Article: RT0341

Biotica Research Today

Vol 2:9 944/945

2020

Some Major Problematic Soils and Their Management

Kumar Chiranjeeb[1*], Vivek Kumar[2], Priyanka Kumari[3] and Abhisek Pal[1]

[1]Dept. of Soil Science and Agricultural Chemistry, GIET University, School of Agriculture, Gunupur, Rayagada, Odisha (765022), India

[2]Dept. of Soil Science, Dr. Rajendra Prasad Central Agricultural University, Pusa, Samastipur, Bihar (848 125), India

[3]Dept. of Soil Science and Agricultural Chemistry, Bihar Agricultural University, Sabour, Bhagalpur, Bihar (813 210), India

Open Access

Corresponding Author

Kumar Chiranjeeb

e-mail: kumar.chiranjeeb3@gmail.com

Keywords

ESP, pH, Problematic Soils, SAR

Article History

Received in 22nd September 2020

Received in revised form 23rd September 2020

Accepted in final form 24th September 2020

E-mail: *bioticapublications@gmail.com*

How to cite this article?

Chiranjeeb *et al.*, 2020. Some Major Problematic Soils and Their Management. Biotica Research Today 2(9): 944-945.

Abstract

A soil provides nutrients and other essential requirements for normal plant growth. A fertile soil with no major constraints can give maximum output. Problematic soils (saline soils, sodic soil, acid and acid sulphate soil, saline sodic soil, etc.) are different from normal soils with certain limitations for plant growth. Excess salinity level, Sodium content that leads to deflocculation and high acidity level all these are harmful for normal plant growth. Correction methods such as scrapping, leaching, profile inversion, organic matter applications, liming, gypsum, etc. are applied in case of these soils along with suitable cropping systems are necessary.

Introduction

Soil is a three dimensional body which provides nutrients and medium for plant growth also contains a lot of microbes, hence called living entity. Soil contains mineral matter (45%), organic matter (5%), air (25%) and water (25%) on different proportions. Normal or arable soils are favorable for cultivation practices as these soils are fertile in nature. Problematic soils are having certain limitations or constraints which make them unfavorable for normal cultivation practices to carry out. The problems like increased salt content, deflocculation, loss of organic matter content, nutrient deficiency and reduction in plant growth due to acidic environment etc. Prolonged problematic situations leads to decline in soil health status thus reduce production. To overcome the food deficiency status of any nation the problematic soils should be corrected or managed properly.

Characteristics of Some Problematic Soils

The problematic soils are having a long potential list but some major problematic soils are defined below.

1. Saline Soil

Saline soils contain chloride, sulphate salts of calcium, magnesium in its solutions. Arid and semiarid climates are favorable for this soil. These soils are called "**Thur**" in Punjab, "**Reh**" in Uttar Pradesh and "**Luni**" in Rajasthan. Salts when deposited on upper surface of soil white efflorescence is seen, so called "**white alkali soils**" or "**solonchaks**". EC-Electrical conductivity (dSm^{-1}) is more than 4.0, SAR (Sodium adsorption ratio) <13, ESP (Exchangeable sodium percentage) <15, pH <8.5 and can be suitable for cultivation with limited restrictions (Figure 1).

2. Sodic Soil

Sodic or alkali soils are excess in sodium salt content in soil. Sodic soils appear brown-black when large amount of organic matter added on surface and called

"**black alkali soil**"; also called "**Kallar**" in Punjab, "**Usar**" in Uttar Pradesh. EC-Electrical conductivity (dSm^{-1}) is < 4.0, SAR (Sodium adsorption ratio) >13, ESP (Exchangeable sodium percentage) >15, pH >8.5 and can be suitable for cultivation with corrections.

Figure 1: Saline Soil-White salt Patches

3. Acid and Acid Sulphate Soil

Acid soils are having low pH conditions (<6.5) and are acidic in nature deprive of basic cations in soil. Acid sulphate soils are having extreme low soil pH (<4.0) and harmful for some crops to be grown on this soil. Acid sulphate soils are called "**Cat clay soils**".

4. Saline Sodic Soil

These soils behave more like sodic soil and also contain free soluble salts in it. pH <8.5, EC-Electrical conductivity (dSm^{-1}) is >4.0, SAR (Sodium adsorption ratio) >13, ESP (Exchangeable sodium percentage) >15 and can be suitable for cultivation with corrections.

Management of Problematic Soils

1. Saline Soil

• **Leaching:** Good quality of water when applied, helps in leaching of soluble salts down the root zone thus minimize the salt content (Figure 2).

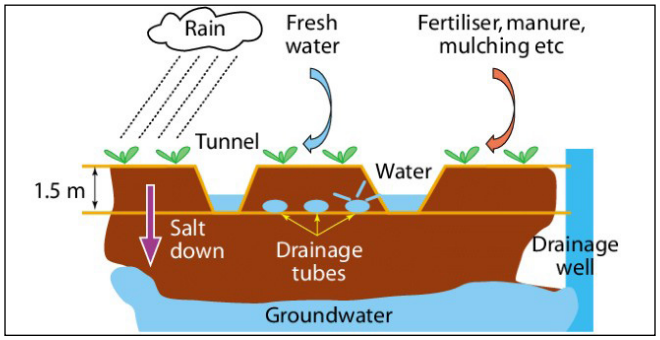

Figure 2: Leaching of Saline soils to remove salts (Liu and Tian, 2000)

• **Scrapping:** Surface scrapping and removal of salts by some instruments.

• **Profile inversion:** Surface layer when inverted down actually reduce the salt content in surface layer.

2. Sodic Soil

• **Application of Gypsum:** Gypsum when applied exchanges sodium from clay colloids and add calcium on it. Removal of sodium creates flocculation and lowers the pH.

• **Application of Organic matter:** Organic matter is the pool of different cations and anions in it. Some basic cations like calcium exchanges sodium from clay colloids and improve the soil structure also.

3. Acid and Acid Sulphate Soil

• **Liming:** Liming of acid soils with Limestone, Calcium oxides and hydroxides etc help in removal of acidic cations from clay complexes in exchange of calcium and other basic cations thus acidity can be corrected.

• **Growing suitable crops:** The crops (Rice, sorghum etc) those can tolerate acidity are grown on this soil.

4. Saline Sodic Soil: Control measures for sodic soils are applied for this soil with leaching. Ridge sowing of crops along with application of gypsum actually improved the soil chemical properties like reduction in electrical conductivity, sodium absorption ratio and pH.

The FYM should be applied well before crop selection and sowing in the field as it will be helpful in increasing infiltration so that soil salt removal increases as well as increases the yield of the crop.

Conclusion

Problematic soils can be managed by different mechanisms and enhanced production capacity can be achieved. Good quality irrigation water with balanced application of chemicals along with organic matter application is very much important in case of correction of soil basic problems.

References

Sathyanarayana, E., Kumar, M.S., 2018. Soil science treatise (1st ed.). India, Jaya Publications.

Liu, X., Mao,R., Bai, P., Luo, C., 2002. Reclaiming the saline soils of Nanpi County: turning knowledge into practice. In: McVicar, T.R., Li Rui, Walker, J., Fitzpatrick, R.W. and Liu Changming (eds), *Regional Water and Soil Assessment for Managing Sustainable Agriculture in China and Australia, ACIAR Monograph No*. 84, 366–370.