEq/L) of Clarias lazera and Cyprinus carpio exposed to 2 ppm and 4 ppm oxadiazon .*



(3.c) Effect of different concentrations of oxadiazon on the plasma glucose level of *Clarias lazera* and *Cyprinus carpio*.

Data presented in table (12) and figures(15-16) indicate the effect of 2 ppm and 4 ppm oxadiazon exposure on *Clarias lazera* and *Cyprinus carpio*.

In *Clarias lazera* the application of both 2 ppm and 4 ppm oxadiazon increase significantly the level of glucose as compared to the control after 3 and 7 days of exposure. The mean plasma glucose values of the treated fish after 3 days exposure are 76.89 and 85.48 mg/100 ml plasma respectively and that after 7 days are 79.33 and 93.50 compared to their control value 56.85 mg/100 ml respectively. However, there is a reversal significant decrease after 14 days of treatment, but the mean plasma glucose level shows higher significant value than control one. The mean values of the control and treated fish are 57.06, 68.18 and 79.88 mg/100 ml plasma respectively.

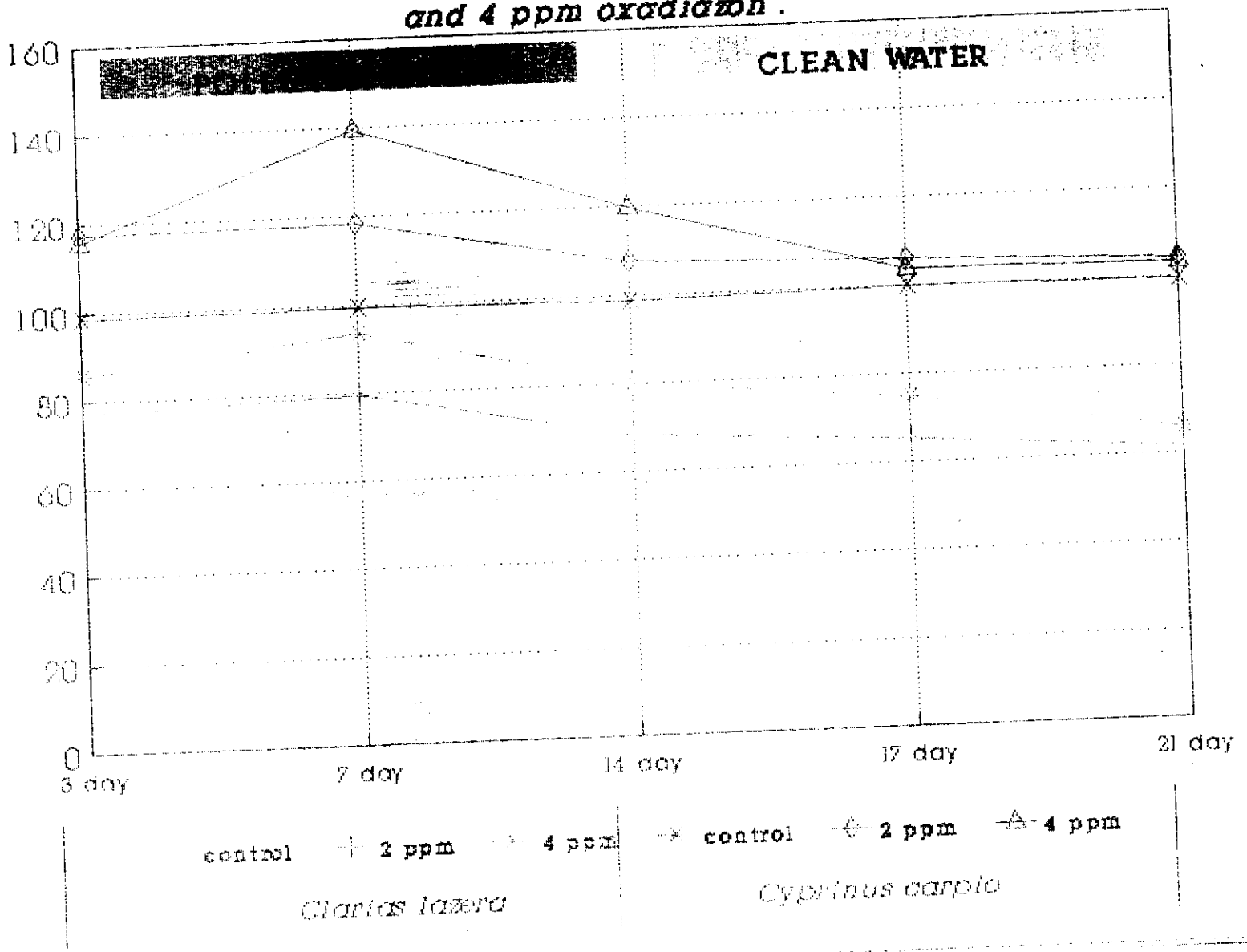
The mean plasma glucose values of the treated *Cyprinus carpio* after 3 days of exposure are 117.40 and 115.71 mg/100 ml plasma respectively. These results indicate a significant increase of plasma glucose level after oxadiazon treatment at both concentration. Further, increase in plasma glucose is observed also after 7 days

of treatment, where the mean values of the treated fish by 2 ppm and 4 ppm oxadiazon are 118.3 and 139.51 mg /100 ml plasma respectively. The mean values of the treated fish after 14 day of exposure are 107.63 and 119.81 mg/ 100 ml plasma at both concentration respectively. These results indicate that the hyperglycaemic effect of oxadiazon decrease significantly after 14 days of treatment, though the treated level is still significantly higher than control.

During the recovery period the mean values of the plasma glucose of *Clarias lazera* treated with 2 ppm and 4 ppm are 65.21 and 74.71 mg/100 ml plasma respectively. These results show significant decrease of glucose level. Also a further decrease in glucose is observed during 7 days of the recovery period where the mean values of the treated fish are 61.60 and 66.01 mg/100 ml plasma for 2 ppm and 4 ppm oxadiazon treated groups in the order mentioned.

The mean plasma glucose values of the 2 ppm and 4 ppm oxadiazon treated *Cyprinus carpio* during 3 days of recovery are 106.01 and 103.68 mg/100 ml plasma for each separately. These results pointed out a significant difference between the treated and control fish. This decrease continues also after 7 days of recovery where the mean values of the treated fish are 104.15 and 103.33 mg/100 ml plasma respectively.

Fig.( ) Changes in the level of plasama glucose (mg/100ml) of Clarias lazera and Cyprinus carpio exposed to 2 ppm and 4 ppm oxadiazon .



(3.d) Effect of different concentrations of oxadiazon on the plasma lactate level of *Clarias lazera* and *Cyprinus carpio*.

As shown in table (13) and figures(17-18) the effect of 2 ppm and 4 ppm oxadiazon exposure on plasma lactate of *Clarias lazera* and *Cyprinus carpio* declare a significant increase of plasma lactate. *Clarias lazera* exposed to 2 and 4 ppm oxadiazon for 3 days showed the control and treated groups mean values (75.96, 84.39 and 92.24 mg/ 100 ml) plasma for each separately, after 7 days of exposure, the plasma lactate level of fish exposed to 2 ppm oxadiazon decrease significantly than that of 3 days exposure while, the 4 ppm oxadiazon treated group shows a further increase of plasma lactate level, (79.71 and 97.81 mg/ 100 ml respectively). At the end of 14 days exposure, the lactate level of 2 ppm group is not differs significantly from that of 7 days treatment. But the value of 4 ppm exposed group decrease significantly than that of 7 days exposure, (the mean values of the treated fish after 14 day are 78.30 and 89.81 mg/100 ml respectively).

The mean values of lactate of the control and oxadiazon treated *Cyprinus carpio* after 3 days are 35.54, 45.43 and 59.15 mg/100 ml plasma respectively. These results show that the lactate level increase significantly after 3 days of exposure. Further, significant increase is observed also after 7 days of

exposure to both concentrations (57.75 and 64.90 mg/100 ml plasma in the order mentioned). However, fourteen days under treatment by 2 ppm and 4 ppm oxadiazon, the lactate level decrease significantly to attain the values observed approximately after 3 days of exposure, (45.83 and 56.83 mg/100 ml plasma respectively).

During the recovery period in fresh water, the lactate level continue to decrease to reach about the control value, so there is no significant difference between the control and treated fish, the mean values of the control and treated ***Clarias lazera*** after 3 days are 76.41, 79.68 and 83.26 mg/100 ml plasma respectively and that after 7 days of recovery period are 76.16 and 76.71 compared to their control value 76.49 mg/100 ml plasma.

In ***Cyprinus carpio*** no marked difference are observed between the lactate level of the control and treated fish. The level restored to about normal value after 7 days. The mean level of the control and treated fish after 3 days are 34.98, 40.75 and 40.44 mg/100 ml and that after 7 days of recovery are 36.95 and 35.83 mg /100 ml compared to that of the control "35.13 mg/100 ml" plasma respectively.

Table (13)

Changes in the level of plasma lactate (mg/100ml) of *Clarias lazera* and *Cyprinus carpio* exposed to 2 ppm and 4 ppm oxadiazon

Species	Group	Treatment period			Recovery period	
		3 day	7 day	14 day	3 day	7 day
Cyprinus carpio Clarias lazera	control	75.96±0.42	75.68±0.53	75.88±0.54	76.41±0.49	76.49±0.91
	2 ppm	84.39±0.50	79.71±0.36	78.30±0.43	79.68±0.37	76.16±0.74
	4ppm	92.24±0.50	97.81±0.41	89.81±0.64	83.26±0.46	76.71±0.83
	control	35.54±0.32	34.98±0.41	35.55±0.44	34.98±0.40	35.13±0.52
	2 ppm	45.43±0.43	57.75±0.38	45.83±0.78	40.75±0.39	36.95±0.33
	4 ppm	59.15±0.26	64.90±0.38	56.83±0.50	40.44±0.56	35.83±0.45

Statistical analysis of plasma lactate level

Items	Treatment period		Recovery period	
	F-Value	L.S.D.	F- Value	L.S.D.
Fish	20277.8 **	0.487	12353.18 **	0.717
Time	129.64 **	0.596	8.463 **	0.717
Oxadiazon	2503.27 **	0.596	31.81**	0.818
Fish x Time	44.7 **	0.843	12.954 **	1.014
Fish x Oxadiazon	136.05 **	0.843	5.77 **	1.242
Time x Oxadiazon	40.0 **	1.033	21.83 **	1.242
Fish x Time x Oxadiazon	45.878 **	1.461	0.928 N. S.	-

* P< 0.05

**P <0.01

N. S. Non Significant

L. S. D. Least Significant Differences at 0.05 level of the factor studied

Fig.( ) *Changes in the level of plasma lactate (mg/100ml) of Clarias lazera and Cyprinus carpio exposed to 2 ppm and 4 ppm oxadiazon .*

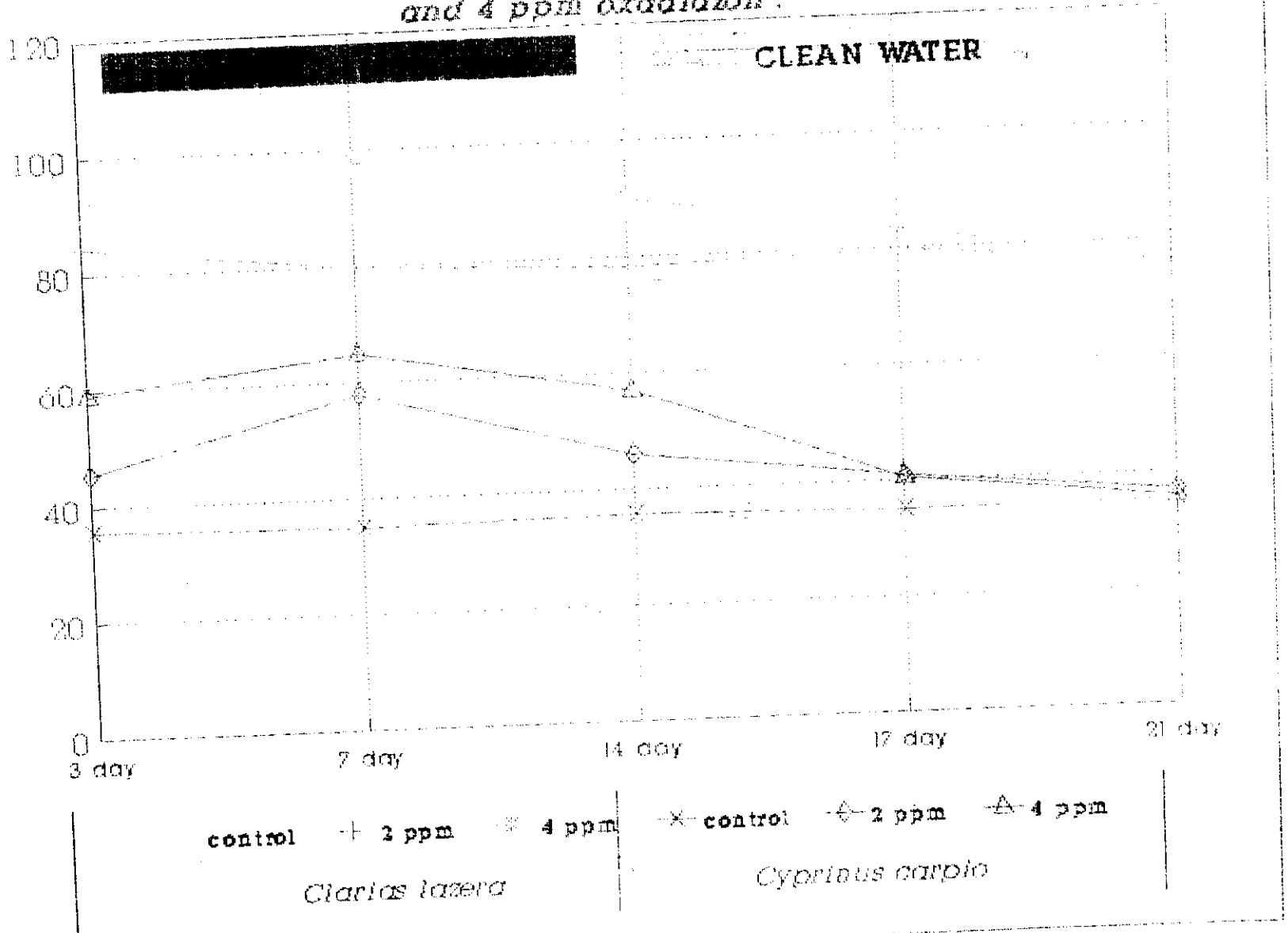


Fig.( ) *Changes in the level of plasma lactate (mg/100ml) of Clarias lazera and Cyprinus carpio exposed to 2 ppm and 4 ppm oxadiazon.*