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Experiment No 5: Determination of gypsum requirement of alkali soils (Schoonover 1952)

Dr. Arunabha Pal



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Theory

The reclamation of alkali soil (pH in water suspension exceeding 8.5) requires gypsum treatment for replacement of sodium ions from the exchange complex. The sodium so released has to be leached out by flooding. The gypsum requirement can be determined by adding a known excess of saturated solution of gypsum ($\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$) to soil and estimating its unreacted amount by EDTA (versenate) titration.



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Reagents

Saturated calcium sulphate solution: About 5g of pure $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$ taken in one liter of distilled water shake mechanically for 10 minutes and filtered it through ordinary filter paper.

Ammonium chloride-ammonium hydroxide buffer of pH 10 : 67.5 g pure ammonium chloride dissolved in 570 mL of concentrated ammonia solution (sp. Gr. 0.88) and diluted to one liter with distilled water and adjusted to pH 10 (Caution : Liquid ammonia should be refrigerated before opening the bottle).

Eriochrome black T indicator: 0.5 g of eriochrome black T (EBT) and 4.5 g of hydroxylamine hydrochloride (AR) dissolved in 100 mL of 95% ethyl alcohol.

0.01 N calcium chloride solutions: 0.500 g of AR grade calcium carbonate taken in little excess of AR HCl (about 10 mL of dil. acid) and the solution made up to one liter with distilled water.

Standard versenate (EDTA) solution 0.01 N : 2.0 g of ethylene diamine- tetra acetic acid disodium salt and 0.05 g of MgCl_2 (AR) dissolved in water and diluted to 1 liter; the solution to be standardized against 0.01 N calcium chloride.



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Procedure

5g of soil is taken in a 250 mL conical flask to which 100 mL of the saturated CaSO_4 solution is poured in, shaken for 5 minutes and filtered through Whatman No.1 filter paper. After rejecting first few mL, 5mL of the extract is pipetted into a 100 mL flask or porcelain dish and diluted to about 25 mL with distilled water. One mL of $\text{NH}_4\text{Cl} - \text{NH}_4\text{OH}$ buffer and 3 to 4 drops of Eriochrome black T indicator are added and titrated with the standard EDTA solution until the colour changes from wine red to blue. Similarly, 5 mL of the saturated CaSO_4 solution is titrated separately to determine the Ca concentration



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Calculation:

normality of the EDTA X mL of the EDTA X 1000

Ca (meL⁻¹) = -----

mL of saturated CaSO₄ Solution taken

= -----

normality of the EDTA X mL of the EDTA X 1000 Ca
+ Mg (meL⁻¹) -----

mL of soil extract (filtrate) taken

= -----



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Gypsum requirement in meL^{-1} 100 g = [(Ca concentration in saturated gypsum solution (meL^{-1}) minus Ca – Mg concentration in filtrate (meL^{-1})] x 2

= -----

Gypsum requirement in metric tons (tonnes) per hectare (15 cm soil depth)

= 1.72 x G.R. (meL^{-1} 100 g of soil) x 2.24

= -----



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Observation: Students must complete your calculation with above formula and write proper conclusion.

Sample No	Gypsum Requirement (t ha⁻¹)	Conclusion
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1.

2.