TABLE I (*Cantd.*)

				n-Butanol–Benzene-*n*-Hexane (23° C)				
n-Butanol (X_1)	Benzene (X_2)	$(\Delta U/U)$ (%)	$(\Delta v/v)$ (%)	$(\Delta R/R)$ (%)	u_{exp} (m/s)	U_{Nomoto} (m/s)	u_{im} (m/s)	$\frac{u^2_{exp}}{u^2_{im}}$
0·2	0·5	0·08	−0·57	−0·42	1227	1232	1252	0·96
0·3	0·4	−0·07	−0·15	−0·37	1227	1226	1252	0·96
0·4	0·3	0·05	−0·32	−0·29	1226	1226	1252	0·95
0·5	0·2	0·35	−0·19	−0·07	1223	1227	1253	0·95
0·7	0·0	0·12	0·15	0·11	1230	1228	1254	0·96
0·6	0·2	1·23	−0·22	0·19	1243	1258	1274	0·95
0·5	0·5	1·78	−0·27	0·32	1289	1312	1312	0·96
0·0	0·0	0·00	0·00	0·00	1113	1113	1113	1·00
1·0	0·0	0·01	−0·87	0·00	1315	1314	1315	1·00
0·0	1·0	0·84	0·27	0·00	1310	1299	1310	1·00

actions in the ternary solution, especially in these cases where properties other than sound velocity and density are not known.

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EMBRYO IN *VALLISNERIA*, A QUANTITATIVE STUDY

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ABSTRACT

Histochemical and statistical analyses for nucleic acids, basic as well as sulfhydryl proteins and polysaccharides, reveal that the developing latency of all the cells of either a quadrant or an octant (*l* and *l'* tiers) is nearly the same. The facsimile of all the cell derivatives of *ca* remain exactly alike till the globular stage and metabolites disperse to reappear at the new loci of growth.

THE major organs of the embryo, shoot apical meristem, radicle and cotyledon (one or two), can be traced back to specific sectors formed at the very beginning of embryonic development in angiosperms. However in the major groups of vascular plants, huge variations exist with respect to the alignment of these quadrants and octants and their role in organogenesis (Maheshwari[1]). According to the

widely accepted view the cell '*m*' engenders the shoot apex and hypocotyl (partly or wholly) while the cell '*q*' develops into the cotyledon but according to Haccius[2] in many species of the monocotyledons, it is the cell '*q*' that gives rise not only to the cotyledon but also to the shoot apex. In the light of the above, changes in distribution, content, and concentration of nucleic acids, two species of proteins and polysaccharides are studied by light microscopic histochemical methods from the zygote to mature embryo in *Vallisneria spiralis* L.

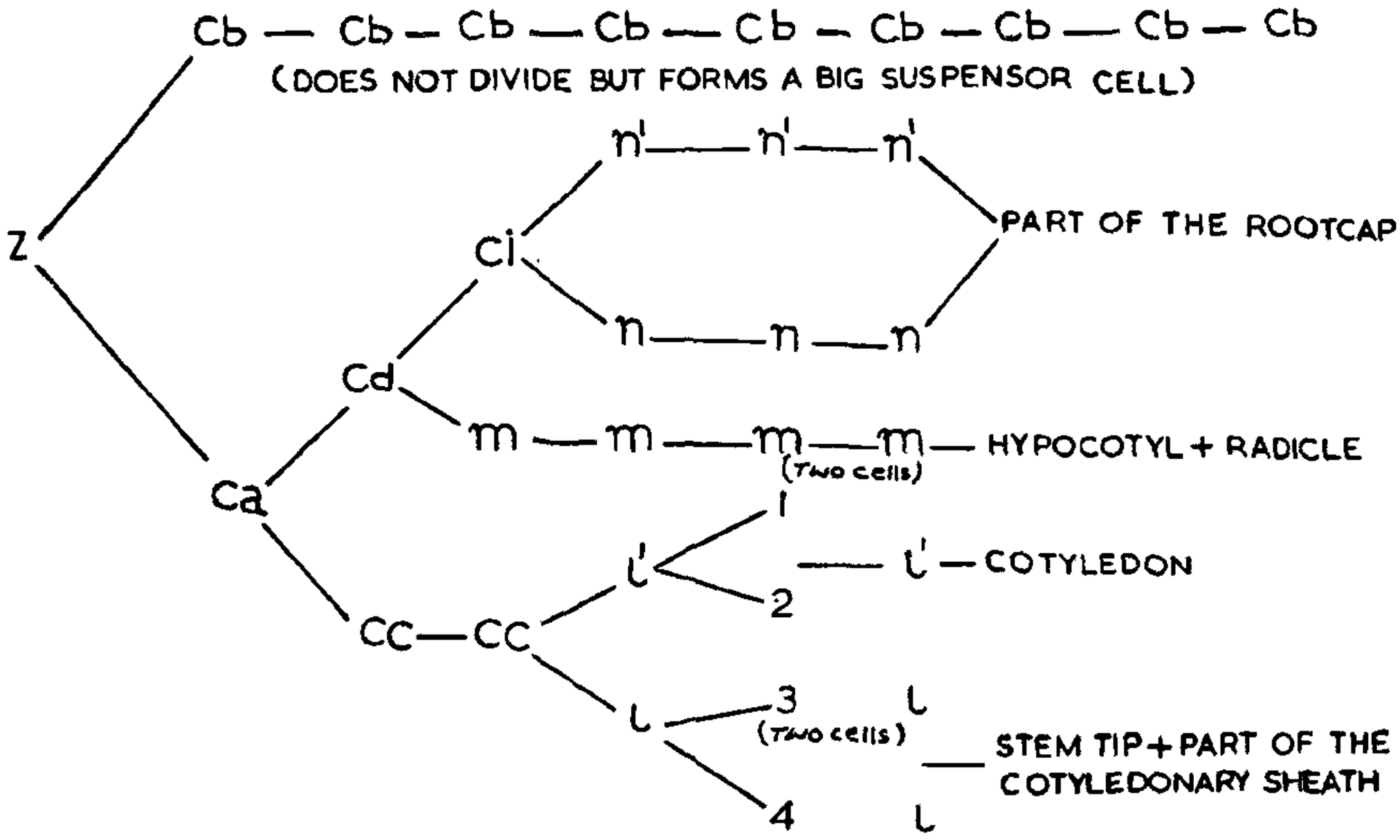
Pollinated flowers were collected and fixed in Carnoy's fluid (Jensen[3]) and 10% neutral buffered formalin (Ruthman[4]). Tissue samples were dehydrated in TBA series, infiltrated, embedded in paraffin (56–58° C) and sectioned at 10 μ thickness. DNA, RNA, histones, –SH proteins and polysaccharides were localized in the manner suggested by Mcleish and Sunderland[5], Tepper and Gifford[6], Black and Ansley[7], Barrnett and Seligman[8], Hotchkiss[9], and McMannus[10] respectively. Absorbance values were measured in a cytophotometer (Shah *et al.*[11]).

The embryogeny in *Vallisneria* conforms to the Sagittaria variation, Caryophyllad type (Maheshwari[1]). The zygote is a polarised cell. The basal cell *cb* which becomes vesicular does not divide again but is transformed into a large hypertrophied suspensor cell. Table I shows the cell lineages.

The various tiers of the proembryo show uniform differential localization of the metabolites indicating their even physiological state. Globular embryo is stained uniformly for all the metabolites, *viz.*, DNA, histones, RNA, –SH proteins and polysaccharides. The organogenetic centres of the proembryo are all physiologically equally active. The finding agrees with Alvarez and Sagawa[12] who have reported that total proteins and RNA are equally concentrated in all the cells of the multicellular globular embryo of *Vanda*. Schultz and Jensen[13] did not detect any apparent differences until the formation of the early heart-shaped embryo in *Capsella*. The profile of the enzymes in the globular embryo in *Tropaeolum* remains at a peak level (Malik *et al.*[14]).

TABLE I

The cell lineages in the embryogeny of Vallisneria spiralis *L.*



The cell walls take uniform intense staining with PAS reaction during the course of embryogeny. It prevents one to define the constituent cells to delimit different tiers leading to their destiny. The detection of –SH proteins shows that cell walls and nucleolus of embryonal and suspensor cells were intensely stained, whereas in the cytoplasm there is a uniform faint staining. The nucleus of embryonal cells contained 2–3 nucleoli.

Both cytoplasmic and nucleolar RNA define the embryonal as well as suspensor cells. Nucleolus shows intense staining for RNA with pyronin during the course of embryo development. In the mature embryo, the plumule cells show high extinction value for RNA (Fig. 2) compared to the radicle and cotyledon cells. DNA and histones show very faint staining for zygote. As the development proceeds, the stain intensity (*e*-values) for DNA and histones in the derivatives of *ca* rises and reaches its peak at the stage of globular embryo (Fig. 1). At the elongated and indented embryo, the extinction values decline.

The data presented in Table II show the extinction values of different metabolites in four different cells of *l* and *l'* tiers. Standard deviation and coefficient of variation for each metabolite show that metabolic potentialities of all the four cells are more or less the same. The cells have not been assigned a role for differentiation at this stage of embryo.

The globular embryo is radially symmetrical. The cells are isodiametric with big nuclei and are stained uniformly. The gradual increase in all the metabolites up to the globular embryo is shown in Fig. 1. It shows that the cells are metabolically active at this stage. Afterwards at the elongated and indented embryo the extinction values of all the metabolites decline. Globular embryo is physiologically the most active in development (Shah *et al.*[15]) and it is the stage when the cells are destined a role for future differentiation. Globular embryo occupies a transitory stage between pro- and mature embryonic phases.

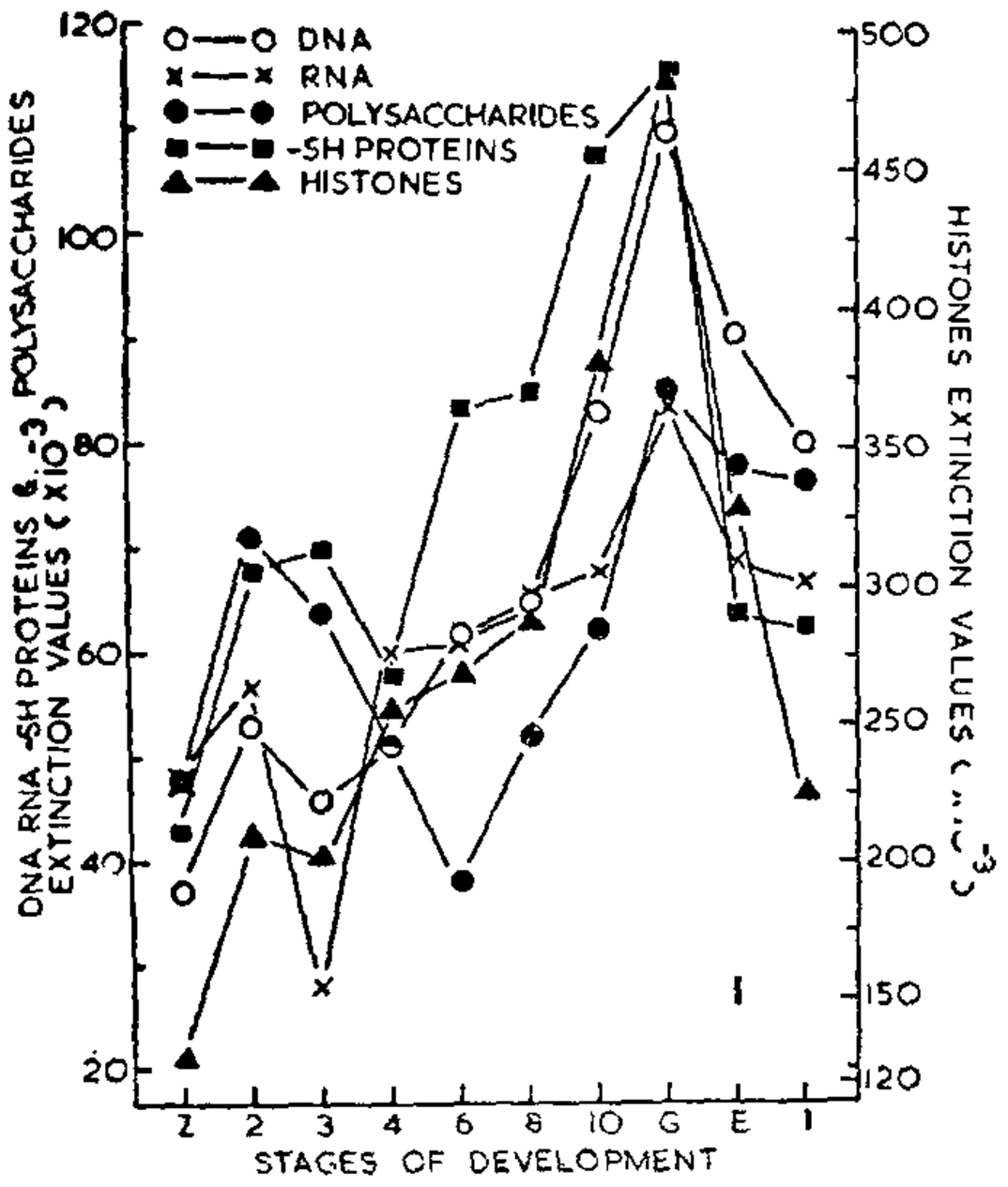


FIG. 1. Shows the extinction values of DNA, RNA, polysaccharides, –SH proteins and histones ($\times 10^{-3}$) during the embryo development from zygote to indented embryo in *Vallisneria*. The numerals of the *x*-axis are depicted in Table I. Note a peak in all the metabolites at globular embryo, later the values decline.

The mature embryo of *Vallisneria* consists of plumule, hypocotyl and a single lateral cotyledon. The high extinction values of all the metabolites in plumule and radicle regions (Fig. 2) show that cells of these regions are more active compared to the differentiated cells of cotyledon. Staining with periodic acid Schiff's reagent for polysaccharides revealed the presence of abundant starch grains in the single lateral cotyledon. Starch grains increased in the mature cotyledon cells

TABLE II

Cytophotometric estimations of four cells of the quadrant embryo in Vallisneria

Analysis of one cell each of the quadrant as shown in Table I	Extinction values of different metabolites				
	DNA	Hitone	RNA	-SH proteins	Polysaccharides
First cell from (*l'*)	0·0661	0·2664	0·0970	0·0953	0·0886
Second cell from (*l'*)	0·0643	0·2799	0·0987	0·0922	0·0755
Third cell from (*l*)	0·0703	0·2850	0·0970	0·0804	0·0886
Fourth cell from (*l*)	0·0739	0·2950	0·0836	0·0739	0·0788
Standard deviation	±0·0037	±0·0103	±0·0060	±0·0086	±0·0058
Coefficient of variation	5·39	3·65	6·38	10·07	7·00

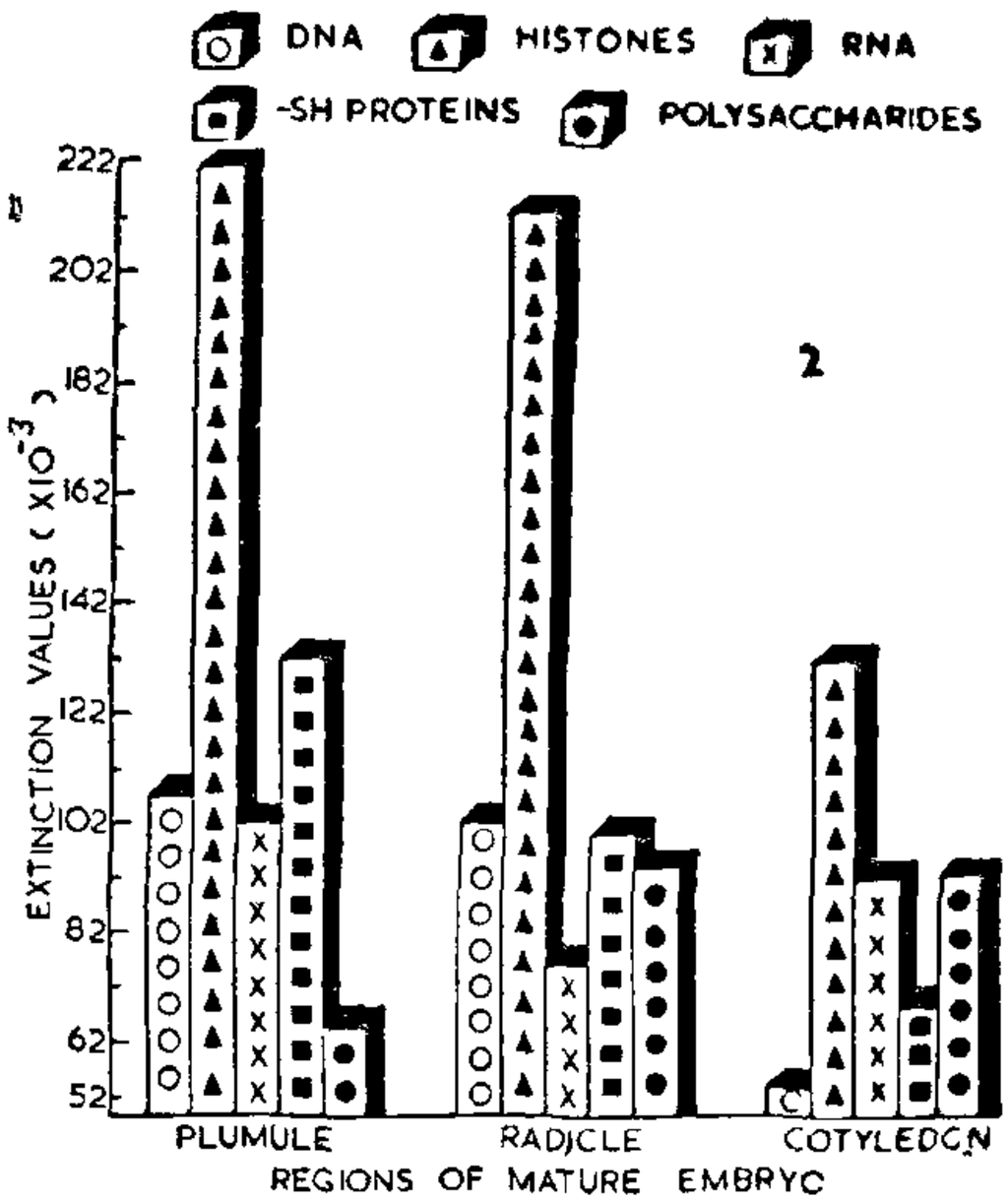


FIG. 2. The extinction values of various metabolites are plotted in different regions of mature embryo, *i.e.*, plumule, radicle and cotyledon. Plumule and radicle cells show the higher extinction values compared to the cotyledonary cells. All the regions of mature embryo show the maximum histone extinction values.

in *Stellaria media* (Pritchard[16]) whereas the plumule is entirely devoid of them. Starch grains are sparse in the radicle.

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ACUTE HISTOPATHOLOGICAL EFFECTS OF LINDANE [γ-BENZENE HEXACHLORIDE] ON THE LIVER OF *COLISA LALIA*

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ABSTRACT

The effect of 96 hr sublethal (0·1 mg/l) and 24 hr lethal (0·37 mg/l) concentrations of lindane on the liver tissue of *Colisa lalia* was studied. Sublethal concentration (exposure time 96 hr) of lindane caused more damage in the liver tissue in the form of histolysis, nuclear enlargement, pycnosis, vacuolation and necrosis. Above changes were observed to a lesser degree in lethal concentration (exposure time 6 hr) indicating that the duration of exposure is more important in bringing about histological damage in the tissues.

INTRODUCTION

PESTICIDES accumulate to varying degree in the tissues of the fish exposed to them[1,2]. Since liver is the centre of pesticide metabolism, they accumulate to a greater extent in that organ[2]. Though histopathological changes in liver and other tissues have been well documented[3,4], the nature and the extent of damage depends on the fish, the pesticide and its concentration. Allison *et al.*[5] examining DDT chronic effects could not detect any pathological change in cutthroat trout but Eisler[6] reported the changes in