

OXYGEN DIFFUSION METER



P1.66
Parts List
Pg 341

In plant cultivation it is very important that the soil has proper ventilation. The necessary oxygen supply for the roots and the discharge of the carbon dioxide gas that is formed there, in case of most cultivated growth, takes place via the soil. Also soil chemical processes depend on the presence of oxygen in the soil.

The major part of the transport of O₂ and CO₂ is executed via the so called 'gas phase' of the soil, or via the air filled pores. The gas phase is an essential part of the soil; plant growth and soil are seriously influenced by the extend and composition of the gas phase. The air content of the soil depends on the soil moisture content and the soil structure.

Lack of oxygen (insufficient aeration) may lead to:

- Reduction of root growth.
- Reduced availability of nutrients.
- Reduction of evaporation.
- Reduction of the rate of photosynthesis.

All of this leads to a reduction in the production of plant material.

Gas transport thus is necessary in order to get enough oxygen into the soil. The partial pressure of the oxygen in the soil air due to consumption will be less than in the atmosphere.

As a consequence the diffusion process causes a net supply of oxygen molecules into the soil and, in the other direction, a discharge of the carbon dioxide molecules from the soil.

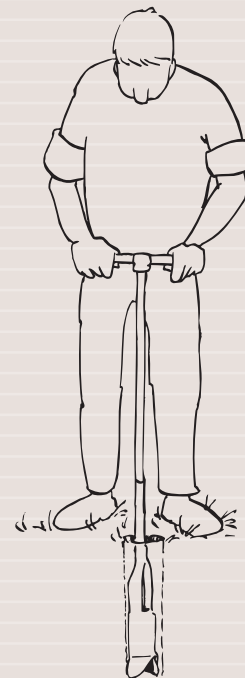
Gas diffusion in the soil almost solely takes place via the continuously air-filled pores (oxygen diffuses through water only very slowly).

Plants need air as well as water, a permanent heterogeneous pore system thus is an essential requirement.

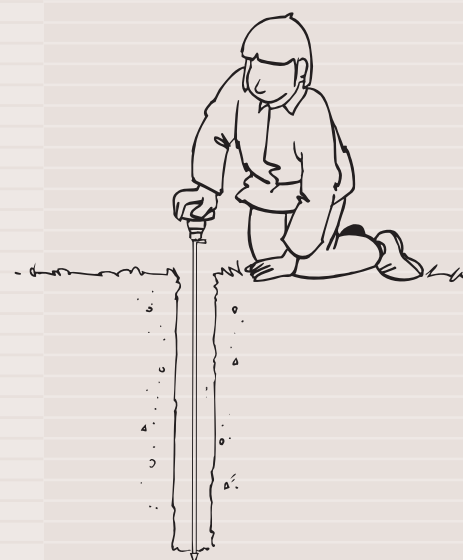
Such a pore system is enhanced by the following: activation of soil life; drainage and tillage.

The process of aeration is hindered by: soil compaction; the soil being too wet; soaking; paving and adding material.

To place the oxygen diffusion probe a hole is pre-drilled with a Riverside auger.



The oxygen diffusion probe is pushed into the bottom of the pre-drilled hole.

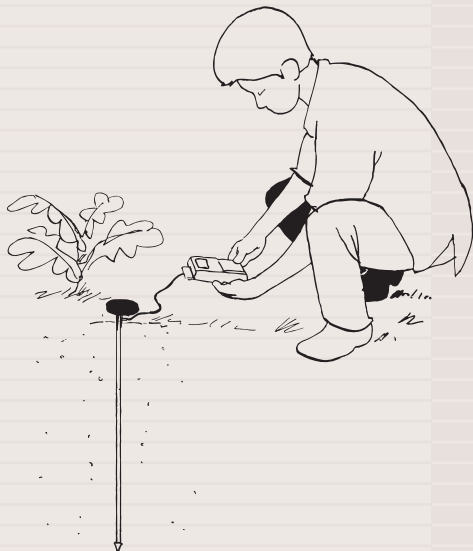


Oxygen diffusion measurement system



P1.66
Parts List
Pg 341

The oxygen diffusion meter is read.



OXYGEN DIFFUSION METER



14.36 Oxygen diffusion meter

The oxygen diffusion meter measures the mobility of oxygen in the soil. A mobility that is important for the availability of oxygen for plants.

The method: measuring the electric current required for the reduction of all oxygen present at the surface of a cylindrical Pt-electrode in the soil. The flow of oxygen through the air-filled pores and the water film on the electrode is measured until the steady state is reached.

The Oxygen Diffusion Rate (ODR) probe (Pt-electrode) should be placed in undisturbed soil. To this purpose a hole is pre-drilled to a depth of approximately 10 mm above the measuring point, after which the probe is lowered and carefully pushed into the bottom of the augerhole. It is advised to remove the electrode from the soil after a series of measurements in order to clean it.

The meter provides a stabilized voltage between the ODR-probe and the Ag-AgCl-reference electrode.

In very dry soils only part of the electrode will be

covered in water. This results in a rising impedance between soil and electrode. In such a situation the meter can also be used to perform a redox-potential measurement.

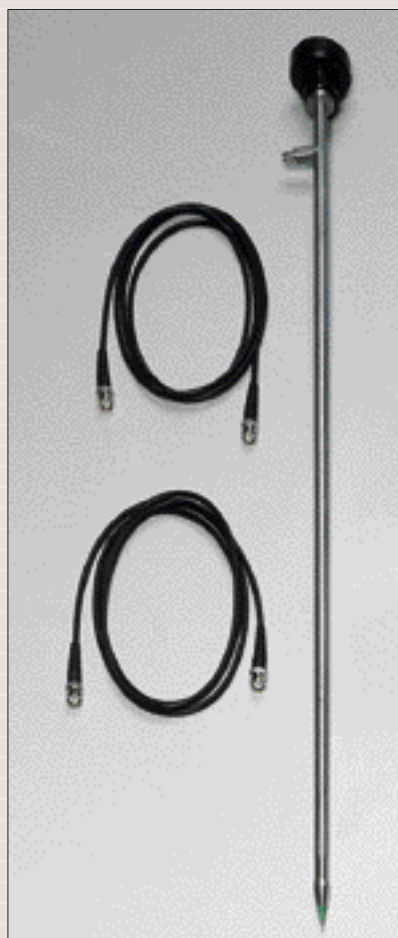
The measuring system consists of a read-out unit with connecting facilities for three ODR-probes, one ODR-probe, one Ag-AgCl reference electrode, KCl-solution and a brass electrode.

The reference electrode is used for measuring and checking the potential between the Pt-electrode and the soil.

The brass electrode is used to close the electrical circuit.

The measuring range for oxygen diffusion is 0 - 999 μ A and for Redox 0 - 999 mV (resolution resp. 1 μ A and 1 mV).

Accuracy +/- 3 μ A and +/- 3 mV. Operating temperature between 0 and 50°C and an air humidity between 30 - 80%. The meter is supplied in a case, incl. batteries.



Oxygen diffusion probe



Oxygen diffusion meter