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

<table>
<thead>
<tr>
<th>Succinate dehydrogenase (activity mg protein)*</th>
<th>50% of LD&lt;sub&gt;50&lt;/sub&gt; (adult rats)</th>
<th>5% of LD&lt;sub&gt;50&lt;/sub&gt; for 15 days (weanling rats)</th>
<th>5% of LD&lt;sub&gt;50&lt;/sub&gt; for 60 days (weanling rats)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control group</td>
<td>29.64 ± 3.82</td>
<td>31.06 ± 2.45</td>
<td>51.85 ± 7.55</td>
</tr>
<tr>
<td>Carbaryl fed group</td>
<td>27.38 ± 7.24</td>
<td>26.68 ± 1.67</td>
<td>41.30 ± 4.48</td>
</tr>
<tr>
<td>(7.6) P &gt; 0.05</td>
<td>(14.1) P &lt; 0.05</td>
<td>(20.3) P &lt; 0.05</td>
<td></td>
</tr>
<tr>
<td>Bavistin fed group</td>
<td>25.26 ± 4.38</td>
<td>28.79 ± 2.94</td>
<td>27.23 ± 1.82</td>
</tr>
<tr>
<td>(14.77) P &gt; 0.05</td>
<td>(7.3) P &gt; 0.05</td>
<td>(47.5) P &lt; 0.001</td>
<td></td>
</tr>
<tr>
<td>Elsan fed group</td>
<td>25.20 ± 6.30</td>
<td>29.98 ± 3.37</td>
<td>37.70 ± 3.73</td>
</tr>
<tr>
<td>(15.0) P &lt; 0.05</td>
<td>(3.5) P &gt; 0.05</td>
<td>(27.3) P &lt; 0.01</td>
<td></td>
</tr>
<tr>
<td>Phosalone fed group</td>
<td>21.55 ± 6.57</td>
<td>25.52 ± 1.94</td>
<td>29.20 ± 2.40</td>
</tr>
<tr>
<td>(27.3) P &lt; 0.05</td>
<td>(17.82) P &lt; 0.01</td>
<td>(43.7) P &lt; 0.001</td>
<td></td>
</tr>
</tbody>
</table>

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 was sluggish.

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2. BASF India Limited, Agrochemicals Division, Bombay, Technical Information Plant Protection.

TETRAZOLIUM REDUCING MICROORGANISMS INSIDE THE ROOT OF BRASSICA SPECIES

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Microscopic studies were carried out to study the presence of diastrophs 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<sup>1</sup> 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 × (LM) 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 coccoïd, 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 Azospirillum-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 dicotyledonous. Some of these microorganisms were confirmed by isolation and acetylene reduction assay to be diastrophs. Till now, the presence of these organisms was reported<sup>1,3</sup> only in the monocot family Gramineae.

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

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.

Fellowship from IARI to SA is gratefully acknowledged. Thanks are due to Dr. Rajani Apte for a critical reading of the manuscript.

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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, in which divalent and monovalent cations 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.

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 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-Summerson 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.