

Agricultural Limestone's Neutralizing Value



The value of limestone is in its ability to neutralize soil acidity. However, you may have uneven results when you add limestone, even if you follow the recommended application rates and procedures.

Limestone's properties differ considerably, and these differences influence the limestone's ability to neutralize soil acidity. Effectiveness depends on the purity of the liming material and how finely it is ground. Handling or storage properties, however, do not indicate the quality of liming material and have no functions in soil chemistry and fertility.

The purity of lime is rated by a laboratory's measurement of a calcium carbonate equivalent (CCE). The CCE is written as a weight percentage of the material. CCE also reflects the chemicals present in the limestone (calcium carbonate, magnesium carbonate, calcium hydroxide, etc.). The lower the CCE value, the more lime you will need to neutralize the soil's acidity.

Lime is not soluble in water, so particles must be finely ground to neutralize soil acidity in an agronomically reasonable period of time. Even very small changes in the size of the particle have a major effect on the time required to dissolve the particles.

Half the limestone particles that can pass through a 10-mesh sieve but not a 50-mesh sieve will dissolve and neutralize soil acidity in a reasonable period of time. Particles smaller than 50 mesh neutralize soil acidity in a relatively short time period. Lime particles larger than 10 mesh do not change the soil pH.

Each quarry selling lime in Mississippi must submit samples yearly for analysis. Most states have similar consumer protection laws. In Mississippi, vendors of liming material are required to provide buyers with relative neutralizing value (RNV) data as determined by the Mississippi State Chemical Laboratory.

The RNV of a lime is an index of how good it is at neutralizing soil acidity. It is sometimes called effective calcium carbonate equivalent (ECCE). It gives credit for one-half of the lime sized between 10 mesh and 50 mesh and all lime finer than 50 mesh. This number estimates how much of the lime will neutralize the soil

in a reasonable amount of time. It then adjusts the value for impurities by multiplying by the CCE value of the material.

Example calculations of RNV or ECCE:

| | |
|----------------------------------|----|
| CCE | 92 |
| Percent passing a 10-mesh screen | 94 |
| Percent passing a 50-mesh screen | 50 |

$$\text{RNV} = (0.92 \times (0.5 \times (94 - 50)) + 50) \times 100 = 66.2\%$$

If you subtract the amount of lime that passes through a 50-mesh screen from the amount that passes through a 10-mesh screen, you find the amount of lime that is about 50 percent effective in a reasonable period of time. In this sample, you would subtract 50 from 94. That gives 44, which you would then multiply by 0.5 (or divide by 2), leaving 22. These calculations estimate the percentage of these particles that will neutralize the soil in time. Then, you add the percent passing through a 50-mesh screen, which in this case is 50. These finer particles aren't divided by anything because they are about 100 percent effective. Next, you multiply the sum (in this case, 77) by the decimal value of the CCE. In this example, about 66 percent of the lime is effective in neutralizing acidity in an acceptable time period.

Adjust application rates according to your own situation. Recommendations from the Soil Testing Laboratory at Mississippi State University are based on a CCE of 100 percent; you will need to adjust the lime recommendations provided by the lab based on the material you actually use. Other soil testing laboratories may base lime recommendations on assumed CCEs or RNVs of less than 100 percent. Always check the assumptions of your laboratory before applying your lime.

If the lime recommendation is 2 tons per acre and the RNV of the lime is 75, adjust the recommended rate by dividing 2 tons by 0.75 for an application rate of 2.67 tons per acre. Using the other example, lime with an RNV of 66 would need 3.03 tons to supply the equivalent of 2 tons of 100 RNV or CCE lime (2 tons/0.66=3.03).

The RNV or ECCE allows you to compare value between materials from different sources. For example, suppose you find two agricultural liming materials. One has an RNV of 66 percent and costs \$25 per ton. The other has an RNV of 85 percent and costs \$30 per ton. Which is the better buy? By dividing the price per ton by the RNV decimal value, you can estimate the agronomic value of the materials.

$$(\$25/0.66) = \$38, \text{ as compared to}$$
$$(\$30/0.85) = \$35$$

In this example, the material that is cheaper per ton actually ends up costing more to neutralize the soil's acidity.

The RNV/ECCE concept emphasizes the lime-quality factors: purity and fineness. Ease of transport, storage, or spreading does not indicate quality of agricultural limestone. To help make good decisions when buying your lime, find and use all legally required and available information about the different liming materials.

More information on lime issues is available in MSU Extension Publication 2647 *Nutrient Management Guidelines for Agronomic Crops Grown in Mississippi*.

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