

Prediction of Hydraulic Conductivity in Red and Lateritic Soils of West Bengal

B.G. Momin^{*1}, R. Ray² and S.K. Patra³

^{1,2}Department of Soil and Water Conservation,

³Department of Agricultural Chemistry and Soil Science

Bidhan Chandra Krishi Viswavidyalaya, Mohanpur,

Nadia-741 252, West Bengal

E-mail: *basandagmn@gmail.com

Abstract—Estimation of soil properties is an excellent tool for predicting the soil hydraulic conductivity. Soil samples were collected from 0-15, 15-30 and 30-45 cm depth from different topographical positions with variable cropping pattern from Purulia, Birbhum, Bardhaman, Bankura and Medinipur districts under Red and Lateritic zone of West Bengal. The objective was to assess the predictability of soil hydraulic conductivity as influenced by different physical and physicochemical variables of the soils. Mechanical separates, bulk density, particle density, water holding capacity, porosity, pH (1:2.5), electrical conductivity, organic carbon, CEC and hydraulic conductivity of soils were determined by standard procedures (Black, 1965; Jackson, 1973). Data set for soil parameters were statistically analyzed (Gomez and Gomez, 1983). Results showed that sand, silt and clay varied from 30.52 to 62.44%, 16.21 to 35.82% and 14.30 to 35.89%, respectively indicating sandy loam to clay loam in texture. Bulk density and water holding capacity of soils varied from 1.13 to 1.49 Mg/m³ and 70.20 to 77.50%, respectively. The corresponding values for pH, EC, organic carbon and CEC ranged from 5.40 to 6.60, 0.13 to 0.39 dS/m, 2.30 to 6.10 g/kg and 6.10 to 16.60 cmol(p+)/kg, respectively. These values were relatively higher in surface soils than in sub-soils. Hydraulic conductivity of the soils ranged between 18.22 to 28.27 cm/h. Hydraulic conductivity had significant positive correlations with porosity, EC, organic carbon and sand and significant negative correlations with pH, CEC, bulk density, WHC, silt and clay fractions. The regressive model ($HC=28.7+0.5 \text{ porosity}+26.5 \text{ EC}-0.5 \text{ CEC}-9.8 \text{ PD}+0.07 \text{ sand}$) developed keeping hydraulic conductivity as dependent variable and porosity, EC, CEC, particle

density and sand as the predictor variables could explain 91.4% variability of hydraulic conductivity of the soils.

References

- [1] Black, C. A. 1965. *Methods of Soil Analysis*. Part I and II. American Society of Agronomy, Inc., Madison, Wisconsin, USA.
- [2] Gomez, K. A. and Gomez, A. A. 1983. *Statistical Procedures for Agricultural Research*. 2nd Edn., Int. Rice Res. Inst., Los Banos, Philippines.
- [3] Jackson, M. L. 1973. *Soil Chemical Analysis*. Prentice Hall of India Pvt. Ltd., New Delhi.