Effect of Organic Nitrogen Levels on N Fixation in Pea-Barley Mixture

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Effect of organic nitrogen levels on N fixation in pea-barley mixture

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Keywords: Organic farming, N fixation.

Introduction

One limitation in organic farming is short supply of forage. Organic fertilizer including cattle manure is overproduced in Korea but farmers are reluctant to use these kinds of resources because of heavy weight and handling cost. Legumes are of crucial importance for the N supply of grassland farming. They convert atmospheric dinitrogen (N₂) to plant available N through symbiosis. Information on grassland farming. They convert atmospheric dinitrogen (N₂) to plant available N through symbiosis. The greatest fixation was from the 80 kg organic N plots. Using the applied difference method, the transfer rate and transfer amount were highest in the 120 kg N treatment (Table 2). N transfer rate was from 23.1 to 47.5% and the amount ranged from 44.1 to 91.7 kg/ha. Haby et al. (2006), reported %Ndfa was 42 and the transfer N yield was less than 18kg/ha/yr. Anderson et al. (2004) reported that the greatest relative amount of N₂ fixed at maturity was measured for the pea grown in association with rape under condition of low N fertilization. Because the 15N dilution method is based on concentration (of 15N) in the N uptake and not on the total N amount as in the difference method, there was difference between two methods in terms of N fixation and transfer amount. (Geijersstam et al. 2006).

Results and Discussion

Table 1 shows the estimate of N fixation and transfer by 15N dilution. The percent of total N derived from atmosphere (%Ndfa) at maturity ranged from 0.89 to 4.45, indicating a very low value. There were significant differences between treatments with 40kg organic N lower than other N levels. Sakai et al. (2011) reported intercropping with lupin and cowpea transferred 18 and 17% of N, and transfer N from pea to oat was 10.7 to10.3 kg/ha. The greatest fixation was from the 80 kg organic N plots. Using the applied difference method, the transfer rate and transfer amount were highest in the 120 kg N

<table>
<thead>
<tr>
<th>Treatments (N/ha)</th>
<th>N fixation rate (%)</th>
<th>Total N (kg/ha)</th>
<th>Fixed amount (kg/ha)</th>
<th>Transfer amount (kg/ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organic N 40 kg</td>
<td>0.89a</td>
<td>192</td>
<td>1.71</td>
<td>0</td>
</tr>
<tr>
<td>Organic N 80 kg</td>
<td>4.43b</td>
<td>233</td>
<td>10.32</td>
<td>0</td>
</tr>
<tr>
<td>Organic N 120 kg</td>
<td>4.65b</td>
<td>195</td>
<td>9.08</td>
<td>0</td>
</tr>
</tbody>
</table>

15N-dilution method. Pnon-leg(<=atm) = 1 - (Enon-leg(m)/Enon-leg(p))
Pleg(<=atm) = 1 - (Eleg(m)/Enon-leg(p))

<table>
<thead>
<tr>
<th>Treatment (N/ha)</th>
<th>N transfer rate (%)</th>
<th>Total N (kg/ha)</th>
<th>Transfer amount (kg/ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organic N 40 kg</td>
<td>23.1a</td>
<td>192</td>
<td>44.1</td>
</tr>
<tr>
<td>Organic N 80 kg</td>
<td>23.2a</td>
<td>232</td>
<td>56.9</td>
</tr>
<tr>
<td>Organic N 120 kg</td>
<td>47.3b</td>
<td>195</td>
<td>91.7</td>
</tr>
</tbody>
</table>

The N-difference method. Nleg(<=non-leg) = Nnon-leg(m) - Nnon-leg(p)R(1, Pnon-leg(<=leg) = Nleg(<=non-leg)/Nnon-leg(m) = 1 - (Nnon-leg(p)R/Nnon-leg(m))

Discussion

Our findings indicate that there was large difference between 15N dilution and difference method for determination of N fixation from atmosphere. N transfer to barley was 0.89 to 4.65% in 15N dilution and 23.1 to 47.5% in difference method when organic N fertilization levels were different. We also confirm that estimates of N₂ fixation were varied with measurement method, maturity, soil, plant and so on.
References


