FREE PROLINE ACCUMULATION IN RESPONSE TO WATER STRESS IN WHEAT SEEDLINGS

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The seedlings were transferred to the solutions of various external water potentials (-1.5, -3, -5 and -7.5 bars). After 1, 2 and 3 days of stress, the seedlings were washed with distilled water, blot-dried, weighed and used for the estimation of total free proline content.

The free proline was determined using the procedure of Bates et al. Duplicate samples (5 seedlings) were homogenised with 10 ml of 3% aqueous sulfosalicylic acid and the homogenate was centrifuged at 8000 g. Two ml of the centrifugate was reacted with 2 ml acid ninhydrin and 2 ml of glacial acetic acid in a test tube for 1 hour at 100°C, and the reaction was terminated in an ice bath. The reaction mixture was extracted with 4 ml toluene and mixed vigorously using a test tube stirrer for 30 seconds. The toluene layer was aspirated from the aqueous phase, warmed to room temperature and the absorbance read at 520 nm using toluene for a blank. Standard curve for the determination of proline concentration was prepared using pure proline obtained from Sigma Chemical Company.

The results shown in table I show that the water stress leads to proline accumulation in both the wheat varieties. These results are similar to those obtained previously. The relative proline accumulation increased with the decrease in external water potentials; this was more in the drought resistant variety on 1st, 2nd and 3rd day as compared to drought sensitive variety at all water potentials though the growth rate of the seedlings of both the varieties at a particular water potential was not significantly different. The proline accumulation increased with degree of stress up to 3 days. The relative proline accumulation was significantly greater in drought resistant variety, which shows that in this species proline accumulation is correlated with drought resistance.

The synthesis and oxidation of proline seem to be very sensitive to water stress in wheat (Triticum aestivum L., var. C-306 and HD-2009) as reflected by its rapid accumulation. As the plants experience water stress, there is an increase in proline synthesis from glutamate and decrease in proline oxidation. The increase in proline accumulation with increasing water stress can be explained by presuming that increasing water stress speeds up proline synthesis from glutamate and decrease in proline oxidation simultaneously.

Free proline accumulation has been suggested as an evaluation parameter for irrigation scheduling and for characterizing drought resistant varieties. The genetically determined potentials for accumulating betaine and proline have been interpreted as adaptive traits associated with salt tolerance in the case of betaine and with both drought resistance and salt tolerance in the case of proline. It can be seen from the present studies that the proline accumulation in...
### Table 1

*Effect of different degrees of water stress on free proline accumulation in 4-day-old seedlings of drought resistant and drought sensitive cultivars of wheat*

<table>
<thead>
<tr>
<th>Water Potential (bars)</th>
<th>Mean proline content (µg per 100 mg fresh weight) after various periods of water stress</th>
<th>1 day</th>
<th>2 days</th>
<th>3 days</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 (Control)</td>
<td></td>
<td>25·1</td>
<td>30·9</td>
<td>28·0</td>
</tr>
<tr>
<td>-1·5</td>
<td></td>
<td>39·6</td>
<td>42·2</td>
<td>40·9</td>
</tr>
<tr>
<td>-3·0</td>
<td></td>
<td>50·4</td>
<td>48·0</td>
<td>49·2</td>
</tr>
<tr>
<td>-5·0</td>
<td></td>
<td>63·8</td>
<td>55·7</td>
<td>59·7</td>
</tr>
<tr>
<td>-7·5</td>
<td></td>
<td>89·7</td>
<td>78·2</td>
<td>84·0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>F Test</th>
<th>V*</th>
<th>V**</th>
<th>V**</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>T**</td>
<td>VXT**</td>
<td>VXT**</td>
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<td></td>
<td>VXT**</td>
<td>VXT**</td>
<td>VXT**</td>
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<td>SEm</td>
<td>V 0·8</td>
<td>V 0·6</td>
<td>V 0·93</td>
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<tr>
<td></td>
<td>T 1·3</td>
<td>T 1·0</td>
<td>T 1·4</td>
</tr>
<tr>
<td></td>
<td>VXT 1·8</td>
<td>VXT 1·5</td>
<td>VXT 2·0</td>
</tr>
<tr>
<td>CD 5%</td>
<td>V 2·6</td>
<td>CD5% V 2·1</td>
<td>CD 5% V 2·9</td>
</tr>
<tr>
<td></td>
<td>T 4·1</td>
<td>T 3·3</td>
<td>T 4·6</td>
</tr>
<tr>
<td></td>
<td>VXT 5·8</td>
<td>VXT 4·8</td>
<td>VXT 6·6</td>
</tr>
</tbody>
</table>

*Significant at 5%
**Significant at 1%
the drought resistant cultivar C-306 on third day of stress (at-7.5 bars) appeared much more over the control value. The survival value of proline accumulation during severe water stress has, however, been questioned and it has been suggested that high proline levels in drought-stressed leaves are essentially a symptom of injury. However the assumption that the capacity for proline accumulation is positively correlated with drought resistances can only be made with some caution. Upon relief of the stress, accumulated proline is rapidly incorporated into protein or oxidized to α-oxoglutarate.

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NEW MARKET DISEASES OF BARHAL FRUIT

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During May-June 1980, about 8-12% fruits of Barhal (*Artocarpus lakoocha* Roxb) carried the rot symptoms in fruit markets at Agra and Aligarh. The infected patches were white, brown and black. The severely infected ones showed irregular depressions and exudation of a slimy substance that emitted repulsive fermented odour.

Two isolates *Aspergillus niger* Van Tieghem, and *Drechslera rostrata* (Drechsler) Richardson and Eraser were the causative agents that reproduced most of the above symptoms on pre-injured inoculated fruits but not on uninjured ones. The injury inflicted during plucking, transportation, etc. may govern the present host-pathogen relationship.

*A. niger* induced soft, black rot that spread rapidly to spoil nearly half of the inoculated fruit within 8 days. Disintegration of tissues brought about by the pathogen resulted in the development of irregular shallow depressions accompanied with secretion of yellowish substance with foul odour.

*D. rostrata* developed irregular white brown spots at the site of inoculation. Mycelial growth accompanied with abundant sporulation indicated host-pathogen compatibility. The rotten tissues turned water-soaked and emitted foul odour.

Prior to the present study only *Rhizopus oryzae*1 Went and Geerlings and *Alternaria tenuis*2 Nees have been recorded on Barhal fruits, hence the diseases described above have been noted for the first time in India.

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A TECHNIQUE FOR SOMATIC COUNTS FROM ROOT TIPS OF CEREAL SEEDLINGS RAISED BY EMBRYO CULTURE

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Wide crosses in cereals are useful for creating variability, transferring genes and studying phylogenetic relationships. In these crosses, however, the hybrid and sometimes even backcross embryos do not develop normally and result into shrivelled, inviable seeds due to the inability of the endosperm to nourish them. Thus cultivating excised embryos at early