Nitrate content in wheat leaf blades

To boost the yield of crop plants, excessive doses of nitrogen fertilizers are applied. This results in accumulation of nitrate in the vegetative parts. The content of accumulated nitrogen varies with the environmental conditions, cultivar, and age of the plant. Further, the accumulation of nitrate is likely to be particularly high under low-light conditions, and in the winter-grown crops. Presence of higher nitrate content in leafy vegetables and forage/fodder plants is of concern, as these are consumed by human beings as well as animals. Nitrate though is hardly toxic as such, its reduction to nitrite by bacteria in the stomach poses threat to human health, as the nitrite causes methaemogloblinemia, particularly in infants. Further, in combination with amines, nitrate also acts as a source of the carcinogenic nitrosamines.

To reduce the nitrate content in the leaves, the various strategies include: (i) Looking for genotypic differences in the level of nitrate accumulation for the same level of applied nitrogen. Such differences have been reported for several crops.

(ii) Steingrover et al., on the basis of their studies in spinach, suggested that harvesting should be carried out in the afternoon when the nitrate content in the leaf blades is low. It was further suggested that the petioles should be removed as they have four- to five-fold higher nitrate content than the leaf blades.

(iii) Considering that the enzyme nitrate reductase (NR) catalyses the rate limiting step in the sequence of reactions involved

<table>
<thead>
<tr>
<th>Variety</th>
<th>16</th>
<th>23</th>
<th>30</th>
<th>39</th>
<th>49</th>
<th>60</th>
<th>70</th>
<th>79</th>
<th>88</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low NR</td>
<td>380.3</td>
<td>218.0</td>
<td>245.8</td>
<td>151.8</td>
<td>148</td>
<td>101.2</td>
<td>13.2</td>
<td>14.4</td>
<td>18.3</td>
</tr>
<tr>
<td>High NR</td>
<td>267.7</td>
<td>151.5</td>
<td>167.9</td>
<td>139.1</td>
<td>8.2</td>
<td>52.3</td>
<td>7.2</td>
<td>8.9</td>
<td>7.9</td>
</tr>
<tr>
<td>LSD</td>
<td>45.5</td>
<td>18.3</td>
<td>21.3</td>
<td>27.4</td>
<td>6.6</td>
<td>15.0</td>
<td>3.8</td>
<td>2.4</td>
<td>3.2</td>
</tr>
</tbody>
</table>

Figures in parentheses indicate per cent decrease in nitrate accumulation in the high NR cultivar over that of the low NR cultivar.

Table 1. Nitrate content (μmol g⁻¹ dry weight) of leaf blades at different stages of growth in high and low NR wheat cultivars.
An interesting observation on the epidermal digestive glands of *Nepenthes khasiana* Hk.f.

The carnivorous plants have always intrigued biologists. Nearly 20–30% of the vascular plants contain glandular surfaces. These glands secrete many of the secondary products which have commercial value. A better understanding of the structure, cell biology and biochemistry of these glands may help in improving plant protection as well as finding additional compounds, secreted by these glands, with useful biological activity.

Heslop-Harrison and Lloyd studied the structure and morphology of secretory glands in the traps of insectivorous plants, particularly in *Nepenthes rafflesiana*. The present investigation is on the secretory glands of *N. khasiana* Hk.f., an endemic and endangered Indian insectivorous plant. The findings reveal that there are distinct digestive glands as well as a glandular epidermis, which are involved in secretion of enzymes for digestion.

The digestive glands are borkin-shaped and have prominent neck distributed on the margins and inner surface of the epidermal flap. These glands through minute openings in their neck discharge the digestive enzymes along with glutinous fluid (Figure 1a and b). The digestive glands are not connected with vascular bundle, and their outer tangential wall is highly thickened with inresutation of organic substances. The digestive enzymes have been located inside the globules present intracellularly in the inner and sub-epidermal layers of the pitcher, and their number ranges from 1 to 10 per cell, occasionally these globules are seen inside the digestive glands as.

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