Soil agrochemical analysis

Published: 17.03.2022.

Soil agrochemical testing provides information on:

- soil fertility;
- the need for liming;
- suitability for growing certain crops.

The soil is tested for:

- organic matter content, soil reaction (pH), mobile phosphorus and potassium content;
- secondary elements - Mg, Ca, S-SO4 and trace elements - B, Cu, Mn, Zn (Fe and Na can also be tested for, but there is no assessment group for these elements).

Soil agrochemical indicators

Soil reaction

The soil reaction (pH KCl) can be acidic (pH KCl < 7), neutral (pH KCl ~ 7) or alkaline (pH KCl > 7).

Each crop has different soil reaction requirements. Preferred pH KCl

7,0 - 7,57 beet, cabbage, alfalfa;

6,0 - 7,00 wheat, barley, maize, rape, peas, beans, clover, chard, cucumbers, onions;

5,5 - 6,00 rye, oats, grasses, radishes, carrots, tomatoes;

5,0 - 6,0 potatoes, flax;

4,2 - 5,2 individual crops (blueberries, cranberries).

In acid soils, most crops develop inefficient root systems, the overall biological activity of the soil decreases and some nutrients become difficult for plants to use.

Soil acidity is reduced by liming. The optimum liming rate should take into account the soil's granulometric composition, organic matter content and pH KCl. Even after liming, soils become progressively more acidic, so liming must be repeated.

Organic matter

Ensures soil structure, thus optimum water and air conditions.

Is a reserve of plant nutrients (especially nitrogen and sulphur) in the soil.

Contributes to the microbiological activity of the soil by providing a food source for soil micro-organisms.

Contains biologically active substances, auxins, which stimulate plant growth and development.

Increases the soil's ability to bind plant nutrients and protect them from leaching.

Depending on the granulometric composition of the soil, the preferred organic matter content for mineral soils is between 2.0 and 3.5%.

To ensure optimum organic matter content in the soil, organic fertilisers should be applied regularly

manure (litter, liquid manure, slurry), digestate, straw, green manure.

On average, at least 2 to 2.5 t ha-1 of organic manure solids should be applied per year.

Minimal tillage and moderate nitrogen application reduce organic matter mineralisation fertiliser.

When manure and digestate are used, no more than 170 kg nitrogen per ha should be applied per year.

Phosphorus and potassium

To avoid reducing soil fertility, fertiliser rates for crops should be planned according to the crop, the planned yield and the phosphorus and potassium supply of the soil.

High yields should not be planned on soils with very low and low phosphorus and/or potassium availability, as the fertiliser applied will not be economically viable to achieve the yield and will also create a risk of contamination (this is particularly true for nitrogen and phosphorus fertilisers applied).

The desired P_2O_5 and K_2O content can be achieved by the systematic application of appropriate fertilisers. To be taken from

P_2O_5 and K_2O should be applied in the base fertiliser.

Secondary plant nutrients

Secondary plant nutrients are relatively essential for plants, so they can become scarce under intensive farming.

Soil agrochemical studies can identify the following secondary elements:

Ca, Mg, S.

Calcium (Ca), like organic matter, is necessary for the formation of a strong soil structure, thus ensuring an optimal water and air regime. Calcium as a nutrient is usually abundant in mineral soils, but may be deficient in acid soils.

Ca is particularly necessary for the normal development and functioning of the root system. Ca deficiency can be prevented by liming the soil.

Magnesium (Mg) is needed for the synthesis of carbohydrates, proteins and fats. Crops with a high vegetative mass (beet, vegetables, grasses) are particularly high consumers of Mg. Magnesium is generally deficient in acid, sandy and peaty soils.

The optimum Ca:Mg ratio is 6.5:1.

Sulphur (S) is an important component of proteins. It is particularly needed in cruciferous (e.g. oilseed rape) and leguminous (e.g. beans, peas) crops. Sulphur is usually deficient in soils with low organic matter content.

Trace elements

The agrochemical analysis of VAAD soils allows the determination of the following trace elements: B, Cu, Mn, Zn.

The trace elements are required by plants in very small quantities, therefore:

- if the soil micronutrient supply is high, micronutrient fertilisers can be avoided,
- if the supply is medium, micronutrient fertilisers should be applied to demanding crops in situations where conditions are unfavourable for micronutrient uptake (freshly limed soils, drought, etc.),
- where supply is low, micronutrient fertiliser must be applied to demanding crops.

Boron (B) demanding crops: rape, beet, cabbage, lupin and lucerne, as well as potatoes, maize.

Copper (Cu) demanding: wheat, barley, oats, flax.

Manganese (Mn) demanding: wheat, oats, beet, rye, barley, rape, potatoes.

Zinc (Zn) demanding: maize, beet, potatoes, flax, grasses.

Micronutrient fertilisers only give a yield increase if the plants are supplied with nitrogen, phosphorus, potassium and secondary plant nutrients.

Agronomic exploration of soils

https://www.vaad.gov.lv/en/soil-agrochemical-analysis