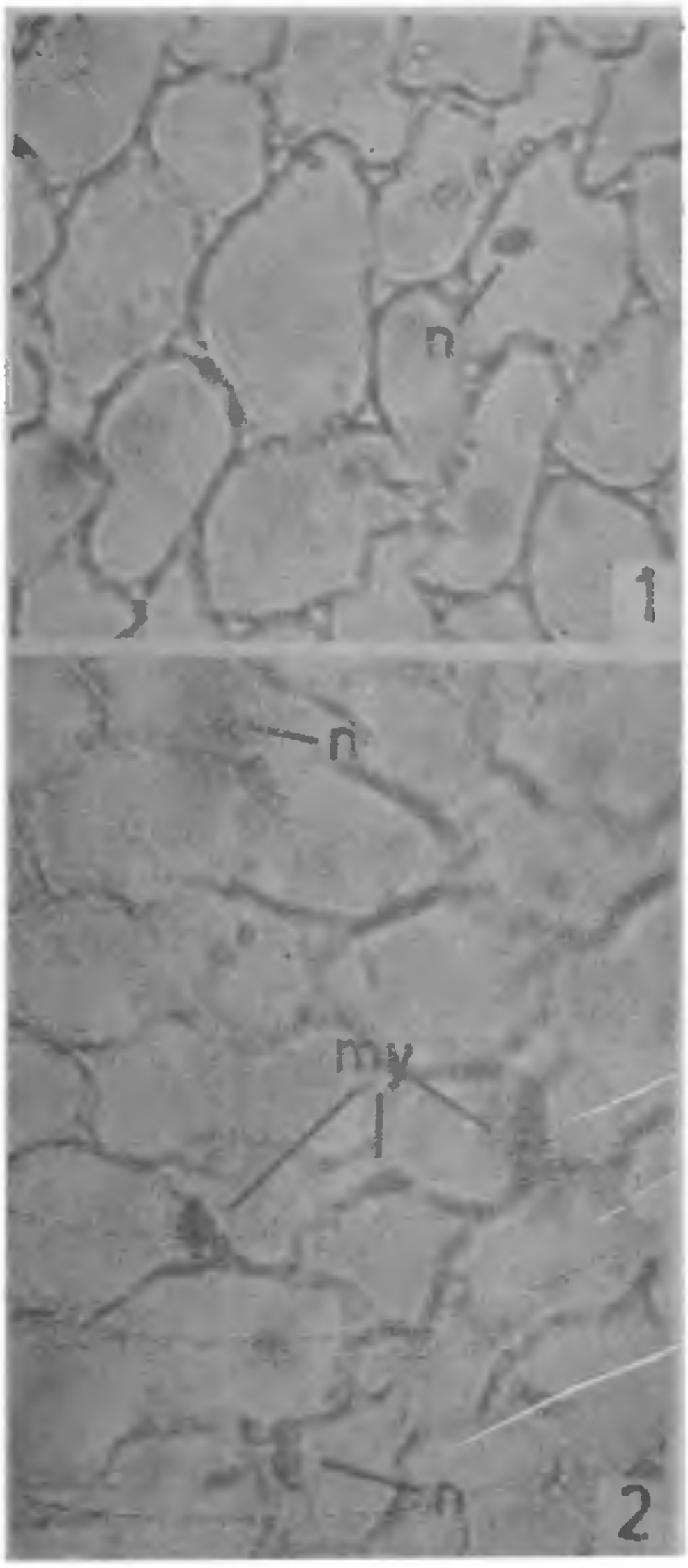
The significance of Feulgen's staining procedure for detection of MLO has been discussed[5]. Electron microscopic detection of MLO in sesamum and light microscopic observation in other plants support our findings.



FIGS. 1–2. *Fig.* 1. Healthy sesamum plant. No mycoplasma zones are stained. *my* = Mycoplasma zone, *n* = nucleus. *Fig. 2. Cross sections of Sesamum indicum* Linn. stained by Feulgen stain. Mycoplasma zones located in the phloem elements of phyllody infected sesamum plant.

In these studies old and severely infected plant materials have been used which ensure the presence of MLO in high density. The organism can escape detection if the early stage of the infected material is taken.

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1. Pal, B. P., and Nath, P., *Indian J. Agric. Sci.*, 1935, 5, 517.
2. Sahambi, H. S., *Proc. Int. Symp. Plt. Pathol.*, India, 1966–67, p. 340.
3. Choopanya, D., *Phytopath.*, 1973, 63, 1536.
4. Cousin, M. T., and Kartha, K. K., *Symposium on Mycoplasmal Diseases*, Chandigarh, India, December 31, 1972 to Jan. 1, 1973, Abstract. p. 30.
5. Kartha, K. K., Cousin, M. T. and Ruegg, E. E., *Indian Phytopath.*, 1975, 28, 51.

IN VITRO PLANT REGENERATION IN PAPAYA

PAPAYA (*Carica papaya* L.) is essentially a cross pollinated crop and propagated through the seed. This leads to a high degree of variability in various morphological characters in the progeny. This adversely affects productivity of the crop. The presence of almost equal number of unproductive male plants in a papaya grove is also an impediment in the successful commercial cultivation of this crop. It is well known that vegetative propagation of papaya through conventional methods has not been successful. Thus the only alternative left to overcome the above limitations is vegetatative propagation of papaya through tissue culture. This technique has been successfully employed in the regeneration of citrus[1], strawberry[2], almond[3], apple[4] and a number of ornamental plants. However, papaya is a problematic crop for tissue culture since it contains latex. Therefore, the present study was undertaken with a view to evolve a tissue culture technique in papaya, which may be helpful in the vegetative regeneration of plants. Initially young papaya seedlings were taken for this purpose.

The 4–5 mm long stem segments of papaya seedlings, raised aseptically on White's medium supplemented with 4 mg/l GA_3, were used as inoculum. Modified White's, Heller's, Nitsch's, Murashige and Skoog's (*see* Butenko[5]) and Linsmaier and Skoog's[6] were used as basal media. These media were also supplemented with auxins (IAA; 2, 4-D; and NAA, 1–10 mg/l) and kinetin (0·5–5·0 mg/l) individually and in combination with each other. The proliferation of the tissue was observed only when NAA was used as auxin in MS and LS medium. A nutrient medium was standardized to enable vigorous growth of papaya callus and a 40–50 fold enlargement of stem tissue of papaya seedling was achieved in 4 weeks on a modified LS medium which contained inorganic salts in kind and concentration as recommended and organic addenda as follows (mg/l): alpha-naphthaleneacetic acid, 2·0; kinetin 0·5; gibberellic acid, 1·0; glycine, 1·0; casein hydrolysate, 1000; malt extract, 500;

adenine sulphate, 100; nicotinic acid, 5·0; thiamin HCl, 1·0; pyridoxin HCl, 1·0; sucrose, 30000 and Difco-Bacto agar, 8000. The cultures were incubated at a light intensity of 3000–3200 lux with 16 hours daily light period at a temperature of 27 ± 1° C.

The callus cultures differentiated into leafy shoots and roots on media containing varying auxin/cytokinin concentrations. High kinetin/NAA ratio (2·0/0·2 mg/l) was found to be favourable for differentiation of callus cultures into leafy shoots (36%), whereas low kinetin/NAA ratio (0·2/0·5 mg/l) was responsible for root differentiation (89·4%). Higher NAA in the medium resulted in decreased root differentiation and the differentiated roots again started de-differentiation on coming into contact with the medium. Kinetin is not essential for root differentiation but its presence in the medium was observed to be critical for root growth. The callus cultures were found to differentiate into leafy shoots with one to four growing points. The differentiated leafy shoots could be made to form roots on a simple medium devoid of auxin (Fig. 1). The cultures once differentiated into roots first could not be made to form shoots and the root growth continued for a long time. Hence, complete papaya plants could be regenerated through *in vitro* culture of stem segments by following a sequence of 3 stages. The first stage is concerned with the establishment of prolific callus growth, in the second stage the callus differentiates into leafy shoots and, the growing leafy shoots are made to form roots in the third stage. In certain plant species, it is possible to proceed with the first two or sometimes three stages by using the same culture medium, but in papaya the requirements of each stage has been observed to be specific.

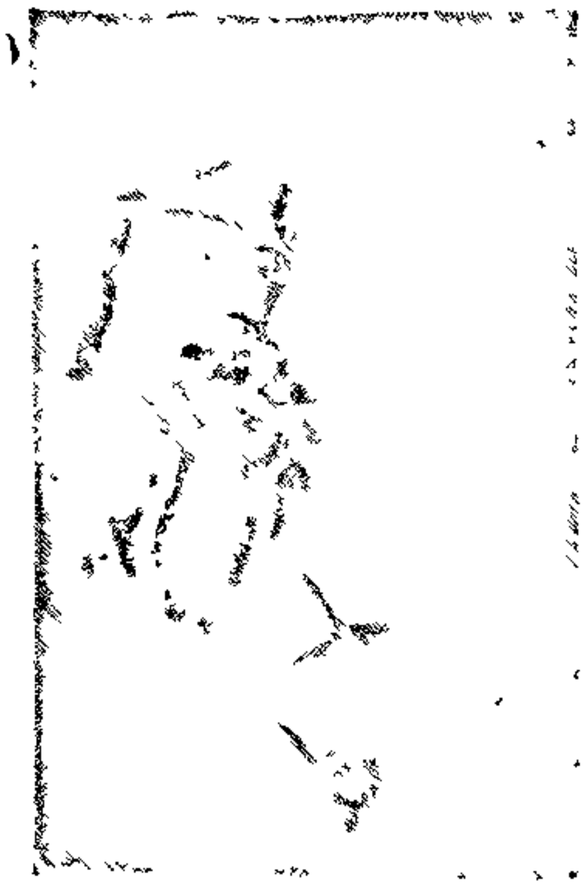

FIG. 1. Papaya plantlet 12 weeks after inoculation on a medium containing 2·0 mg/l kinetin and 1·0 mg/l NAA and then sub-culturing it on a medium devoid of auxin (× 1·7).

This technique can be employed for the proliferation of tissue obtained from mature papaya plants for the commercial multiplication of clones of desired genotype and sex.

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1. Grinblat, U., *J. Am. Soc. Hort. Sci.*, 1972, **97**, 599.
2. Boxus, P., *J. Hort. Sci.*, 1972, **49**, 209.
3. Mehra, A. and Mehra, P. N., *Bot. Gaz.*, 1974, **135**, 61.
4. Abbott, A. J. and Whiteley, E., *Scientia Hort.*, 1976, **4**, 183.
5. Butenko, R. G., *Plant Tissue Culture and Plant Morphogenesis*, Academy of Sciences of USSR, 1968, p. 47.
6. Linsmaier, E. M. and Skoog, F., *Physiol. Plant.*, 1965, **18**, 100.

CADMIUM INTOXICATION ON TISSUE GLYCOGEN CONTENT IN THREE FRESH WATER TELEOSTS

THOUGH several studies appeared in the past regarding the effects of environmental pollutants on aquatic organisms, they pertain to mortality studies. The reports on the damage caused to different internal organs and the changes in various physiological and biochemical processes and causes of death after exposure to aquatic poisons are relatively few[1]. Contamination of water and the utilisation of cadmium in industries cause health hazards of considerable magnitude. Cadmium intoxication is responsible for hypertension, renal tubule damage, emphysema, liver dysfunction, cancer[2] and exhibits a marked tendency to accumulate in the body with a very long biological half life[3].

The aim of the present investigation is to provide information on the internal disturbances of physiological and biochemical nature caused by cadmium intoxication. The author has studied the effects of cadmium intoxication on glycogen content in liver, muscle, brain, and kidney tissues in *Labeo rohita* (Ham), *Ophicephalus punctatus* (Bloch) and *Clarias batrachus* (Linn.).

Fifteen live *L. rohita*, *O. punctatus* and *C. batrachus* 18–20 cm in length were obtained locally and acclimatized in the laboratory for 4 days; 5 fishes of *L. rohita*, *O. punctatus* and *C. batrachus* were kept in the glass aquarium containing (5, 10 and 15) × 10^{-4}% of cadmium nitrate for 3 hours. Liver, muscle, brain and kidney tissues were removed after decapitation and dissection of the treated fishes. The tissues were soaked on a filter paper in order to remove the adheing fluid. The preparation of tissue samples, estimation