Measurement of ORP (Eh) in Soil

Soil Eh levels are indicators of soil health[1], influencing plant growth and agricultural productivity.

Ideal Eh for most crops ranges from +400 to +450 mV[2], signifying well oxygenated, nutrient-rich soil.

Eh is measured by mixing soil with water to assess the solution's redox potential, offering insights into nutrient availability and overall soil condition.

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LAQUAtwin ORP-11 Product Page

Introduction

Redox potential (Eh) can serve as a measure of the soil's ability to engage in oxidation and reduction reactions, which are crucial for various soil processes. Soil Eh measurement is essential for understanding soil conditions and their impact on agricultural productivity. It provides insights into oxygen availability, nutrient availability, and overall soil health.[3]

Eh measurement serves as a valuable tool for optimizing soil management practices and detecting issues such as waterlogging.[4]

The optimal conditions for plant growth are dependent on factors like soil Eh and pH.[5]

Generally, oxygen-rich soils with higher Eh values typically promote better nutrient availability and foster healthy plant growth.

The optimal Eh range for plant growth varies among crops, with values typically falling between +400 to +450mV, at pH 5.5-8 indicating well oxygenated and nutrient-rich soils.[6]

Deviations from this range, such as soil Eh levels above +450mV (over oxygenated soil) or oxygen-deprived soil below +400mV, can pose risks such as mineral deficiency, heavy metal toxicity, and pathogen development, negatively impacting plant health.[7]

Maintaining adequate soil aeration and drainage is essential for preventing oxygen poor conditions and promoting healthy plant growth.

LAQUAtwin ORP-11 pocket meter offers a convenient solution for monitoring soil Eh, providing exceptional accuracy of ±2mV.

With its ease of use and reliability, the meter facilitates efficient Eh measurement in soil, enabling agricultural practitioners to make informed decisions regarding soil management.

The pocket-sized ORP meter measures both ORP and Eh value (voltage reading vs. the Standard Hydrogen Electrode or SHE)

ORP uses practical reference electrodes like Ag/AgCl commonly used in industry and field applications, while Eh is typically referenced to the theoretical SHE (Standard Hydrogen Electrode) used in scientific research and standardization.

Selection of parameter (Eh or ORP) can be done during the set-up of LAQUAtwin meter. For more information, refer to meter manual.

pH measurement can be taken using our LAQUAtwin pH meter.

Method

Collection & Preparation

1. Collect dry soil samples from representative areas and pass them through a 2mm sieve to remove debris. Take note that soil moisture affects ORP readings.
2. Prepare a soil extract by mixing soil and water in a 1:2 ratio. Shake the mixture and take the reading. (Ensure soil is moist but not too much that it affects ORP reading)

Calibration

Calibrate the **LAQUAtwin ORP-11 pocket meter** using 225-mV standard solution to ensure accurate readings.

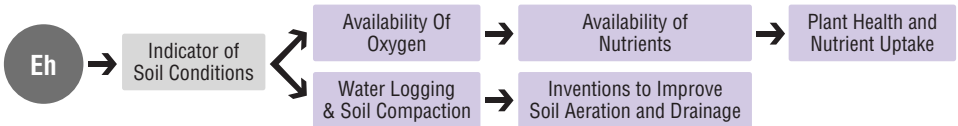
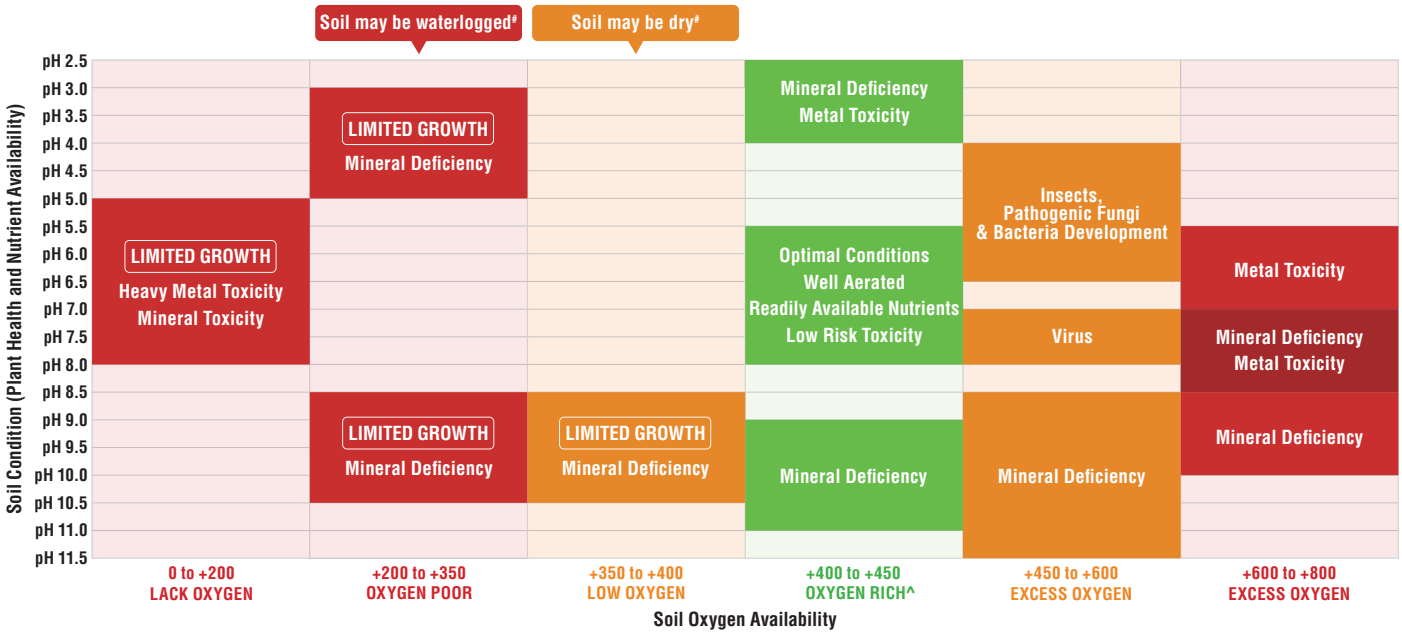


Figure 1: Eh as Indicator of Soil Conditions

Continued at the back

Continued from the front

Figure 2: Soil Conditions at Different Eh Levels



^Plant health depends on soil pH as well #Pearsall and Mortimer 1939; Pezeshki 2001 *Subjected to crop

Measurement

1. Place drops of clear liquid from the top layer of the soil extract (or filtrate, if filtered) onto the sensor.
2. Record the stabilized reading.
3. Rinse the sensor with water and blot it dry with tissue after each sample.
4. Measure pH with our LAQUAtwin pH and refer to the table above.

Results And Benefits

Measurement of ORP helps farmers optimize irrigation, drainage, and fertilization practices.

It detects waterlogging, preventing conditions that lack oxygen that can hinder plant growth.

Additionally, it enhances nutrient and oxygen availability in the soil.

Overall, ORP measurement supports sustainable crop production by ensuring efficient soil management.

Table 2: Ways to increase ORP or decrease ORP (Oxygen Levels)

Increasing ORP	Decreasing ORP
• **Enhance Aeration** – Soil Aeration using tilling[8] or making holes in soil	• **Reduce Aeration** – Avoid excessive aeration • **Improve Soil Moisture** – Higher soil moisture
• **Improve soil structure** – Soil Amendments[9]: Add materials like perlite(granular), sand	• **Use of Reducing Agents** – Organic Matter[10]: Add compost or manure to the soil
• **Water Management** – Proper drainage[11] to prevent waterlogging conditions.	

References And Suggested Readings

1-7 Husson, O. Redox potential (Eh) and pH as drivers of soil/plant/microorganism systems: a transdisciplinary overview pointing to integrative opportunities for agronomy. *Plant Soil* ***362***, 389–417 (2013). https://doi.org/10.1007/s11104-012-1429-7

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Figure 1 Husson, O. Redox potential (Eh) and pH as drivers of soil/plant/microorganism systems: a transdisciplinary overview pointing to integrative opportunities for agronomy. *Plant Soil* ***362***, 389–417 (2013). https://doi.org/10.1007/s11104-012-1429-7

Figure 2 Husson, O. Redox potential (Eh) and pH as drivers of soil/plant/microorganism systems: a transdisciplinary overview pointing to integrative opportunities for agronomy. *Plant Soil* ***362***, 389–417 (2013).

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