Using Urea Nitrogen as a Fertilizer

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Using Urea Nitrogen as a Fertilizer

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Solid granular or prilled urea (45-46% N) has become widely available in Kentucky, as has 28% nitrogen solution (UAN solution) which is half urea and half ammonium nitrate. When applied to a field, urea is transformed to ammonium N soon after application. The rate of transformation is greatly increased by urease, the enzyme found to varying degrees in soil and on plants and plant residues. Due to the chemical reactions involved as urea nitrogen undergoes transformation, there is some degree of likelihood for volatilization loss of some N. Whether such a loss will occur, and how much N will be lost if it does occur, relates to temperature, moisture, degree of contact with soil, and pH of the soil.

Effect of Temperature - Enzymes which convert urea to ammonium are not very active until the weather warms. Our research in Kentucky indicates that it will usually be early April before this rate of transformation will be great enough that risk of volatilization is economically important.

Effect of Moisture - There are two thoughts to keep in mind about moisture, (1) if soil, plants, or residue onto which urea is applied are moist, enzymatic activity will be increased and urea will rapidly convert to ammonium assuming the temperature is warm enough, and (2) if applied onto soil, plants, or residues and enough rain occurs within 1-2 days to soak the urea into the soil, volatilization loss will be minimal.

Degree of Contact With Soil - As urea converts to ammonium, the ammonium will react strongly enough with soil to minimize volatilization. The less soil contact with urea or UAN solutions when the N is applied, the greater the risk for volatilization loss of N. When surface applied to bare soil and worked in, there is virtually no risk. When surface applied to bare soil and not worked in, there is little risk unless soil pH is above 6.5. When surface applied to no-till corn, the risk can vary from great where there are enough residues to prevent much soil contact, to slight where residues are thin enough that most of the N contacts the soil. When topdressed onto grass sod where there is little initial contact with soil, risk is great after mid-spring.

Effect of Soil pH - This has little effect on N loss except where urea is spread onto bare soil and not worked in. Under such conditions risk of volatilization can be great if surface pH of soil is above 6.5.
Additional Notes - If using starter fertilizers which have been blended using urea, do not place the fertilizer in contact with seed since concentration of ammonia resulting from urea breakdown can be toxic to germinating seeds. Solid urea (46% N) contains 920 pounds of actual N per ton of material; UAN (28%) contains 560 pounds of actual N per ton of material (approx. 3 lbs actual N per gallon); ammonium nitrate (33.5%) contains 667 pounds actual N per ton of material. Carefully consider the price per pound of actual N together with convenience in application and the relative risk of N loss for the particular crop when deciding which source of N is best for you.

<table>
<thead>
<tr>
<th>Crop</th>
<th>Comments on Use of Urea</th>
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<tbody>
<tr>
<td>Tobacco</td>
<td>No problem if worked into soil. Watch pH since urea is acid forming and plants utilize ammonium forms of N best at soil pH of 6.0 to 6.5.</td>
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<tr>
<td>Conventional Corn</td>
<td>No problem if worked into soil or even if not worked in when pH of surface is not above 6.5.</td>
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<tr>
<td>No-Till Corn</td>
<td>There is risk for volatilization if enough residue is present to prevent soil contact of N and it doesn't rain within a day or two after application. UK research shows that urea sometimes performs as well or better than ammonium nitrate, and sometimes performs worse. Because of its rainfall related performance, the risk of N loss from urea on no-till corn cannot accurately be predicted.</td>
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<tr>
<td>Small Grains</td>
<td>Since small grains are topdressed in cool weather, there is little risk involved. UK research shows no difference among ammonium nitrate, urea or UAN solutions for this practice.</td>
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<tr>
<td>Cool Season Grass</td>
<td>Since there won't be much soil contact of N when topdressed onto grass meadows and pastures, risk for volatilization can be great, particularly if applied after mid-spring. UK research shows 5-30% losses as compared to ammonium nitrate when topdressed after mid-spring.</td>
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