Table 1 *Effect of pesticides on succinate dehydrogenase activity in rat brain*

Succinate dehydrogenase (activity/mg protein)*	50% of LD_{50} (adult rats)	5% of LD_{50} for 15 days (weanling rats)	5% of LD_{50} for 60 days (weanling rats)
Control group	29.64 ± 3.82	31.06 ± 2.45	51.85 ± 7.55
Carbaryl fed group	27.38 ± 7.24 (7.6) $P > 0.05$	26.68 ± 1.67 (14.1) $P < 0.05$	41.30 ± 4.48 (20.3) $P < 0.05$
Bavistin fed group	25.26 ± 4.38 (14.77) $P > 0.05$	28.79 ± 2.91 (7.3) $P > 0.05$	27.23 ± 1.82 (47.5) $P < 0.001$
Elsan fed group	25.20 ± 6.30 (15.0) $P < 0.05$	29.98 ± 3.37 (3.5) $P > 0.05$	37.70 ± 3.73 (27.3) $P < 0.01$
Phosalone fed group	21.55 ± 6.57 (27.3) $P < 0.05$	25.52 ± 1.94 (17.82) $P < 0.01$	29.20 ± 2.40 (43.7) $P < 0.001$

Number of rats in each group was five.
Figures in parentheses indicate per cent inhibition.
*Specific activity of the enzyme was defined as number of μg of TTC (Triphenyl tetrazolium chloride) reduced per hour per mg of protein at 37 C.

the overall brain functioning sluggish.

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TETRAZOLIUM REDUCING MICROORGANISMS INSIDE THE ROOT OF *BRASSICA* SPECIES

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MICROSCOPIC studies were carried out to study the presence of diazotrophs within the root tissue of mustard plants. The roots of mustard varieties Varuna (*Brassica juncea*) and ISN-129 (*B. napus*) grown in field and treated with strains M4 and W5 of *Azotobacter chroococcum* were taken as experimental material. The tetrazolium reduction technique[1] was used for the purpose. Free hand sections of the roots were observed under phase contrast and light microscope, using magnifications 150×, 400× and 1000× (L.M) and 250× and 400× (PH).

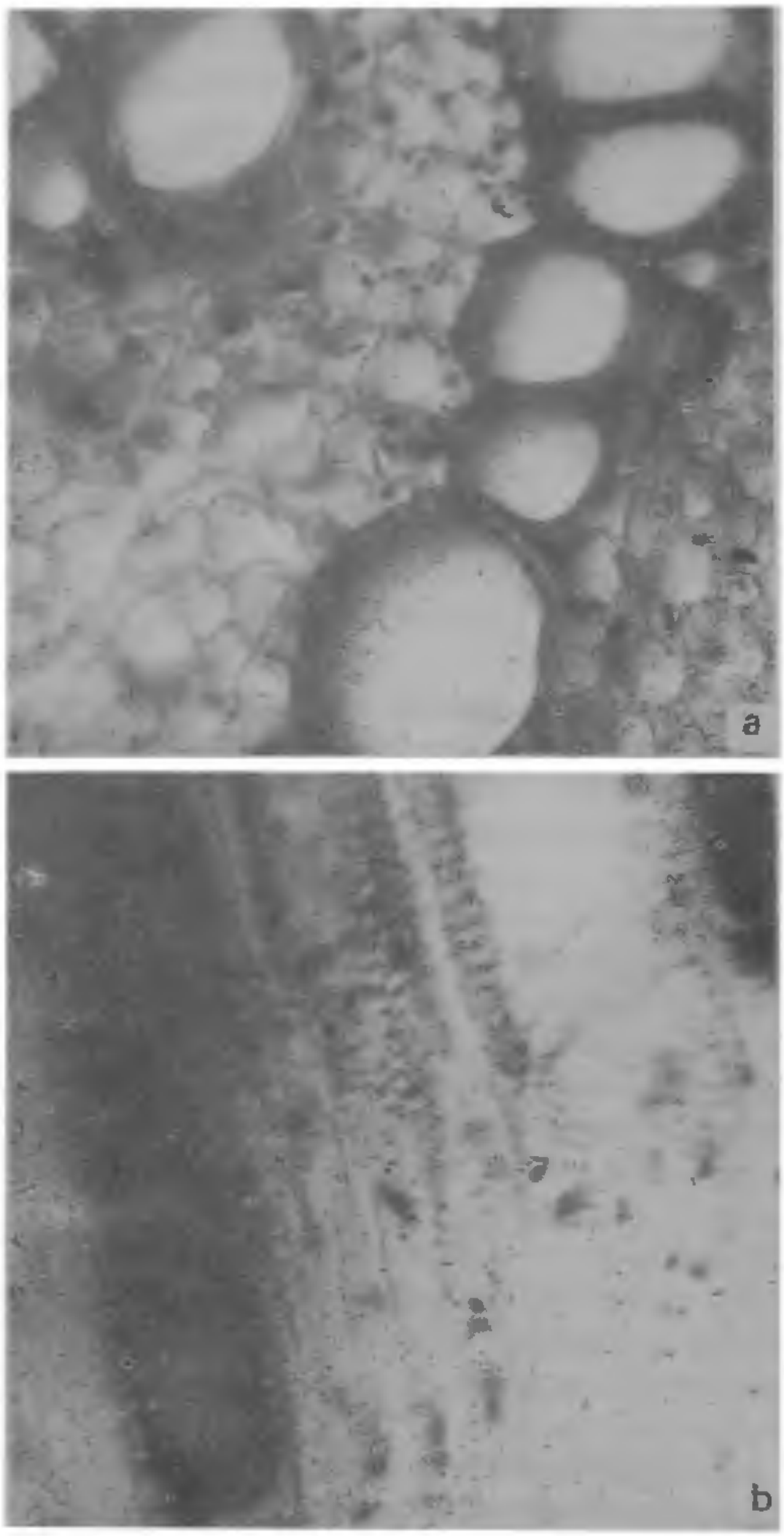
The roots were stained maroon with varying intensity at different sites. In general, there was more colour at the tip of the roots and around the place of origin of the secondary roots. In most cases the secondary roots were deeply stained.

In cross-sections (figure 1a) a number of coccoid, spiral and bacillus-shaped, deeply-stained cellular bodies of various sizes were observed. Some of these appeared to be motile. They were localized in certain areas like the cortex and around the xylem vessels. The bodies in the cortex appeared as a maroon band in the centre with no colour in the outer cortex and the pericyclic area under low magnification. The cells occurred singly or in aggregates around the xylem vessels. Some typical *Azotobacter*-like cells were seen moving very actively around the xylem vessels. Some spiral-shaped bodies with a typical *Azospirilum*-like motion were also seen.

Transverse sections of the secondary root region (figure 1b) showed a darkly-stained area at the origin of the secondary root with longitudinal streaks throughout the root. These streaks were mainly confined to the stelar region. The colourless roots showed no stained bodies inside the root tissue.

Results of microscopic observations indicated the presence of tetrazolium-reducing microorganisms in plants of two species of *Brassica*, which are dicotyledenous. Some of these microorganisms were confirmed by isolation and acetylene reduction assay to be diazotrophs. Till now, the presence of these organisms was reported[2,3] only in the monocot family Gramineae.

Seed inoculation with *Azotobacter* did not show much effect on the endorhizosphere microbial population, though in a few cases the uninoculated control was devoid of microflora. These observations



Figures 1a and b. Presence of microorganisms in stelar region of roots of mustard (×250). **a.** T. S. showing localization of microorganisms in vascular bundle. **b.** L. S. through secondary root.

indicate the presence of inherent microflora in the plant which may be enhanced by artificial bacterization. The entry of the introduced strains however could not be ascertained and requires further study.

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STUDIES ON FLOCCULATION OF *ZYMOMONAS MOBILIS**

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IN ethanol fermentations, flocculation facilitates removal of organisms from the product. In yeast, specific cell surface interactions under genetic control are responsible for flocculation[1], in which divalent and monovalent cations[2-4] play a key role. The present work describes the effect of divalent and monovalent ions on the flocculation of *Zymomonas mobilis*, an alternative organism for large scale ethanol production.

Zymomonas mobilis ATCC 10988 and ATCC 12526 were obtained from Oak Ridge National Laboratory, USA and maintained on YPS agar. The fermentation medium contained 1% yeast extract, 1% peptone and 15% (w/v) sucrose. The fermentation was carried out as reported earlier[5].

To measure flocculation, cells were harvested from 24 hr grown culture and washed twice with phosphate buffer (pH 7.0) and resuspended again in buffer. The standard procedure for seeded settling[6,7] was to mix the required quantity of seed with the suspension and allow it to settle. The initial absorbance was adjusted to 0.2 OD at 550 nm. After 10 min a sample of the supernatant was taken to determine the drop in absorbance of the samples at 550 nm using Klett-Summersion type colorimeter (Biochem Model M6).

The flocculation rate was calculated by the difference in the absorbance per initial absorbance multiplied by the time factor.

Figure 1 shows a comparison of the flocculation of

*Dedicated to Prof. S. Krishnaswamy, Vice-Chancellor, Madurai Kamaraj University in commemoration of his 60th birth anniversary, 1986.