Pusa neem golden urea for increasing nitrogen use efficiency in rice

Rice occupies about 23 million hectares of cultivated land and uses more than one-third of the total fertilizer nitrogen consumed in India\(^1\). However, nitrogen use efficiency in rice is hardly 30–40\% (ref. 2). Recovery of fertilizer N applied to rice and other crops can be increased by the use of nitrification inhibitors\(^3\). Nitrification-inhibiting property of neem seed extract and neem cake has been reported\(^4,5\). It has been reported that nitrification-inhibiting compounds are lipid associates\(^5\). An attempt was therefore made to prepare a urea-neem oil product.

Pusa neem golden urea (PNGU) an urea-neem oil 'adduct' was prepared by the process of crystallization from an oil/water emulsion containing urea. The coral-shaped golden yellow 'adduct' (Figure 1) analysed 33\% N as urea and 12\% neem oil. The detailed process of preparation of this urea product is covered under a patent application.

PNGU was tested against commercial prilled urea with a high-yielding rice variety Pusa 169 in a microplot field study at the Indian Agricultural Research Institute farm. The soil of the experimental field was a sandy clay loam of pH 8.1 and had 0.6% organic C. The experiment was laid out in a randomized block design with 3 replications. The treatments were all six combinations of 3 sources of N (PNGU, commercial prilled urea and urea-neem oil liquid emulsion) and two levels of N (60 and 120 kg N ha\(^{-1}\)) and a no nitrogen control. The results are given in Table 1. At 60 kg N ha\(^{-1}\) all the three sources of N were equally effective but at 120 kg N ha\(^{-1}\), which is the general recommended dose for high-yielding varieties of rice, PNGU produced 1.7 t ha\(^{-1}\) more grain than commercial urea, the difference was statistically significant. The increase in grain yield of rice was 36\% over that of commercial urea. Neem oil urea liquid emulsion without drying and crystallization was no better than urea. This is a preliminary report and more laboratory and field trials are planned in future.

Small amounts of PNGU can be obtained by researchers for laboratory/pot culture studies from the authors.

<table>
<thead>
<tr>
<th>Source</th>
<th>60 kg N ha(^{-1})</th>
<th>120 kg N ha(^{-1})</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urea</td>
<td>5.0</td>
<td>4.7</td>
</tr>
<tr>
<td>Neem oil-urea emulsion</td>
<td>4.2</td>
<td>5.2</td>
</tr>
<tr>
<td>Pusa neem gold</td>
<td>4.5</td>
<td>6.4</td>
</tr>
<tr>
<td>CD 5%</td>
<td></td>
<td>1.06</td>
</tr>
</tbody>
</table>


RAJENDRA PRASAD*  
V. S. SAXENA¹  
C. DEVAKUMAR³

Divisions of *Agronomy, ¹Entomology and ³Agricultural Chemistry,  
Indian Agricultural Research Institute,  
New Delhi 110012, India