

JOB ROLE – GARDENER

Sector – Agriculture

(Qualification Pack Code: AGR/Q0801)

PPT's for Class XI



PSS Central Institute of Vocational Education
Shyamla Hills, Bhopal – 462 013, Madhya Pradesh, India

www.psscive.ac.in

UNIT 5: SOIL MANAGEMENT AND FIELD PREPARATION

Session 2: Soil Reclamation or Improvement

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Session Objectives

The student will be able to :

- Describe acidic and alkali soil.
- Demonstrate soil sampling and testing.

Introduction

Soils that are more acidic, alkaline or saline in nature are not desirable for cultivation of crops. Such soils do not favour desirable nutrient supply to plants or support beneficial activities of microbes. Acidic soils are mostly found in areas receiving high rainfall, which causes leaching of bases or salts. Saline and alkaline soils are mostly found in arid and dry regions, where the rate of evaporation is high.

Causes of Acidic Soil

- Soils developed from acidic rocks like granite are acidic in nature.
- Application of Ammonium sulphate and Ammonium chloride as fertilisers also causes increase in soil acidity.

Effects of soil acidity on plants

- Soil acidity has a toxic effect on root tissues.
- It adversely affects beneficial soil microorganisms.
- Soil acidity lowers calcium and potassium content in the soil.
- Aluminium, manganese and iron are highly soluble in acid medium, and thus, become toxic.

Correction of soil acidity

Soil acidity can be corrected by liming. Lime is applied into soil at the time of land preparation or in ploughed land. About 1,500 kg lime per hectare is required to raise the pH of the soil by one unit. Limestone, burnt lime or slaked lime can be used to correct the acidity of the soil. Lime increases phosphorus, nitrogen, potassium and molybdenum content in the soil.

Saline and Alkaline Soil

Saline soil

In such a soil, a white layer of salts is commonly seen on the surface. This is due to the presence of excess chlorides and sulphates of sodium, calcium and magnesium. It contains enough soluble salts to interfere with the growth of most crop plants. The presence of exchangeable sodium is less than 15 per cent and the pH is below 8.5.

Saline-alkaline soil

Such soil contains adequate quantity of soluble salts. Exchangeable sodium is more than 15 per cent in the soil. The pH of saline-alkaline soil is 8.5 or more.

Saline and Alkaline Soil

Alkaline soil

Alkaline soil is poor in aeration and drainage. The Ph of such soil is 8.5 – 10. The presence of exchangeable sodium is more than 15 per cent. The high sodium content present in the soil is often toxic for crop growth.

Causes of soil salinity

- Arid and dry conditions
- High water table
- Sloppy land that washes out salts in catchment areas
- Irrigation with saline water
- Poor drainage

Saline and Alkaline Soil

Reclamation methods

- The application of gypsum (Calcium sulphate) is effective for the improvement of alkaline or sodic soil.
- Saline soil can be improved by ensuring effective drainage system.
- Scrapping off surface salts from highly saline patches is beneficial for the soil.
- Use of acidifying fertilisers, e.g., superphosphate and Ammonium sulphate is also beneficial.
- Green manuring with *dhaincha*, *sunhemp*, *mung* bean, or addition of organic matter reduces the salinity of the soil.

Soil Testing and Soil Sampling

Soil testing

Soil testing helps ascertain the status of various nutrients, soil fertility level, pH, etc. It is important to know the fertility status and physical properties of a soil for maximum production and rational soil management. A complete soil test programme essentially consists of three basic steps.

- (i) Soil sampling
- (ii) Soil testing
- (iii) Soil test interpretation

Soil Testing and Soil Sampling

Purposes of soil testing

- It helps in the evaluation and improvement of soil productivity.
- It helps determine the nature of the soil, i.e., alkaline, saline or acidic.
- It helps ascertain the use of fertilisers and manures, and their dosage in order to improve the fertility of the soil.
- It reveals the actual condition of the soil so that it can be improved with the application of nutrients and other management practices .

Soil Testing and Soil Sampling

Soil sampling

The field from where the sample is to be collected must be divided into different sections, according to variations in slope and texture, and separate samples must be collected from each section. By using various sampling tools, such as soil auger, soil tube, spade, etc., the sample must be collected from plough depth, i.e., 15 cm for normal agronomic crops and from deeper zones, i.e., 15-30 cm for deep-rooted and horticultural crops at different spots, and then, all must be mixed thoroughly. This composite soil sample is then spread on a clean sheet. It is divided into four equal parts. Two opposite quarters are rejected and samples from the other two are mixed.

Soil Testing and Soil Sampling

Soil sampling

To obtain the desired size of the sample (500 g), the same procedure is repeated. Before sending the sample to a laboratory, it must be dried and put into plastic bags. The bags, containing the samples, must be labelled and sent to the nearest soil testing laboratory of the Department of Agriculture, ICAR institutes, KVKs and SAUs, along with an information sheet.

Soil Testing and Soil Sampling

Soil sampling

Information sheet required for soil testing

- Name and address of the farmer
- Identification or number of the field
- Date of sampling
- Local name of the soil, if any
- Colour of the soil (dry and moist)
- Type of land (unirrigated, irrigated, waterlogged)
- Source of irrigation (canal, well, tank)
- Depth of sampling
- Topography (level, sloppy , undulated)

Soil Testing and Soil Sampling

Soil sampling

Information sheet required for soil testing

- Crop rotation followed
- Previous crop
- Next crop to be cultivated
- Details of manures or soil amendments applied earlier
- Any other remark

Soil Testing and Soil Sampling

Sample analysis

The collected sample is analysed by using standardised method in a laboratory for the following parameters.

- pH (indicates whether the soil is acidic, alkaline or neutral in nature)
- Presence of total soluble salts
- Organic carbon, which is a measure of nitrogen content in the soil
- Available nitrogen, phosphorus and potassium content in the soil

Soil Types on the Basis of Soil pH

Soil test interpretations

Based on the soil analysis, data can be interpreted with the help of ratings as given in the following tables.

S. No.	Soil type	Soil reaction(pH)
1.	Acidic	Below 6.0
2.	Neutral	7.0
3.	Neutral to saline	7.0- 8.5
4.	Tending to alkaline	8.6- 9.0
5.	Alkaline	Above 9.0

Soil Types on the Basis of Soil Electro-conductivity (EC)

S. No.	Soil type	ECe (dSm ⁻¹)
1.	Normal	Below 1.0
2.	Critical for germination	1.0-2.0
3.	Critical for the growth of salt sensitive crops	2.0- 4.0
4.	Injurious to most crops	Above 4.0

Rating of Soil on The Basis of Nutrient Availability

S.N.	Nutrient	Low	Medium	High
1.	Organic carbon	Below 0.5%	0.5-0.75%	Above 0.75%
2.	Available nitrogen (N)	Below 280 kg/ha	280-560 kg/ha	Above 560kg/ha
3.	Available phosphorus (P)	Below 10kg/ha	10-25 kg/ha	Above 25kg/ha
4.	Available potassium (K)	Below 110 kg/ha	110-280 kg/ha	Above 280 kg/ha

Summary

In this session you have learnt about the acidic and alkali soil, effect of soil acidity on plant, reclamation method of saline and alkaline soils, soil sampling and soil test interpretations.

Project Coordinator : Dr. Rajiv Kumar Pathak

Assistance

Dr. Narendra Vasure

Dr. Sanvar Mal Choudhary



Joint Director

**PSS Central Institute of Vocational Education
Shyamla Hills, Bhopal – 462013 , Madhya Pradesh, India**

E-mail: jdpsscive@gmail.com

Tel. +91 755 2660691, 2704100, 2660391, 2660564

Fax +91 755 2660481

Website: www.psscive.ac.in