

MODELISATION OF THE DISSOLUTION KINETIC OF PARTICLES OF CHALK FERTILIZER

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(Science du Sol n° 1982-4)

In acid soils which represent about half of the french soils, the performances of the majority of cultivated plants are greatly improved through use of chalk fertilizers. The acid soils of Brittany, more particularly, which lie on granites or schists rich in organic matter (4 to 8%), frequently of little depth and of sand-loam texture, have a pH inferior to 5 when they have not been fertilized with chalk for a long time.

Following addition of chalk fertilizers, the pH variations of an acide soil suggest that the equation and dissolution of these fertilizing substances is : $dq = K S dt$ which expresses that the quantity of calcium dq springing from chalk particles during dt is proportioned to their surfaces. We studied in the laboratory the dissolution of chalk particles of bryozoaires in sticks.

The particles are individualized in the aqueous phase by using a column in fluidised bed. The fluidisation output is regulated by a circulation pump. The aggressivity level of the solution is obtained by taking into account the value of $(Ca_{eq}^{++}-Ca^{++})$ and the P_{CO_2} of gaz put into contact with this solution. This gaz is first humidified to the experiment temperature ($-Ca^{++}$ eq, corresponds to the calcium concentration for the equilibrium).

We placed ourselves under such conditions that the limiting kinetic was the same that of the dissolution. To achieve those conditions we used an adequate output, in the vicinity of 1/min to avoid a control by the transfert kinetic of CO_2 of the gaseous phase into the liquid phase.

Te results obtained in the laboratory seem to show that the chalk stick studied melt more quickly at the beginning of the dissolution than perfect cylinders ; however, the homogeneity of their chemical composition ought to be studied. This speed of dissolution decreases with the state of progress of the latter. Towards the end of the dissolution, one can observe through the scanning electronic microscope a rapid diminution of the surface used. Among the values of the P_{CO_2} and of the calcium concentration permitting to obtain the average speed of the dissolution, lie the average values probably found in that soil. Under these conditions, the speed of dissolution in the soil could be controlled chiefly through the surface reactions. However, it would be desirable to find out how this average speed develops in time and space.

Lastly, as these results were obtained with a solution output high by comparison to that found in the soil, it would be suitable to know if, for the potentiality factors characteristic of the soil, the dissolution speed diminishes when the output decreases. From these results, some principles relating to the modes of use of chalk fertilizers were drawn and a practical guide was proposed to adjust, thanks to the model studied, a few of the parameters taken into account to control the pH of acid soils thanks to chalk amendments (calcium count in the soil, characteristics of the fertilized soil layer, size and form of the chalk particles).

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This work, however, did not permit to know precisely the way in which the dissolution speed of chalk particles may vary in the ground in relation to its characteristics and the hydric regime, thus limiting its bearings ; in order to improve it, some new researches, analytic as well as synthetic would be required.